



Development of a sports nutrition knowledge questionnaire for elite track and field athletes

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Abstract

Background: Satisfactory nutrition knowledge among athletes is important to encourage proper dietary habits to overcome deficiencies and enhance sports performance. Identifying knowledge gaps in sports nutrition is essential for improving athletes' understanding through a tool that evaluates both general nutrition knowledge (GNK) and sports nutrition knowledge (SNK).

Objective: This study aims to develop the Athletic Sports Nutrition Knowledge Questionnaire (A-SNKQ) specifically for Sri Lankan track and field athletes.

Methods: The development of the A-SNKQ followed an extensive step-wise approach. Firstly, a systematic literature review was conducted on existing SNK questionnaires for athletes. Secondly, sports nutrition guidelines were incorporated into the questionnaire. Thirdly, information from local literature was gathered to ensure contextual relevance. Lastly, a qualitative study involving key athletic stakeholders was conducted to gain cultural insights.

Results: The final version of the questionnaire consists of 32 questions in 12 sub-sections under two main sections: GNK section covers macronutrients, micronutrients, energy balance, hydration, and weight management, SNK section addresses carbohydrate loading, pre-training, training and post-training meals, sports supplements, supplement label reading, isotonic drinks, doping, and relative energy deficiency syndrome in sports.

Conclusion: A-SNKQ is a culturally tailored questionnaire which includes 32 questions across two major sections, designed to assess the GNK and SNK among track and field athletes in Sri Lanka. This was developed through a systematic literature review, examination of nutrition guidelines, exploration of local literature, and insights from a qualitative study with athletic stakeholders.

Keywords: knowledge, questionnaire, sports nutrition, Sri Lanka, athletics

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Introduction

Athletics is one of the most common sports worldwide.¹ The International Association of Athletics Federations (IAAF) recognizes several distinct athletic disciplines, including track sprints, middle/long distance hurdles, and relays; field throws and jumps; heptathlon and decathlon combined events; road running; race walks; cross-country; and mountain running and ultra-running.¹ Utilizing evidence-based, sports-specific nutrition practices is extremely valuable for enhancing sports performance and maintaining overall health.²

Sprinters heavily rely on response time, acceleration, and the capacity to maintain them despite increasing fatigue. There is common agreement that training nutrition should take priority over competition nutrition to ensure the athlete meets the higher metabolic demands of training.³ Further, in order to optimize training capacity, recovery, and body composition, nutrient intake should be strategically timed before, during, and after exercise.³ Energy intake should be personalized according to variability in training regimens, seasonality, and training volumes during the preparation period or the competition phase. In addition to energy supply, micronutrients are essential for energy metabolism, haemoglobin synthesis, bone health, and immune system stimulation.⁴

Further, hydration is essential for optimal sports performance and to prevent adverse events. Several ergogenic supplements, which can be defined as performance-enhancing substances, nutritional supplements, and a variety of techniques aimed at improving an athlete's exercise performance capacity⁵ such as caffeine, creatine, beta-alanine, and bicarbonate—can benefit athletes depending on the event.³ While there is no nationally published data on the dietary habits of athletes, a study on the nutritional intake of the undergraduate Sri Lankan athletic community found that they do not get sufficient energy or protein, and do not meet daily requirements for micronutrients, including vitamins B₁, B₂, B₉, B₁₂, and C and calcium, magnesium, and potassium.⁶ While the majority of Sri Lankan athletes take nutrition supplements,

including multivitamins (51.8%), creatine (37.3%), and protein powders (14.8%), they buy these supplements without recommendations from qualified professionals.⁷

Increasing evidence suggests that the nutrition knowledge of athletes is generally insufficient.⁸ In a systematic review, Trakman and colleagues reported that athletes' sports nutrition knowledge (SNK) test scores ranged from 33% to 84%,⁹ with more than half of the included studies reporting nutrition knowledge scores below 50%. suggesting that the majority of the athletic population may be at risk for chronic, inappropriate nutrition choices due to a lack of SNK. Indeed, a systematic review of twenty-nine original studies showed that athletes with strong nutrition knowledge are more likely to follow dietary recommendations,¹⁰ which can improve athletes' performance and overall health.¹¹

The development of a questionnaire begins with generating items, then moves on to the design of the questionnaire itself, and finishes with a thorough scientific assessment.¹² The structured approach to creating a questionnaire involves generating items, formatting these items, and refining the initial draft to ensure it is clear, engaging, and free of specialized language.¹²

