Nutrition knowledge levels and nutritional supplement beliefs of professional karate athletes

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ABSTRACT

Aim: The aim of this study is to evaluate the relationship between the nutritional knowledge levels, nutritional supplement belief levels, and body mass indexes of professional karate athletes.

Material and Method: Professional karate athletes (1st Dan and above) attending various karate schools in the province of Ankara, Turkey, and volunteering to participate in the study were included in the study. A total of 106 sportspeople, 52 male and 54 female, with an age average of 24.08±6.54 years, participated in the study. The participants answered the Nutrition for Sports Knowledge Questionnaire and the Sports Supplements Belief Scale questions after the questionnaire in which their demographic and anthropometric characteristics were questioned.

Results: When the sportspeople's average nutrition knowledge level was examined, it was determined that they are at a weak level of knowledge (34.18±13.84) and that they are less prone to using doping and similar banned nutritional supplements (17.79±9.01) in terms of their approach to sports nutritional supplements. No statistically significant difference was found in terms of the sports supplements belief scale and the nutrition for sports knowledge questionnaire based on the sportspeople's sex, age, karate categories, training duration, and BMI (p>0.05).

Conclusion: Adequate and balanced nutrition habits are very important for sportspeople to have good physical performance as well as health. Clubs, coaches and sportspeople seeking success in national and international fields should cooperate with a nutrition expert.

Keywords: Combat sports nutrition, karate sports nutrition, nutrition knowledge, sports supplement, body mass index

INTRODUCTION

Combat sports represent approximately 25% of all Olympic games and include a wide variety of contact sports disciplines, in which two opponents with similar physical characteristics face each other in order to knock out the opponent or get more points than the opponent (1). Karate sport has also been included in the "Olympic Combat Sports" in recent years. Apart from karate, boxing, judo, taekwondo, fencing, and wrestling are also included in this group of sports (2). Karate is an ancient martial art that is thought to have emerged on the Japanese island of Okinawa and its origins date back to China. It is a martial art in which hands and feet are used to disperse and block beats. Karate aims to develop oneself physically with certain fighting techniques and to establish a balance between mind control and body and mind (3). Karate tournaments may include Kata and/or Kumite competitions, which may consist of individual and team components. Kata involves the use of predetermined techniques without direct confrontation, while Kumite involves free fighting with an opponent using the same techniques (4).

Exercise performance describes the efforts exerted by the sportsperson within the prescribed time to achieve a certain goal. In general, the concept of sportsperson is divided into two as professional sportsperson and amateur sportsperson. While professional sportspeople are people who perform sports as their profession and continue their lives thanks to the sports they are active in, amateur sportspeople are people who struggle for the sports they are interested in, with the purpose of winning, but without expecting financial return from their sports activities (5). Factors such as aerobic and anaerobic energy capacity, technique, tactical skills, and motivation affect sports results by helping sportspeople develop their potential in the field of sports (6). There are

numerous interactions between nutrition and exercise, and nutrition has a great influence on determining long-term exercise performance results. Sportspeople's nutrition has become a subject that attracts more and more attention in recent years, on which a lot of studies has been performed. Accordingly, it is an area where sports scientists, sportspeople, their families, and coaches should have accurate and sufficient information. The most important goal in sportspeople's nutrition is to protect and improve the general health of the sportsperson, to increase his performance, and to make the sportsperson have an adequate and balanced diet depending on his age, sex, energy expenditure, physical activity, and dietary habits (7). Sportspeople consist of a population with special nutritional needs. With proper body composition and proper nutrition, it is ensured that the sportsperson can train more and longer, while at the same time, with faster recovery, the risk of fatigue, illness, and injury is reduced and his athletic performance is increased (8). Evidence-based sports nutrition principles should be applied to optimize the health and performance of sportspeople. Inadequate intake of macronutrients and micronutrients may lead to decreased training adaptation of the sportsperson, decreased performance, and increased risk of injury and disease (9). Increasing sportspeople's nutrition knowledge is of great importance in improving their nutritional behavior (10). Sports nutritionists aim to increase sportspeople's sports performance by increasing their nutrition knowledge levels in order to make positive changes in their food consumption (7). Nutrition education programs are developed to increase nutrition knowledge in order to consume adequate and balanced food, improve health status and provide higher athletic performance for sportspeople. Sportspeople's nutrition knowledge is generally similar or better than the general population (11). Nutrition knowledge is one of the determinants of dietary behaviors and affects individuals' food intake levels. As with all individuals, correct nutrition knowledge enables sportspeople to make informed decisions about their health (12). The increase in sportspeople's nutrition knowledge is associated with an increase in their performance levels by gaining healthier dietary habits. However, many factors including sex, age, socio-demographic characteristics, and educational level are defined as demographic factors affecting nutrition knowledge. In studies on sportspeople, there are some studies showing that factors that can increase focus on food intake, especially athletic ability, type of exercise, and physical capacity, are associated with nutrition knowledge (7,13,14).

