



**BMOE7007 Master's Dissertation in Health,
Outdoor Education and Physical Literacy**

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"Perceived Nutritional Requirements for Adolescent Athletes – a qualitative study to gather nutrition knowledge of parents and coaches in relation to fuelling adolescents for growth, development, training and performance."

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I'd like to thank my research supervisor for all their help and guidance, not only with the research project but also throughout the course, thank you for all your support, Chris.

DECLARATION

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

Signed Beca Lyne-Pirkis..... (Student)

Date 6th May 2026.....

DECLARATION

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

Signed (Lecturer)

Date

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Abstract

Adolescence is a period of growth whereby nutrition or lack of it can impact the individual lifelong. Increased energy needs due to high levels of physical activity can cause further health issues if sufficient fuel and micronutrients aren't met through a balanced diet. This study aims to better understand the current nutrition knowledge and practices of parents and coaches of UK adolescent athletes.

A qualitative survey was shared amongst sport and dance clubs to gather simple quantitative data alongside qualitative experiences from participants, shared via digital platforms and social media channels.

Of the n=57 participants, 91% were parents (n=52) and 9% were coaches (n=5) of adolescent athletes. 85% of participants reported that their adolescent would have some form of fuel prior to training. N=28 reported that their adolescent didn't take any form of vitamin or mineral supplement. 4 out of the 5 coaches had not heard of the term RED-S, which raised concerns around supporting vulnerable athletes with misinformation in relation to nutrition and their chosen sport.

With the prevalence of eating disorders increasing within the adolescent population and the link with mental health, body composition and sport highlighted by the IOC as a symptom of RED-S to be aware of, the results of this study showed a need to educate athletes, parents and coaches of the importance of a balanced diet in support of growth and training and a need for information to be accessible to all.

Keywords: adolescent, athletes, nutrition, growth, development, training.

Introduction

The aim of this research is to gather information from parents and coaches of adolescent athletes on their nutrition intake and habits to better understand current practice amongst this cohort. There is a concern in relation to energy intake when considering growth and development for this cohort and how the demands of being physically active can affect growth when energy intake is sub-optimal. When energy intake is not meeting the activity demands alongside micronutrient deficiencies, this can inhibit growth and affect performance and participation in exercise, coupled with longer-term health concerns for both females and males.

Adolescents are individuals aged between 10–19-years-old, an age bracket and life stage defined by the World Health Organisation (WHO, 2026) and is a transitional phase for when older children grow and develop through puberty into young adults. With this demographic in mind, this study focuses particularly on the energy requirements of adolescent athletes. During this life-stage, individuals experience rapid physical, cognitive, and emotional development, necessitating higher energy and micronutrient intakes than in adulthood (McGregor, 2015). Adolescents also undergo significant life transitions; starting secondary school, the hormonal and physiological changes associated with puberty, which in females includes the onset of menstruation, and academic pressures in secondary education, all of which place additional physical and mental stress on the body (Cooke and Lowdon, 2019).

Dietary reference values for during adolescents vary between females and males, and take into consideration energy, protein and fats alongside micronutrients which are all recommended to support the promotion of healthy developmental and physiological milestones within the general population for this age range (DH, 1991). Within paediatric dietetic practice, growth monitoring is used to track healthy development of individuals if they're being supported by a dietitian. Other health professionals who work within paediatrics can refer children and adolescents into the service if there is concerns raised relating to growth factors, as if not supported can lead to stunted growth and long term health complications (Cooke and Lowdon, 2019).

Macronutrient and micronutrient requirements for adolescents aged 10-19 can be seen in the following table, outlining the range needed across this age bracket as individual grow and develop, alongside their protein and micronutrient needs to further support health growth and development.

Table 1: Dietary Reference Values ranges for females and males aged 11-18-years-old (DH, 1991; GOSH, 2015; SACN, 2016).

	Females	Males
Energy	1936kcal-2462kcal	2032kcal-3155kcal
Protein	41.2g-45.4g	42.1g-55.2g
Calcium	480mg-800mg	452mg-1000mg
Vitamin D	10µg	10µg
Iron	8.0mg-14.8mg	6.1mg-11.3mg

The requirements outlined in table 1 are calculated with median physical activity levels as expected for individuals in this age bracket and do not take into consideration those who train and participate in higher levels of activity. Many adolescent athletes engage in high levels of physical activity, often training before and after school and competing on weekends. Sports like swimming, gymnastics, tennis, and dance may demand 10–17 hours of training per week, not including school-based physical activities, and with increased demands on the body, these rigorous schedules require increased nutritional support to meet both developmental and athletic demands (Bagchi et al., 2013; Bingham et al., 2015; Purcell et al., 2013).

