YALOVA ÜNİVERSİTESİ SPOR BİLİMLERİ DERGİSİ
YALOVA UNIVERSITY JOURNAL OF SPORTS SCIENCES

CİLT: 3 SAYI: 1 YIL: 2024

GELİŞ TARİHİ(RECEIVED): 06.01.2024 KABUL TARİHİ(ACCEPTED): 01.04.2024 YAYIN TARİHİ(PUBLISHED): 03.04.2024

ISSN: 2822-664X

Validity and Reliability of the Turkish Version of the Short Sports Nutrition Knowledge Questionnaire for Athletes

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Abstract

This study aims to assess the validity and reliability of the Short Sports Nutrition Knowledge Questionnaire for Athletes (NUKYA), which was developed to evaluate the nutrition knowledge levels of athletes, in the Turkish population. The study was conducted on 355 athletes registered in the faculties of sports sciences at universities. The study was conducted in three stages. In the first stage, the language verification of the NUKYA scale was carried out. The second stage involved the test-retest application of this scale to all participants. Finally, "The Nutrition for Sport Knowledge Questionnaire (NSKQ)" was applied to 103 athlete participants to determine its construct validity. The validity and reliability study of the scale was evaluated with the SPSS 29.0 package program. It was determined that there was a positive correlation between the total scores of the NSKQ and NUKYA questionnaires ($r = 0.379$, $p < 0.01$). The Cronbach α coefficient of the scale was calculated as 0.888 for the overall survey. Since the Cronbach α value of 59 items on the scale was below 0.888, no items were removed from the survey. When the test-retest reliability results of the scale were examined, a positive, moderate correlation was found for the total score ($r = 0.599$, $p < 0.001$). It seems that the NUKYA is a comprehensive measurement tool that includes 59 items and 4

sections. Based on its validity and reliability, it could be an effective way to assess the nutritional knowledge levels of Turkish athletes.

***Keywords**: sports, sports nutrition, athlete's nutrition knowledge, nutrition*

Sporcular için Kısa Beslenme Bilgi Anketi'nin Türkçe Geçerlik ve Güvenirliği

Özet

Bu çalışma, sporcuların beslenme bilgi düzeylerini değerlendirmek amacıyla geliştirilen Sporculara Yönelik Kısa Sporcu Beslenme Bilgi Anketi'nin (NUKYA) Türk toplumunda geçerlilik ve güvenilirliğinin değerlendirilmesini amaçlamaktadır. Araştırma üniversitelerin spor bilimleri fakültelerine kayıtlı 355 sporcu üzerinde gerçekleştirilmiştir. Çalışma üç aşamada gerçekleştirildi. İlk aşamada NUKYA ölçeğinin dil doğrulaması yapıldı. İkinci aşamada bu ölçeğin tüm katılımcılara test-tekrar test uygulaması yapılmıştır. Son olarak yapı geçerliliğini belirlemek amacıyla "Sporda Beslenme Bilgi Anketi (NSKQ)" 103 sporcu katılımcıya uygulandı. Ölçeğin geçerlik ve güvenirlik çalışması SPSS 29.0 paket programı ile değerlendirilmiştir. NSKQ ve NUKYA anketlerinin toplam puanları arasında pozitif korelasyon olduğu belirlendi ($r=0,379$, $p<0,01$). Ölçeğin Cronbach α katsayısı anketin geneli için 0,888 olarak hesaplanmıştır. Ölçekte yer alan 59 maddenin Cronbach α değeri 0,888'in altında olduğundan hiçbir madde anketten çıkarılmamıştır. Ölçeğin test-tekrar test güvenirlik sonuçları incelendiğinde toplam puan arasında pozitif yönde orta düzeyde bir korelasyon bulunmuştur ($r=0,599$, $p<0,001$). NUKYA'nın 59 madde ve 4 bölümden oluşan kapsamlı bir ölçme aracı olduğu görülmektedir. Geçerlik ve güvenirliğine dayanarak Türk sporcuların beslenme bilgi düzeylerini değerlendirmenin etkili bir yolu olabilir.