Trakman and colleagues developed a questionnaire informed by recent updates in sports nutrition guidelines to evaluate SNK.¹³ This tool has undergone validation through rigorous methods that include both classical test theory (CTT) and item response theory (IRT), specifically using Rasch analysis. This questionnaire consists of 89 questions divided into six categories: weight management, macronutrients, micronutrients, sports nutrition, supplements, and alcohol.¹³ Similarly, Furber et al. have developed a psychometrically sound tool designed to measure general and SNK.¹⁴ This instrument, consisting of 85 questions, was formulated with the guidance of an expert panel.¹⁴ Tam and his team developed an electronically administered sports nutrition knowledge tool called the Platform to Evaluate Athlete Knowledge of Sports Nutrition Questionnaire (PEAKS-NQ), which consisted of 94 items.¹⁵ The questionnaire was developed using focus group data from 16 high-level sports nutritionists, scientific literature, and an up-to-date

sports nutrition position stand. It was modified in cooperation with two experienced sports nutritionists to ensure its applicability to the intended population.¹⁵

In the Sri Lankan context, nutrition knowledge questionnaires for adolescents¹⁶ and reproductive-age women¹⁷ have been developed. However, to date, no published evidence exists for an SNKQ to assess the SNK in Sri Lankan athletics. Therefore, the aim of this study is to design and validate a culturally appropriate, comprehensive questionnaire that assesses both general and sports-specific nutrition knowledge among track and field athletes in Sri Lanka. This tool is intended to bridge the gap in current nutritional assessment methodologies by incorporating insights from systematic literature reviews, guidelines from authoritative bodies such as the International Olympic Committee (IOC), local dietary practices, and direct stakeholder inputs. Ultimately, this questionnaire aims to enhance the accuracy and relevance of nutrition knowledge evaluation within the athletic community, contributing to targeted nutritional interventions and improved athletic performance.

Methods

A mixed-methods approach was designed based on an extensive review of the literature¹⁸ and used for the development of the questions (in English) for the current A-SNKQ. The reporting of the present study fulfils the design and conduct of GUIDED – a guideline for reporting for intervention development studies, in the EQUATOR library of reporting guidelines¹⁹ (**Supplementary material 1**). The approach for developing the items in the tool comprised the following steps: (1) Conducting a systematic review of previous literature on SNKQs used in athletic sports; (2) Reviewing athletic-related SN guidelines; (3) Searching for local literature; (4) Conducting in-depth interviews with athletic stakeholders in Sri Lanka. This process was followed by an additional four steps to format and translate the questionnaire as follows: categorization into sections and subsections; implementation of branching logic; translation and

cultural adaptation; and making the tool available online.

1. Systematic review of literature

A systematic review was conducted to synthesize data regarding existing questionnaires used to assess the SNK of athletes worldwide. Detailed information regarding this review has been published elsewhere.²⁰ In summary, the PubMed®, Web of Science®, and SciVerse Scopus® databases were searched using the keywords "sport" AND "nutrition" OR "diet" AND "knowledge" AND "questionnaire" OR "assessment" OR "survey". The titles, abstracts, and full texts of the identified articles were screened by two team members (RJ and KW). The principal investigator (RJ) carefully examined each questionnaire and extracted the most relevant questions for the Sri Lankan context. Subsequently, prior permission to use each question was sought from the respective authors, resulting in the compilation of a pool of questions.

2. Review of sports nutrition guidelines

Recent athletic-related sports nutrition guidelines²¹ and educational materials related to athletics, including the International Olympic Committee (IOC) recommendations were closely reviewed to further modify the questions.

3. Search for local literature

Thirdly, to make the instrument culturally appropriate, two literature search strategies were used. First, searches were undertaken in index databases such as PubMed® and Scopus® using "Sri Lanka" as a keyword along with other sports and nutrition-related keywords, such as "sport," "athletic," "nutrition," and "dietary." Second, using the same set of keywords, non-index publications relevant to the Sri Lankan context were identified using Google Scholar (Google LLC, Mountain View, CA, USA).

4. Qualitative exploration

In this step, in-depth interviews were conducted with support staff (n = 11) and elite-level athletes in Sri Lanka (n = 4), involving human participants, to investigate practices and perceptions concerning four key areas of sports nutrition at the ground level.²² These areas encompassed opinions regarding dietary practices, sports supplements, hydration, and other habits such as alcohol consumption and doping. The findings of this study have been previously published.²² Informed written consent was obtained from each participant after giving them adequate time to ask questions and clarify doubts about the research.

All methods were performed in accordance with the declaration of Helsinki and ethical approval for the study was obtained from the Ethics Review Committee, Faculty of Medicine, University of Peradeniya, Sri Lanka [Ref No. 2022/EC/66].