There is concern that many adolescent athletes may be under-fuelling, either unintentionally due over-training and busy schedules, or consciously due to body image pressures relating to historic perceived ideals for body composition or body weight that is still associated with some sports or coaches. This can lead to Relative Energy Deficiency in Sport (RED-S), a condition that impairs growth, delays puberty and menstruation, disrupts hormones, and increases the risk of osteoporosis, frequent illness, injury, and compromised mental health. Such deficiencies can also impact athletic performance and long-term health outcomes, with RED-S affecting both females and males (Mountjoy et al., 2023).

Some known contributing factors that can bring about RED-S in an athlete of any age include overtraining whereby the individual is training in excess of their energy intake; inadequate energy intake as not aware of how much is needed to train and perform

(Currie, 2010); inadequate energy intake due to restrictive eating behaviours such as those seen in 'picky or fussy' eaters, or external pressures to conform to idealized body types in certain sports (Kontele and Vasilakou, 2021). A factor that can also be linked with RED-S is eating disorders, which are a significant concern among both adolescents and athletes, with some sports culturally reinforcing harmful body image standards from a young age which can lead to long-term health complications and impact the athlete's ability to perform at their best (Mountjoy et al., 2023; Amawi et al., 2024).

Food insecurity is also a consideration that may impact some families and individuals' ability to meet nutritional needs, with the rising cost of living impacting food availability and choice, with data from the Food Standards Agency (FSA) Food and You Survey (FSA, 2025), reporting an increase in the concern of food affordability which increased from 26% in wave 2 to 49% in wave 8 of the survey. Habits role modelled and formed in early life and the home environment can also have an influence on an individual's eating and drinking in relation to physical activity, alongside the level of nutrition literacy in the home and by the individual that can impact their knowledge and awareness with food and where to access relevant information to support choices and decisions around food and physical activity (Cooke and Lowdon, 2019).

Despite these challenges, there is currently a lack of specific energy requirement guidelines tailored for adolescent athletes. Most existing recommendations apply only to individuals over 18, creating a gap in support for younger athletes. While several studies address adolescent energy needs (Bagchi et al., 2013; Bingham et al., 2015; Capra et al., 2024; Smith and Jeukendrup, 2013; Purcell, 2013; Smith et al., 2015), there is no consensus, leaving this population vulnerable to the consequences of poor nutrition and under-fuelling which as discussed can affect their growth and development, and lead to longer-term health complications.

Simultaneously, public health narratives often emphasize the obesity epidemic among children and young people, overlooking the parallel issue of malnutrition in the form of nutrient-poor, high-energy diets or under-fuelling among young athletes, and causing mixed messages in relation to how those adolescents should be fuelling for their body and activity (Jovanon et al., 2019).

Both extremes of over-nutrition and under-nutrition pose long-term health risks and can hinder optimal growth and development (Cooke and Lowdon, 2019). Addressing the unique nutritional needs of adolescent athletes is essential to support their growth, safeguard their health, and enhance their potential in both sport and life.

Literature Review

Rationale

There is a gap in the current research to better understand current nutrition knowledge of the parents of adolescent athletes and coaches who have an influence on this age group. There is also a need to identify and develop a consensus on the nutritional requirements for this age group, identifying the differing needs between the genders and the varying requirements for different sports and activities. Education also plays a part in ensuring that the age group, their parents and coaches are informed as to what nutritional needs should be consumed to ensure optimal energy for training and performing alongside daily school and life activities, and growth and development. Before this can be achieved, further research needs to be conducted to gather data on current practices relating to training and nutrition in this age group, to identify any cause for concern and to build evidence to support the case of creating guidelines on nutritional requirements for adolescent athletes. This research aims to collate specific data in relation to fuelling by adolescents prior to training, something that could potentially be impacted due to the time-of-day training happens and any prior commitments by the adolescent athlete that may affect their ability to fuel appropriately. Adolescence is the second fastest developmental stage after infancy, where several physiological and cognitive changes take place and thus requiring sufficient nutrition to allow and optimise these changes to happen (Desbrow and Leveritt, 2015).