***Anahtar Kelimeler:** spor, sporcu beslenmesi, sporcu beslenme bilgisi, beslenme*

Introduction

Athletes are known to have specific nutritional requirements to meet the demands of physical training and optimize sports performance (Kerksick et al., 2018). In general, athletes require higher amounts of energy, protein, and carbohydrates as a result of high activity levels, intense training, and increased amounts of lean body mass compared to the non-athlete population (Slater and Phillips, 2013). Due to increased energy and special nutritional requirements, athletes may seek nutritional diversity, follow different types of diets, and take supplements to improve their sporting performance (Calella et al., 2017). Previous literature has shown that athletes often fail to meet appropriate nutritional recommendations for their training intensity. These studies reveal the importance of having adequate nutritional knowledge for athletes for both healthy lives and long-term sports careers (Calella et al., 2017; Jagim et al., 2019).

Nutritional knowledge is a modifiable indicator of nutritional behaviour, and nutritional practices are known to affect athletic performance. Therefore, there is great interest in the assessment of athletes' general and sports nutrition knowledge levels (Trakman et al., 2017). The focus of assessing general and sports nutrition knowledge is to increase awareness of proper eating habits and improve nutritional knowledge, thus helping to eliminate myths and misbeliefs related to nutrition in athletes (Calella et al., 2017). Increasing the level of awareness of nutritional knowledge positively affects the performance of athletes. In this context, scientifically validated tools are needed to assess and determine the nutritional knowledge levels of athletes according to their characteristics, such as culture, religion, and nationality (Kutlu et al., 2022). In studies, questionnaires on sports nutrition have been developed and validated to evaluate the level of knowledge and to analyze the effectiveness of nutrition education programmes (Trakman et al., 2017; Tam et al., 2020; Karpinski et al., 2022).

Short Sports Nutrition Knowledge Questionnaire for Athletes (NUKYA) is one of the questionnaires developed to assess the nutritional knowledge of athletes. The questionnaire focuses on topics considered a priority in the education of athletes and consists of sections assessing macronutrients, micronutrients, hydration and periodization. Unlike other similar validated questionnaires on sports nutrition knowledge, the NUKYA is very short and requires less time to complete as it can be answered in an average of 12 minutes (Vázquez-Espino et al., 2020). This study aimed to evaluate the validity and reliability of the Short Sports Nutrition

Knowledge Questionnaire for Athletes developed by Vázquez-Espino et al. (2020) in the Turkish population.

Materials and Methods

Study Design and Participants

This cross-sectional study was conducted between October 2023 and December 2023 with athletes registered in the faculties of sports sciences at universities.

This study was carried out in three stages. In the first stage, language validation was performed, in the second stage, the scale was applied to 355 athletes as test and retest, and in the third stage, the "Short Sport Nutrition Knowledge Questionnaire for Athletes" and the "The Nutrition for Sport Knowledge Questionnaire (NSKQ)" were applied to 103 athletes to determine the construct validity.

Short Sports Nutrition Knowledge Questionnaire for Athletes

NUKYA which was developed in English and Spanish by Vázquez-Espino et al. (2020) in 2020 consists of 59 items and is divided into four sections: Macronutrients (29 items), micronutrients (19 items), hydration (8 items) and periodization (3 items). The questionnaire focuses on issues that are considered a priority in the training of athletes. The questionnaire does not include aspects such as supplement intake, weight control and alcohol consumption.

