PJAHS
Philippine Journal of Allied Health Sciences

Original Article

The Filipino dietary habits and nutrition knowledge questionnaire (DHNKQ-FIL): a psychometric study

Karen Leslie Pineda[a], Alessandro Cardenas[a], Ronell Angelo Esteban[a], Stephanie Claire Pagarigan[a], Rayesha Azzedine Ma. Quilala[a], Johnmer Paul Se[a], Niccol Servañez[a]

[a] Department of Sports Science, College of Rehabilitation Sciences, University of Santo Tomas, Manila, Philippines

Correspondence should be addressed to: Karen Leslie Pineda; klpineda@ust.edu.ph

Abstract

Background: The Dietary Habits and Nutrition Knowledge Questionnaire (DHNKQ) is a validated assessment tool that provides information about the nutritional practices of collegiate athletes as an integral support to sports performance. This psychometric study aims to translate and validate the DHNKQ for the Filipino collegiate population to come up with the DHNKQ-FIL using various psychometric protocols consolidated into two phases. **Methods**: The first phase involved the translation of the tool into Filipino and testing for face and content validity through a focus group discussion by an expert committee and was finalized with the administration of a pre-test to 30 collegiate athletes for final modification purposes. The second phase tested the validated DHNKQ-FIL on a new set of 30 collegiate athletes for internal consistency and reliability testing, statistically analyzed using Cronbach's α and intraclass correlation coefficient, respectively. **Results**: The DHNKQ-FIL used modern Filipino terminologies, more appropriate for the modern Filipino collegiate athlete. Item Content Validity Index (I-CVI) had scores of 90% and above in semantic, idiomatic, experiential, and conceptual equivalence for both sections. Food guides and choices, along with the usage of medical jargon, were identified areas for modification in the validity testing. Pre-test subjects considered the questionnaire appropriate and applicable for Filipino athletes after cognitive interview. The pilot test showed scale reliability scores of 0.68 or "Questionable" for dietary habits section and 0.81 or "Good" for nutritional knowledge. Test-retest reliability had a score of 0.79 or "Acceptable" for dietary habits and 0.60 or "Questionable" for nutrition knowledge. **Conclusion**: The acceptable scores for the translation, validation, and reliability of the DHNKQ-FIL makes it a valid tool for assessing dietary habit and nutritional knowledge among Filipino collegiate athletes.

Keywords: nutrition knowledge, dietary habits, translation, validation

INTRODUCTION

Having adequate nutrition can improve athletic performance. It is known among athletes that optimum nutrient and caloric intake with adequate nutrition knowledge is a crucial part of a training diet[1]. Still, many athletes continue showing unhealthy nutrition practices and do not translate their nutrition knowledge to their food choices[2]. Hornstrom et al.[3] reported that the lower the nutrition knowledge of female softball players from different universities in the United States, the poorer their eating habits[3,4]. College athletes with higher nutrition knowledge were more likely to fulfill the recommended daily servings of food from USDA Food Guide Pyramid[3]. Studies point out that good nutritional knowledge was found to be significantly associated with good nutritional practice[2,4,5].

Knowledge should be well assessed in order to relate the possible nutrition-related behavior of athletes[4]. Questionnaires have been widely used to assess dietary habits and nutritional knowledge. A validated sports nutrition knowledge questionnaire is needed to accurately gather information about their knowledge and practices[4]. Zinn et al stated that the lack of validity and reliability measures would result to

inconsistencies in results[4]. Lack of validity and reliability measures may result to inconsistencies on the association between dietary behavior and nutrition knowledge in athletes[7]. However, it is also important that a validated questionnaire is culturally adapted as examples, standards and situations in the original questionnaire may not be applicable to the local setting. Items related to food and dietary recommendations can be culturally adapted from the standard set by the Food and Nutrition Research Institute of the Philippines to be acceptable in the present setting.

In the adaptation of a nutrition instrument from one language and culture to another, it is essential to take into consideration the applicability of the original instrument to the target population and their proficiency with the target language. While this may not be the case for all adaptation of instruments, it is applicable to this study in particular, as the Philippines is foremost considered a bilingual nation due to its history in using the US education system and English as its medium of instruction[8]. The Bilingual Education Policy advocates the use of Filipino in the primary level and English during the secondary and tertiary levels. This policy, however, only benefits the regions such as the National Capital Region and major private and public schools but may be troublesome for those whose primary language does not involve English[8]. Existence of the Bilingual Education Policy happened in which Tagalog was mandated to be the language of literacy and the language of scholarly discourse. While for English, it was described as the international language and non-exclusive language for science and technology[6]. To the authors' awareness, no psychometrically validated sports nutrition questionnaires have been investigated for the Filipino population.

Therefore, this study aimed to translate, culturally adapt and investigate psychometric properties of the Dietary Habits and Nutrition Knowledge Questionnaire (DHNKQ) for Filipino athletes.

METHODOLOGY

Research Design

This two-phased psychometric study included a systematic approach to the cultural adaptation of the Filipino version of the DHNKQ by means of translation, validation, and reliability testing based on various translation guidelines (see Table 1)[10,11,12,13,14]. The DHNKQ, adapted from the original study conducted by Paugh 2012[15], was translated and back-translated by bilingual experts on the Tagalog and English languages to create the DHNKQ-FIL.

Participants – Inclusion and Exclusion

The study obtained ethics approval from the UST College of Rehabilitation Sciences Ethical Review Committee. A total of 60 college student-athletes from the University of Santo Tomas and 11 experts which included a forward translator, two backward translators, three registered nutritionists, one sports scientist, one anthropologist, two sport coaches, and a professional athlete participated in the study[10]. The sample population was randomized through convenience sampling to maximize gathering various perspectives from different sports. A total sample size of 60 student-athletes was obtained, with 30 participants involved in the translation and validation phase and the remaining in the reliability phase[16]. Participants were randomly selected through convenience sampling, from UAAP Teams such as Athletics (n=11), Swimming (n=10), Martial Arts (n=9).