Current sporting commitment by adolescents in the UK is estimated at around 48% meeting the recommended 60+ minute daily activity (Sport England, 2024). This data is for general population level, with more accurate numbers for adolescents who exceed the physical activity recommendations difficult to quantify, however in one study by Murray (2017) in which they looked at the training load in adolescent athletes,

hour per week could range from 3.5-22.5 hours of training per week, depending on the sport and at which level the adolescent was representing (Murray, 2017).

Macronutrient and Micronutrient Requirements for Adolescents

As outlined previously, recommendations for energy, protein and some key vitamins and minerals can be seen in table 1 above (DH, 1991; GOSH, 2015), and although a consensus on these needs isn't available there have been a number of studies and recommendations made to support adolescent athletes (Bagchi et al., 2013; Bingham et al., 2015; Capra et al., 2024; Smith and Jeukendrup, 2013; Purcell, 2013; Smith et al., 2015), although awareness of these recommendation by the general population is likely to be low.

Desbrow (2018) discuss the increased energy needs for adolescent athletes alongside macronutrient and micronutrient needs for growth and physical activity, highlighting the lack of consensus to support this age group. Carlsohn et al. (2011) discusses the use of validated PAL recommendations for adults are not suitable for adolescent athletes, and that a different PAL range needs to be considered to calculate the energy needs of this population group, suggesting a range of 1.75-2.05. The study identified that energy requirements need to consider the increased demands of growth and the higher metabolic activity levels in this population. Suggested estimates of energy expenditure for adolescent athletes differ greatly from what is outline in table 1, which outlines energy expenditure for adolescents and not the athletic population within this age group. The suggested estimates are 3100 +/- 720kcal/day for females, and 3640 +/- 830kcal/day for males (Desbrow, 2018).

Ercan in their 2018 study that investigated the status of micronutrient elements in adolescent athletes, analysing hospital records of 166 athletes. The blood results were from athletes aged 12-17 years old and found that iron deficiency in the group was determined in 10 females and 1 male. However, serum 25 (OH) vitamin D concentration was found to be statistically significant in the cohort, with female athletes and those who trained indoors with lower serum 25 (OH) vitamin D levels. The study concluded that age and gender are factors than can affect micronutrient elements status in adolescent athletes, and that training location and seasonal factors can also play a part in serum 25 (OH) vitamin D levels, with those who participated in sports

that predominantly train indoors and females at a higher risk of lower levels (Ercan, 2018). Desbrow (2018) highlights the important role that vitamin D plays in not only bone health, but its support with the immune system and the muscular system, citing that insufficiency is linked to muscle pain and inflammation, skeletal muscle function and may increase risk of injury and slower rate of rehabilitation from injury. Desbrow (2018) goes on to discuss that these findings have not been studied sufficiently in adolescent athletes, but that it is known that the demands on this age group in regards to growth can increase the risks if they have low levels of vitamin D.

Both iron and calcium play important roles in during adolescence and the physiological and cognitive changes that happen during puberty require increased amounts of these minerals to support growth and development (Capra et al., 2024). Alongside vitamin D, calcium helps support health bone synthesis with requirements for male adolescent reaching 1000mg per day to support the rapid changes that occur during this period (DH, 1991). Females require 800mg alongside increased requirements for iron at 14.8mg to support the onset of menstruation and bone health (SACN, 2010). Due to food habits or dietary preferences both minerals can be impacted due to a diet lacking in calcium and iron which can cause additional health concerns within the adolescent athlete population (Bean, 2022). Vicente et al. (2023) discussed concerns with low calcium and iron intake in a cohort of adolescent gymnasts, assessing to see if their diet was adequate for their age, gender, development and sport, with 66 participants took part, with 60% female and aged between 12-18. Of the 66 participants in the study, only 2 had calcium intake that met recommendations, and 1 of 5 had iron intake within recommendations. The study concluded that although sufficient energy needs were being met, the diet within this cohort of Portuguese gymnasts contained high amounts of ultra-processed food that had low amounts of iron and calcium (Vicente et al., 2023). As discussed previously, there is also the concern that those who train mainly indoors are also at risk of lower levels of vitamin D, which alongside calcium and iron are vital in the development and maintenance of healthy bones and muscles, both of which develop rapidly during adolescence.