Scoring of the questionnaire: For questions 1-8, 10, and 16-20, each correct answer in the question options is scored as +1 point, an unanswered option is scored as 0 points and an incorrect answer is scored as -1 point. In multiple-choice questions (9, 11-15), the correct answer is evaluated as +1 point for the whole question, the wrong answer is evaluated as -1 point for the whole question, and 0 points if the question is not answered. The maximum score is 59 points and the minimum score is -59 points. To convert this questionnaire into a scoring from 0 to 100 points, it is suggested to apply the following formula:

$$y = 100 * (x + 59) / 118$$

There are 4 sections in the questionnaire:

Macronutrients (questions 1 to 8): 29 points (49.1 points on a 100-point scale)

Micronutrients (questions 9 and 17 to 20): 19 points (32.2 points on a 100-point scale)

Hydration (questions 10 to 13): 8 points (13.6 points on a 100-point scale)

Periodization (questions 14 to 16): 3 points (5.1 points on a 100-point scale) (Vázquez-Espino et al., 2020).

Language Validity

In the process of adapting the questionnaire for language validity, the translation-retranslation method was used (Prieto, 1992). The questionnaire was translated into Turkish by an academic who knew both languages well and then translated back into English by a native English-Turkish speaker who had not seen the original questionnaire. The translations were evaluated and the final version of the questionnaire was reviewed and approved by the researchers.

Content Validity

After the language adaptation of the questionnaire, the content validity of the questionnaire was carried out with the expert opinion method. For this, expert opinion was obtained from 10 academicians qualified in the field of sports nutrition. All the questionnaire items were evaluated by each expert through a 4-point Likert scale: relevance; 1 = 'not relevant' to 4 = 'truly relevant'; clarity; 1 = 'not clear' to 4 = 'very clear'. Necessary adjustments were made in line with expert opinions.

Convergent validity

For the determination of construct validity, the convergent validity method was used. The correlation between the "NUKYA" and the "NSKQ" was examined. For the correlation coefficient of at least 0.40 between the two variable to be significant with 80% power and 0.05 type I error, the scales were applied to 103 athletes (Bujang and Baharum, 2016).

The Turkish validity and reliability of the NSKQ scale developed by Trakman et al. (2017) was conducted by Çırak and Çakıroğlu (2019). The Nutrition for Sport Knowledge Questionnaire consists of 68 statements and 6 sub-dimensions titled weight control (3 statements), macronutrients (22 statements), micronutrients (12 statements), sports nutrition (11 statements), supplements (11 statements), and alcohol (9 statements). The items of the scale are multiple-choice and 3-point Likert type (agree-disagree-not sure; effective-not effective-not sure). Knowledge scores are calculated from the correct answers and the overall performance on the scale (68 statements were accepted as 100) is evaluated using the scoring system; "poor" knowledge (0-49%), "average" knowledge (50-65%), "good" knowledge (66-75%) and "excellent" knowledge (75-100%) (Çırak and Çakıroğlu, 2019).

In the examination of convergent validity, the relationship between the questionnaire scores was tested and evaluated by correlation analysis.

Extreme Group Comparison Analysis

To determine distinctiveness, t-values were calculated for the significance difference between the means of the questionnaire scores of the upper and lower groups for each section of the questionnaire. Total questionnaire scores ranged from low to high. The upper and lower groups were made up of 96 athletes, representing 27% of the total score. This method is often used to achieve greater statistical power in subsequent hypothesis testing. It can be used for power, standardized effect size, reliability, model specification and interpretability of results (Preacher et al., 2005).

Internal Consistency Reliability

After the questionnaire was adapted to Turkish, its internal consistency reliability was evaluated with Cronbach's α coefficient. The α coefficient should be at least 0-70, while values of 0-80 and above are considered very good and values of 0-90 and above are considered excellent (Kline, 2016). Test-retest measurement was evaluated for each section and the total score. Two weeks after the first application, the questionnaire was applied again to the same group. The intraclass correlation coefficient was calculated for the total score. Values less than 0.5, between 0.5 and 0.75, between 0.75 and 0.9, and greater than 0.90 are indicative of poor, moderate, good, and excellent reliability, respectively (Ercan and Kan, 2004; Koo and Li, 2016).

