

Evaluating Recreational Athletes' Sports Nutrition
knowledge: Differences by Age and Ability

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DECLARATION

I certify that the whole of this work is the result of my individual effort, and that all sources have been acknowledged.

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I am satisfied that this work is the result of the Student's effort.

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Abstract

This main purpose of this study was to explore the extent of sports nutrition knowledge among recreational runners, a group often overlooked in existing research on athletic nutrition. The study seeks to examine the relationship between age, running ability, and nutrition knowledge using a mixed-methods approach that incorporates both quantitative and qualitative data collection.

In Phase 1, the Nutrition for Sport Knowledge Questionnaire (NSKQ) was employed to assess participants' understanding of sports nutrition. The findings indicated a moderate level of knowledge within the sample, with an average score of 8.00 out of 18. Independent samples t-tests showed no statistically significant differences in nutrition knowledge between age groups (18–25 years and 30+ years) or running ability groups (lower-ability and higher-ability runners). No notable findings were observed, and the results suggest there were no meaningful differences that warrant further investigation.

In Phase 2, an open-ended questionnaire provided qualitative insights into participants' sources of nutrition information and their views on the role of nutrition in performance and recovery. The results highlighted a strong reliance on online resources, including social media, as well as guidance from peers and professionals. Participants also expressed concerns about the reliability of these sources.

The findings emphasise the need for improved and more accessible nutrition education specifically designed for recreational runners, as considerable knowledge gaps were identified. This study concludes by recommending the integration of structured nutrition support within recreational running communities to encourage more beneficial dietary habits that can enhance both athletic performance and overall well-being.

Introduction

Nutrition plays a fundamental role in running performance, influencing endurance, injury prevention, and recovery. Proper fuelling supports energy levels, enhances immune function, and reduces the risk of overtraining (Martín-Rodríguez et al., 2024). According to the British Nutrition Foundation (2024), adequate nutrition is essential for meeting the energy demands and recovery needs of both elite and recreational athletes. While elite athletes rely on specific nutritional strategies to optimize performance, recovery, and muscle maintenance during intense training, recreational athletes also require a balanced diet to sustain energy levels, reduce fatigue, and improve overall fitness (National Institute of Sports Science, 2021).

The British Dietetic Association (BDA, 2020) emphasises the importance of a well-balanced diet comprising carbohydrates for energy, protein for muscle repair, fats for sustained fuel, and essential vitamins and minerals for overall health. In contrast, inadequate nutrition can negatively impact an athlete's performance, recovery, and overall well-being (Better Health Channel, 2023). Research by Dave and Fisher (2022) found that athletes experiencing low energy availability due to under-fuelling reported poorer recovery, heightened fatigue, weakened endurance, and even psychological distress, emphasising the critical role of adequate nutritional intake.

Nutritional knowledge is essential for athletes to meet their energy and nutrient needs, support training adaptations, and reduce the risk of conditions such as Relative Energy Deficiency in Sport (RED-S). RED-S develops when athletes fail to consume sufficient fuel to meet training demands, especially carbohydrates, leading to adverse effects on reproductive health, bone density, and psychological well-being (Dooney, 2020). However, despite the significance of proper nutrition, many athletes lack sufficient nutritional knowledge. Alahmadi et al. (2023) found that athletes demonstrated limited understanding of macronutrient distribution, hydration, and supplementation, resulting in uneducated dietary choices. Similarly, Bird and Rushton (2020) identified substantial knowledge gaps among youth academy athletes, particularly regarding carbohydrate, protein, and fat intake, as well as supplement use.

A study by Snezana Barjaktarovic Labovic et al. (2024) compared the nutritional knowledge of elite and recreational athletes, revealing that while elite athletes scored higher (77.2% correct answers), recreational participants exhibited lower knowledge levels (67.7%). Additionally, many recreational athletes made independent supplementation decisions without professional guidance, raising concerns about misinformation and suboptimal dietary choices. These findings highlight the necessity for targeted nutrition education to support informed decision-making and improve overall health. Limited awareness of the importance of sports nutrition can contribute to inconsistent dietary habits, which may hinder performance outcomes and overall well-being. Expanding access to evidence-based nutrition education could help bridge this gap and promote healthier eating behaviours among athletes ((Martín-Rodríguez et al., 2024).

This study aims to assess the nutrition knowledge of recreational athletes across different ages and performance levels. Given the evidence of knowledge gaps, particularly among non-elite athletes (Alahmadi et al., 2023; Bird & Rushton, 2020), this study will evaluate sports nutrition knowledge among members of a local running club. Endurance sports such as running place significant physiological demands on the body, requiring appropriate nutritional strategies to support energy needs and recovery. To explore this issue, participants will complete a questionnaire assessing their understanding of nutrition. The findings will provide insight into current knowledge levels and highlight areas where further education may be beneficial.

Literature Review

What is a recreational athlete?

A recreational athlete is an individual who engages in physical activity but does not train with the same level of intensity or focus as a competitive athlete. These individuals participate in sports primarily for fitness and enjoyment. While their main goal is personal well-being, some recreational athletes may also participate in competitions, but typically for fun or to challenge themselves rather than pursuing high-level competition (Izadpanah and Südkamp, 2020).

The Importance of Nutrition for Runners

Nutrition is a key factor for runners, as it directly impacts their performance, recovery, and overall health. To meet the physical demands of running, a well-balanced diet is essential to fuel the body, support training, and optimize efficiency during runs. The fundamental components of a runner's diet include carbohydrates, fats, and proteins. These nutrients work together to provide energy, facilitate recovery, and maintain muscle function (Mcgregor, 2024). For endurance activities like running, carbohydrates are the primary fuel source, supplying energy during exercise. Glycogen, stored in muscles and the liver, is broken down into glucose for energy, but these stores can be depleted within 120 minutes of sustained activity, leading to fatigue. Runners should consume 30-60 grams of carbohydrates per hour during exercise lasting up to three hours, and 60-90 grams per hour for longer events, like marathons. While carbohydrates are crucial, fats also serve as a secondary energy source. Research suggests that 30% of daily calories should come from fat, as lower fat intake is associated with an increased risk of injury among runners (Leanne, 2024). Protein is vital for muscle recovery post-run. The Recommended Daily Allowance (RDA) for protein is 0.8 grams per kilogram of body weight, but endurance athletes benefit from 1.0-1.6 grams per kilogram to support muscle repair and reduce injury risk (Cintineo et al., 2018).