Categorization of the pooled questions

After careful consideration of the pooled list of questions, the principal investigator (RJ) categorized them into two main sections, namely GNK and SNK, based on robust theoretical nutritional concepts. The commonly consumed local foods to be included in the questionnaire were identified based on in-depth interviews with support staff and elite-level athletes conducted during the qualitative study²² and by using the food exchange atlas for Sri Lankan adults.²³ The general nutrition section included questions related to a non-athlete population's understanding of key nutrition concepts, with sub-sections on macronutrients, micronutrients, energy balance, hydration, and weight management. The sports nutrition section focused on the nutrition knowledge associated with sporting performance among athletes, such as carbohydrate loading, pre-training meals, meals during training, post-training meals, sports supplements, supplement label reading, alcohol, isotonic drinks, doping, and relative energy deficiency syndrome in sports (RED-S). The research team determined the number of questions in each sub-section, taking into account the relevance of individual items to the

Sri Lankan population, the scientific credibility of the items, and the practicality of the overall number of items in the final tool.

Implementation of branching logic for questions

Branching logic, or skip logic, is a feature in survey design that changes the questions presented based on a participant's response to previous questions.²⁸ This method is particularly useful in tailoring the questionnaire to be more relevant and less burdensome to respondents by avoiding unnecessary questions.²⁸

Given the diversity within the athletic population, it was not anticipated that athletes would possess comprehensive nutrition knowledge regarding the use of various supplements across all events. Hence, a decision was made to employ branching logic for questions related to supplement usage, where only the relevant supplements based on their sporting event were displayed. For instance, if an individual selects the 100 m event, questions related to supplements for other events will be disabled, allowing them to answer solely in relation to the selected event. This tailored approach enhances the questionnaire's relevance for each athlete's specific needs.

Translation and cultural adaptation

First, a forward translation was conducted from English to Sinhala by an independent translator who was a native Sinhalese speaker and had a good understanding of the instrument's domains. The translator was instructed to focus on capturing the conceptual equivalence rather than a literal word-for-word translation. Then a bilingual expert panel (n= 4), convened by the principal investigator (RJ), reviewed the translation and addressed any inadequacies in expressions or concepts. The panel consisted of the original translator, experts in sports nutrition (n=4), and individuals experienced in instrument development and translation (n=2). They also made modifications to individual questions to ensure cultural adaptation of the questionnaire. The third stage involved the back-translation of the instrument from Sinhala to English. It was carried out by a second independent

translator who had no prior knowledge of the original questionnaire. Any discrepancies identified in the back translation were discussed with the expert panel, and revisions were made until a satisfactory Sinhalese version of the A-SNKQ was obtained. A similar procedure was performed for the translation of the Tamil language.

Making the tool available online

Subsequently, an online version of the questionnaire was developed using Google Forms (platform: Google Forms, Google LLC, California, USA) to facilitate easy accessibility and data collection. It was made available in all three official languages of Sri Lanka: English, Sinhala, and Tamil ensuring inclusivity for participants across different language backgrounds.

Results

The systematic literature review (step 1) revealed a total of 11 studies on questionnaires assessing SNK. Among these, eight studies focused only on athletic disciplines, while three encompassed athletics and other sports. 26 questions from these studies were deemed appropriate and relevant for the Sri Lankan athletic population. By incorporating recent sports nutrition guidelines including IOC recommendations (step 2), we developed an additional 10 questions, resulting in an updated and evidence-based draft questionnaire consisting of 36 questions. The Google Scholar search (step 3) that was conducted specifically targeting local literature for contextual modifications resulted in a total of five articles, of which the first 100 search hits were examined. This led to an additional three items for the question pool. Finally, the in-depth interviews conducted with athletic stakeholders contributed two items, which were predominately related to the selection of food items according to the local setting and

cultural practices on dietary practices, sports supplementation, and hydration. For the sports supplement questions, sports supplement labels (n=3) were collected from local stores and websites to be included in the current questionnaire (**Figure 1**). A total of eight draft items were excluded due to their lack of applicability within the local context and being beyond the scope of the A-SNKQ. The final version of the questionnaire comprises a total of 32 questions.

The final compiled SNKQ comprises 33 questions covering 12 sub-sections that are divided into two main sections: GNK and SNK. The general nutrition section comprises 15 questions distributed among sub-sections covering macronutrients (n=4), micronutrients (n=3), energy balance (n=4), hydration (n=3), and weight management (n=1). Within the sports nutrition section (n=17), specific emphasis is placed on carbohydrate loading, pre-training meals, and meals during training, each represented by one question. Post-training meals and RED-S are addressed with two questions, followed by sports supplements (n=6), supplement label reading, alcohol, isotonic drinks, and doping (n=4) in subsequent sub-sections. The questionnaire employed the main two-question formats of single-best response questions (SBRQs: n=29) and multiple-choice questions (MCQs: n=3) with no open-ended questions.

The structure of these questions varied, with some having three options, such as 'agree,' 'disagree,' and 'unsure,' while others had five responses carrying the most accurate answer. A plus mark (+1) was awarded for the correct answers and a negative mark (-1) for the wrong answers; zero marks (0) were given for an unsure response. The estimated time required to complete the questionnaire was approximately 10 - 15 minutes. A comprehensive overview of the A-SNKQ is represented in **Table 1**.