Ethical Approval

The study was conducted following the Declaration of Helsinki and approved by the Non-Interventional Clinical Studies Ethics Committee of Marmara University, Faculty of Health Sciences (Approval number: 28.09.2023/93). Written informed consent was obtained from all athletes who volunteered to participate in the study. During the current research, we acted within the framework of the "Higher Education Institutions Scientific Research and Publication Ethics Directive".

Statistical analysis

The data was evaluated with the SPSS 29.0 package program. The conformity to normal distribution was checked with the one-sample Kolmogorov-Smirnov test. Item scores from the scale are given as mean ($\bar{x}$) and standard deviation (SD) values. For the correlation between NUKYA and NSKQ scores, the Pearson correlation was used and for the correlation between

the test and retest scores, Spearman correlation was used. For reliability analysis, the intraclass correlation test and unpaired *t*-test were used. For all analyses, a significance level of $p < 0.05$ was used.

Results

To determine the reliability of the scale, 355 athletes were included. The mean age of these athletes was 20.0 ± 2.2 years and 55.2% of them were male. To determine the validity, 103 athletes were included. The mean age of these athletes was 20.0 ± 2.1 years and 61.2% were male.

Convergent validity

Convergent validity was assessed by determining the correlation coefficients between the NSKQ total scores and the NUKYA total scores. A positive correlation was found between the total scores ($r = 0.379$, $p < 0.01$). (Table 1)

Table 1

Correlation of the Short Sport Nutrition Knowledge Questionnaire for Athletes with the The Nutrition for Sport Knowledge Questionnaire (n=103)

Scale	r	p	%95 CI
NSKQ	0.379	< 0.001	0.201 - 0.534

P < 0.05 considered as statistically significant. *P* values are calculated using Pearson Correlation tests. r: Pearson correlation coefficient, 95% CI: A range of values that you can be 95% certain contains the true mean of the population.

Extreme Group Comparison Analysis

Table 2 shows the significant difference between the means of the Upper-Lower 27% groups of the section and total scores. The difference between the Upper-Lower 27% groups was statistically significant in all sections and total score ($p < 0.001$).

Table 2

T-test results for score means of %27 of lower groups and %27 of upper group of the questionnaire (n=96)

Section/Total	Group	Mean±SD	t	p
Macronutrients	Upper	14.84±3.71	-23.747	< 0.001
	Lower	3.23±3.04		
Micronutrients	Upper	5.72±2.72	-12.366	< 0.001
	Lower	0.85±2.73		
Hydration	Upper	2.79±2.13	-7.087	< 0.001
	Lower	0.61±2.12		
Periodization	Upper	2.02±1.18	-5.619	< 0.001
	Lower	0.83±1.70		
Total Score	Upper	25.38±3.63	-36.522	< 0.001
	Lower	5.53±3.89		

Values are expressed as mean ± SD. *P* < 0.05 considered as statistically significant. *P* values are calculated using Independent Sample T Tests.

Table 3

Correlation and Cronbach's α for the items (n=355)