Under fuelling as a runner can have significant negative effects on performance and overall health. When a runner does not consume enough food to meet the energy demands of daily activities and training, it can lead to low energy availability and conditions such as relative energy deficiency syndrome (RED-S). Signs and symptoms of RED-S include Fatigue, Weight loss, Gastrointestinal (stomach) problems, Abnormal or absent periods and bone loss (RED-S in the Active Female, 2022). This condition can affect athletes of any gender or skill

level. If left untreated, RED-S not only disrupts an athlete's training but can also negatively impact various body systems, including reproductive health, bone health, and psychological well-being (Dooney, 2020).

Therefore, it is evident that nutrition plays a crucial role in improving runners' performance, recovery, and health. A balanced diet with carbs, fats, and proteins provides the energy needed for training and running efficiency. Carbs are the main energy source for endurance activities, and not getting enough can lead to low energy availability and increase the risk of Relative Energy Deficiency in Sport (RED-S), which affects athletes' health and performance. Adequate fat intake is also important, as low-fat levels can increase injury risk, while protein helps with muscle recovery after runs. Endurance athletes may need more protein to support muscle repair and reduce injury. As evidenced above, proper nutrition helps runners perform better, recover faster, and stay healthy.

Barriers to Nutrition Education Among Recreational Athletes

Recreational athletes face barriers when it comes to accessing and proper nutrition education. One of the most leading challenges is the lack of access to professional nutrition advice. Unlike elite athletes, who often have access to dietitians or sports nutritionists, recreational athletes may not have the financial resources or knowledge to seek out expert guidance (Linton and Valentin, 2020). Professional nutrition advice, especially from experts in sports nutrition, can be expensive. This cost barrier can limit many recreational athletes from seeking out personalised advice, despite their potential need for more targeted nutrition information (Carter et al., 2022). Athletes often struggle to find reliable nutrition advice and, as a result, frequently turn to social media for guidance. However, these platforms can lead to misinformation since influencers may lack the necessary qualifications to offer sound advice. This can result in athletes adopting practices that aren't based on solid evidence or expert knowledge (Jiménez-Alfageme et al., 2024). This establishes how difficult it is for athletes to find reliable sources of information, making it important to find better ways to access trustworthy advice.

General Sports Nutrition Knowledge Among Athletes, both elite and recreational

Understanding sports nutrition is important for athletes, but it is often lacking or insufficient. A study by Hopper, Mooney, and McCloat (2025) looked at athletes' general and sport-

specific nutrition knowledge and how it relates to their eating habits. The study found that athletes' overall nutrition knowledge was mostly low to moderate, with significant gaps in areas like macronutrient timing, hydration, and recovery nutrition. Many athletes also had poor dietary habits, such as not getting enough energy or having the wrong balance of macronutrients, which can lead to deficiencies and injuries. These findings show that there is a clear need for better nutrition education to improve athletes' knowledge, boost performance, and support long-term health. A similar review by Janiczak et al. (2021) also looked at athletes' general and sport-specific nutrition knowledge and how it affects their eating habits. They found that athletes' nutrition knowledge was mostly low to moderate, with scores ranging from 40% to 70%. While better nutrition knowledge was linked to healthier eating, many athletes still did not follow recommended dietary guidelines. This shows that a lack of nutrition knowledge affects athletes' food choices and performance, suggesting that improving their knowledge could help them make healthier choices.

In addition, studies show that elite athletes tend to have better nutrition knowledge than recreational athletes. A study by Barjaktarovic Labovic et al. (2024) compared sports nutrition knowledge between recreational and elite athletes. They found that elite athletes answered an average of 77.2% of questions correctly, compared to 67.7% for recreational athletes. Recreational athletes were also more likely to make their own decisions about supplements (67.9%), while elite athletes were more likely to ask professionals or trainers for advice (28.6%). These findings suggest that elite athletes have better nutrition knowledge, likely because they have more access to professional guidance. For elite athletes, getting personalised nutrition advice from a qualified sports nutritionist or dietitian is an important part of their training, whereas recreational athletes may not have the same access to this expert advice (NSE-Exercise-and-Training, 2019).

A recent study by Héctor Esteve-Ibáñez et al. (2025) highlights significant gaps in nutrition knowledge among non-elite athletes. It found that elite athletes have better nutrition knowledge and lower body fat percentages compared to non-elite athletes. The research emphasises the need for professional nutrition support for non-elite athletes, as relying on unofficial nutrition sources can be risky. The study suggests that improving nutrition knowledge could help optimise athletic performance and reduce health risks associated with poor dietary habits.

The Role of Running Ability in Nutrition Knowledge

Faster recreational runners tend to have better nutrition knowledge. A study by Avery et al. (2014) assessed the dietary habits and nutrition knowledge of 60 female marathon runners. The results showed that faster runners had a better understanding of hydration, fuelling strategies, and iron intake. Not only did they have more nutrition knowledge, but they also demonstrated a stronger grasp of performance-enhancing fuelling strategies compared to slower runners. Similarly, the Eat Run study on UK-based ultramarathon runners examined the relationship between nutrition knowledge and performance. The findings suggested that greater nutrition knowledge may contribute to improved race outcomes, as athletes who understand proper fuelling, hydration, and recovery strategies are more likely to make informed dietary choices (Nca.ac.uk, 2019). These choices can help optimise energy levels, prevent fatigue, and enhance endurance.