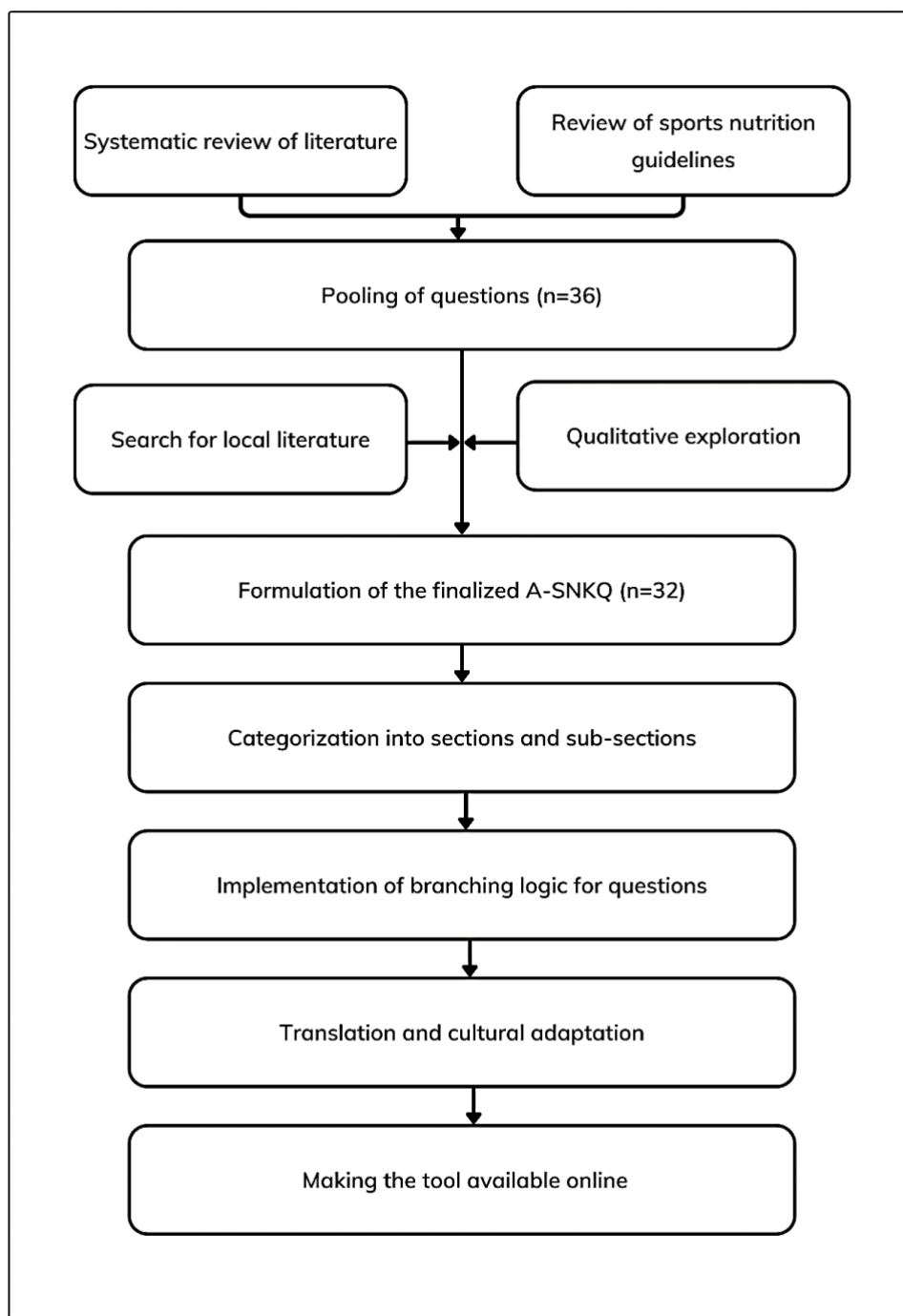


Figure 1. The step-wise approach for the development process of the A-SNKQ (Athletic Sports Nutrition Knowledge Questionnaire)

Table 1. Summary of A-SNKQ

Sections and sub-sections	Source of questions	Number of items	Question format
1. GNK			
Macronutrients	1,2,3,4	27	SBRQs
Micronutrients	1,2,3	08	SBRQs
Energy balance	1,2,4	09	SBRQs
Hydration	2,3,4	11	SBRQs
Weight management	3	01	SBRQs
2. SNK			
Carbohydrate loading	2	01	SBRQs
Pre-training meals	3,4	04	SBRQs
Training meals	2,4	06	MCQs
Post-training meals	2,3,4	11	MCQs, SBRQs
Sports supplements	2,4	26	SBRQs
Supplement label reading, alcohol, isotonic drink, and doping	1,2,3,4	16	SBRQs
RED-S	2	02	SBRQs

The four-step approach followed during the development of A-SNKQ: 1. Systematic review of literature, 2. Review of sports nutrition guidelines, 3. Search for local literature, 4. Qualitative exploration.