Table 1. Reference Guidelines Used for the Process of Translation

Stages	Beaton et al	WHO	Sousa et al	Artino et al	Wild et al	Swaine-Verdier et al
Stage I – Forward Translation	X	X				
Stage II – Synthesis of The Translation	X	X				
Stage III – Back Translation	X	X				X
Stage IV – Expert Committee	X				X	
Stage V – Pre-testing and Cognitive Interviewing	X	X	X	X	X	
Stage VI – Psychometric Testing of Prefinal Version			X	X	X	
Stage VII – Submission of Documentation to the Developers or Coordinating Committee of the Adaptation Process	X	X				

Instrument

The original DHNKQ is a validated tool used to assess and evaluate the different nutritional practices and information that may affect athletic performance and health[15] The DHNKQ psychometric tests results showed acceptable scores of moderate internal consistency with a reliability of 0.66 and 0.65 for dietary habits and nutrition knowledge respectively. It was then pilot tested to 117 American college student-athletes from various sports in the NCAA Division II[15].

DHNKQ Sections. The questionnaire was composed of three sections that identify the athlete's records, dietary habits, and nutritional knowledge. The personal information section included demographics, sport played, chosen program, years of play and sources of nutritional information. The dietary habits section consisted of 18 items that identified nutritional practices of athletes such as how often a certain food item was eaten, how often an athlete consumed food from each portion of the Food Guide Pyramid, and their consumption of beverages, vitamins, and mineral supplements. The nutritional knowledge section composed of 29 questions which distinguishes facts and information known, and skills acquired by the athlete either theoretically or experientially.

Scoring Key. Items were evaluated using a scoring key developed by the original author in the form of a Likert scale ranging from 4 to 1, each with a corresponding point value. A high score of 4 indicates excellent habits and correct nutritional knowledge while 1 indicates a lack of knowledge and poor dietary habits. Some items have answers that involved a reverse score of 1 as the highest. These include numbers 2-4, 8-9, 14-15, and 17 for the Dietary Habits section and numbers 2, 6, 8, 20, and 29 for Nutrition Knowledge section. The total score per section is equivalent to the number of items with the highest point value. Possible points for Section 2 range from 18 to 72 points while Section 3 range from 29 to 116 points.

The total points per section are then compared to the possible total number of points in that section. The computed percentage is then classified into their respective interpretations. Sections would be remarked excellent should the actual score be 85-100% of the total score, good for 70-80%, fair for 55-69%, and poor for 54% or less of the total score.

Procedures

The procedures utilized in this study were adapted from various translation guidelines and were split into two phases. Phase 1 designated as the 'Translation and Validation' section, includes the main translation process of the questionnaire into its Filipino version and its subsequent validation. On the other hand, phase 2, designated as 'Reliability Testing', includes the administration of the questionnaire to a chosen set of participants and subjecting the results to chosen statistical analyses.

Phase 1: Translation and Validation. The initial phase of the study termed as *Phase 1 – Translation and Validation*, involved the translation and subsequent validation of the questionnaire. Many translation guidelines were

utilized and consolidated to form the various stages involved in the process of translation and validation. There are 5 stages in particular for this phase: 1) Stage I – Forward Translation[10,11], 2) Stage II – Synthesis of the Translation[10,11], 3) Stage III – Back Translation[10,11,17], 4) Stage IV – Expert Committee[10,13], 5) Stage V – Pre-testing and Cognitive Interviewing[10,11,12,13,14].

Phase 1 Participants – Inclusion and Exclusion. The study obtained ethics approval from the UST College of Rehabilitation Sciences Ethical Review Committee. For this phase, 30 college student-athletes from the University of Santo Tomas and 11 experts which included a forward translator, two backward translators, three registered nutritionists, one sports scientist, one anthropologist, two sport coaches and a professional athlete participated in the study[10]. The sample population was selected via convenience sampling through a selection of participants that were immediately available and were willing to participate in the randomly selected different collegiate sports associated with UST to maximize gathering various perspectives from different sports. A sample size of 30 was computed, for participants that were involved in the translation and validation phase[16]. Selected participants were selected from UAAP Teams, composed of Athletics (n=11), Swimming (n=10), Martial Arts (n=9).

1. *Forward Translation.* Translation of the DHNKQ from English to Tagalog was done by two bilingual forward translators of the Tagalog-English language - one with a health profession background and another without. The two translated versions of the questionnaire were synthesized to produce a synthesized translated version[10,11].

2. *Backward Translation.* The synthesized version of the questionnaire was translated back to English by two bilingual backward translators, both of English proficiency and neither aware of the concept being explored. This validated whether the Tagalog translation coincided with the original[10,11,17].

3. *Expert Committee Review.* A focus group discussion was conducted by experts for content and face validity[18]. It comprised of a forward translator, 2 backward translators, 3

registered sports nutritionists, a sports scientist, 2 sport coaches, an anthropologist, and a Filipino professional athlete, along with the researchers who facilitated the discussion. Content validity was assessed in terms of semantic, idiomatic, experiential and conceptual equivalence to the Filipino culture[10,13]. Item-Content Validity Index (I-CVI) was evaluated for individual content per question. Scale-Content Validity Index (S-CVI) was evaluated for comparison of content in relation to other items within a given set of questions and Average Congruency Percentage (ACP) for the computed average of the relevance of individual questions across all experts. Scores for I-CVI that ranged from 0.78 and above, S-CVI with 0.90 and above, and ACP for 90% and above were considered acceptable, otherwise, questionable. Feedback regarding the appropriateness and applicability of the instrument from the experts were compiled for face validity and synthesized to produce the DHNKQ-FIL for pre-test and cognitive interview.

4. *Pre-testing and Cognitive Interview.* Thirty collegiate student-athletes aged 18 – 25 years old were assigned to answer of the Tagalog version for the pre-test. A cognitive interview followed to check for the appropriateness and applicability of the Tagalog version to Filipino athletes, as feedback from the target population of the questionnaire[10,11,12,13,14]. This was done by asking the selected participants to review every item on the questionnaire to record their responses and understanding of that specific item. This was mediated by the researcher facilitators (see Table 2).