Nutritional supplements are used by sportspeople for the purpose of protecting health, meeting appropriate energy and nutrient needs, eliminating or preventing nutrient deficiencies, directly increasing performance or providing support for training, reducing the risk of injuries and diseases, and achieving an indirect performance increase as a result of accelerating the recovery process and improving the mood. Some supplements, when used properly, can help sportspeople meet their nutrition goals and provide performance enhancement (15,16).

It is known that there is a strong interaction between training and nutrition, and nutrition plays an important role in adaptation to training so that sportspeople can achieve high-level exercise performance. The aim of this study is to evaluate the relationship between the nutritional knowledge levels, nutritional supplement belief levels, and body mass indexes of professional karate athletes. Although there are studies on nutrition knowledge levels and the use of nutritional supplements in other sports branches in the literature, no research is found on karate athletes, so it is thought that this study will shed light on the literature.

MATERIAL AND METHOD

The study was carried out with the permission of Ankara Medipol University, Noninvasive Clinical Researches Ethics Committee (Date: 03.12.2021, Decision No: 56). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

Study Design and Participants

The study was carried out with the sportspeople aged 18 and over who volunteered to participate in the study and professionally engage in karate, and live in Ankara between December 2021 and January 2022. The sportspeople included in the study were selected from two different centers. A total of 106 karate athletes, 52 male and 54 female participated in the study. The study data were collected using the face-to-face survey technique. After informing the participants about the purpose of the study consent was obtained for each individual.

Instruments

The participants answered the Nutrition for Sports Knowledge Questionnaire (17) and the Sports Supplements Belief Scale (18) questions after the questionnaire in which their demographic and anthropometric characteristics were questioned.

The Demographic, Health, Nutrition Information and Anthropometric Measurements

In the first part of the questionnaire applied face-to-face to individuals who volunteered to participate in

the study, the individuals were asked questions about their age, sex, duration of performing karate, seniority, karate category, number of trainings per week, and training duration, educational level, nutritional education status, and the person from whom they receive training, their state of thinking whether their nutritional knowledge is sufficient or not, the amount of water consumed daily, the amount of water consumed during training, the use of nutritional supplements, their state of thinking whether their nutrition is sufficient or not, smoking status, number of main and snack meals per day, frequency of eating out. The body mass index of all individuals participating in the study was calculated by dividing the body weight (kg) reported by the participants by the square of the height (m) (BMI=kg/m²). According to the World Health Organization (WHO), 18.5 kg/m² of BMI is classified as underweight, 18.5-24.9 kg/m² as normal, and 25 kg/m² and above as overweight (19).

The Nutrition for Sports Knowledge Questionnaire (NSKQ)

The questionnaire, originally named "The Nutrition for Sports Knowledge Questionnaire" (NSKQ), which was developed by Trakman et al. in 2017 to evaluate the nutrition knowledge of adult sportspeople, composes of a total of 89 items and the reliability coefficient (Cronbach's Alpha) was found to be 0.906 (17). In the Turkish validity and reliability study of the Nutrition for Sports Knowledge Questionannaire (NSKQ) conducted by Çırak and Çakıroğlu (2019), The use of the questionnaire in the evaluation of the Turkish sportspeople's nutrition knowledge was found appropriate and recommended (20). The scoring information of the questionnaire was obtained from Çakıroğlu herself, and according to the information received, the overall performance in NSKQ (68 items were accepted as a total of 100) is evaluated using the scoring system as "poor" knowledge (0-49%), "average" knowledge (50-65%), "good" knowledge (66-75%), and "excellent" knowledge (76-100%). In this study, the Cronbach's alpha coefficient of the questionnaire was found to be 0.859.