Items	Mean±SD	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
M1	1.88±0.60	0.142	0.875
M2	1.88±0.81	0.278	0.873
M3	1.66±0.79	0.312	0.873
M4	1.19±0.52	0.300	0.873
M5	1.90±0.79	0.308	0.873
M6	1.90±0.76	0.291	0.873
M7	1.56±0.77	0.309	0.873
M8	1.17±0.51	0.256	0.873
M9	1.75±0.79	0.318	0.872
M10	2.02±0.37	0.267	0.874
M11	1.91±0.95	0.270	0.873
M12	1.88±0.67	0.213	0.874
M13	1.06±0.30	0.278	0.874
M14	1.65±0.76	0.228	0.874
M15	1.87±0.65	0.254	0.873
M16	2.14±0.51	0.281	0.873
M17	2.06±0.56	0.290	0.873
M18	1.58±0.77	0.256	0.873
M19	1.18±0.55	0.068	0.875
M20	2.06±0.45	0.229	0.874
M21	2.04±0.69	0.438	0.871
M22	1.83±0.79	0.516	0.870
M23	1.92±0.79	0.425	0.871
M24	1.87±0.80	0.448	0.871
M25	1.92±0.82	0.493	0.870
M26	1.68±0.85	0.447	0.870
M27	2.08±0.77	0.485	0.870
M28	2.15±0.58	0.505	0.871
M29	1.71±0.86	0.442	0.871
M30	1.50±0.74	0.175	0.874
M31	1.83±0.85	0.222	0.874
M32	2.01±0.44	0.265	0.873
M33	1.72±0.90	0.279	0.873
M34	1.95±0.72	0.289	0.873
M35	2.12±0.45	0.226	0.874
M36	2.06±1.16	0.228	0.875
M37	2.79±1.25	0.099	0.878
M38	4.05±1.31	0.267	0.875
M39	1.62±1.09	0.245	0.874
M40	4.35±1.33	0.002	0.881
M41	1.33±0.61	0.191	0.874
M42	1.54±0.75	0.267	0.873
M43	1.56±0.72	0.226	0.874
M44	2.25±0.86	0.328	0.872
M45	1.47±0.82	0.418	0.871
M46	1.36±0.75	0.396	0.871
M47	1.99±0.86	0.374	0.872
M48	1.33±0.71	0.418	0.871
M49	2.08±0.82	0.469	0.870
M50	2.24±0.50	0.484	0.871
M51	2.26±0.54	0.463	0.871
M52	1.72±0.82	0.353	0.872
M53	1.81±0.86	0.440	0.871
M54	1.73±0.88	0.351	0.872
M55	1.16±0.52	0.409	0.872

M56	1.92±0.87	0.415	0.871
M57	1.33±0.69	0.379	0.872
M58	2.28±0.53	0.525	0.871
M59	2.06±0.73	0.405	0.871

Values are expressed as mean ± SD.

Cronbach's α coefficient, which gives the internal consistency of the items that make up the questionnaire, was calculated as 0.888 for the overall questionnaire. The correlation and Cronbach's α values for items are shown in Table 3. The values for items ranged between 0.870 and 0.878, since all 59 items have Cronbach's α below 0.888, there is no need to remove any item from the questionnaire.

The test-retest reliability results for the sections and the total score of the 355 athletes are shown in Table 4. Correlation coefficients were calculated and found to be positively moderate for the total score ($r = 0.599$, $p < 0.001$).

Table 4

Test-retest measurement for each section and total score (n=355)

Section/Total	**Test Mean ± SD**	**Retest Mean ± SD**	**r**	**p**
Macronutrients	7.93 ± 5.20	8.36 ± 5.71	0.554	< 0.001
Micronutrients	2.59 ± 3.34	2.07 ± 3.79	0.407	< 0.001
Hydration	1.37 ± 2.33	0.96 ± 2.37	0.408	< 0.001
Periodization	1.31 ± 1.52	1.22 ± 1.63	0.390	< 0.001
Total Score	13.20 ± 7.34	12.62 ± 8.53	0.599	< 0.001
Total Score*	61.18 ± 6.22	60.69 ± 7.23	0.599	< 0.001

Values are expressed as mean ± SD. $P < 0.05$ considered as statistically significant. *P* values are calculated using Spearman Correlation Tests. r: Spearman correlation coefficient. *Score formulated as 0 - 100 points.

Discussion

To investigate the relationship between nutritional knowledge and dietary habits in athletes, validated tools are needed to assess nutritional knowledge in this population (Trakman et al., 2017). This study aimed to determine the validity and reliability of the Short Sports Nutrition Knowledge Questionnaire (NUKYA) for Athletes in Turkish, thus providing a compact sports nutrition questionnaire needed in the field to be introduced to the literature.

