

Nutrition knowledge, attitudes, and dietary behaviours of Irish adolescent athletes

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Abstract

Context: Adolescents are amongst the most nutritional vulnerable groups in our population due to the anatomical and physiological developments that occur at this stage of life. The additional energy and hydration demands on adolescent athletes mean they may be more exposed to nutritional problems such as low energy intake and nutrient deficiencies. **Purpose:** To examine the nutrition knowledge, attitudes, and dietary behaviours of Irish adolescent athletes, and explore these variables by sex, sport played, and level of sport played. **Method:** 416 (224 female and 192 male) adolescent athletes (15.96 ± 0.76 years) from 21 secondary schools across Ireland, completed an online questionnaire, which assessed general and sports nutrition knowledge, attitudes to nutrition, and dietary behaviours. Data were analysed using Mann-Whitney U and Kruskal-Wallis tests for each variable and grouped by sex, sport played, and level of sport played. Significance level $p \leq 0.05$. **Results:** The mean nutrition knowledge score was $55.16\% \pm 13.51$, with athletes scoring significantly ($p < 0.05$) higher in general nutrition knowledge (60.37%) than in sports nutrition knowledge (49.8%). Mean nutrition knowledge scores were significantly higher ($p = 0.014$) amongst those playing at international level (60.61%) compared to club level athletes (53.17%). The most significant gap in knowledge related to nutrient requirements around training and competition. Differences in attitudes and dietary practices by sex were found to be significantly higher in male than female athletes believing nutritional supplements were necessary to support training ($p = 0.006$). **Conclusions:** The results highlight that Irish adolescent athletes recognise that athletic performance is enhanced with optimal nutrition but are lacking fundamental sports nutrition knowledge related to nutrient requirements. Consequently, athletes may not adopt nutrition strategies that optimise their performance or recovery but also their health. These findings will inform future education programmes to improve and reinforce nutrition knowledge in the adolescent athlete cohort.

Keywords: Sports nutrition knowledge, supplements, health, performance, youth athletes

Introduction

There are critical anatomical, physiological, and social developments that occur during adolescence that have significant impacts on nutrition needs and influence dietary behaviours (Meiklejohn, Ryan, & Palermo, 2016). During adolescence, 37% of total bone mass is accumulated, 15 - 25% of adult height is achieved, and 45% of skeletal growth takes place (Levine, 2012). Accounting for 16% of the worlds' population (United Nations, 2024), adolescents are amongst the most vulnerable to malnutrition (World Health Organization, 2018). Over the last two decades increasing rates of overweight and obesity amongst adolescents have been observed worldwide (Salam, et al., 2016). Irish adolescents have the tenth highest obesity level in the developed world with 5% of the Irish adolescent population obese compared to 2% in Japan and 13% in the US (Shah & Hagell, 2019). Despite this nutritional deficiencies, suboptimal growth and undernutrition are major concerns for adolescents (Christian & Smith, 2018). The nutritional concerns of adolescents are often due to suboptimal diet and physical activity, which can pose serious risks for the future health of this population (Kumar, et al., 2020). One group who are especially vulnerable to undernutrition and deficiencies are adolescents with high levels of physical activity (Bergeron, et al., 2015).

Some adolescents train and compete in several sporting activities (Desbrow, et al., 2014). These sporting activities in addition to normal growth and development, mean adolescent athletes must ensure adequate energy is consumed to fuel training, reduce the risk of injury and optimise performance (Gibson, Stuart-Hill, Martin, & Gaul, 2011). Therefore, these adolescent athletes have additional nutritional and hydration needs above the general adolescent population (Burke & Deakin, 2010; Esa, Saad, Phing, & Karppaya, 2015). Energy needs should be met by adjusting nutrient intake to reflect daily exercise demands which includes critical times before, during, and after exercise to optimise fuelling and recovery (Baker, Heaton, Nuccio, & Stein, 2014; Desbrow, et al., 2014). Nutritional supplements, including those that enhance performance (ergogenic) are not recommended in the adolescent population unless deemed necessary by medical personnel to correct a deficiency (Heaney, O'Connor, Michael, Gifford, & Naughton, 2011; Meyer, O'Connor, & Shirreffs, 2017; Nemet & Eliakim, 2009). However, research has found that nutritional supplement use is widespread amongst

adolescent athletes with ergogenic supplement use more prevalent amongst male athletes (Manore, Patton-Lopez, Meng, & Wong, 2017; Noll, de Mendonça, de Souza Rosa, & Silveira, 2017).