Current UK Population Eating Data

The National Diet and Nutrition Survey (NDNS) aims to assess the general UK population's diet, highlighting nutrient intake and nutritional status of all 4 UK countries.

This sample is a representation of current UK diets and is used by the devolved governments to help develop and evidence nutrition policies for general population health and wellbeing (NDNS, 2025). The results published in July 2025 consists of data gathered between 2019 and 2023 and although the data collected has its limitations due to data being self-reported by participants, it does give an idea as to the food habits of all ages from 18 months to 75 years and over. As previously discussed, the importance for the adolescent athlete to eat a balanced diet to help maintain good health status is imperative for performance outcomes and aligns with the recommendations for active adults (Smith and Jeukendrup, 2013). Focusing on the NDNS (2025) age group of 11-18 years, the data reports that of those surveyed on average 2.8 portions of fruit and vegetables are consumed daily, with less than 1 in 10 11–18-year-olds (9%) meeting the recommended 5-a-day for fruit and vegetables.

Fruit and vegetables are key foods for micronutrients and fibre and are important components of a balanced diet for general and long-term health outcomes. Alongside fruit and vegetable consumption it was found that of those surveyed, 96% of 11-18-year-olds did not meet the recommendations for fibre daily. 11-16-year-olds should aim for 25g per day and 16 years and over should aim for 30g per day, the same for adult age range (DH, 1991). Fibre helps to manage cholesterol in the body, maintains gut and digestive health and has strong evidence to support and manage chronic conditions including CVD, diabetes and some cancers (Barber et al., 2020; SACN, 2015), and plays an important part in a balanced diet. With the adolescent athlete in mind, ensuring sufficient energy for growth and activity and fibre recommendations will need to be considered if energy deficiency is of a concern (Desbrow and Leveritt, 2015).

Mean total energy intake data from the NDNS (2025) reports that on average girls aged 11-18 years are consuming circa 1538kcal per day, and boys aged 11-18 years are consuming 1808kcal per day. Comparing this data to the Department of Health Dietary Reference Values for energy (DH, 1991; SACN, 2015); girls aged 11-14 years energy requirements are estimated as 1845kcal, and girls aged 15-18 years are 2110kcal; with boys estimated average energy for 11-14 as 2220kcal, and boys aged 15-18 years energy estimated as 2755kcal. These energy estimations are for general

population age groups and genders and do not take into considerations those with a higher energy demand. This data is concerning and potentially highlights that within the general population there's energy deficiency amongst 11-18-year-olds, which would be exasperated within some in this age group when physical activity levels (PAL) is considered, which can lead to effects on performance in the short-term and potentially longer-term effects on health (Todd et al., 2022). Table 2 details daily PAL, which been categorised to help calculate energy needs of individuals using weight in kilograms (kg) multiplied by the most appropriate PAL, which as previously highlighted by Carlsohn et al. for the adolescent athlete population should be adjusted to between 1.75-2.05 (2011).

Table 2: Physical Activity Levels (PAL) and their descriptors (Bean, 2022)

PAL	PAL Descriptors
1.4	Mostly sitting, little physical activity
1.5	Mostly sitting, some walking, low levels of exercise
1.6	Daily moderate exercise
1.8	Daily moderate-high exercise level
2.0	Daily high exercise level

With the figures displayed above taken into consideration – these can increase the estimated energy requirements of an adolescent athlete to an amount higher than outlined in the DRVs (DH, 1991), which may still be insufficient for some adolescent athletes if growth is still affected.

The consumption of sugar sweetened drinks was reported to be highest amongst 11-18-year-olds with on average 124mls drunk per day, with highest consumed reported to be 606mls per day (NDNS, 2025). Free sugar consumption was reported to be highest with girls aged 11-18 years at 12% of total energy from the NDNS (2025), and with total energy reported for girls within this age group at an estimated 1538kcal from the survey (NDNS, 2025) this potentially highlights further concerns in relation to energy sources consumed by adolescents.

Relative Energy Deficiency in Sport

Relative Energy Deficiency in Sport (RED-S) is a condition that was formally known as the Female Athlete Triad and considered the combination of disordered eating, bone health and irregular menstrual cycle on the female athlete – linking to low energy availability (LEA) due to intentional or unintentional under fuelling (Bean, 2022). The term RED-S was first introduced by the International Olympic Committee's expert writing panel in 2014, which was update in 2018 and again in 2023 with further research in the area to support the condition within wider populations of athletes (Mountjoy et al., 2023), however although more has been done to gather further research on male athletes, further studies need to be conducted to better understand how the condition presents itself in males across a variety of sport and ages, with adolescent athletes being one of these categories that needs further research for both males and females (Mountjoy et al., 2023; Briggs et al., 2020; Todd et al., 2022).