Abbreviations: GNK= General nutrition knowledge, MCQs= Multiple-choice questions, RED-S= Relative energy deficiency syndrome in sports, SBRQs= Single-best response questions, SNK= Sports nutrition knowledge.

Section 1: General Nutrition Knowledge

The initial question presents 20 common food items and asks respondents to identify the most abundant macronutrient. Eleven, five, and four food items predominantly contain carbohydrates, proteins, and fats, respectively. The second question focuses on dietary fibre, while the third and fourth questions address protein distribution and recommendations. In the micronutrient sub-topic, we listed six common food items and asked participants to identify the most abundant micronutrients, including calcium, iron, and vitamin C. Other questions in this sub-section explored participants' understanding of the availability of antioxidants in local sour fruits and the recommendation of micronutrient supplements for athletics. The subsequent sub-section covered knowledge of energy in nutrients and balance, as well as post-exercise recovery requirements, including the importance of consuming adequate amounts of carbohydrates and protein following

exercise. The 'hydration' sub-section assessed participants' knowledge of signs of dehydration, food sources of salt, and the recommended post-training fluid intake. Lastly, participants' knowledge of weight management was evaluated through a separate question on appropriate low-energy, high-volume foods that can be used as a rice substitute.

Section 2: Sports Nutrition Knowledge

The sports nutrition section covered a range of topics related to carbohydrate loading, training-related meals, sports supplements efficacy and comprehension of supplement labels, the impacts of alcohol on performance and recovery, isotonic drinks, doping, and RED-S. Athletes' awareness of the importance of nutrition before training was assessed via a question that listed food items and inquired about the recommended intervals at which they should be consumed. Likewise, in order to evaluate participants' knowledge about the

appropriate food and beverage choices during an intense 2-hour training session and post-training meals, they were presented with 6 and 9 options, respectively, and asked to select appropriate choices, with several possible correct answers. Further, an MCQ format was utilized to evaluate the SNK of the respondent regarding the importance of having a recovery meal.

Four SBRQs were used to assess the understanding of recommended doses for whey protein, creatine, beta-alanine, and bicarbonate supplementation. An additional question was incorporated to specifically identify any misconceptions about the use of supplements. Recognizing that not all ergogenic supplements are equally effective for every sporting event, participants were provided with a list of events and asked to select their main athletic contest. Following that, they were provided with five supplement options, namely caffeine, creatine, nitrate, beta-alanine, and bicarbonates, and allowed to select the most appropriate supplement for their particular event.

To assess knowledge of banned substances, participants were presented with six substances and asked to identify the three banned items among them, alongside three safe items. Additionally, participants were shown three "real-life" supplement labels in the form of images to read the product labels and identify them. The final subtopic on RED-S was concerned with the impact on performance and health caused by athletes failing to meet their daily calorie needs.

Discussion

This study presents the first SNKQ developed in Sri Lanka, specifically tailored for track and field athletes. To ensure an extensive, locally acceptable tool, we employed four comprehensive strategies that combined cultural acceptance and the latest evidence. Consequently, the development of the A-SNKQ in this study addresses a significant gap in the existing literature and offers a valuable instrument for assessing SNK within the local athletic context.

Furber and colleagues (2017) listed Weetabix, chocolate spread, whole meal bread, and jelly

beans as food items for participants to choose between high or low carbohydrates.¹⁴ However, in the Sri Lankan context, during our in-depth interviews and literature review, these food items did not emerge. Hence, we incorporated bread, cooked rice, string hoppers, and sweet potatoes as examples of carbohydrate-rich foods in our study. Similarly, while they listed kidney beans and tuna as foods rich in proteins, we have included chickpeas and fish as corresponding items in our SNKQ.¹⁴ Similarly, we substituted canola margarine, cottage cheese, and sunflower seeds with coconut oil and coconut sambal as sources of dietary fats. This replacement was implemented based on the prevalent use of coconut oil as the primary fat source in Sri Lanka.^{27, 8}

Trakman and colleagues utilized a specific question within the SNK section to evaluate the approximate daily protein requirements of well-trained resistance athletes. In general, Sri Lankans have a low daily protein intake.¹³

Furber and his team employed a separate question to assess the participant's knowledge regarding vitamins B, C, calcium, and iron.¹⁴ However, in order to prevent excessive length, we have chosen to consolidate the various subcategories of vitamins into two questions.