Nutrition knowledge is reported to be a modifiable determinant of dietary behaviour, meaning it can influence eating practices and in turn health and athletic performance (Heaney, O'Connor, Michael, Gifford, & Naughton, 2011; Trakman, Forsyth, Devlin, & Belski, 2016). General nutrition knowledge relates to overall dietary intake, whereas sports nutrition, relates to pre, during, and post training and competition fuelling, recovery and hydration (Birkenhead & Slater, 2015; Spronk, Heaney, Prvan, & O'Connor, 2015). In previous studies, better nutrition knowledge has shown a positive correlation with favourable dietary behaviours like increased fruit and vegetable intake and reduced consumption of energy dense, low nutrient foods like fried foods (Daniel, Jürgensen, Padovani, & Juzwiak, 2016; Patton-Lopez, Manore, Branscum, Meng, & Wong, 2018). Inadequate sports nutrition knowledge of adolescent athletes in previous studies highlights a difficulty identifying which foods to consume and appropriate timing of these foods to meet their fuelling and recovery needs (Partida, Marshall, Henry, Townsend, & Toy, 2018; Walsh, Cartwright, Corish, Sugrue, & Wood-Martin, 2011). Walsh et al. (2011) assessed the sports nutrition knowledge of 203 Irish schoolboy rugby players aged 15 to 18 years and reported a sports nutrition knowledge score of 59.6%. Manore et al. (2017) found a sports nutrition knowledge score of 45.6% in 535 American male ($n=238$) and female ($n=297$) adolescent soccer players (15.3 ± 1.14 years). Other recent studies have reported mean nutrition knowledge scores of 43.8% (Bird & Rushton, 2020) and 54.6% (Noronha, et al., 2020) in adolescent athlete populations. However, research carried out to date with adolescent athletes focused on one sex (male or female), one sport, or a specific level of play, and whilst it provides valuable insight into nutrition knowledge and dietary behaviours, it may not extrapolate beyond those specific populations. Therefore, the current study investigated the nutrition knowledge of adolescents across sexes, multiple sports, and levels of play, for general and sport nutrition knowledge differences. These finding could then be addressed by future education interventions, which has been found to be an effective strategy in improving and maintaining dietary behaviours in athletes (Sánchez-Díaz, Yanci, Castillo, Scanlan, & Raya-González, 2020; Tam, et al., 2019).

Spronk et al. (2015) found that the source of nutrition information may affect nutrition knowledge. Literature suggests that most adolescent athletes receive nutrition advice from coaches (Manore, Patton-Lopez, Meng, & Wong, 2017; Walsh, Cartwright, Corish, Sugrue, & Wood-Martin, 2011) or other sources such as social media or other athletes whose own knowledge may be limited (Trakman, Forsyth, Devlin, & Belski, 2016; Zinn, Schofield, & Wall, 2006). Research amongst adult athletes whose key source of information were nutritionists or dieticians showed improved nutrition knowledge and dietary behaviours that aligned more closely with established sports nutrition guidelines (Spronk, Heaney, Prvan, & O'Connor, 2015; Tam, et al., 2019). The current study explored whether the source of nutrition information may have an impact on nutrition knowledge as this could guide future nutrition interventions with this adolescent cohort. Heaney et al. (2011) found in addition to nutrition knowledge, attitudes to nutrition also influence food choice and dietary behaviours. Attitudes within certain sports may result in a lack of recognition of sports nutrition protocols, or practices that promote performance over the long-term health of athletes, e.g., sports like gymnastics and boxing where body weight is a focus (Anderson & Petrie, 2012; Christian & Smith, 2018; Sundgot-Borgen, et al., 2013). Research across different sports does not currently exist, therefore, further research is required to explore the effect of sport played on attitudes to sports nutrition and the subsequent influence on dietary behaviours (Partida, Marshall, Henry, Townsend, & Toy, 2018). The current study therefore explored if sport played influences nutrition knowledge, attitudes, and dietary behaviours of Irish adolescent athletes.