The IOC'S most updated Consensus Statement on RED-S in 2023 aimed to address and highlight further developments as to what is known and how best to treat and support athletes who are diagnosed with, or at risk of developing RED-S (Mountjoy et al., 2023). Some key areas highlighted in the updated consensus statement include better understanding between LEA and low carbohydrate availability (LCA) and the affect that this can have on an athlete; the symptom overlap of RED-S and overtraining syndrome (OTS); a better understanding of mental health associated with RED-S; and some advance in knowledge on male athletes and RED-S (Mountjoy et al., 2023).



Figure 1: Mountjoy et al., (2023) RED-S Health conceptual Model figure taken from the IOC Consensus Statement on RED-S.

In their 2021 study, Kontele and Vassilakou discuss the nutritional risks among adolescent athletes, linking this with disordered eating and the effect this can have on the athlete's growth and performance outcomes. The increase in children and adolescents receiving treatment for eating disorders in the UK rose from 5240 in 2016-2017, to 11800 in 2022-2023 according to National Health Service data and as discussed in Pastore et al. article in the Journal of Pediatrics (2023). Although not directly linked the athletic population within this age group, the recent data shows an alarming increase in children and adolescents with eating disorders, which is a factor to consider when investigating adolescent athletes and their intake alongside activity levels and growth. The updated RED-S consensus statement (Mountjoy et al., 2023) highlights the rise in prioritising mental health awareness within the sport community and its link to eating disorders and disordered eating. Previous versions of the consensus statement linked psychological issues with RED-S symptoms, whereas the updated 2023 statement emphasizes mental health issues as seen in figure 1 and its link to LEA. As discussed by Currie (2010), athletes develop eating disorders for similar reasons to others, however within some sports there is additional pressure to achieve or maintain a specific weight or body composition.

Endurance sports like long-distance running was highlighted with runners who are several kgs over their ideal weight for performance may not perform to the best of their ability. Sports that have weight categories like martial arts, boxing and wrestling require competitors to be within a weight and if found to be over the upper weight category will not be allowed to compete. Other aesthetic sports like dance and gymnastics have historically linked to a particular body composition, which can be promoted by some teachers and coaches as a positive endorsement within these sports (Bean, 2022; Currie, 2010).