In this study, the validity and reliability of the NUKYA questionnaire developed by Vázquez-Espino et al. (2020) was examined on 355 participants consisting of Turkish athletes. The questionnaire aims to reveal the nutrition knowledge levels of athletes.

During the adaptation phase into Turkish, the questionnaire, which consists of 4 sections and 59 items, was first translated from the main form into Turkish and then back into English, and the necessary adjustments were made in line with expert opinions and reached its final Turkish format. Unlike other sports nutrition information surveys (Bujang and Baharum, 2016)

adapted to Turkish, NUKYA is a short questionnaire that can be completed in a short time. In addition, macronutrients, micronutrients, hydration, and periodization sections, can help athletes determine nutritional information in detail.

For the convergent validity of the questionnaire, correlation coefficients between NSKQ and NUKYA total scores were examined. There is a positive correlation between the total scores of the two questionnaires ($r = 0.379$, $p < 0.01$).

In Durnali's study, a statistically significant difference was found between the Upper-Lower 27% groups in all items, as in our study, which was an indication that items are good at differentiating individuals (Durnali, 2022).

The field of application may often affect the cut-off values for the reliability of questionnaires, because of this, generalization is not recommended. Internal consistency is recommended as 0.7 at minimum (Trakman et al. 2017; Parmenter and Wardle, 2000), whereas, a Cronbach's α value over 0.6 is also acceptable by some authors (Taber, 2018; Cronbach, 1951). Several questionnaires were presented as validated with a Cronbach's α value ranging between 0.6 – 0.7 (Nahar et al., 2019; Nackers et al., 2019). In a review, Contento indicates that for studies that measure nutrition knowledge, Cronbach's α values were reported mostly between 0.6 and 0.7 (Contento, 2008). In a validation study by Rosi and colleagues, about general and sports nutrition knowledge conducted with Italian adolescents, an acceptable internal consistency reliability, by Cronbach's α scores was revealed (0.684) (Rosi et al., 2020). In a study of Alsaffar, internal reliability for the scale (0.89) and the two sections which were "sources of nutrients" (0.88) and "diet–disease relationships" (0.81) were high. The other two sections which were "dietary recommendation" and "choosing everyday foods" had lower values for reliability (0.47 and 0.43, respectively) (Alsaffar, 2012). In our study, the Cronbach α internal consistency coefficient for the overall questionnaire was determined as 0.888 and item values are between 0.870-0.878. No items were removed from the questionnaire. The Cronbach α value is a statistical measure that ranges between 0 and 1. As the value approaches 1, the reliability of the scale increases (Büyüköztürk, 2002; Hayran and Hayran, 2018). For measuring knowledge structures, reliability estimates of 0.70 or greater indicate the sufficient reliability of the test (Axelson and Brinberg, 1992). This suggests that the current questionnaire is reliable and can effectively measure nutritional knowledge in athletes.

To measure the test-retest reliability of the NUKYA questionnaire, the Turkish form was applied to athletes studying at universities at two-week intervals. As a result of the

application, the consistency coefficient for the entire questionnaire was calculated as r = 0.599. In line with the results obtained, the questionnaire has a positive and medium level of internal consistency. The results of the t-test of the test and retest indicated that this questionnaire was repeatable. In a similar study conducted with track and field athletes, the test and retest correlation was found as $r = 0.98$, $p < 0.05$ which demonstrates satisfactory internal reliability (Kline, 2015). In Furber and colleagues' study, the test and retest correlation was found to be high and consistent across the total test and retest correlation for the whole questionnaire was 0.98 (Fuber et al., 2017).