Phase 2: Reliability Testing. Reliability testing of the DHNKQ-FIL was performed on another set of Filipino college student-athletes aged 18-25 years old (n=30)[12], separated by a washout period of 1 week[14]. Statistical analysis was done using the SPSS Software[10,14]. Internal consistency was used to assess reliability between items as reflected by Cronbach α scores while test-retest reliability was used to measure the consistency of reliability as reflected in Intraclass Correlation Coefficient (ICC) scores.
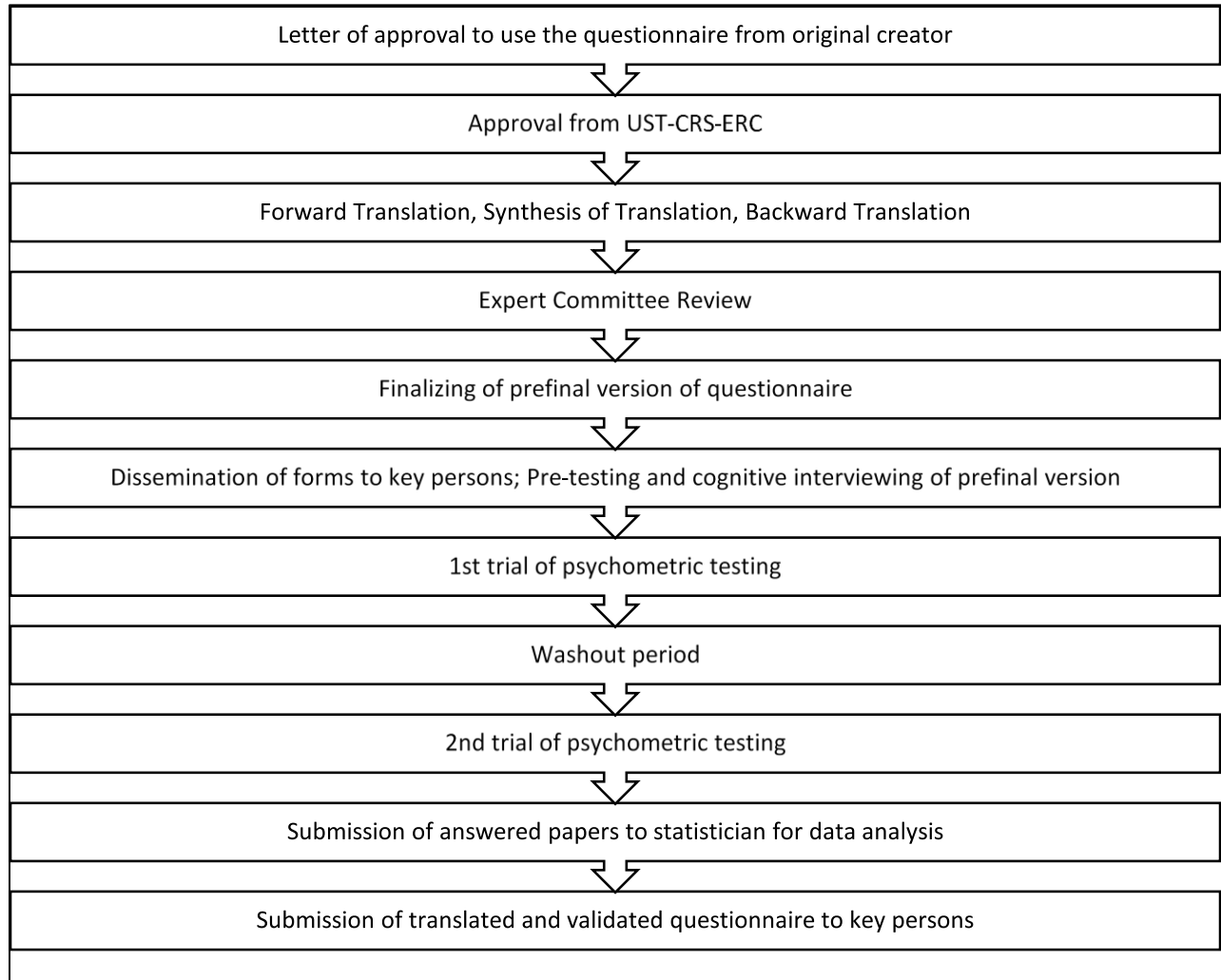
Figure 1. Flow of Methodology

RESULTS

Phase 1: Translation and Validation

Item-Content Validity Index (I-CVI) scores were acceptable except for three items from the dietary habits section; thus, modifications were made to simplify questions. These questions were "*Batay sa tatlong beses na pagkain sa bawat araw, gaano kadalas kang hindi kumain nang hindi bababa sa minsan kada araw?*" changed to "*Gaano kadalas kang hindi kumakain?*", from "*Gaano kadalas kang uminom ng supplement na bitamina?*" changed to "*Gaano kadalas kang uminom ng "vitamin supplements"?*", and from "*Gaano kadalas kang uminom ng supplement sa mineral?*" changed to "*Gaano kadalas kang*

uminom ng "mineral supplements". The S-CVI and ACP scores of both sections also demonstrated high ratings for all equivalence scores which indicate the validation of the questionnaire (see Table 3).

Face validity testing identified the need for instructions stated, wordings and grammar, medical jargons, food choices, and use of the local Food Guide Pyramid to be revised in the DHNKQ-Fil. Words such as *"itala"* were changed to *"irekord"*, and *"mataas sa asukal"* to *"matatamis"*. Medical jargons such as "vitamin supplements", "mineral supplements, "iron", and "fiber" were maintained as they had no accurate translation of the term in Filipino. Adding phrases like "*sa isang araw*" at the end of

Table 2. Demographic Profile of Participants

Demographic		Number of Participants (Total 60)	Percentage
Age Range	18-19	38	63%
	20-25	22	37%
Sex	Male	25	42%
	Female	35	58%
Year Level	1st	15	25%
	2nd	7	12%
	3rd	21	35%
	4th	12	20%
	5th	5	8%
Playing Years	1-5	42	70%
	1-10	12	20%
	11-15	6	10%
Sports	Athletics	11	18%
	Swimming	10	17%
	Judo	8	13%
	Football	7	12%
	Lawn Tennis	3	5%
	Fencing	3	5%
	Baseball	3	5%
	Badminton	3	5%
	Cheerleading	3	5%
	Volleyball	3	5%
	Softball	2	3%
	Basketball	2	3%
	Chess	1	2%
	Poomsae	1	2%

questions about food consumption based on the Filipino Food Pyramid Guide were also emphasized (see Table 4).