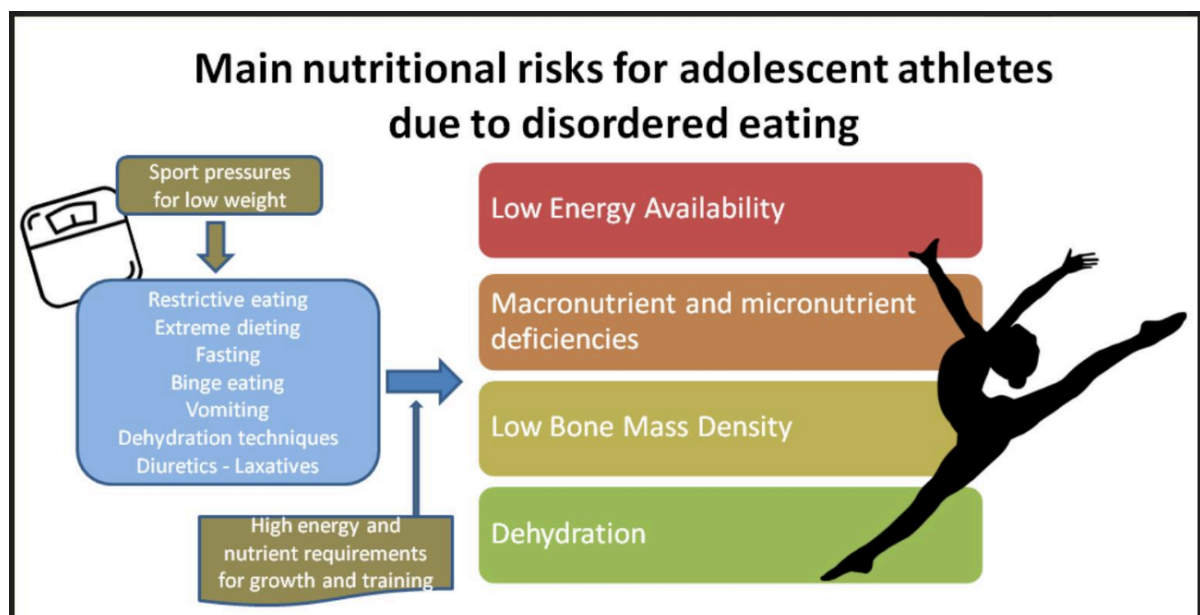


Figure 2: Infographic by Kontele and Vassilakou detailing nutritional risks of disordered eating for adolescent athletes (2021).

Kontele and Vasilakou discuss the risks that can lead to RED-S within the adolescent athlete population, with their infographic in figure 2 above connecting how sport pressures for low weight can cause disordered eating, which when alongside higher energy requirements can lead to further health complications as outlined by the IOC in their consensus statement (Mountjoy et al., 2023). Often, the GP is the first health professional that may come across an adolescent who presents with signs and symptoms that can be linked to RED-S, with an article in the British Journal of General Practice by Todd et al., discussing the condition and the signs to be aware of as a GP (2022). Although this study on adolescent athletes isn't directly looking at signs and symptoms linked to RED-S, there are questions within the survey that have been included to better understand if further information or education interventions would

benefit this population to be better informed as to their energy needs and what symptoms to be aware of as early signs of RED-S.

Sport Supplements for Adolescent Athletes

The use of supplementation marketed by the sports industry is well researched within adults and can be used to provide some additional performance enhancing gains, especially within elite athletes (McDowell, 2007). Supplements that are well researched include protein, creatine, caffeine and multivitamins, with the use of these supplements also growing in popularity by adolescent athletes (Smith and Jeukendrup, 2013). McDowell (2007) reports that supplements are reported to be used by both genders within adolescent athletes and that access to dietary and sport supplements is highly accessible and unregulated, with misinformation and pressure from social media and sporting performance pressure a factor as to why some adolescent athletes use supplements. Protein supplements like shakes and bars are popular due to perceived needs of having additional protein to support their training, but this is a common misconception by athletes and coaches, with the standard westernised diet providing, if not exceeding the protein needs of adolescents if a balanced diet is followed (Bean, 2022; Smith and Jeukendrup, 2013). Jovanov et al. (2019) conducted an international study to better understand the prevalence, knowledge and attitude by adolescent athletes towards using sports supplements. Of the 348 athletes studied, there was an 82.2% prevalence rate for sports supplements, with 54.5% of these using protein supplementation. Many of these athletes were aware of the health risks associated with sport supplements, however there was a varying level of knowledge within the cohort, with less than 40% of the athletes possessing appropriate knowledge on the intended use of supplements like protein and creatine, but with a greater understanding of sports drinks, vitamins and minerals and caffeine. Athletes identified coaches as their main source of information with regards to sports supplements and their use, with the study concluding that comprehensive education for all involved with adolescent athletes was needed, with a recommendation for careful supervision of these athletes and their development (Jovanov et al., 2019).

Smith and Jeukendrup (2013) go on to discuss creatine and caffeine, 2 other popular supplements that are being used by adolescent athletes. With both supplements, although extensive studies have been carried out on adults, there is no research to

support its use in adolescent athletes, with the American College of Sports Medicine Roundtable and the American Academy of Paediatrics position statements advising that it should not be used by children and young people under the age of 18 (Kreider, et al., 2017). Similarly with caffeine, it is a well-known supplement used by adults as an ergogenic aid, however its use and effect on adolescents is not recommended due to varying stages of maturation in adolescent and high levels having adverse effects (Smith and Jeukendrup, 2013). When discussing advice on multivitamins, both Bean (2022) and Smith and Jeukendrup (2013) share that if an adolescent is eating and maintaining a balanced diet, there is no need for supplementation with a multivitamin. Bean goes on to caveat this advice by stating that it may not always be possible to have consistent balanced diet for several reasons linked to restrictive eating habits, reliance on fast foods or potentially food availability, and in which case a comprehensive multivitamin that's age appropriate could help support the individual (Bean, 2022).