Conclusion

The NUKYA questionnaire is a valid and reliable tool to measure the nutritional knowledge of Turkish athletes. Since this questionnaire, which has been adapted into Turkish, is shorter than other questionnaires, its use may create an advantage in terms of time. Moreover, it is thought that this questionnaire can provide more accurate information since it has a short measurement period, which can increase the athlete's focus on the questions. With these Turkish-adapted questionnaires, dietitians, clinicians, coaches, sports scientists and researchers will be provided with detailed information about the nutritional knowledge of athletes and the effectiveness of nutrition education intervention studies to increase nutritional knowledge can be evaluated effectively.

Conflict Declaration

The author(s) have no declaration of conflict regarding the research.

References

Alsaffar, A. A. (2012). Validation of a general nutrition knowledge questionnaire in a Turkish student sample. *Public health nutrition*, *15*(11), 2074-2085.

Axelson, M. L., and Brinberg, D. (1992). The measurement and conceptualization of nutrition knowledge. *Journal of Nutrition Education*, *24*(5), 239-246.

Bujang, M. A., and Baharum, N. (2016). Sample size guideline for correlation analysis. *World*, *3*(1), 37-46.

Büyüköztürk, Ş. (2018). Sosyal bilimler için veri analizi el kitabı (Data Analysis Handbook for Social Sciences). *Pegem Yayıncılık*, 179-180.

Calella, P., Iacullo, V. M., and Valerio, G. (2017). Validation of a general and sport nutrition knowledge questionnaire in adolescents and young adults: GeSNK. *Nutrients*, *9*(5), 439.

Contento, I. (2008). Review of nutrition education research in the Journal of Nutrition Education and Behavior, 1998 to 2007. *Journal of nutrition education and behavior*, *40*(6), 331-340.

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *psychometrika*, *16*(3), 297-334.

Çırak, O., and Çakıroğlu, F. P. (2019). Sporcu beslenme bilgisi ölçeğinin Türkçe formunun geçerlik ve güvenirlik çalışması (The validity and reliability study of the Turkish version of the Nutrition for Sport Knowledge Questionnaire).. *Ankara Sağlık Bilimleri Dergisi*, *8*(1), 35-49.

Durnali, M. (2022). The Development and Validation of Technological Leadership Behavior Instrument for School Principal. *Journal of Learning and Teaching in Digital Age*, *7*(2), 210-221.

Ercan, I., and Kan, I. (2004). Reliability and validity in the scales. *Uludağ Üniversitesi Tıp Fakültesi Dergisi*, *30*(3), 211-6.

Furber, M. J. W., Roberts, J. D., and Roberts, M. G. (2017). A valid and reliable nutrition knowledge questionnaire for track and field athletes. *BMC nutrition*, *3*, 1-7.

Hayran, M., and Hayran, M. (2018). Sağlık Araştırmaları İçin Temel İstatistik (Basic Statistics for Health Research). Ankara: Omega Araştırmaları.

Hinton, P. S., Sanford, T. C., Davidson, M. M., Yakushko, O. F., and Beck, N. C. (2004). Nutrient intakes and dietary behaviors of male and female collegiate athletes. *International Journal of Sport Nutrition and Exercise Metabolism*, *14*(4):389-405.

Hoogenboom, B. J., Morris, J., Morris, C., and Schaefer, K. (2009). Nutritional knowledge and eating behaviors of female, collegiate swimmers. *North American journal of sports physical therapy: NAJSPT*, *4*(3),139.

Jagim, A. R., Zabriskie, H., Currier, B., Harty, P. S., Stecker, R., and Kerksick, C. M. (2019). Nutrient Status and perceptions of energy and macronutrient intake in a Group of Collegiate Female Lacrosse Athletes. *Journal of the International Society of Sports Nutrition, 16*(1), 43.

Karpinski, C. A., Dolins, K. R., and Bachman, J. (2019). Development and validation of a 49-Item Sports Nutrition Knowledge Instrument (49-SNKI) for adult athletes. *Topics in Clinical Nutrition*, *34*(3), 174-185.