Establishing an insight into the nutrition knowledge, attitudes, and dietary behaviours of Irish adolescent athletes is vital in identifying gaps in nutrition knowledge. These knowledge gaps may predispose adolescent athletes to make poor nutrition choices, which may impact negatively on growth, physical development, and athletic performance (Noronha, et al., 2020). Furthermore, by exploring how nutrition knowledge and behaviours could be influenced by sex or sport played, the findings may inform targeted education interventions aimed at improving nutrition knowledge. Implementing dietary behaviours that benefit health and performance in adolescence may result in behaviours that continue into adult life (Partida, Marshall, Henry, Townsend, & Toy, 2018). Therefore, this period is critical in making a long-term impact on nutrition knowledge and dietary behaviours. The aims of this study were to, i) assess nutrition knowledge, attitudes, and dietary behaviours of Irish adolescent athletes, and ii) compare these variables by sex, sport played, and level of sport played.

Methods and Materials

Participants

In this observational study, secondary school students were invited to participate from 21 schools around Ireland. In total, 1088 questionnaires were completed and 416 adolescents (38%) with a mean age of 15.96 ± 0.76 years, met the inclusion criteria. Of these 416 adolescents, 53.8% ($n = 224$; 15.88 ± 0.78 years) were female and 46.2% ($n = 192$; 16.04 ± 0.743 years) were male. Parental consent was obtained for all participants. The inclusion criteria was that individual should; i) practice and play competitive sports (Trakman, Forsyth, Devlin, & Belski, 2016) and ii) train or compete for three or more sessions weekly (Araújo & Scharhag,

2016). Athletes were grouped according to sport type and level (see Table 1) based on previous research (Sundgot-Borgen, et al., 2013), with an additional category, multiple sports, added for athletes who played across more than one category. Ethical approval for the study was granted by the University research ethics committee (TPREC2020.C.009).

Questionnaire

Participants completed an online anonymous questionnaire, which consisted of 50 questions in 4 sections. Section 1) Demographic information relating to age, sex, sport played, level played, training schedule, sources of nutrition information and attitudes to sports nutrition; Section 2) Dietary behaviours; Section 3) General nutrition knowledge; Section 4) Sports nutrition knowledge. In section 1, screening questions were used to establish eligibility for this study. Questions investigating dietary behaviours were adapted from a questionnaire used in a previous study with adolescent athletes (Walsh, Cartwright, Corish, Sugrue, & Wood-Martin, 2011). Multiple choice questions were used to examine nutrition knowledge in sections 3 and 4 of the questionnaires. These questions were adapted from a validated questionnaire, which examined general and sports nutrition knowledge in adult athletes (Trakman, Forsyth, Hoye, & Belski, 2018). Questionnaires were completed in school, under the supervision of a teacher.

Table 1. Demographic Data on all Participants (n=415) Sport Played and Level of Play

Sport type	n (% of sample)	n (% of females)	n (% of males)
Ball sports	300 (72.1)	149 (66.50)	151 (78.6)
Racket sports	4 (1)	4 (1.8)	0 (0)
Endurance sports	29 (7)	24 (10.7)	5 (2.6)
Aesthetic sports	7 (1.7)	6 (2.7)	1 (0.5)
Combat sports	2 (0.5)	1 (0.4)	1 (0.5)
Mixed sports	73 (99.8)	39 (17.4)	34 (17.7)
Level played			
Club	261 (62.7)	146 (65.2)	115 (59.9)
County	97 (23.3)	47 (21)	50 (26)
Interprovincial	22 (5.3)	9 (4)	13 (6.8)
National/International	36 (8.7)	22 (9.8)	14 (7.3)

Statistical Analysis

Statistical analysis was conducted using IBM SPSS statistics (version 27.0; SPSS Inc., Chicago, IL). Descriptive statistics were reported as mean $\pm$ standard deviation (SD), together with frequency and percentages, which were used to summarise findings for nutrition knowledge scores, attitudes, sources of information and dietary behaviours. The mean nutrition knowledge scores were calculated by adding the number of correctly answered questions for general and sports nutrition knowledge sections. A Shapiro-Wilks test revealed that data collected were not normally distributed, therefore the Mann-Whitney U and Kruskal-Wallis tests were used to explore differences in dietary behaviours, attitudes, and sources of nutrition information between sexes, across different sports and level of play. Significance level was set at $p \leq 0.05$. Spearman correlations were used to explore the relationships between variables: nutrition knowledge, including fruit and vegetable intake and intake of fried foods, and level of play. Correlation values were set at: 0.1 to 0.39 = weak; 0.4 to 0.69 = moderate and ≥ 0.7 = strong correlations (Schober, Boer, & Schwarte, 2018).