To further support the relationship between nutrition knowledge and running performance, a study by Serhan et al. (2023) investigated sports nutrition knowledge among 384 university athletes in Lebanon. The findings revealed that athletes with higher nutrition knowledge scores demonstrated better dietary practices, which are essential for optimal athletic performance. Both studies indicate that nutrition knowledge plays a key role in running performance. Faster runners are more aware of how to fuel their bodies effectively, which may give them a competitive advantage. This suggests that improving nutrition education among slower runners could help enhance their performance by ensuring they adopt better dietary strategies.

The Impact of Age on Nutrition knowledge

According to Alahmadi and Albassam (2023) age is also a contributing factor when it comes to nutrition knowledge, their study examined the relationship between nutrition knowledge and various factors, including age, among athletes from different sports. Using Stepwise multiple regression analysis, a statistical method that helps identify the most significant variables influencing a particular outcome, the researchers found that age was a significant factor positively linked with nutrition knowledge. Specifically, older athletes were found to have better nutrition knowledge than the younger athlete. This suggests that as athletes gain more experience, they are more likely to be exposed to advanced nutritional strategies and develop a deeper understanding of how nutrition impacts performance and recovery.

Younger athletes frequently turn to social media for nutrition advice, which significantly influences their dietary knowledge and choices, Galloway and Millar (2018) found that New Zealand athletes commonly use social media as a primary source of nutritional information, highlighting its impact on their understanding of diet and performance. Similarly, Feldman et al. (2019) found that young adults rely on online platforms to learn about nutrition, though the reliability of this information varies, suggesting that while social media can be a valuable educational tool, it often lacks scientific rigor. Therefore, younger athletes should be encouraged to seek evidence-based guidance from qualified professionals rather than relying solely on social media.

These studies highlight that athletes of different ages often obtain their nutrition knowledge from varying sources, as shown by the differences in how older athletes rely on experience and professional advice, while younger athletes tend to turn to social media platforms for information.

Gaps in Current Research & the Need for Improved Education - Rationale for the study

Despite growing recognition of the role nutrition plays in sports performance, there are still gaps in research on recreational athletes' nutrition knowledge, especially in endurance sports like running. While elite athletes have access to specialised nutrition support, recreational athletes often rely on self-learning or social media for advice. However, these sources may not always be based on scientific evidence, as noted by Burke et al. (2019). This difference in nutrition education is a concern, as poor nutrition can affect performance, recovery, and overall health in recreational athletes (Burke et al., 2019). This suggests that many athletes have limited knowledge of the best nutrition strategies for endurance sports and would benefit from more structured, targeted education (Devries & Phillips, 2015).

Research measuring the impact of structured nutrition education on young female endurance athletes found that those who received guidance from registered dietitians showed significant improvements in both their nutrition knowledge and dietary habits (Cansu Tektunalı Akman, Canan Gönen Aydın, and Ersoy, 2024). This suggests that implementing similar nutrition education programmes within recreational running clubs could enhance athletes' understanding of nutrition and promote healthier dietary practices.

While specific studies on recreational running clubs offering professional nutritional support are limited, some organisations do provide such services. For example, We Run, a UK-based coaching service, offers running nutrition analysis conducted by professional coaches.

However, the overall availability of professional nutrition support within recreational running clubs is not well-documented (Linton and Valentin, 2020).

The rationale for this study

As this literature review suggests, there is a significant gap in research on runners' nutrition education. Therefore, the rationale for this study is to assess the current level of nutrition knowledge among recreational runners and determine the potential need for more accessible and targeted nutrition education for recreational runners.

Aims

- To assess the overall level of sports nutrition knowledge among recreational runners.
- To investigate the relationship between sports nutrition knowledge and running ability, comparing lower-ability runners (group 1-3) with higher-ability runners to determine whether competitive athletes demonstrate greater knowledge.
- To explore the impact of age on sports nutrition knowledge, comparing younger runners (18-25 years) with older runners (30+ years) to assess whether life experience influences nutritional understanding.

Hypothesis

- Higher-ability runners will possess greater sports nutrition knowledge due to their increased focus on performance
- Older participants (30+ years) will demonstrate better nutritional knowledge compared to younger runners (18-25 years), potentially due to greater life experience or prolonged exposure to nutrition practices.
- The running club collectively will demonstrate poor to moderate nutrition knowledge, likely due to a lack of access to professional nutrition advice.

Method

Participants were recruited from a local running club to participate in completing a questionnaire evaluating their sports nutrition knowledge. The running club consisted of different levels of running ability, ranging from recreational to competitive runners. Participation was voluntary, and all members of the club aged 18+ were invited to complete the questionnaire, which was posted on the club's social media page.

Study design

Phase 1

The Nutrition for Sport Knowledge Questionnaire (NSKQ), developed and validated by Trakman et al. (2017), was used to assess participants' sports nutrition knowledge. While the full questionnaire contained more items, for the purpose of this study, a subset of 18 questions was selected, focusing on the most relevant aspects of sports nutrition knowledge for the target population. The questionnaire was chosen because it was designed to evaluate knowledge related to nutrition in athletic populations, including topics such as macronutrient needs, hydration, supplementation, and optimal dietary practices for performance and recovery. It had been used in various studies with athletes and physically active individuals to measure both general and sports-specific nutritional knowledge. It was suitable for this study because it covered key areas that were directly relevant to runners, such as energy intake, hydration strategies, and the role of supplements, which were important for optimising performance, endurance, and recovery in endurance sports like running.