The Sports Supplements Belief Scale

The validity, reliability, and validation study of the scale, orginally named The Sports Supplements Belief Scale (18) was conducted by Karanfil et al. (21). The scale is a 6-point Likert-type scale consisting of six questions. The scale items are in the form of -1- strongly disagree, -6- strongly agree. The lowest score that can be obtained from the scale can be calculated as 6 points by giving the answer I strongly disagree -1-, and the highest possible score can be calculated as 36 points by giving the answer I strongly agree -6- to all questions.

Statistical Analysis

SPSS for Windows, version 24.0, was used to analyze the data (SPSS Inc., Chicago, IL, United States). Frequency tables and descriptive statistics were used to interpret the findings. For the measurement values suitable for normal distribution, parametric methods were used. In accordance with the parametric methods, while the "Independent Sample-t" test (t-table value) method was used to compare the measurement values of two independent groups, the "ANOVA" test (F-table value) method was used to compare three or more independent groups. For the measurement values not suitable for normal distribution, the non-parametric methods were used. In accordance with the non-parametric methods, while the "Mann-Whitney U" test (Z-table value) method was used to compare the measurement values of two independent groups, the "Kruskal-Wallis H" test ($\chi 2$-table value) method was used to compare three or more independent groups. The "Spearman" correlation coefficient was used to examine the relationship between two quantitative data not having a normal distribution. The Binary Logistic Regression: Backward LR model was used to determine the factors affecting poor knowledge status.

RESULTS

The general characteristics and dietary habits of the participants are given in **Table 1**. It was determined that 54 individuals (50.9%) were female, 41 (39.6%) were in the 21-25 age group, 42 (39.6%) had been practicing karate for 6-10 years, and 60 (56.6%) were 1st Dan. It was determined that 61 individuals (57.6%) performed Kumite, 38 (35.7%) trained 3 days a week, 75 (70.8%) spent 2 hours in training, and 60 (56.6%) had high school/equivalent educational level. It was determined that 86 individuals (81.1%) were single, 83 (78.3%) did not receive education on nutrition, 16 (69.6%) received education on nutrition from a dietitian, and 46 (43.4%) considered their nutrition knowledge insufficient. It was determined that 100 individuals (94.3%) thought that nutrition and sports were closely related, 54 (50.9%) had 3 main meals, 53 (50.0%) had 2 snacks and 62 (58.5%) did not skip meals. It was determined that 21 individuals (47.7%) skipped lunch, 25 (56.8%) skipped meals due to lack of appetite, 63 (59.4%) ate out 1-4 times a week, and 52 (49.1%) had 2-3 liters of water daily. It was determined that 64 individuals (60.4%) consumed 1-1.5 liters of water during training, 12 (11.3%) used supplements, 80 (75.5%) had a BMI in the normal range, and 92 (86.8%) had an average/good nutritional status (**Table 1**).

Table 1. Distribution of socio-demographic findings and dietary habits of individuals					
Variable (n=106)	n	%	Variable (n=106)	n	%
Sex			Marital status		
Female	54	50.9	Single	86	81.1
Male	52	49.1	Married	20	18.9
Age [x-±SD→24.08±6.54 (years)]			Nutrition and sport relationship		
≤20	37	34.9	Closely related	100	94.3
21-25	41	38.7	Unrelated	6	5.7
>25	28	26.4	Daily water consumption		
Duration of performing karate [x⁻±SD→9.75±6.29 (years)]			1 liter	41	38.7
≤5	29	27.4	2-3 liters	52	49.1
6-10	42	39.6	>3 liters	13	12.2
>10	35	33.0	Water consumption during training		
Seniority			0.5 liter	33	31.2
1st Dan	60	56.6	1-1.5 liters	64	60.4
2nd Dan	27	25.5	>1.5 liters	9	8.4
3rd Dan and over	19	17.9	Use of nutritional supplements		
Karate category			Yes	12	11.3
Kata	17	16.0	No	94	88.7
Kata and Kumite	28	26.4	BMI [x-±SD→22.4±3.31 (years)]		
Kumite	61	57.6	Underweight	8	4.7
Number of training per week			Normal	80	75.5
1 day	2	1.9	Overweight	17	16.0
2 days	9	8.5	Obese	4	3.8
3 days	38	35.8	Nutritional status assessment (self-assessment)		
4 days	29	27.4	Bad	14	13.2
5 days or more	28	26.4	Average/good	92	86.8
Training duration			Nutritional education status		
1 hour	21	19.8	Yes	23	21.7
2 hours	75	70.8	No	83	78.3
3 hours	7	6.6	The person from whom education on nutrition is taken		
4 hours or more	3	2.8	Coach	6	26.1
Educational level			Dietician	16	69.6
High school and equivalent	60	56.6	Doctor	1	4.3
Undergraduate	41	38.7	Nutrition knowledge (is it self-reported)		
Master's degree	3	2.8	Not sufficient	46	43.4
Doctoral degree	2	1.9	Sufficient	42	39.6
			No idea	18	17.0