Results

Nutrition Knowledge

The mean nutrition knowledge score was $55.16\% \pm 13.51\%$. There was no significant difference ($p=0.571$) in nutrition knowledge scores between male ($55.24\% \pm 14.28\%$) and female ($55.12\% \pm 13.16\%$) participants. No significant difference in nutrition knowledge scores were found between sports, see Figure 1. However, a significant difference was found between the level of play and nutrition knowledge scores ($p = 0.002$). The mean nutrition knowledge score for club players was $53.33\% \pm 13.7\%$ whilst those playing at international level had a mean score of $60.61\% \pm 10.36\%$. The Bonferroni adjusted measure of significance ($p = 0.014$) confirmed that players at national/international level had significantly higher nutrition knowledge score than those playing at club level.

Participants scored significantly higher ($p < 0.05$) in questions relating to general nutrition knowledge with a mean score of 60.37%, compared to 49.8% for sports nutrition knowledge. Questions relating to hydration and its impact on performance had the most correct answers with 76% of respondents answering correctly. In contrast, when identifying nutrients required before, during, and after training and competition, only 37%, 34.6%, and 33.3% respectively were answered correctly.

A significant very weak positive correlation was found between nutrition knowledge and fruit and vegetable intake ($r = 0.157$, $p = 0.001$), indicating as nutrition knowledge improved fruit and vegetable intake was higher. Weak significant negative correlations were found between nutrition knowledge and consumption of fried ($r = -0.116$, $p = <0.018$) and takeaway foods ($r = -0.156$, $p = 0.001$), indicating that as nutrition knowledge improved, the amount of fried and takeaway food consumed decreased. However, due to the weak correlations, caution should be taken when interpreting these results.

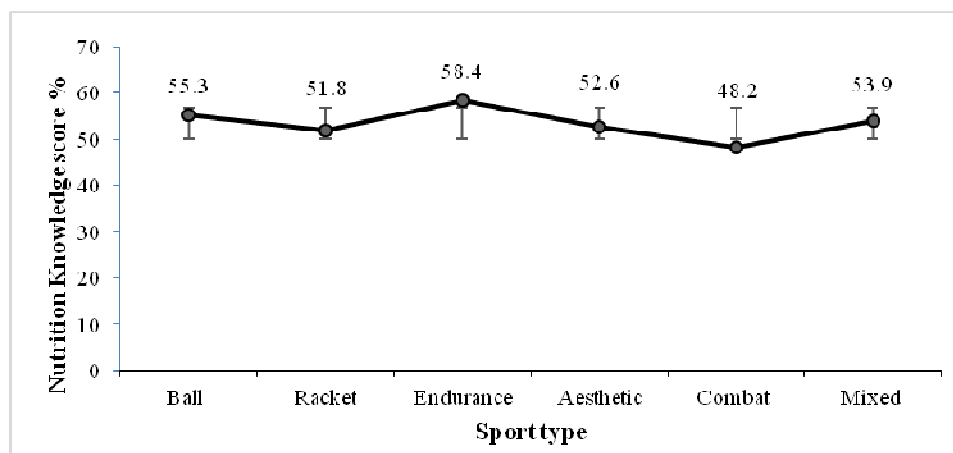


Figure 1. Mean nutrition knowledge score (%) based on sport type. No significant difference ($p > 0.05$) was found in nutrition knowledge scores across different sports.