Kerksick, C. M., Wilborn, C. D., Roberts, M. D., Smith-Ryan, A., Kleiner, S. M., Jäger, R. et al. (2018). ISSN exercise & sports nutrition review update: research & recommendations. *Journal of the international society of sports nutrition*, *15*(1), 38.

Kline, P. (2015). Personality (Psychology Revivals): Measurement and Theory. Routledge.

Kline, R. (2016). Principles and Practices of Structural EquationModeling, 4th ed. New York: The Guilford Press.

Koo, T. K., and Li, M. Y. (2016). A guideline of selecting and reporting intraclass correlation coefficients for reliability research. *Journal of chiropractic medicine*, *15*(2), 155-163.

Kutlu, M., Cintesun, E. E., Ugur, H., and Tosun, M. I. (2022). Validation and implementation of general and sport nutrition knowledge questionnaire for university students and athletes. *Central European Journal of Sport Sciences and Medicine*, *40*(4), 77-88.

Nackers, F., Roederer, T., Marquer, C., Ashaba, S., Maling, S., Mwanga-Amumpaire, J., et al. (2019). A screening tool for psychological difficulties in children aged 6 to 36 months: cross-cultural validation in Kenya, Cambodia and Uganda. *BMC pediatrics*, *19*(1), 1-11.

Nahar, B., Hossain, M., Ickes, S. B., Naila, N. N., Mahfuz, M., Hossain, D., et al. (2019). Development and validation of a tool to assess appetite of children in low income settings. *Appetite*, *134*, 182-192.

Parmenter, K., and Wardle, J. (2000). Evaluation and design of nutrition knowledge measures. *Journal of Nutrition Education*, *32*(5), 269-277.

Preacher, K. J., Rucker, D. D., MacCallum, R. C., and Nicewander, W. A. (2005). Use of the extreme groups approach: a critical reexamination and new recommendations. *Psychological methods*, *10*(2), 178.

Prieto, A.J. (1992). A method for translation of instruments to otherlanguages. *Adult Educ* Q 43, 1–14.

Rosi, A., Ferraris, C., Guglielmetti, M., Meroni, E., Charron, M., Menta, R., et al. (2020). Validation of a general and sports nutrition knowledge questionnaire in Italian early adolescents. *Nutrients*, *12*(10), 3121.

Slater, G., and Phillips, S. M. (2013). Nutrition guidelines for strength sports: sprinting, weightlifting, throwing events, and bodybuilding. Ronald, J.M., Susan, M.S., (Eds.). Food, Nutrition and Sports Performance III. Routledge, pp. 67-77.

Taber, K. S. (2018). The use of Cronbach's alpha when developing and reporting research instruments in science education. *Research in science education*, *48*, 1273-1296.

Tam, R., Beck, K. L., Gifford, J. A., Flood, V. M., and O'Connor, H. T. (2020). Development of an electronic questionnaire to assess sports nutrition knowledge in athletes. *Journal of the American College of Nutrition*, *39*(7), 636-644.

Trakman, G. L., Forsyth, A., Hoye, R., and Belski, R. (2017). Developing and validating a nutrition knowledge questionnaire: key methods and considerations. *Public health nutrition*, *20*(15), 2670-2679.

Trakman, G. L., Forsyth, A., Hoye, R., and Belski, R. (2017). The nutrition for sport knowledge questionnaire (NSKQ): development and validation using classical test theory and Rasch analysis. *Journal of the International Society of Sports Nutrition*, *14*(1), 26.

Valliant, M. W., Pittman Emplaincourt, H., Wenzel, R.K., and Garner, B.H. (2012). Nutrition education by a registered dietitian improves dietary intake and nutrition knowledge of a NCAA female volleyball team. *Nutrients*, *4*(6), 506-516.

Vázquez-Espino, K., Fernández-Tena, C., Lizarraga-Dallo, M. A., and Farran-Codina, A. (2020). Development and validation of a short sport nutrition knowledge questionnaire for athletes. *Nutrients*, *12*(11), 3561.