The questionnaire results were used to explore the relationship between age, ability, and nutrition knowledge. Participants were divided into groups based on running ability and age. Running ability was categorised into two groups: lower-ability runners (Groups 1-3), who completed a 5K in over 25 minutes, and higher-ability runners (Groups 4-6), who achieved a sub-25-minute 5K. This division allowed for a comparison of nutritional knowledge between more competitive runners and those with lower performance levels. Participants were also categorised into two age groups: 18–25 years and 30+ years. These age ranges were chosen to capture differences in nutritional knowledge across different life stages. The younger group (18–25) represented a population that may have been less familiar with athletic nutrition

practices, while the older group (30+) may have had greater exposure to nutrition education through life experiences or long-term involvement in sport.

Phase 2

In addition to the quantitative data gathered through the Sports Nutrition Knowledge Questionnaire, Phase 2 involved collecting qualitative data through an open-ended questionnaire. This phase aimed to provide more detailed insights into the participants' perspectives on sports nutrition and to explore themes that may not have been captured through the quantitative questionnaire alone.

Existing literature suggested that athletes often relied on a variety of sources for nutrition information, with younger athletes in particular turning to social media influencers and bloggers (Vázquez-Espino, Rodas-Font, and Farran-Codina, 2022). To understand this dynamic, participants were asked the question: "Where did you typically get your nutrition advice from?" This question helped identify the prevalence of social media as a source of nutrition knowledge, which may or may not have been based on reliable evidence. It also provided insight into other sources, such as coaches, professionals, or personal research, that athletes were relying on for nutrition advice.

The next question, "Why was nutrition important to you as a runner?" sought to explore the runners' understanding of the role of nutrition in their performance, endurance, and recovery. Previous research had shown that athletes with better nutrition knowledge were likely to make more informed dietary choices, which could enhance their athletic performance (Hopper, Mooney, and Mc Cloat, 2025). This question aimed to delve into the participants' perceptions of how nutrition impacted their training outcomes, helping to link their knowledge with practical application.

The third question, "Did you follow nutrition advice from social media influencers or bloggers?" investigated how much influence these platforms had on participants' nutrition habits, especially since social media had been shown to play a significant role in shaping the dietary practices of younger athletes (Sina et al., 2022). Addressing this could identify whether the advice they received aligned with evidence-based practices or was influenced by non-expert sources.

Finally, participants were asked: "Did you feel it was easy to access professional nutrition advice or support when you needed it for your running?" This question provided insights into whether recreational runners experienced barriers in obtaining expert nutrition advice. Research had suggested that elite athletes often had better access to qualified professionals, which could give them a nutritional edge (NSE-Exercise-and-Training, 2019). By understanding whether recreational runners faced challenges in this regard, was aimed to identify any gaps in access to professional support.

Data Analysis

Participant Data Collection Phase 1

- Running ability groups – lower ability (Group 1-3) and higher ability (Group 4-6).
- Age group categories (18-25) and (30+)
- Sports nutrition knowledge score (total score from the questionnaire)

For data analysis, SPSS was used to evaluate the sports nutrition knowledge of recreational runners. Descriptive statistics were applied to summarise the participants' knowledge, including the mean and median of the total scores from the Sports Nutrition Knowledge Questionnaire. To test for differences in nutrition knowledge between groups, independent samples t-tests were conducted. These tests compared the mean knowledge scores between lower-ability and higher-ability runners, as well as between younger (18-25 years) and older (30+ years) participants. The t-test was suitable as it allowed comparison of means between two independent groups, helping to determine if significant differences in knowledge existed based on running ability or age.

Participant Data Collection Phase 2 Qualitative responses

Themes related to sources of nutrition advice, the importance of nutrition for performance, and the accessibility of professional nutrition support.

For data analysis, the qualitative responses were collected and discussed as a whole. The responses were reviewed to identify common themes, such as participants' sources of nutrition advice, the perceived importance of nutrition for athletic performance, endurance, and recovery, as well as the accessibility of professional nutrition support. The findings were discussed to gain insights into the runners' attitudes, understanding, and practices regarding sports nutrition.

Results.

Phase 1

Phase 1 Involved the quantitative results from participants from the run club who completed the Nutrition Sports Knowledge Questionnaire (NSKQ). The questionnaire was designed to assess participants' knowledge regarding sports nutrition, particularly in relation to running. Results from the completed NSKQ were analysed using SPSS. Descriptive statistics were calculated to understand the overall distribution of responses from the participants. An independent samples t-test was conducted to compare scores between different age groups and running ability groups.

NSKQ Results

Descriptive statistics were calculated to understand the overall distribution of the questionnaire scores from all participants. The scores ranged from 1 to 15, with an average score of 8.00 and a standard deviation of 3.87.

Table 1: Descriptive Statistics for the NSKQ (overall)

	N	Minimum	Maximum	Mean	St. Deviation
Score	32	1	15	8	3.873

Age- t test

An independent samples t-test was conducted to compare questionnaire scores between two age groups: 18–25 years (Group 1) and 30+ years (Group 2). The results indicated that there was no statistically significant difference in scores between the groups, $t(30) = 1.833$, $p = .077$. However, the effect size was large ($d = -1.649$), suggesting a meaningful difference between the groups despite the lack of statistical significance. The 95% confidence interval for the mean difference ranged from -5.04 to 0.27.

Table 2: Descriptive Statistics for Questionnaire Scores by Age Group

Group	N	Mean	Std. Deviation	Std. Error Mean
1 (18–25 years)	15	6.73	4.08	1.05
2 (30+)	17	9.12	3.28	0.79

Run group t-test

An independent samples t-test was conducted to compare questionnaire scores between two running ability groups: Group 1-3 (Group 3) and Group 4-6 (Group 4). The results indicated that there was no statistically significant difference in scores between the groups, $t(30) = -0.183$, $p = .856$. The effect size was very small ($d = -0.033$), suggesting that the difference between the groups is minimal. The 95% confidence interval for the mean difference ranged from -3.05 to 2.55.