Dietary Behaviours that support health and performance

Overall, 76.2% of participants reported eating breakfast daily, with males significantly more likely to eat breakfast than females ($p < 0.001$). Fresh fruit was the most commonly reported snack ($n = 277/416$) followed by biscuits, chocolate, cakes, and sweets ($n = 222$); cereals ($n = 222$); yogurts ($n = 158$) and smoothies ($n = 146$). Only 20% of participants reported reaching the daily recommended fruit and vegetable intake, with 22.8% of females reporting this behaviour, compared to 16.7% of males, with no significant found between sexes ($p = 0.91$). Consuming the recommended portions of dairy was reported significantly higher ($p = 0.001$) by 19.3 % of males compared to 10.3% of females. The consumption of fried food, e.g., chips, burgers and chicken nuggets were reported significantly ($p < 0.001$) more frequently by males than females, with 26.6% of males reporting its consumption 2-3 times weekly compared to 12.9% of females. Most participants ($n = 361$) reported consuming a snack an hour, or within an hour of training or competition and within the first hour after training or competition ($n = 396$), whilst 292 participants reported consuming a main meal three to four hours before training or competition. Sports drinks were consumed by 23.3% of participants during training or competition.

Sources of nutrition information

Table 2 shows the sources of nutrition information reported by participants. Results found that significantly more males ($n = 52$) than females ($n = 38$) had access to a nutritionist/dietician ($p = 0.002$). Sources of nutrition information did not differ significantly by sport. A weak significant positive relationship was found between participants who sought advice from nutritionists/dieticians and nutrition knowledge score ($r = 0.225$; $p = 0.026$), indicating that athletes receiving advice from nutritionists or dieticians had higher nutrition knowledge scores. However, due to the weak correlation, caution should be taken when interpreting this result.

Table 2. Nutrition Knowledge scores and sources of nutrition information of athletes (n=415)

	Mean % (SD)	Female % (SD)	Male % (SD)
Nutrition Knowledge score	55.16 (13.51)	55.12(13.18)	55.25 (13.89)
	N (%)	N females (%)	N Males (%)
Dietary Advice sought	224 (53.8)	111 (47.6)	113 (58.9)
Dietary advice sources			
Nutrition/Dietician	90 (21.6)	38 (17)	52 (27.1)
Coach/trainer	110 (26.4)	57 (25.4)	53 (27.6)
Social media	66 (5.9)	30 (13.4)	36 (18.8)
Internet	105 (25.2)	49 (21.9)	56 (29.2)

Attitudes to sports nutrition

Male athletes showed a significantly greater awareness than females that their nutritional requirements differed to the non-athlete adolescent population ($p = 0.047$). Athletes recognised that athletic performance is enhanced by optimal nutrition with 96.9% of females and 91.9% of males reporting its as important or very important. Similarly, 86.3% of females and 86.4% of males reported nutrition as being important or very

important for training. Despite this, athletes reported uncertainty relating to timing and type of nutrient intake around training and competition. Figure 2 reports attitudes to sports nutrition by sex. Increasing muscle mass was seen as essential to performance by 82.1% of female and 77.8% of male athletes yet significantly more males than females felt muscular athletes were more successful than “thin” athletes ($p=0.01$).

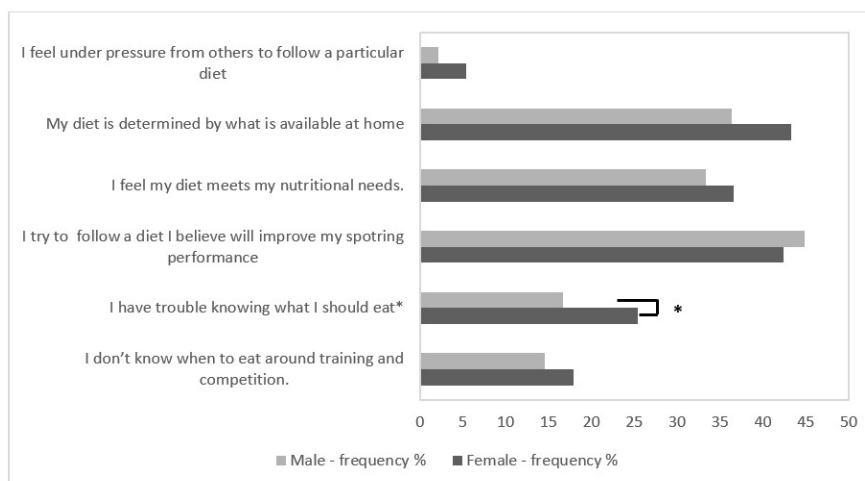


Figure 2. Attitudes to sports nutrition reported by participants. Percentages represent participants indicating how much the statement applied to them. A statistically significant difference was found between female and males ($p = 0.003$), where female athletes reporting “trouble knowing what to eat” more frequently than males.