Engaging in intense training while maintaining a low energy intake can present substantial health risks, including the potential development of adverse conditions such as low energy availability (LEA).²⁶

Proper hydration for sports is an essential area to access in any questionnaire related to sports nutrition. Previous studies have primarily concentrated on various aspects of hydration, including the determination of optimal fluid intake during exercise sessions,²⁵ the composition of sports drinks,²⁵ the myths and importance of hydration for sports performance,¹³ and the identification of dehydration signs.¹⁴ Hence, the subtopic 'hydration' was subsequently employed in our work to evaluate various aspects, including the identification of dehydration symptoms, the recognition of salt-rich sources, and the recommended post-training fluid intake for athletes. Our previous studies have also identified

limitations in knowledge regarding hydration within a similar population.²²

The A-SNKQ developed in the current study has some limitations to consider. While it is a comprehensive tool, it contains knowledge items that may not be equally important for every athlete. As well, the length and technical nature of the questionnaire might pose challenges for athletes who lack motivation or have lower literacy levels. By implementing evidence-based interventions based on the findings of the SNK assessment tool, national athletic programs can optimize their athletes' nutrition knowledge and practices, leading to improved performance and overall success in the sporting arena. However, it is crucial to emphasize the need for proper validation of the current A-SNKQ, followed by the process of development. Precise validation of this developed questionnaire is important to ensure its relevance and significance in future research and practical applications.

Conclusion

In conclusion, we aimed to develop a culturally acceptable tool to assess SNK among track and field athletes in Sri Lanka. The questionnaire encompasses a total of 32 questions, categorized into two major sections: GNK and SNK. The development process followed a four-step approach that incorporated sources of information to formulate the current questionnaire. This involved conducting a systematic literature review, reviewing sports nutrition guidelines, searching for local literature, and gathering insights from a qualitative study involving relevant athletic stakeholders. These areas are considered fundamental to awareness of the overall nutrition principles applicable to athletes.

Conflict of interest

The authors declare there is no conflict of interest regarding this article.

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Athletic Sports Nutrition Knowledge Questionnaire (A-SNKQ)

This short survey is designed to assess the knowledge of Sri Lankan elite athletes regarding general and sports nutrition. Your participation and honest responses will be highly appreciated. The questionnaire takes about 10-15 minutes to complete. For statement-based questions, please indicate whether you agree with the given statements or not. If you do not know the answer to any question, please select the "unsure" option. The information you provide will be kept strictly confidential.

Section 1 – General Nutrition Knowledge

1. Macronutrients

1. Please consider the following food items and select **the most abundant** macro-nutrient in each food.
(Check the one that applies the most)

Food item	Carbohydrates	Proteins	Fats	Unsure
Banana	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Beef	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bread	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chicken	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chickpeas	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Coconut oil	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Coconut <i>sambal</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Corn flakes	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dates	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dhal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dried fish	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Egg white	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fish	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Oats	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Olive oil	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Pasta	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Peanuts	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Rice	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
String Hoppers	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sweet Potatoes	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2. Please consider the following food items and indicate whether they are a good source of dietary fibre source or not.

Food item	Yes	No	Unsure
Beef	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Fruits	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Green leafy vegetables (<i>mallum</i>)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Milk	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Vegetables	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3. For athletes wanting to enhance recovery from physical activity and optimize muscle growth, spreading out protein consumption throughout the day is more effective than consuming it all at once.

Agree

Disagree

Unsure

4. The optimum daily protein intake for athletes who have a goal of weight maintenance or weight gain is (in grams per kilogram of body weight per day),

0.3 g/kg BM/day

0.8 g/kg BM/day

1.5 g/kg BM/day

2.5 g/kg BM/day

Unsure

2. Micronutrients

5. Select the micronutrient of which the following foods are a rich source,
(Check the one that applies the most)

Food item	Calcium	Iron	Vitamin C	Unsure
Banana	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Beef	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Curd	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Full cream milk powder	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Local mandarins	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Sweet potatoes	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

6. Most of the local sour fruits contain a **high amount** of antioxidants.

Agree

Disagree

Unsure

7. You should take vitamin supplements if,

1. You feel tired
2. You are getting sick often
3. Your colleagues also take the same
4. You have been told you have a deficiency by a medical professional
5. Unsure

3. Energy balance

8. Please consider the following nutrient or substance and indicate whether it provides energy.

Type of nutrient/substance	Yes	No	Unsure
Alcohol	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Carbohydrate	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fats	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Iron	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Proteins	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vitamin B ₁₂	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

9. Feeling tired midway through a workout might be a sign of insufficient energy-rich food in one's diet.

Agree

Disagree

Unsure

10. Consuming a sufficient amount of carbohydrates helps to reduce protein breakdown in the body.

Agree

Disagree

Unsure

11. During resistance exercises, the body tends to use protein as the main energy source.

Agree

Disagree

Unsure

4. Hydration

12. Please read each of the following signs and state whether it is a method/sign of dehydration after an intense training session.

Method/Sign	Yes	No	Unsure
Assessing urine colour after training	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Presence of dry mouth	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Presence of loose stools	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Feeling of thirst	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Measuring urine-specific gravity	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

13. If you lost one kilogram of weight during a training session, how much water do you need to consume after training (in liters)?