Table 3: Descriptive Statistics for Questionnaire Scores by running Group

Group	N	Mean	St. Deviation	St. Error Mean
3 (Group 1-3)	17	7.88	4.19	1.02
4 (Group 4-6)	15	8.13	3.46	0.89

Phase 2

Phase 2 involved collecting qualitative data through an open-ended questionnaire to gather more detailed insights into nutrition knowledge among the runners. The same run club members who completed the NSKQ also participated in this phase. This included runners from the same two age groups (18-25) and (30+) as well as the same running ability groups, with Groups 1-3 representing higher ability runners and Groups 4-6 representing lower ability runners.

The open-ended questionnaire allowed participants to expand on their understanding of nutrition beyond the NSKQ providing deeper insights into their beliefs, experiences, and challenges related to nutrition.

Question	Theme	Actual Response
Where do you typically get your nutrition advice from?	online	"Mostly Google." "Online ie social media, YouTube, Google searches."
	professionals	"Registered Dietitians or Nutritionists." "Online nutritionists."
	Social circle	"Friends/Family – If they're into fitness or healthy eating." "I usually just speak to other runners."
Why is nutrition important to you as a runner?	Energy & Performance	"To help sustain long runs without hitting the wall." "To fuel my runs properly to ensure good performance."
	Training Goals	"To make sure I have enough energy for my training." "To benefit my training and be better."
Do you follow nutrition advice from social media influencers or bloggers?	Follow social media advice	"Yes, influencers may share personal experiences with nutrition and fitness, which can feel relatable and motivating." "Yes, I follow influencers because they usually advise

		on which products are beneficial." "Yes, even though sometimes I shouldn't, I'm easily influenced."
	Does not follow social media advice	"I'm not someone who follows social media influencers much, especially when it comes to nutrition."
Do you feel it is easy to access professional nutrition advice or support when you need it for your running?	Easy to access nutrition advice	"Yes, there's now more online access to experts, many dietitians and nutritionists now offer online." "Yes, plenty of articles/videos online."
	Not easy to access nutrition advice	"Not really – there aren't many people local. There are a lot of online nutritionists, but I don't know who to trust." "Not easy, but there is plenty available online if you have an idea of what nutrition you want."

Discussion

Overview of Key Findings

The aims of this study were to explore sports nutrition knowledge among recreational runners through a combination of quantitative and qualitative data collection. Phase 1 involved administering the Nutrition Sports Knowledge Questionnaire (NSKQ) to assess participants' understanding of sports nutrition in relation to their running activities. Phase 2 involved an open-ended questionnaire to gather qualitative insights into participants' sources of nutrition advice, perceptions of nutrition's role in their performance, and the accessibility of professional nutrition support.

Phase 1: Quantitative Findings

The results from Phase 1 showed that the overall nutrition knowledge of the participants, as measured by the NSKQ, had a mean score of 8.00 out of 18, with a standard deviation of 3.87. The distribution of scores indicated a moderate level of sports nutrition knowledge among participants, with some variance in individual knowledge levels.

When comparing participants by age, an independent samples t-test revealed no statistically significant difference in nutrition knowledge between younger (18–25 years) and older (30+ years) runners, although the effect size was large ($d = -1.649$), suggesting that the differences in knowledge between these groups may be meaningful despite the lack of statistical significance.

Similarly, when comparing runners based on their self-reported running ability (Group 1-3 vs. Group 4-6), the analysis also showed no statistically significant difference in sports nutrition knowledge. This suggests that knowledge of nutrition for performance may not be strongly associated with running experience, at least within the scope of this study.

Phase 2: Qualitative Findings

Phase 2, which aimed to delve deeper into participants' personal experiences and insights, revealed important themes. When asked about their sources of nutrition advice, participants most frequently reported turning to online resources, including social media, Google searches, and YouTube. However, a notable proportion also sought advice from professional nutritionists or dietitians, and some relied on recommendations from their social circles, such

as friends or fellow runners. This highlights the importance of improving the quality and accessibility of nutrition education, particularly for recreational athletes.

In terms of the perceived importance of nutrition, participants emphasised its role in energy management and performance, particularly for sustaining long runs and enhancing training outcomes. However, there was a diversity of opinions on whether participants follow advice from social media influencers or bloggers, with some admitting to following influencers' recommendations while others were more cautious about the credibility of such advice.

Finally, while many participants reported easy access to online nutrition advice, there was a notable concern about the credibility and trustworthiness of these sources. Some participants found it difficult to access professional nutrition support locally, although they acknowledged that the increasing availability of online nutritionists offered a potential solution, even if they felt unsure about which professionals to trust.

Existing Literature on Sports Nutrition Knowledge

The findings from this study indicate that recreational runners display a moderate level of sports nutrition knowledge, with a mean score of 8.00 on the NSKQ, this result aligns with previous studies that have shown that recreational athletes often possess some basic understanding of nutrition, but their knowledge may not be sufficient for optimal performance. Research by Vitale and Getzin (2019) revealed that recreational runners generally have a basic understanding of the importance of nutrition for endurance sports but are less knowledgeable about the specific nutritional strategies required for performance optimisation. Similarly, a study by Moss et al. (2023) showed that endurance athletes had moderate to good nutrition knowledge. However, despite generally meeting the recommended intake for most macronutrients, there were notable deficiencies in certain micronutrients. Specifically, the study highlighted inadequate consumption of iron and vitamin D among the participants. These deficiencies indicate gaps in the application of nutrition knowledge, as proper intake of these micronutrients is crucial for optimal performance and overall health in endurance sports. This underpins the need for enhanced nutritional education and personalised dietary strategies to address these gaps.

Influence of Age on Nutrition Knowledge

The findings of this study indicate that while no statistically significant difference was observed in sports nutrition knowledge between age groups, the large effect size suggests a

meaningful practical difference. This result aligns with research by Alahmadi and Albassam (2023), who found that older athletes generally possess better nutrition knowledge due to their greater life experience and prolonged exposure to sport-specific nutritional practices. This supports the idea that maturity and experience in the sport may contribute to a deeper understanding of nutrition. In contrast, younger athletes are increasingly turning to digital platforms and social media for nutrition information. Studies by Galloway and Millar (2018) and Feldman et al. (2019) highlight that younger athlete, especially those aged 18-25, often rely on social media and online influencers for nutrition advice, which can lead to misinformation, as the quality of the information found online can vary.