In the pre-testing and cognitive interview, comments and suggestions of the participants focused on the format of the instrument, wordings or phrases, and scientific terms which affected the way questions were understood (see Table 5). The choices of words and phrases were made to be direct and simple so that the desired meaning of each sentence in Filipino would convey the same meaning as originally stated in English. Since a Filipino term may have more than one English translation, cognitive interviewing assured that the term's meaning being relayed in the question, as well as its

grammatical representation, would be synonymous to its original English concept.

Phase 2: Reliability Testing

For Dietary Habits Section, overall results indicate a 'Questionable' rating, according to the provided grading scale (see Table 6). Cronbach's α ranged from 0.63 to 0.70 across 18 items in this section. A scale reliability α score of 0.68 (95% lower confidence limit = 0.53) was computed earning an overall 'Questionable' rating. Only two questions (Questions 4 and 7) received an 'Acceptable' rating, with a Cronbach's α of 0.70.

For Nutrition Knowledge Section, results indicated a rating of 'Good', through a range of 0.79 to 0.82 across 29 items. Section III resulted

Table 3. Content Validity Testing Results: Expert Committee Review

Question	Description	Semantic I-CVI	Idiomatic I-CVI	Experiential I-CVI	Conceptual I-CVI
SECTION 2: DIETARY HABITS					
Question 1	Frequency of eating breakfast	0.91	1.00	0.91	0.91
Question 2	Skipping meals	0.27	0.45	0.82	0.73
Question 3	Taking of vitamin supplements	0.91	0.91	0.91	0.91
Question 4	Taking of mineral supplements	0.91	0.91	0.91	0.73
Question 5	Frequency of eating breakfast, lunch and dinner	0.73	0.82	0.91	0.73
Question 6	Recording of food intake	0.91	1.00	0.91	0.82
Question 7	Hydration	1.00	1.00	1.00	1.00
Question 8	Drinking carbonated drinks	1.00	1.00	1.00	1.00
Question 9	Frequency of dieting	1.00	1.00	1.00	1.00
Question 10	Frequency of eating carbohydrates	1.00	1.00	1.00	0.82
Question 11	Frequency of eating fruits	1.00	1.00	1.00	1.00
Question 12	Frequency of eating vegetables	1.00	1.00	1.00	1.00
Question 13	Frequency of eating dairy products	1.00	0.91	0.91	1.00
Question 14	Frequency of eating sweets	0.91	1.00	1.00	1.00
Question 15	Frequency of eating junk foods	1.00	1.00	1.00	1.00
Question 16	Frequency of eating snacks	0.82	1.00	0.64	0.82
Question 17	Frequency of eating fast foods	1.00	0.91	1.00	0.91
Question 18	Nutrition information	1.00	1.00	1.00	0.91
S-CVI Average		**0.91**	**0.94**	**0.94**	**0.90**
Average Congruency Percentage		**0.91**	**0.94**	**0.94**	**0.91**
SECTION 3: NUTRITIONAL KNOWLEDGE					
Question 1	Skipping breakfast	1.00	0.91	1.00	1.00
Question 2	Protein consumption	1.00	1.00	1.00	1.00
Question 3	Mental performance	0.82	0.82	0.91	0.91
Question 4	Pre-event meal	1.00	0.91	0.91	0.91
Question 5	Alcohol consumption	0.82	0.82	0.91	0.91
Question 6		0.91	1.00	1.00	0.91
Question 7		1.00	1.00	1.00	0.91
Question 8	Food Guide Pyramid	1.00	1.00	1.00	0.91
Question 9		1.00	1.00	1.00	0.82
Question 10	Concentration	1.00	1.00	1.00	1.00
Question 11		0.91	0.91	1.00	1.00
Question 12	Carbohydrate consumption	1.00	1.00	0.91	0.82
Question 13		1.00	1.00	1.00	1.00
Question 14	Excess vitamin consumption	0.82	0.91	0.91	0.91
Question 15	Iron deficiency	1.00	1.00	0.91	1.00
Question 16	Fat levels	0.82	0.91	0.82	0.82
Question 17	Carbohydrate food sources	0.91	1.00	1.00	1.00
Question 18	Protein food sources	1.00	1.00	1.00	1.00
Question 19	Protein consumption	0.82	0.82	0.91	0.91
Question 20		0.82	1.00	1.00	1.00

Question 21	Iron food sources and absorption	0.91	1.00	1.00	1.00
Question 22		0.82	0.91	0.82	0.82
Question 23	Protein and fat function	0.91	1.00	1.00	1.00
Question 24		1.00	1.00	1.00	1.00
Question 25		0.82	0.91	0.91	0.91
Question 26	Fiber sources	1.00	1.00	1.00	1.00
Question 27		1.00	1.00	0.91	0.91
Question 28	Vitamin intake	1.00	1.00	1.00	1.00
Question 29	Dehydration	1.00	1.00	1.00	1.00
S-CVI Average		**0.93**	**0.96**	**0.96**	**0.94**
Average Congruency Percentage		93.42	95.92	95.61	94.36

Table 4. Face Validity Results: Expert's Remarks

Question	Description	Remarks/Comments from the Experts
SECTION 2: DIETARY HABITS		
Question 1	Frequency of eating breakfast	The phrase "in the morning" should be included to set time frame.
Question 2	Skipping meals	The question may be hard to understand. It should be simplified.
Question 3	Taking of vitamin supplements	Vitamin supplements are well understood by collegiate-level athletes as compared to a literal translation.
Question 4	Taking of mineral supplements	Mineral supplements are well understood by collegiate-level athletes as compared to a literal translation.
Question 5	Frequency of eating breakfast, lunch and dinner	Three base meals may not be fully understood by most people hence the need to specify.
Question 6	Recording of food intake	*Itala* may be too deep for the targeted population to comprehend
Question 7	Hydration	None
Question 8	Drinking carbonated drinks	Some athletes may associate carbonated drinks with solely soft drinks, and some may not think of carbonated water.
Question 9	Frequency of dieting	None
Question 10	Frequency of eating carbohydrates	It is important to indicate the designated food group for the question to lessen confusion.
Question 11	Frequency of eating fruits	There is no need for examples as most people would understand that the question pertains to fruits.
Question 12	Frequency of eating vegetables	There is no need for examples as most people would understand that the question pertains to vegetables.
Question 13	Frequency of eating dairy products	Dairy products may not be well understood by some athletes, so it is important to specify what falls under this food group.
Question 14	Frequency of eating sweets	*Matatamis* may not necessarily mean sugary foods, as there are some foods that are naturally sweet-tasting but cannot be considered a sweet.