1. 0.5 L
2. 1.0 L
3. 1.5 L
4. 2.0 L
5. Unsure

14. Please consider the following food items and indicate whether it is a rich source of salt.

Food item	Yes	No	Unsure
<i>Jeewani</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
King coconut water	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Marmite	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Milk	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Watermelon juice	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

5. Weight management

15. If you want to lose weight, rice should be replaced with which of the following food items? (**Check the one that applies the most**).

1. Chicken curry
2. Potato curry
3. Dhal curry
4. Vegetable salad
5. Unsure

Section 2 – Sports Nutrition Knowledge

6. Carbohydrate loading

16. To maximize muscle glycogen stores, carbohydrate loading is best followed by how many hours before the competition (in hours)?

- 1. 6-12 h
- 2. 12-24 h
- 3. 24-48 h
- 4. 168 h
- 5. Unsure

7. Pre-training meals

17. Please indicate the correct time gap for the pre-training meals given below.

Food item	4-hours before exercise	½-1-hour before exercise	Unsure
Rice and curry	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A banana	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Boiled chickpeas with coconut	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A jam sandwich	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

8. Training meals

Check all that apply. Please note that minus marks will be given for each incorrect answer.

18. Which of the following food/beverage can be taken in the middle of an intense 2-hour training session?

1. A banana
2. A small sandwich
3. Nuts
4. Raw eggs
5. *Jeewani*/ORS
6. Unsure

9. Post-training meals

This section consists of multiple-choice questions, you can select one or more answers for each question.

Please note that minus marks will be given for each incorrect answer.

19. Recommended meal/s after two hours of an intense training session is/are,

1. A glass of *kola kanda*
2. Milk packet
3. A piece of fried chicken
4. Boiled chickpeas
5. Boiled sweet potatoes
6. Bowl of cornflakes with non-fat milk
7. Bread with jam
8. Two boiled eggs
9. White rice with dhal and chicken
10. Unsure

20. After heavy training athletes should,

1. Drink fluids but avoid eating as digestion is impaired after exercise
2. Wait until your next meal to avoid overeating and gaining weight
3. Eat foods high in carbohydrates and proteins within 30 minutes to 2 hours and eat sooner rather than later if you are training/competing again on the next day
4. Eat whatever you can find as soon as possible to avoid low blood glucose
5. Unsure

10. Sports supplements

21. What is the amount of whey proteins that should be consumed per serving for optimum muscle building/muscle protein synthesis/recovery (in grammes)?

1. 5 g
2. 10 g
3. 15 g
4. 20 g
5. Unsure

22. What is the recommended daily creatine maintenance dose (in grams)?

1. 2 g
2. 5 g
3. 7 g
4. 10 g
5. Unsure

23. What is the recommended daily dose of beta-alanine (in grammes)?

1. 1 g
2. 2 g
3. 3 g
4. 4 g
5. Unsure

24. How do you calculate the recommended total dose of the bicarbonate according to body weight (in grammes per kilogram of the body weight per day)?

1. 0.05 g/kg BM/day
2. 0.15 g/kg BM/day
3. 0.3 g/kg BM/day
4. 0.5 g/kg BM/day
5. Unsure

25. Which statement about the contribution of sports supplements to your sports performance is true?

1. Taking supplements is more important than changing your diet if you want to improve your sports performance
2. Taking supplements is equally as important as improving your diet if you want to improve your sports performance
3. Supplements do not benefit performance and are never needed
4. Some supplements can have a small impact on performance but the contribution will depend on the type of supplement and what sport you play
5. Unsure

26. Select your primary sporting event and the corresponding optimal sports supplement.

(Certain sporting events may have multiple suitable sports supplements.)

Event	Caffeine	Creatine	Nitrate	Beta-alanine	Bicarbonate
100 m	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
200 m	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
100/110 m hurdles	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
400 m	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
400 m hurdles	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
800 m	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1500 m	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
3,000 m steeple chase	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
5,000 m	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10,000 m	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Race walking	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Half marathon	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Marathon	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Long jump	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
High jump	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Triple jump	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pole vault	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Throws (discus, hammer, javelin and shot put)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Heptathlon	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Decathlon	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

11. Supplement label reading, alcohol, isotonic drink, and doping

27. Which of the following is banned by the World Anti-Doping Agency (WADA) for use before the competition?

1. Bicarbonate
2. Caffeine tablets
3. Iron-IV infusion
4. Polybion-IV infusion
5. Steroid injections
6. Whey protein
7. Unsure

28. Drinking alcohol slows down recovery after training.

- Agree
- Disagree
- Unsure

29. Identify the safe to use supplement put of the following three labels.

1.