Qualitative data from this study revealed that older participants were more likely to reference personal experience when discussing their nutrition practices. Many participants in the 30+ age group explained that they had learned about nutrition through friends over the years or were guided by coaches and mentors. In contrast, younger participants (aged 18-25) frequently mentioned seeking nutrition advice through digital platforms, particularly social media. Some participants noted that they follow influencers for nutrition tips but expressed uncertainty about the reliability of the information they were receiving. This reliance on digital sources was also noted in the study by Galloway and Millar (2018), which found that younger athletes often turn to social media for advice, which could affect the quality of their nutrition knowledge. Despite these trends, the differences in knowledge between age groups did not reach statistical significance in this study, which may suggest that while age-related differences exist, they might not be large enough to cause significant differences in sports nutrition knowledge.

Impact of Running Ability on Nutrition Knowledge

The findings of this study indicated that there was no statistically significant difference in sports nutrition knowledge between lower ability (Group 1-3) and higher ability group (4-6) runners, suggesting that running ability may not significantly influence nutrition knowledge. This lack of a significant difference is interesting, given the expectation that more experienced runners would have a greater understanding of nutrition due to their increased exposure to training and performance goals. This result is consistent with research by Galloway and Millar (2018) and Feldman et al. (2019), that found that both beginner and competitive athletes often rely on the same digital platforms and social media for nutrition information. As a result, despite differences in their running experience, both groups may end

up with similar levels of nutrition knowledge. This suggests that, despite running ability, athletes may not seek out or prioritise advanced nutrition knowledge unless they are explicitly aware of its direct impact on their running performance. The findings of this study coincide with these existing studies in showing that the availability of general nutrition information online may line up with knowledge levels between lower and higher ability runners. This suggests that structured education programs should be designed to cater to all levels, focusing on the practical application of nutrition for training and recovery for all.

Perceived Importance of Nutrition for Performance

The qualitative data from this study identified that participants view nutrition as crucial for maintaining energy and optimising performance. Many runners emphasized that proper nutrition helps sustain long runs and prevent "hitting the wall"—a common challenge in endurance sports. One participant noted that nutrition is essential for "fuelling my runs properly to ensure good performance", reflecting the general understanding that nutrition plays a significant role in supporting energy needs during training. These observations support existing research that highlights the importance of nutrition in endurance sports. Studies such as Vitale and Getzin (2019) suggest that recreational athletes recognise the link between nutrition and performance but often lack detailed knowledge of how to implement specific dietary strategies. For example, while participants in this study acknowledged the need to fuel for long runs, their understanding of nutrient timing and how to balance macronutrients (carbohydrates, proteins, fats) to maximize performance remained limited. This gap is also seen in Moss et al. (2023), where endurance athletes showed a moderate understanding of sports nutrition but had deficiencies in micronutrients like iron and vitamin D, which are critical for performance. This is consistent with trends in the literature, where athletes often recognise the role of nutrition but may not fully understand how to implement effective dietary strategies for endurance sports. Bridging this gap through tailored education could help athletes optimise their performance and recovery.

Challenges in Accessing Professional Nutrition Support

The qualitative data from this study revealed mixed responses regarding the accessibility of professional nutrition advice. Several participants noted that online access to nutritionists and dietitians has improved, with many offerings virtual consultations, making professional advice more accessible. One participant remarked, "Yes, there's now more online access to experts, many dietitians and nutritionists now offer online," highlighting the growing

convenience of digital platforms. However, other participants expressed scepticism about the quality and reliability of online advice, particularly when it comes to trusting the credentials of nutritionists. As one participant stated, “There are a lot of online nutritionists, but I don’t know who to trust”. This reflects a common concern among runners about the credibility of nutrition advice available through digital platforms. Alahmadi and Albassam (2023) noted that recreational athletes often struggle to find qualified nutrition professionals, relying on online sources that may lack personalised guidance. Similarly, Galloway and Millar (2018) found that athletes have better access to nutritionists on online platforms however the credibility of these sources remains a concern, highlighting the need for greater education on navigating online advice and ensuring access to reputable professionals. Access to in-person support remains a challenge for many recreational runners, which makes it essential to continue developing accessible online education that can provide high-quality, reliable information.

Limitations of the Study

Sample size

Some limitations of the study include the sample size, as the study included only 32 participants, which may not be large enough to draw conclusions that apply to all recreational runners. A larger and more diverse sample would improve the reliability and generalisability of the findings.

Sampling Bias

Another limitation is sampling bias, as the participants were all members of a run club, which may not represent the broader population of recreational runners. Participants in a run club may be more motivated and dedicated to training, which could influence their nutrition knowledge compared to individuals who are not a part of a club who run casually or infrequently.

Self-Reported Data

The study also relied on self-reported data for the qualitative portion, where participants were asked about their sources of nutrition advice and their perceptions of nutrition's importance. Self-reported data is prone to bias, including social desirability, misinterpretation of questions, over-reporting or being untruthful.

Variability in Experience with Nutrition Professionals

The study did not account for participants' prior experiences with nutrition professionals, such as dietitians or nutritionists. Those who have previously consulted with a professional may have a higher level of nutrition knowledge and a better understanding of how to apply this knowledge compared to participants who have never sought professional advice. This variability in prior experiences could impact the overall assessment of sports nutrition knowledge and the perceived accessibility of professional advice, potentially leading to misinterpretation of the adequacy of available resources.