Question 15	Frequency of eating junk foods	The question pertains to snacks taken in-between meals, or *meryenda* hence local examples must be cited.
Question 16	Frequency of eating snacks	Question pertains to the habit of eating healthy snacks, hence examples should be replaced by local versions.
Question 17	Frequency of eating fast foods	The concept of fast food differs in various cultures.
Question 18	Nutrition information	None

SECTION 3: NUTRITIONAL KNOWLEDGE

Question 1	Skipping breakfast	Not all athletes may be aware of the benefits of breakfast and the complications of skipping such, hence the inclusion of some examples of these negative effects.
Question 2	Protein consumption	*Pinakaepisyenteng* may be too deep for the targeted population to comprehend
Question 3	Mental performance	The concept of mental performance in the context of sports nutrition may not be apparent for athletes, thus the importance of adding examples.
Question 4	Pre-event meal	The phrase *pre-event meal* may not be widely used by athletes, hence it is better to indicate it simply as a meal before competition.
Question 5	Alcohol consumption	*Inilalabas sa katawan* may mean too literally coming out of the body rather than the process of excretion. The word *tumataas* is closer to the word "increases" and equates to an appropriate single consumption rather than *dumarami* which may mean a longer period of time and collective effort of alcohol consumption
Question 6 **Question 7** **Question 8** **Question 9**	Food Guide Pyramid	The original questionnaire uses the standard US Food Guide Pyramid, so it is necessary to find a local source of information for appropriate cultural adaptation.
Question 10	Concentration	None
Question 11		*Pagkaing mataba* may be misinterpreted by some athletes as solely fat coming from animal products according to the experts.
Question 12	Carbohydrate consumption	Not all athletes are familiar with the concept of calories, as some may associate it with only carbohydrates, not knowing the inclusion of protein and fat.
Question 13		*Taba* may be misinterpreted by some athletes as solely fat coming from animal products according to the experts. *(Same as #11)*
Question 14	Excess vitamin consumption	*Makalalason* or *toxic* may impose a message that consumption of excess vitamin consumption may cause death, and not merely some health complications.
Question 15	Iron deficiency	It is important to indicate iron as a micronutrient.
Question 16	Fat levels	*Katamtaman* may mean different to various types of athletes, it may help to have a specified type of example.
Question 17	Carbohydrate food sources	None
Question 18	Protein food sources	Nuts and beans may pose to be too general for some athletes hence the need for more specific examples.
Question 19 **Question 20**	Protein consumption	*Gaya* may imply that twice the consumption is the recommended, instead of going over it.

Question 21		Usage of the word *hayop* may seem misleading, thus it is better to indicated it as meat instead.
Question 22	Iron food sources and absorption	*Sabayan* is needed in this translation to imply that products with vitamin C must be taken together with iron-enriched bread, to avoid misleading messages such as the consumption of vitamin C-enriched bread.
		Pagsipsip sa iron may not properly convey the concept of nutrient absorption, hence it is better to use pagtanggap instead.
Question 23	Protein fat function	*Tisyu ng kalamnan* may be misinterpreted by some athletes as some may understand *muscle* better.
		Magka-hormones may imply something else instead of the production of hormones.
		Immune system may be simply translated to *sistemang panlaban sa sakit*. (Some also suggest the use of *resistensya*)
Question 24	Fat function	None
Question 25	Protein function	The word *diet* may imply a strictly weight-loss diet, as compared to a person's usual food routine.
Question 26	Fiber sources	*Natutunaw na fiber* is not a widely used translation for soluble fiber hence it is better to retain the original version per recommendation by experts.
Question 27		None
Question 28	Vitamin intake	Retain vitamin C as a borrowed term because it may be more used by the target population
Question 29	Dehydration	*Maaaring* should be added as the original mentions must not.

Table 5. Face Validity: Pre-Testing and Cognitive Interviews – Athlete's Remarks

F5 version of DHNKQ	Question	Athlete No. (A#)	Participant's Remarks
SECTION 1: DEMOGRAPHICS			
Section I (Demographics)		A4	Outline " saan makukuha ang nutrition pangnutrisyon" because of wide spacing
		A5	Indicate in the directions how many choices could be answered
Section II (Dietary Habits)	2. Gaano kadalas ang hindi mo pagkain?	A22	*"Hindi mo pagkain"* is misleading & unclear
		A24	Suggested *"Gaano kadalas kang hindi kumakain?"*
	6. Gaano kadalas mong italâ (record) ang iyong kinakain?	A5	Change *"itala"* to *"irekord"*
		A14	The word *"itala"* is too deep
		A22	
		A24	Without the English version of the word *"italâ"*, the client will not understand the question
	9. Gaano kadalas kang "nagdidiyeta"?	A20	*Nagdiyediyeta* connotates *'nagpapapayat'*, strict in caloric intake, practice of a healthy diet, respectively.
		A22	
		A23	