* Statistically significant difference ($p \leq 0.05$)

Nutritional supplements

Despite 69.9% of respondents disagreeing ($n=230$) or strongly disagreeing ($n=61$) that supplements were not necessary to support their training programme, 89.6% reported consuming nutritional supplements. Significantly more males than females thought supplements were necessary to support training ($p = 0.006$). Vitamins and minerals were the most commonly reported ($n = 207$) followed by protein supplements ($n = 93$), caffeine tablets or gum ($n = 27$) and then creatine ($n = 22$). Figure 3 shows the nutritional supplement consumption of athletes by sex. Weak positive correlations were found between those that reported supplements were necessary to support training and consumption of creatine ($r = 0.253$; $p = <0.001$) and protein supplements ($r = 0.309$; $p = 0.001$). Furthermore, a very weak positive correlations was found between athletes who reported increasing muscular mass as essential to improving athletic performance and consumption of protein ($r = 0.154$; $p = 0.002$) and creatine supplements ($r = 0.123$; $p = 0.012$). Only 31.25% of athletes were aware that not all nutritional supplements are tested to confirm the absence of illegal or harmful substances.



Figure 3. Athlete supplement use reported by participants. Females were found to be statistically ($p < 0.05$) more likely than male participants to consume vitamins and minerals. Males reported significantly higher frequency use of creatine ($p = <0.001$) and protein ($p = < 0.001$) supplement than female participants.

*Statistically significant difference ($p \leq 0.05$)

**Highly significant difference ($p = \leq 0.001$)

Discussion

The main findings in this study were that the nutrition knowledge, especially sports nutrition knowledge, of Irish adolescent athletes regardless of sex or sport played was deficient. Nutrition knowledge was lowest related to nutrient requirements before, during, and after training and competition. Nutrition knowledge scores were significantly higher for those playing at international level than at club level. Additionally, it was found that male athletes reported the use of ergogenic supplements more commonly than female athletes.

The mean nutrition knowledge score found in this study ($55.16\% \pm 13.51$) is comparable with scores found in previous studies of the adolescent population, 43.8% to 59.6% (Bird & Rushton, 2020; Manore, Patton-Lopez, Meng, & Wong, 2017; Noronha, et al., 2020; Walsh, Cartwright, Corish, Sugrue, & Wood-Martin, 2011). However, it is difficult to accurately compare scores from different studies due to differences in the measuring tool used and the type of nutrition knowledge assessed. Nonetheless, these studies all found adolescent athletes do not fully understand the role that each nutrient plays in their diet. Heaney et al. (2011) also found adult athletes showed poor knowledge of the energy content of nutrients in addition to the role they fulfil.

Despite athletes' behaviours in the current study aligning well with guidelines around timing of pre and post event feeding (Desbrow, et al., 2014; Heaney, O'Connor, Michael, Gifford, & Naughton, 2011), athletes could not correctly identify the nutrients and fluids required at these times. Adolescent athletes knew when to consume food pre and post training or competition, but they did not know what foods to consume. This illustrates the similar lack of knowledge around the specific role of nutrients amongst adolescent athletes in this study, which was found in previous studies and highlights a real challenge for these athletes in optimising their training and recovery, which may negatively impact growth and performance (Desbrow, et al., 2014). This is an important finding from the current study and emphasises the need to educate adolescents on the role of nutrients in addition to when and how much to consume, and how best to support their health and performance needs. Education interventions addressing gaps in the nutrition knowledge of adolescent athletes resulted in improved nutrition knowledge scores, a greater understanding of key nutrition concepts (Rossi, et al., 2017; Valliant, Pittman Emplainscourt, Wenzel, & Garner, 2012) and improved food selection around training and competition (Sánchez-Díaz, Yanci, Castillo, Scanlan, & Raya-González, 2020). Nutrition education may be an appropriate tool to elicit improvements in nutrition knowledge for Irish adolescent athletes in future, however, further research is required in this area.