Future Research Directions

Development of Group Education Programs

Future research could explore key areas that were not fully addressed in this study. One potential direction is the development of group education programs aimed at improving sports nutrition knowledge among recreational runners. Research could focus on investigating how group-based education whether through run clubs, local fitness groups, or online communities could enhance understanding of key nutritional strategies. These programs could cover essential topics like fuelling for endurance, recovery nutrition, and hydration. Group education could also help create a sense of community and provide peer support, potentially increasing better nutrition practices.

Exploring Nutrition Education Formats

Another important area for future research is examining the effectiveness of different nutrition education formats. While personalised advice from professionals is valuable, group education programs may be more accessible and affordable. Researchers could investigate the impact of structured group workshops or online courses on runners' knowledge of sports nutrition and their performance outcomes, this could be particularly helpful for runners who may not have access to local professionals, this would help identify if there are differences in outcomes between in-person and virtual group education settings.

Longitudinal Studies

Future research could adopt a longitudinal approach to monitor changes in sports nutrition knowledge and practices over time among recreational runners. This design would enable

researchers to evaluate the effects of structured nutrition education, running experience, and different life stages on the development of nutrition knowledge. It could offer valuable insights into how sustained involvement in running impacts the understanding and application of nutrition in everyday life.

Conclusion

In conclusion, this study demonstrates an evaluation of the overall level of sports nutrition knowledge among recreational runners. Additionally, the study highlighted the relationship between sports nutrition knowledge and running ability by comparing lower-ability runners (Groups 1-3) with higher-ability runners to determine whether more competitive athletes possess greater knowledge. It explored the impact of age on sports nutrition knowledge by comparing younger runners (18-25 years) with older runners (30+ years) to assess whether life experience influences nutritional understanding.

The rationale for this study stemmed from the significant gap in research on nutrition education among runners, as highlighted in the literature review. With limited existing studies on this subject, the aim was to assess the current level of nutrition knowledge among recreational runners and determine the potential need for more accessible and targeted nutrition education for this group. Given that proper nutrition is crucial for endurance, recovery, and overall performance, understanding athletes' knowledge gaps is essential for developing effective strategies to enhance nutrition education.

The results indicated no statistically significant difference in nutrition knowledge when comparing age and running ability, contradicting the hypothesis that higher-ability runners would have greater sports nutrition knowledge and that older participants (30+ years) would demonstrate better nutritional understanding than younger runners (18-25 years). However, the hypothesis that the running club collectively exhibited poor to moderate nutrition knowledge was supported, as the group achieved a moderate nutrition knowledge score.

The findings suggested that factors such as experience and performance level may not necessarily correlate with greater nutrition knowledge among recreational runners. This highlights a clear need for structured and accessible nutrition education tailored specifically for this group. It was acknowledged that one way to address this gap could be through recreational running clubs providing access to a club nutritionist or dietitian, allowing runners to seek professional guidance when needed. Additionally, clubs could organise nutrition talks led by professionals from time to time, giving runners the opportunity to learn evidence-based nutrition strategies to support their training and performance.

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Appendices

Appendix A- qualitative questionnaire

1. Where do you typically get your nutrition advice from?

2. Why is nutrition important to you as a runner?

3. Do you follow nutrition advice from social media influencers or bloggers? If so, why?

4. **Do you feel it is easy to access professional nutrition advice or support when you need it for your running?**
(Why or why not?)

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Appendix B – Quantitative questionnaire

The Nutrition For Sports Knowledge Questionnaire

1. Which age group do you belong to?

Mark only one oval.

18-25

30+

2. What running group do you belong to?

Mark only one oval.

Group 1-3

Group 4-6

3. What dietary changes are effective for healthy and sustainable weight 2 points loss?

Mark only one oval.

Swapping carbohydrates/energy dense foods for low-energy foods like vegetables

Eating margarine instead of butter

Eating protein bars and shakes instead of yogurts, muesli/granola bars and fruits

Choosing lower glycemic index (G') carbohydrates to help regulate appetite

4. If they want to lose weight, athletes should: 1 point

Mark only one oval.

eat less than 50 grams (1.7 ounces) of carbohydrate per
day eat less than 20 grams (0.7 ounces) of fat per day eat
less calories/kilojoules than your body needs

5. To ensure they meet their energy (kilojoule/calorie) requirements, all 1 point athletes should:

Mark only one oval.

plan their diet based on their age, gender, body size, sport and training
program eat based on their natural hunger and fullness signals eat at least
8000 kilojoules (2000 calories) per day eat more foods that have lots of
carbohydrate

6. Which is a better recovery meal option for an athlete who wants to put 1 point on muscle?

Mark only one oval.

A 'mass gainer' protein shake and 3 - 4 scrambled eggs

Pasta with lean beef and vegetable sauce, plus a dessert of fruit, yoghurt and
nuts

A large piece of grilled chicken with a side salad (lettuce, cucumber, tomato)

A large steak and fried eggs

7. Which is a better recovery meal option for an athlete who wants to 1 point lose weight?

Mark only one oval.

A side salad with no dressing (lettuce, cucumber, tomato)

A pure whey protein isolate (WPI) shake made on water

A mixed meal that includes a small-moderate serving of meat and carbohydrate (e.g. small bowl pasta with lean mincemeat and vegetable sauce) plus a large side salad

8. An athlete doing a moderate to high-intensity endurance training point program for about two hours should eat: 1

Mark only one oval.

1 - 3 g carbohydrate per kg (0.016 - 0.048 ounces per 1b) body weight per day

5-7 g, increasing up to 10 g/kg with intense training/competition loads 15 - 25% of total daily kilojoule/calorie intake as carbohydrate

75 - 85% of total daily kilojoule/calorie intake as carbohydrate

9. Which food has the most carbohydrate?

1 point

Mark only one oval.

- 1 cup (1 68 g/5.6 ounces) boiled rice
- 2 slices of white sandwich loaf bread
- 1 medium (1 50 g/ 5 ounces) boiled potato
- 1 medium (1 50 g/5 ounces) ripe banana

10. Which food has the most protein?

1 point

Mark only one oval.