	14. Gaano kadalas kang kumain ng mga pagkaing matataas sa asukal?	**A23**	Change *"matataas sa asukal"* to *"matatamis"*
	17. Gaano kadalas kang kumain ng fast food tulad ng pizza, burger, o fries?	**A22**	Add fried chicken to examples.
	18. Gaano kadalas kang maghanap ng impormasyong pangnutrisyon?	**A23**	The term *"impormasyong pangnutrisyon"* is a broad term & too literal in translation.
Section III (Nutrition Knowledge)	5. Tumataas ang inilalabas na calcium ng katawan kapag umiinom ng inuming alkohol.	**A4** **A24**	Replace *"inuming alkohol"* to *alak.* Replace *"inilalabas na calcium ng katawan"* to *"inilalabas na calcium sa katawan."*
	6. Ayon sa Food Guide Pyramid, dapat kumonsumo ang isang tao ng 6-8 o 5-8 na serving mula sa pangkat ng pagkaing tinapay, cereal, kanin at pasta 7. Ayon sa Food Guide Pyramid, dapat kumonsumo ang isang tao ng 3 o 2-3 na serving mga pagkaing prutas 8. Ayon sa Food Guide Pyramid, dapat kumonsumo ng 1 na serving mula sa pangkat ng pagkaing o inuming gawa sa gatas.	**A1**	Add *"sa isang araw"* at the end of the sentence
	9. Ayon sa Food Guide Pyramid, dapat kumonsumo ng 2½ o 3- 4 na serving mula sa pangkat ng pagkaing karne.	**A20** **A21** **A22** **A23**	Fish or *"isda"* is part of the meat group or *"karne"*.
	14. Ang labis na pag-inom ng bitamina ay nakakasama sa katawan.	**A8**	The word *'bitamina"* is not clear
		A24	Not familiar with the word *"labis".*
	15. Ang anemia ay kakulangan ng mineral na iron sa dugo.	**A8**	Not familiar with the term *"iron".*
	19. Ang mga atleta ay nakakaubos nang dobleng dami ng protina na higit sa inirerekomenda.	**A1**	*"What is the recommended amount of protein"?*
	22. Ang pagkain ng cereal o tinapay na dinagdagan ng iron ay dapat sabayan nang iba pang pagkaing mayaman sa bitamina C para sa mas epektibong pagtanggap ng iron ng katawan.	**A19**	*"What is "bitamina"?"*
		A5	Bold important keywords such as *"bitamina C"* & iron.
	26. Ang oatmeal, monggo, at prutas ang pinagkukunan ng soluble fiber.	**A1** **A3** **A8** **A18** **A19** **A26** **A23**	Replace "soluble" to "*natutunaw".* Add explanation on "soluble fiber" *"What is soluble fiber?"* *"Ang oatmeal, monggo, at prutas "ay" pinagkukunan ng soluble fiber."*
	27. Ang inirerekomendang dami ng fiber ay 25 gramo kada araw.	**A16** **A17** **A27**	*"What is fiber?"*

Table 6. Test-Retest Reliability Results

Question	Description	Pearson's *r*	Interpretation (Pearson's *r*)	Intraclass Correlation	Interpretation (ICC)
SECTION 2: DIETARY HABITS					
Question 1	Frequency of eating breakfast	0.97 (< 0.00)	Excellent	0.97	Excellent
Question 2	Skipping meals	0.84 (< 0.00)	Excellent	0.84	Excellent
Question 3	Taking of vitamin supplements	0.80 (< 0.00)	Excellent	0.80	Excellent
Question 4	Taking of mineral supplements	0.86 (< 0.00)	Excellent	0.86	Excellent
Question 5	Frequency of eating breakfast, lunch and dinner	0.82 (< 0.00)	Excellent	0.78	Excellent
Question 6	Recording of food intake	0.50 (0.0045)	Fair	0.48	Fair
Question 7	Hydration	0.70 (< 0.00)	Good	0.54	Fair
Question 8	Drinking carbonated drinks	0.83 (< 0.00)	Excellent	0.83	Excellent
Question 9	Frequency of dieting	0.83 (< 0.00)	Excellent	0.85	Excellent
Question 10	Frequency of eating carbohydrates	0.66 (< 0.00)	Good	0.66	Good
Question 11	Frequency of eating fruits	0.77 (< 0.00)	Excellent	0.76	Excellent
Question 12	Frequency of eating vegetables	0.77 (< 0.00)	Excellent	0.75	Excellent
Question 13	Frequency of eating dairy products	0.72 (< 0.00)	Good	0.72	Good
Question 14	Frequency of eating sweets	0.70 (< 0.00)	Good	0.68	Good
Question 15	Frequency of eating junk foods	0.47 (0.0081)	Fair	0.46	Fair
Question 16	Frequency of eating snacks	0.66 (< 0.00)	Good	0.64	Good
Question 17	Frequency of eating fast foods	0.42 (0.02)	Fair	0.41	Fair
Question 18	Nutrition information	0.79 (< 0.00)	Excellent	0.79	Excellent
Overall Score		**0.82 (< 0.00)**	**Excellent**	**0.79**	**Excellent**
SECTION 3: NUTRITIONAL KNOWLEDGE					
Question 1	Skipping breakfast	0.43 (0.02)	Fair	0.39	Poor
Question 2	Protein consumption	0.83 (< 0.00)	Excellent	0.83	Excellent
Question 3	Mental performance	0.45 (0.01)	Fair	0.45	Fair
Question 4	Pre-event meal	0.75 (< 0.00)	Excellent	0.75	Excellent
Question 5	Alcohol consumption	0.71 (< 0.00)	Good	0.70	Good
Question 6		0.39 (0.03)	Poor	0.33	Poor
Question 7		0.48 (0.007)	Fair	0.46	Fair
Question 8	Food Guide Pyramid	0.51 (0.0041)	Fair	0.50	Fair
Question 9		0.25 (0.19)	Poor	0.19	Poor
Question 10	Concentration	0.10 (0.60)	Poor	0.10	Poor
Question 11		0.45 (0.01)	Fair	0.44	Fair
Question 12	Carbohydrate consumption	0.24 (0.20)	Poor	0.17	Poor
Question 13		0.41 (0.02)	Fair	0.40	Fair
Question 14	Excess vitamin consumption	0.62 (0.0003)	Good	0.62	Good
Question 15	Iron deficiency	0.18 (0.34)	Poor	0.15	Poor
Question 16	Fat levels	0.56 (0.0013)	Fair	0.53	Fair
Question 17	Carbohydrate food sources	0.68 (< 0.00)	Good	0.68	Good
Question 18	Protein food sources	0.59 (0.0006)	Fair	0.59	Fair
Question 19	Protein consumption	0.60 (0.0005)	Good	0.56	Fair
Question 20		0.66 (< 0.00)	Good	0.60	Good
Question 21	Iron food sources and absorption	0.56 (0.0011)	Fair	0.50	Fair

Question 22		0.22 (0.25)	Poor	0.11	Poor
Question 23		0.13 (0.48)	Poor	0.13	Poor
Question 24	Protein and fat function	0.57 (0.0011)	Fair	0.57	Fair
Question 25		0.42 (0.0222)	Fair	0.42	Fair
Question 26	Fiber sources	0.62 (0.0003)	Good	0.61	Good
Question 27		0.49 (0.0059)	Fair	0.48	Fair
Question 28	Vitamin intake	0.64 (0.00)	Good	0.59	Fair
Question 29	Dehydration	0.51 (0.004)	Fair	0.51	Fair
Overall Score		**0.60 (0.0005)**	**Good**	**0.60**	**Good**

in a scale reliability α score of 0.81 (95% lower confidence limit = 0.72), earning an overall 'Good' rating. Only two questions (Questions 9 and 26) received a lower rating of 'Acceptable', with a Cronbach's α of 0.79. Only a few items were noted to have fair scores in terms of test-retest reliability. The Dietary Habits section resulted in positive outputs, with an overall score 0.79 rated as 'Excellent' while some items such as questions 6, 7, 15 and 17 were rated as 'Fair', with an ICC score between 0.40 to 0.55. No questions were rated 'Poor' (see Table 6).