Nutrition Literacy and Misinformation

Nutrition literacy (NL) in parents and coaches of adolescents can vary greatly due to the differing level of formal education attained by these individuals, which can influence the nutrition literacy of the adolescent. In Jacobsson et al.'s 2021 cross-sectional study that looked to assess parents, youth athletes and coaches' subjective health literacy (HL), concluded that HL was low in mentors when considering injury prevention in youth athletes, and that parents looked to the coaches for guidance on injury prevention. This study highlights the trust that parents put onto coaches to have an awareness of injury prevention which would link to having an awareness of the signs and symptoms of RED-S. Repeat injuries and or illnesses, or prolonged recovery from these can be associated to RED-S, with an expectation that coaches would have attained some qualifications on this area and know who or where to signpost parents for further support and advice. Cockburn et al. (2014) discuss the nutritional knowledge of UK coaches stating that athletes look up their coaches for nutritional information but highlighting that competency levels are lacking. Worryingly, over half of the coaches that were surveyed in the paper had provided nutritional advice to athletes even though they did not have the relevant qualifications to do so.

The paper concluded that coaches would benefit from continued professional development within sports nutrition that would enhance their coaching skills and provide those athletes under the care with appropriate information (Cockburn et al., 2014). UK Coaching (2026) provides some basic advice and training for coaches to access via their online Health and Lifestyle Guide. Basic information is available here and includes raising awareness around mental health, eating disorders and RED-S within the cohort they support.

Segado-Fernández et al., ask for a call to action in their 2025 paper which discusses the level of disinformation on nutrition across social media platforms, asking that public health institutions take action to help the public with their digital literacy to be able to assess if information is evidence-based. There's a further call to action by Segado-Fernández et al., (2025) directed at health professionals to utilise social media platforms better to help dispel misinformation and provide evidence-based information to help inform and educate the general population. There has been a growing number of health professionals taking to social media platforms and supported by their professional bodies to help cut through misinformation being shared by individuals, with the aim of making evidence-base information more accessible to help the public with their digital, health and nutrition literacy (BDA, 2026). Tiller et al., highlights that although there is a need to counter the misinformation being shared by journalists, influencers and pseudo-experts to name a few, that as a community – many scientists believe that they lack the necessary science communication skills needed for mainstream media platforms and to content with 'would-be' scientists and the reach that they are able to achieve, with and without industry-based sponsors (tiller et al., 2024). Logue et al., interviewed 9 elite athletes (6 = female, 3 = male) and 9 high-performance coaches (3 = female, 6 = male) in their 2021 study to gain insight into perceived needs of nutrition and advice in relation to this. The results shared that athletes often were shocked when nutrition was highlighted and a need to eat more was suggested by coaches, and that the shock was in relation to worry about weight gain by athletes. The athletes had also not considered the need to increase how much they ate to meet the demands of their general health, training and psychological needs, with the findings supporting that further needs to be done to support education for athletes, parents and coaches in relation to nutrition and adequate intakes (Logue et al., 2021).

With the above in mind, the proposed research question is as follows:

“Perceived Nutritional Requirements for Adolescent Athletes – a qualitative study to gather nutrition knowledge of parents and coaches in relation to fuelling adolescents for growth, development, training and performance.”

Objectives

- To ascertain the current nutritional knowledge of parents with adolescent athletes and their coaches; and
- To compare collected data to current research on energy needs within sport for this group, specifically looking at gathering information in relation to pre-training and competition fuelling.
- The above 2 objectives combined will identify current practices to evidence need for further research within the specialist topic.

Methods

Research Design

Quantitative research was considered and could've been chosen and conducted via a questionnaire, with an array of questions for participants to answer that would gather data on their understanding of the topic. Undertaking solely quantitative research for this study design could limit the answers to those questions being asked due to the nature of quantitative research utilising questions with multiple choice answers for participants to choose from, or Likert scales for participants to rate their confidence as an alternative way of gathering data and understanding (Sullivan and Artino, 2013). A large number of questions may need to be used within a quantitative questionnaire to gather an acceptable amount of data to report and discuss, this could prove to be time consuming for participants to answer and may impact the number of participants who take part and complete the survey (Sharma, 2022). A benefit of quantitative research is the ability to gather data from an opportunistic sample to better understand phenomena within a larger number of the population.

It further allows the researcher to keep a distance from participants, and not influence or guide the line of questions to suit the researcher's own understanding and beliefs of the literature and topic, something that can happen during qualitative interviews or focus groups (Then et al., 2014).