- 2 eggs
- 1 ooz (3 ounces) raw skinless chicken breast
- 30g (1 ounce) almonds

11. The protein needs of a 100 kg (220 lb) well trained resistance athlete 1 point are closest to:

Mark only one oval.

- 1 ooz (1 g/kg) 1 50g
- (1 .5g/kg)
- 500g (5g/kg)

They should eat as much protein as possible

12. The amount of protein in skim milk compared to full cream milk is: 1 point

Mark only one oval.

- much less
- about the same
- much more

Not sure

13. Athletes should drink water to:

1 point

Mark only one oval.

keep plasma (blood) volume stable

Stop dry mouth

Allow proper

sweating

All of the above

14. Experts think that athletes should:

1
point

Mark only one oval.

drink 50 - 100 ml (1.7 - 3.3 fluid ounces) every 15 - 20 minutes

suck on ice cubes rather than drinking during practice

drink sports drinks (e.g. powerade) rather than water when exercising

drink to a plan, based on body weight changes during training sessions performed in a similar climate

15.

1
point

How much sodium (salt) should fluid consumed for hydration purposes (during exercise) contain?

Mark only one oval.

At least 11 - 25 mmol/L (^N 250 - 575 mg/L)

At least 4-8 mmol/L (^N 90 - 185 mg/L)

None

16. Before competition, athletes should eat foods that are high in:

1
point

Mark only one oval.

fluids, fat and
carbohydrate fluids, fibre
and carbohydrate fluids
and carbohydrate

17. Which is the best snack to have during an intense 90-minute training 1
point session?

Mark only one oval.

A protein shake
A ripe banana
2 boiled eggs
A handful of
nuts
Not sure

18. After a competition, athletes should eat foods that are high in? 1 point

Mark only one oval.

Protein, carbohydrate and fat
Only protein
Only carbohydrate
Carbohydrate and protein

19. During a competition, athletes should eat foods that are high in: 1 point

Mark only one oval.

Fluids, fibre and fat
Fluids and protein
Fluids and carbohydrate
Not sure

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Google Forms

Appendix C- SPSS Collective group data

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Score	31	1	15	8.00	3.873
Valid N (listwise)	31				

Appendix D- SPSS T- test running ability

T-Test

Notes

Output Created		22-MAR-2025 13:19:44
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	Split File	<none>
	N of Rows in Working Data File	32
Missing Value Handling	Definition of Missing	User defined missing values are treated as missing.
	Cases Used	Statistics for each analysis are based on the cases with no

		missing or out-of-range data for any variable in the analysis.
Syntax		T-TEST GROUPS=groups(3 4) /MISSING=ANALYSIS /VARIABLES=score /ES DISPLAY(TRUE) /CRITERIA=CI(.95).
Resources	Processor Time	00:00:00.00
	Elapsed Time	00:00:00.03

[DataSet1] C:\Users\riawr\OneDrive\Desktop\ability info.sav

Group Statistics

	groups	N	Mean	Std. Deviation	Std. Error Mean
score	3	17	7.8824	4.19646	1.01779
	4	15	8.1333	3.46135	.89372

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means	
		F	Sig.	t	df
score	Equal variances assumed	.703	.408	-.183	30
	Equal variances not assumed			-.185	29.882

Independent Samples Test

		Significance		Mean Difference	Std. Error Difference
		One-Sided p	Two-Sided p		
score	Equal variances assumed	.428	.856	-.25098	1.37122

Equal variances not assumed	.427	.854	-.25098	1.35449
-----------------------------	------	------	---------	---------

Independent Samples Test

t-test for Equality of Means

95% Confidence Interval of
the Difference

		Lower	Upper
score	Equal variances assumed	-3.05139	2.54943
	Equal variances not assumed	-3.01766	2.51570

Independent Samples Effect Sizes

		Standardizer ^a	Point Estimate	95% Confidence Interval	
				Lower	Upper
score	Cohen's d	3.87082	-.065	-.759	.630
	Hedges' correction	3.97107	-.063	-.740	.614
	Glass's delta	3.46135	-.073	-.766	.624

Appendix E – T-test age

T-Test

Notes

Output Created		22-MAR-2025 12:53:38
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	N of Rows in Working Data File	32
Missing Value Handling	Definition of Missing	User defined missing values are treated as missing.
	Cases Used	Statistics for each analysis are based on the cases with no missing or out-of-range data for any variable in the analysis.
Syntax		T-TEST GROUPS=group(1 2) /MISSING=ANALYSIS /VARIABLES=score /ES DISPLAY(TRUE) /CRITERIA=CI(.95).
Resources	Processor Time	00:00:00.02
	Elapsed Time	00:00:00.02

Group Statistics

	group	N	Mean	Std. Deviation	Std. Error Mean
score	1	15	6.7333	4.07898	1.05319

2	17	9.1176	3.27648	.79466
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Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means	
		F	Sig.	t	df
score	Equal variances assumed	1.137	.295	-1.833	30
	Equal variances not assumed			-1.807	26.861

Independent Samples Test

		Significance		Mean Difference	Std. Error Difference
		One-Sided p	Two-Sided p		
score	Equal variances assumed	.038	.077	-2.38431	1.30110
	Equal variances not assumed	.041	.082	-2.38431	1.31935

Independent Samples Test

		t-test for Equality of Means	
		95% Confidence Interval of the Difference	
		Lower	Upper
score	Equal variances assumed	-5.04151	.27288
	Equal variances not assumed	-5.09206	.32343

Independent Samples Effect Sizes

		Standardizer	Point	95% Confidence	
		a	Estimate	Interval	
				Lower	Upper
score	Cohen's d	3.67286	-.649	-1.357	.069
	Hedges' correction	3.76799	-.633	-1.323	.068
	Glass's delta	3.27648	-.728	-1.456	.020