In this section, hydration and recording of food intake, frequency of junk food and fast food consumption were items that would have the greatest possibility of change over a one-week period. This could also be particularly true for the Nutrition Knowledge Section where participants would have guessed their answers directly in terms of nutritional information, as opposed to misunderstanding the concepts grammatically. In this section, test-retest reliability resulted in an overall score of 0.60 interpreted as 'Good'. Items were mostly rated 'Fair' and 'Poor', with an ICC score ranging from 0.10 to 0.59. Only seven items were recorded to be 'Good' or 'Excellent'.

DISCUSSION

The DHNKQ-Fil was created using a variety of translation and validation guidelines to ensure cultural adaptability and statistical reliability. In the expert committee review, items that did not meet the score of Item-Content Validity Index (I-CVI) score of 0.78 were modified due to its grammatical difficulties as its chosen translation may be difficult to comprehend. With the modern age Filipino athlete, more relevant terminologies allow for better conceptualization of the subject being referred to in the question stated. Items were simplified enough to better adapt to modern Filipino culture applicable to the practices and lifestyles of these athletes[18]. Food terminologies such as junk food, carbonated drinks, and dairy were modified to correspond to the typical Filipino food terms such as *meryenda*, *softdrinks* and *gatas*. Samples of Filipino food items were also provided, and

some were modified to be more understood and adaptable to the local participants.

The Food Guide Pyramid used in the original questionnaire was the US version[19]. In this study, however, a modified version of the Food Guide Pyramid which was adapted for the Filipino population was used. For the purpose of this study, this modified version will be referred to as the 'Filipino Food Guide Pyramid'. Adding phrases like "sa isang araw" at the end of each question about food consumption based on the Filipino Food Pyramid Guide were emphasized. In the Filipino Food Guide Pyramid, the population was classified into two; Filipinos aged 18-19 years old and 20-25 years old. As there are two different age groups involved in the target population being tested, two versions of the questionnaire were made for each age group, one modified to the Food Guide Pyramid recommendation for 18-19 years old[20] and another for 20-25 years old[21]. This rationale for the creation of two different versions of the questionnaire was to highlight the differences in the dietary recommendations between the two age groups.

Internal consistency is defined as how well the item being tested measures what it is supposed to measure. Reliability test results of "Questionable" for dietary habits section could be attributed to the selection of participants coming from different sports. Different sports exhibit different dietary habits as they have to meet the requirements of their sport[22]. Judo, for example, a sport which categorizes athletes by their weight classes, cannot be compared to a team sport like basketball because dietary habits would be given more emphasis by players whose weight will be greatly affected by it. Dietary habits practiced by these kinds of athletes will differ from non-weight category sports because nutrition habits will have a much greater impact on their target performance and classification in the sport. An example of this would be the habit of dieting, food recording, eating fast food, or the habit of eating food high in sugar. Considering the varying concepts behind dietary habits per sport, scores in its Filipino translated version may as well be affected.

Internal consistency is defined as how well the item being tested measures what it is supposed to measure. Reliability test results of "Questionable" for dietary habits section could be attributed to the selection of participants coming from different sports. Different sports exhibit different dietary habits as they have to meet the requirements of their sport[22]. Judo, for example, a sport which categorizes athletes by their weight classes, cannot be compared to a team sport like basketball because dietary habits would be given more emphasis by players whose weight will be greatly affected by it. Dietary habits practiced by these kinds of athletes will differ from non-weight category sports because nutrition habits will have a much greater impact on their target performance and classification in the sport. An example of this would be the habit of dieting, food recording, eating fast food, or the habit of eating food high in sugar. Considering the varying concepts behind dietary habits per sport, scores in its Filipino translated version may as well be affected.

The Nutrition Knowledge Section, however, has an overall scale reliability rated as 'Good'. In a study by Folasire et al[2], nutrition knowledge is a foundation for any individual who would consider nutrition as an essential part of life regardless of what sport an athlete is engaged in. Although the specified recommended dietary intakes for Filipinos varied from the original English questionnaire, the concept and information behind each question still provided one and the same meaning after translation. The understanding of eating the three fundamental meals a day, vitamins and minerals, macro and micronutrients, for example, would be the same across any sport with only its amounts varying with each sport. This is a common nutritional information among participants that is why scores would be high.

Test-retest reliability is defined as how consistent an item is over time when tested on a set on the same set of participants. Intraclass Correlation Coefficient (ICC) was used to measure this aspect. The results of both Dietary Habits and Nutrition Knowledge sections produced overall acceptable ratings which indicate the consistency of the understanding towards the questionnaire. In the outputs obtained, it does not necessarily construe as unreliable but the information on these questions may change due to habit formation as recalled from the previous questionnaire rather than grammatical or linguistic inconsistency.

The Bilingual Education Policy existing in the Philippines advocates the use of Filipino in primary level and English during the secondary and tertiary levels, but it also advocated those who reside in the National Capital Region's (NCR) private and public schools. As the sample size is also limited, the study would have produced different results and distribution of responses for each statistical tool. Also, athlete participants in the study, although randomized, were not fully representative of their sport, thereby affecting items such as dietary habits which could have been validated better should the comparisons be made within their sporting teams only. Lastly, changes in the school system have not yet been implemented during the time of the study; thus, age differences in the collegiate level may vary in the future.