The scale scores of the answers given by the individuals to the scales are given in **Table 2**. It was determined that the answers given by the individuals to the scales were generally at a high reliability level. When the average nutrition knowledge level of the sportspeople was examined, it was determined that they have poor knowledge (0-49%) and that they may be less prone to using doping and similar banned nutritional supplements in terms of their approach to sports nutritional supplements (**Table 2**).

No statistically significant difference was found in terms of the sports supplements belief scale and nutrition for

sports knowledge questionnaire scores depending on sex, age, karate categories, training duration, and BMI classification of the sportspeople (p>0.05) (**Table 3**).

Table 2. Distribution of findings on scales					
Scales (n=106)	Average	Standard deviation	Median	Min	Max
The sports supplements belief scale	17.79	9.01	18.0	6.0	36.0
The nutrition for sports knowledge questionnaire	34.18	13.84	36.0	0.0	69.1

Table 3. Comparison of the sports supplements belief scale and nutrition for sports knowledge questionnaire scores depending on some characteristics of the karate athletes

Variable	n	The sports supplements belief scale		The nutrition for sports knowledge questionnaire	
		x̄±SD	Median [Min-Max]	x̄±SD	Median Min-Max]
Gender					
Female	54	17.68±8.51	18.0 [6.0-36.0]	33.55±14.06	36.0 [0.0-63.2]
Male	52	17.91±9.59	17.5 [6.0-36.0]	34.84±13.70	35.3 [0.0-69.1]
Analysis*		Z=-0.006		t=-0.478	
Possibility		p=0.995		p=0.633	
Age grades					
≤20	37	18.40±9.09	18.0 [6.0-36.0]	33.14±13.65	38.2 [0.0-63.2]
21-25	41	16.75±9.08	14.0 [6.0-36.0]	32.17±12.77	33.8 [0.0-52.9]
>25	28	18.50±8.98	19.0 [6.0-36.0]	38.49±15.07	38.9 [1.5-69.1]
Analysis		χ2=1.170		χ2=3.081	
Possibility		p=0.557		p=0.214	
Category					
Kata	17	15.59±9.07	12.0 [6.0-36.0]	37.19±8.36	36.8 [22.1-52.9]
Kata&kumite	28	19.11±9.71	20.5 [6.0-36.0]	35.24±16.11	36.8 [0.0-69.1]
Kumite	61	17.80±8.69	18.0 [6.0-36.0]	32.86±13.96	33.8 [0.0-63.2]
Analysis		χ2=1.416		F=0.761	
Possibility		p=0.493		p=0.470	
Training duration					
1 hour	21	17.95±8.36	19.0 [6.0-30.0]	29.97±15.92	30.9 [1.5-69.1]
2 hours	75	17.48±8.92	16.0 [6.0-36.0]	34.76±13.58	36.8 [0.0-64.7]
3 hours and more	10	19.80±11.63	22.5 [6.0-36.0]	38.68±9.33	38.2 [22.1-52.9]
Analysis		χ2=0.278		F=1.583	
Possibility		p=0.870		p=0.210	
BMI					
Underweight	8	18.80±8.67	18.0 [6.0-30.0]	26.18±16.09	29.4 [1.5-42.7]
Normal	80	17.96±9.15	19.0 [6.0-36.0]	34.50±12.28	35.3 [0.0-64.7]
Overweight/obese	21	16.90±8.90	14.0 [7.0-36.0]	34.88±18.46	38.2 [0.0-69.1]
Analysis		χ2=0.070		F=0.883	
Possibility		p=0.965		p=0.417	