The current study found a weak positive correlation between increasing nutrition knowledge and increased consumption of fruit and vegetables and a weak negative correlation between increased nutrition knowledge and reduced intake of fried and takeaway foods. In a study of adolescent volleyball players (Daniel, Jürgensen, Padovani, & Juzwiak, 2016), found that as nutrition knowledge improved intake of fruit and vegetable increased, and consumption of energy dense, low nutrient foods decreased. Patton-Lopez et al. (2018) studied 535 adolescent male and female athletes, 15.3 ± 1.14 years and found improvements in nutrition knowledge resulted in improved dietary behaviours in line with recommendations and increased adherence to sports nutrition guidelines that may improve performance. These findings suggest that increasing nutrition knowledge may lead to improved dietary behaviours like increased fruit and vegetable consumption which is aligns well with dietary recommendations for adolescent and is important in helping adolescents meet their micronutrients needs.

The current study found that at higher levels of play, national/international compared to club, nutrition knowledge improved. This finding is novel and to the authors knowledge has not been explored in previous studies with adolescent athletes. Interestingly, the current study found that all athletes playing at county level or higher had access to nutritionists or dieticians, and this may provide the basis for their better knowledge score. Furthermore, a weak positive correlation was found between advice received from nutritionists and dieticians and nutrition knowledge scores. Valliant et al. (2012) found dietician led nutrition education resulted in increased knowledge (+12.4%) in 125 female volleyball players, improvements in total energy intake, and protein and carbohydrate intakes that were closer to recommended levels. Consequently, the involvement of nutritionists or dieticians in the design and roll out of targeted education programmes and nutrition interventions may lead to increased adherence to nutrition recommendations. Future research could further explore the association between level of play, nutritional knowledge, and nutritional advice from dietician/nutritionist and caution should be taken when interpreting the results of the current study due to the weak correlation.

No differences in nutrition knowledge between sexes or by sport played were found, however, some differences in attitudes and dietary behaviours were evident. Female athletes reported consuming vitamin and mineral supplements more frequently than males ($p < 0.05$), whereas male athletes reported greater consumption of ergogenic supplements ($p = 0.001$). Consistent with the current study, Walsh et al. (2011) found that male adolescent Rugby players perceived athletes with muscular body shape as more successful and reported high consumption of supplements. This suggests that male adolescent athletes may associate the intake of ergogenic supplements with increased muscle mass. Existing research shows that male adolescent athletes already consume adequate protein in their diet to support muscle protein synthesis (Desbrow, et al., 2014; Heaney, O'Connor, Michael, Gifford, & Naughton, 2011). Furthermore, ergogenic supplements efficacy and long-term impacts have not been studied in adolescent populations (Desbrow, et al., 2014). Supplement safety is an area that should be addressed in any future interventions to improve nutrition knowledge in adolescents.

Future research should look to the validation of a nutrition knowledge questionnaire explicitly for the adolescent population to ensure consistency and allow for comparisons across studies. A limitation of this study was that the majority of athletes participated in ball games, and many played more than one sport, which meant distribution of athletes across sport categories was not uniform. Despite this reflecting sport participation patterns in Ireland currently (Woods, et al., 2019) future research should seek a greater spread of athletes across sport types to facilitate greater comparison of nutrition knowledge, attitudes and dietary behaviours by sport. Additionally, future research should explore the impact of different nutrition education interventions on nutrition knowledge.

Conclusion

This was the first study in Ireland to investigate the nutrition knowledge, attitudes, and dietary behaviours of Irish adolescent athletes between sexes, different sports, and level of play. This study identified that Irish adolescent athletes lack fundamental nutrition knowledge that enables them to identify the nutrients they require at key times, and to make informed decisions on nutritional supplement use. This means that the athletes may not consume the appropriate nutrients required to optimise performance and recovery as well as their overall health. Improving knowledge of nutrients and how to maximise their timing and distribution across the day and around training and competition may assist in improving the health and performance of adolescent athletes. The input of nutrition professionals in the design and roll out of future nutrition education programmes for athletes may result in behaviours that align more closely with established nutrition recommendations and meeting the athletes' needs. These findings may be valuable to sports nutrition professionals, coaches, physical education teachers, parents, and adolescents in highlighting where knowledge is inadequate and may guide them in providing targeted nutrition education to adolescent athletes and their parents/guardians and coaches.

The Authors have no conflicts of interest to declare.

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