Supplement Facts

Serving Size: 1-3 Scoops (5.55g-16.65g)
Servings Per Container: 15-45

Amount Per Serving:	%DV
Proprietary Blend: 4,145mg *	12,435mg *
(Arginine Alpha-Ketoglutarate, Creatine Monohydrate, Beta Alanine, Caffeine, 2-Aminoisooheptane HCl, Geranium Extract (stem & leaves), Yohimbe Extract (bark)(Standardized for Yohimbine Alkaloids), Schisandra Chinensis (berry) Extract (Standardized for Schizandrol A))	
Caffeine	135mg * 405mg *

*Daily value not established

Other Ingredients: Citric Acid, Natural and Artificial Flavors, Acesulfame-K, Sucralose, Silicon Dioxide, FD&C Red #40 and FD&C Blue #1

2.

CARNIVOR 10 LBS - CHOCOLATE FUDGE

Supplement Facts

Serving Size: 4 Scoops (194 g)
 Servings Per Container: 25

Amount Per Serving	% Daily Value
Calories	710
Calories from Fat	25
Total Fat	2.5 g 5%†
Saturated Fat	2.5 g 13%†
Cholesterol	0 mg 0%
Total Carbohydrate	125 g 42%†
Dietary Fiber	2 g 8%†
Sugars	0 g ‡
Protein	50 g 100%†
Chromium (as Chromium 454® Bio-Organic Yeast Matrix)	200 mcg 167%
Sodium	580 mg 24%
Potassium	310 mg 9%

† Percent Daily Values are based on a 2,000 calorie diet.
 ‡ Daily Value not established.

Ingredients: **ISPIKE** Technology [consisting of Insulin-Release-Amplifying Reactive Carbohydrate System (Micronparticulated Maltodextrin, Micronparticulated Waxy Maize, Amylase and Gluco-Amylase) and Insulin-Signal-Amplifying System (*Agaricus blazei*, Chromium 454® brewer's yeast extract, 4-hydroxyisoleucine, D-Pinitol)], **CARNIVOR BPI** [consisting of Hydrolyzed Beef Protein Isolate, creatine monohydrate, L-glutamine, Branched Chain Amino Acids (BCAAs: L-leucine, L-valine and L-isoleucine) and Anabolic Nitrogen Retention Technology™ Intermediates: GKG (glutamine-alpha-ketoglutarate), OKG (ornithine-alpha-ketoglutarate), AKG (alpha-ketoglutarate) and KIC (alpha-ketoisocaproate)], cocoa, medium-chain triglycerides (MCTs) natural and artificial flavors, silicon dioxide, salt, acesulfame potassium and sucralose.

3.

NUTRITION INFORMATION		
Servings Per Container: Approx. 42		
Serving Size: 1 Rounded Scoop (43 g)		
	Quantity Per Serving	Quantity Per 100g
Energy	710kJ/170 cal	1652kJ/395 cal
Protein	30g	70g
Total Fat	4g	9.3g
Cholesterol	85mg	198mg
Total Carbohydrate	4g	9.3g
Dietary Fiber	1g	2.3g
Sugars	2g	4.7g
Vitamin C	5mg	11.6mg
Calcium	210mg	488mg
Iron	0.72mg	1.7mg
Sodium	140mg	326mg
Ripped® Matrix		
L-Carnitine L-Tartrate	500mg	1163mg
CLA (Conjugated Linoleic Acid)	250mg	581mg
<i>C. canephora robusta</i> Extract (bean)	250mg	581mg
(Robusta Coffee) Standardized for 45% Chlorogenic Acids		
Green Tea Extract (as Camellia sinensis) (leaf)		
Standardized for 15% EGCG	100mg	233mg
Rose Hip Extract (as Rosa canina) (fruit)		
Kelp (as Laminaria digitata) (stem and leaf)	100mg	233mg
All specified values are averages	20mg	47mg

Ingredients: Isolate Protein & Peptide Blend (Whey Peptides, Whey Protein Isolate, Whey Protein Isolate 97%), Cocoa (Processed with Alkali), Natural and Artificial Flavours, Gum Blend (Cellulose Gum, Xanthan Gum, Carrageenan), Salt, Soy or Sunflower Lecithin, Flaxseed, Medium Chain Triglycerides, Silicon Dioxide, Sucralose, Acesulfame-Potassium.

4. None of the above

5. Unsure

30. Which of the following is/ are examples of an isotonic solution (A solution with a concentration roughly equal to the composition of body fluids)?

1. Dextrose

2. Fruit juice

3. *Jeewani* (ORS)

4. Water

5. Unsure

12. RED-S

31. 'Meeting relatively lesser energy than the required amount causes poor performance and serious health issues.'

Agree

Disagree

Unsure

32. 'It is important not to change your dietary habits during overseas competitions.'

Please indicate whether you agree with this statement by checking the appropriate box.

Agree

Disagree

Unsure