*While the "Independent Sample-t" test (t-table value) was used to compare two independent groups with normal distribution in terms of the measurement values, the "ANOVA" test (F-table value) method was used to compare three or more independent groups. The "Mann-Whitney U" test (Z-table value) was used to compare two independent groups without normal distribution in terms of the measurement values, the "Kruskal-Wallis H" test (χ2-table value) method was used to compare three or more independent groups.

When the relationship between the answers given by the karate athletes participated in the study to the scales used in the study and the body mass index was examined, it was determined that there is no statistically significant relationship between the scales and BMI (kg/m²) values (p>0.05) (**Table 4**).

As a result of the Backward: LR logistic regression analysis conducted in the scale in which the sportspeople's nutrition knowledge was measured, using estimated parameters that may have any effect, based on poor knowledge level (0-49%), the optimal model is given in the table. In the current model, age (year) was determined to be an important parameter (p=0.004<0.05). As age increases by 1 unit, the risk of poor knowledge will decrease by 20.8% (OR=0.792). Karate duration (year) was determined to be an important parameter (p=0.004<0.05). As the time to practice karate (years) increases by 1 unit, the risk of poor knowledge will increase by 24.5% (OR = 1.245). The amount of water (liter) consumed during training was determined to be an important parameter (p=0.040). As the amount of water (liter) consumed during training increases by 1 unit, the risk of poor knowledge will decrease by 77.2% (OR=0.228) (**Table 5**).

Table 4. Investigation of the relationships between the scales and BMI (kg/m²) values

Correlation* (n=106)		BMI (kg/m²)
The sports supplements belief scale	r	-0.005
	p	0.956
The nutrition for sports knowledge questionnaire	r	0.050
	p	0.608

* The "Spearman" correlation coefficient was used to examine the relationship between two quantitative data that did not have a normal distribution.

Table 5. The Logistic Regression model formed on weak knowledge level

Variable	B	S.H.	Wald	sd	p	OR	95% Confidence Interval (OR)	
							Min	Max
Age (year)	-0.233	0.081	8.337	1	0.004	0.792	0.676	0.928
Karate duration (year)	0.219	0.090	5.887	1	0.015	1.245	1.043	1.486
Training water (liter)	-1.479	0.721	4.200	1	0.040	0.228	0.055	0.938
Fixed	7.810	1.950	16.044	1	0.000	24.216		

CCR=90.6%, χ2(8)=3.293; p=0.857

DISCUSSION

Genetic structure, appropriate training programs, and nutrition are the main factors affecting sportspeople's performance. The recent increase in interest in sports nutrition can be attributed to the fact that nutrition improves performance (22). For sportspeople, nutrition knowledge covers all of the nutrition-related practices and strategies specific to sports performance. A sportsperson should have sufficient nutrition knowledge by considering its importance on performance, recovery, and health while making daily food choices (23, 24). As a result of this study, it was determined that the nutrition knowledge level of karate athletes was poor (34.18±13.84). Additionally, it was determined that as the age of karate athletes increases, the level of nutrition knowledge increases; and as the duration of karate practice increases, the risk of poor knowledge increases. When the sportspeople in the study were evaluated according to the karate type (Kata and Kumite), it was determined that there was no difference in terms of nutrition knowledge. In addition to this, no relationship was found between the body mass indexes of the sportspeople and their nutrition knowledge levels. It was stated that the participants who received nutrition training received nutritional advice and information from a dietitian (69.6%), a trainer (26.1%) and a doctor (4.3%), respectively. In a study evaluating the nutrition knowledge levels of one hundred and ten professional sportspeople, it was determined that 5.4% of the participants had good and moderate nutrition knowledge, while 94.6% of the participants had insufficient nutrition knowledge. Additionally, similar to this study, no relationship was found between the body mass indexes of the sportspeople and their nutrition knowledge levels (25). In the study conducted by Devlin et al. (7) on 66 participants, the average nutrition knowledge score for all participants was 69.9 ± 11.9 (57%) out of 123 points. In a study conducted in Lebanon, the nutrition knowledge of basketball players was questioned and it was determined that only 20% of the sportspeople had sufficient nutrition knowledge (26). In a study conducted on football players, it was determined that most of the sportspeople (79.2%) had insufficient knowledge of sportspeople's nutrition (27). In a systematic review of 36 studies on the nutrition knowledge of sportspeople and coaches by Trakman et al. (14) supporting the results of this study, it was concluded that older participants had better general nutrition knowledge.