Although the questionnaire was successfully translated, validated and tested for its reliability, some considerations should be taken note of in future studies to further reinforce findings gathered in this study. These considerations include increasing sample size to 300 – 500 participants as stated in guidelines set by Sousa and Rojjanasrirat[12]. Validating the questionnaire to a single sport to eliminate the effects of anthropometric and nutritional characteristics from the psychometric analysis is highly recommended, as the responses of the participants in this study are extremely varied due to the assortment of sports with different dietary needs. This is apparent in weight control sports that have weight classes, such as Judo and Boxing. Lastly, considering the different dialects being used in the Philippines, it would also be recommended to revalidate and translate to these dialects for future use among collegiate athletes outside the National Capital Region. Ultimately, this questionnaire could be used in sports nutrition for performance enhancement through proper nutritional recommendations.

CONCLUSION

The Dietary Habits and Nutrition Knowledge Questionnaire is a tool that can aid health experts in assessing collegiate athletes' nutrition practice and knowledge. The cultural adaptation of the instrument was carried out in accordance with various international guidelines. The DHNKQ-FIL was shown to have acceptable levels of validity and reliability. It can be suitable for use in determining sports nutrition knowledge and dietary habits that may affect athletic performance and health of Filipino athletes. Moreover, this questionnaire can be used to investigate the relationship of nutrition knowledge and dietary habits according to sports. Lastly, due to its reliability, this can serve as a valuable assessment tool in planning nutrition education program.

Authors Contributions

Mrs. Karen Leslie L. Pineda conceived of the presented idea. Together with Ms. Stephanie Claire L. Pagarigan, verified the analytical methods and lead all investigators in the structure of the translation process. Mr. Alessandro B. Cardenas, Ms. Rayesha Azzedine Ma. G. Quilala and Ms. Niccol V. Servañez developed the theory and framework of related translation studies. Mr. Ronell Angelo P. Esteban and Mr. Johnmer Paul M. Se processed almost all the experimental data, verified results and drafted the manuscript. All authors took part in organizing and facilitating the focus group discussions, data gathering, results analysis and discussion and writing of the final manuscript.

Disclosure Statement

The authors of the publication declare no relevant or material financial interests that relate to the research described in this paper.

Conflict of Interest

No potential conflict of interest was reported by the authors.

Supplementary File

SI_DHNKQ-FIL. Copy of the Dietary Habits and Nutrition Knowledge Questionnaire- Filipino (DHNKQ-FIL).

References

1. American College of Sports Medicine, American Dietetic Association, Dietitians of Canada. Joint position statement: nutrition and athletic performance. Med sci sports exerc 200; 32(12):2130-45.

2. Folasire OF, Akomolafe AA, Sanusi RA. Does nutrition knowledge and practice of athletes translate to enhanced athletic performance? Cross-sectional study amongst nigerian undergraduate athletes. Global journal of health science. 2015 Sep;7(5):215.

3. Hornstrom GR, Friesen CA, Ellery JE, et al. Nutrition knowledge, practices, attitudes, and information

sources of mid-American conference college softball players. Food and Nutrition Sciences. 2011 Apr 26;2(02):109.

4. Alaunyte I, Perry J, Aubrey T. Nutritional knowledge and eating habits of professional rugby players: does knowledge translate into practice? Journal of the Intl Society of Sports Nut. 2015, 12:18. https://doi.org/10.1186/s12970-015-0082-y.

5. Montecalbo RC, Cardenas RC. Nutritional knowledge and dietary habits of Philippine collegiate athletes. International Journal of Sports Science. 2015;5(2):45-50.

6. Zinn C, Schofield G, Wall C. Development of a psychometrically valid and reliable sports nutrition knowledge questionnaire. Journal of science and medicine in sport. 2005 Aug 1;8(3):346-51.

7. Calella P, Iacullo VM, Valerio G. Validation of a general and sport nutrition knowledge questionnaire in adolescents and young adults: GeSNK. Nutrients. 2017 Apr 29;9(5):439.

8. Halliday MAK, Gibbons J, Nicholas H. Learning, keeping and using language. John Benjamins Publishing Company. Philadephia. 1990; 2:153-161.

9. Bernardo AB. McKinley's questionable bequest: Over 100 years of English in Philippine education. World Englishes. 2004 Feb;23(1):17-31.

10. Beaton DE, Bombardier C, Guillemin F, et al. Guidelines for the process of cross-cultural adaptation of self-report measures. Spine. 2000 Dec 15;25(24):3186-91.

11. World Health Organization. Process of translation and adaptation of instruments. 2007

12. Sousa VD, Rojjanasrirat W. Translation, adaptation and validation of instruments or scales for use in cross-cultural health care research: a clear and user-friendly guideline. Journal of evaluation in clinical practice. 2011 Apr;17(2):268-74.

13. Wild D, Grove A, Martin M, Eremenco S, McElroy S, Verjee-Lorenz A, et al. Principles of good practice for the translation and cultural adaptation process for patient-reported outcomes (PRO) measures: report of the ISPOR Task Force for Translation and Cultural Adaptation. Value in health. 2005 Mar;8(2):94-104.

14. Artino Jr AR, La Rochelle JS, Dezee KJ, et al. Developing questionnaires for educational research: AMEE Guide No. 87. Medical teacher. 2014 Jun 1;36(6):463-74.

15. Paugh SL. Dietary habits and nutritional knowledge of college athletes. Bachelor's Thesis, Faculty of the School of Graduate Studies and Research, California University of Pennsylvania. 2005.

16. Anthoine E, Moret L, Regnault A, et al. Sample size used to validate a scale: a review of publications on newly-developed patient reported outcomes measures. Health and quality of life outcomes. 2014 Dec;12(1):2.

17. Swaine-Verdier A, Doward LC, Hagell P, et al. Adapting quality of life instruments. Value in health. 2004 Sep;7:S27-30.

18. Bolarinwa OA. Principles and methods of validity and reliability testing of questionnaires used in social and health science researches. Nigerian Postgraduate Medical Journal. 2015 Oct 1;22(4):195.

19. United States Department of Agriculture Center for Nutrition Policy and Promotion. Food guide pyramid. 1992

20. Republic of the Philippines Food and Nutrition Research Institute Department of Science and Technology. Daily nutritional guide pyramid for Filipino children (13-19 years old). 2000

21. Republic of the Philippines Food and Nutrition Research Institute Department of Science and Technology. Daily nutritional guide pyramid for Filipino adults (20-39 years old). 2000

22. Galanti G, Stefani L, Scacciati I, et al. Eating and nutrition habits in young competitive athletes: a comparison between soccer players and cyclists. Translational Medicine@ UniSa. 2015 Jan;11:44.