Sportspeople believe that more nutritional supplement consumption is necessary to manage compelling training efforts, maximize recovery, improve performance and/ or prevent disease and maintain overall health (28). Although the use of nutritional supplements is often preferred by sportspeople to increase performance,

the use of prohibited substances to increase physical performance is called doping. Doping use is ethically and legally wrong. For this reason, sportspeople should not use supplements that fall into the doping class (29). For this reason, it is important to increase the knowledge level of sportspeople about nutritional supplements. In a study involving 567 athletes in Canada, it was determined that 98% of the athletes used nutritional supplements (30). Creatine is in the category of nutritional supplements with performance-enhancing effects (31). Creatine is one of the most used supplements by sportspeople (32). Creatine's effects such as increasing exercise capacity, increasing adaptation to training, and providing faster recovery make it available as an ergogenic aid (33). Supporting this information, Claudino et al. (34) found that creatine supplementation prevented the training-induced gradual decrease in lower extremity performance during pre-season progressive training in professional elite football players. L-Carnitine is known as one of the supplements with supportive effects for body-weight loss. L-carnitine provides a decrease in body weight with the energy conversion it performs by contributing to fat oxidation and backing up muscle glycogen during exercise (35). In this study, 88.7% of professional karate athletes do not use any nutritional supplements. As a result of this study, it was determined that individuals are less prone to using doping and similar banned nutritional supplements in terms of their approach to sports nutritional supplements (17.79±9.01). It was determined that those who use nutritional supplements (n=11) prefer to use multivitamins, protein powder, creatine, and L-carnitine. Since the rate of use of nutritional supplements by the sportspeople is relatively low compared to the literature and it was determined that people may be less prone to the use of doping and similar prohibited nutritional supplements in terms of their approach to sports nutritional supplements, it is thought that the professionalism of the sportspeople and the sports branch may have affected this situation.

CONCLUSION

Adequate and balanced nutrition habits are very important for sportspeople to have good physical performance as well as health. Nutrition knowledge is one of the determinants of dietary behavior and affects individuals' food intake. The fact that sportspeople have adequate nutrition knowledge enables them to make informed decisions about their health. Inadequate nutrition knowledge of sportspeople, on the other hand, negatively affects their dietary habits and diet quality, leading to a decrease in their sportive performance. It is important to establish education on nutrition programs in order to increase sportspeople's knowledge in this

field and to positively affect their nutritional habits and accordingly to improve their sportive performance. In addition to determining the nutrition knowledge level of sportspeople, other issues that they lack should be determined and training should be given on these issues. Rational use of nutritional supplements can support the sportsperson in case of an insufficient nutrient intake. Incorrect or prohibited substance use can cause sportspeople to end their sports lives. For this reason, it is important for sportspeople to have sufficient knowledge about the correct use of nutritional supplements when needed. Sportspeople, need to be trained about nutrient intake and timing before, during, and after exercise to maximize their performance. Clubs, coaches and sportspeople seeking success in national and international fields should cooperate with a nutrition expert. At this point, it is very important to emphasize the role of qualified dietitians in sports clubs. This is a descriptive study investigating the nutrition knowledge levels of karate athletes and the evaluation of some data on karate sports. Longitudinal intervention studies are needed to see the impact of education on nutrition on individuals' attitudes and behaviors.

Limitations: As the study was carried out during the COVID-19 pandemic, the anthropometric measurements of the participants such as body weight and height were taken based on their own statements. Additionally, since there are not enough studies on karate athletes, the comparisons were made with other sportspeople. However, this study was conducted on karate athletes living in Ankara and cannot be generalized.

ETHICAL DECLARATIONS

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