A mixed-methods survey consisting of qualitative and quantitative questions to gauge current knowledge and practices of fuelling adolescent athletes by parents and coaches could have allowed for more in-depth understanding of participants' comprehension on the topic (Hafsa, 2019). A mixed-methods survey would also be less time consuming for participants to answer and allow participants the opportunity to share what is known with the researcher including multiple-choice questions and Likert Scales, alongside free text boxes to allow participants the opportunity to share more of their experiences and understanding (Hafsa, 2019). This method of survey can also potentially be less time consuming for the researcher to analyse depending on the number of qualitative questions used within the questionnaire. Mixed-methods research will allow for richer understanding of the phenomena, helping to comprehend better the ontological beliefs and practices of nutrition for adolescents in general and specifically in relation to physical activity and growth (Doyle et al., 2009). This study can also be closely aligned to deductive research, with a theory linked to nutrition literacy at the centre of the study, and the aim of testing the theory through the mixed-methods survey and data collection, making this an observational study which has the potential to be replicated by other researchers in the future (Hyde, 2000).

Although mixed methods appealed as a study design, a qualitative research questionnaire was decided as a research method for this study due to the ability to gather experiences from a range of individuals. (Ricci et al., 2019). Individual interviews and focus groups were considered as they can allow participants to share information on the chosen research topic which in turn can show gaps in knowledge and understanding but can also demonstrate awareness and comprehension of the topic area, with the ability to discuss in-depth information and experiences with the researcher. Qualitative research enables the researcher to better understand participants' experiences of the phenomena being studied alongside understanding (Agius, 2013), which when considering this research study's aim, can allow for better understanding of current practices and knowledge of parents and coaches, comparing

the data to what is already known. Organising conducting, transcribing, and theming interviews and focus groups can be a time-consuming process for the researcher dependent on the number of participants and the length of the interviews as whole.

The questions were constructed to ensure appropriateness to the topic and research aim, with consideration given to what data would be meaningful to the study and taking into consideration that the questions would be posed to parents and coaches of adolescents. The questionnaire was divided into 2 parts, the 1st part aimed at collecting demographic information and information on the types of sports that were being represented and the training commitment for these sports. The 2nd part of the questionnaire was aimed at collecting information and data on the nutrition practices happening for the adolescents. The full research tool can be found in the appendices, with sample questions highlighted in table 3 below:

Table 3: A selection of questions from the research tool

Question no.	Question:	Multiple Choice Answer:
3.	Do you have any dietetic or nutrition qualifications? Please give further details:	<i>(Free text box)</i>
8.	How many hours per week do they train for their specific discipline(s) in total per week?	<6 hours, 8 hours, 10 hours, 12 hours, 15 hours, 17 hours, 20 hours >20 hours.
10.	Do they train more than once per day?	Yes or No. <i>(further questions to gather more detail on this topic)</i>
12.	PARENTS: When does your adolescent train?	Morning before school; Afternoon/Evening after school; Weekend in the morning; Weekend in the afternoon.
16.	Do athletes have a snack with them to have during training sessions?	Yes or No. <i>(further questions to gather more detail on this topic)</i>

20.	PARENTS: are there any barriers that affect the ability of your adolescent having a snack/some form of nutrition prior to training sessions?	Early morning sessions; Training straight from school; Lack of appetite; Lack of time; Unsure as to what to have; Other.
21.	PARENTS: Does your adolescent athlete take any vitamin/mineral supplements? Please give details:	<i>(Free text box)</i>
30.	Have you heard of the term RED-S (Relative Energy Deficiency in Sport)?	Yes; No; Maybe. <i>(further questions to gather more detail on this topic)</i>

Sample

The study included 57 participants that completed the survey and were a mixture of parents (n=52) and coaches (n=5) of adolescent athletes. The research could have solely looked at parents as the sample for the study, however it was felt that as coaches can act as a role model to many of their athletes, and potentially influencing their nutrition choices it was important to also include them within the sample. The participants' gender and age weren't gathered as part of the data, however demographic information did include if they were a parent or a coach, their occupation, and did they have form of nutrition training or knowledge. Due to the study looking into adolescents, the age range of the adolescents was outlined in the introduction to the questionnaire as part of the participant information section and as a key inclusion criterion for the study. It was important that participants were either parents or coaches or adolescents aged 10-19 due to the physical and cognitive changes that would happen to this demographic and the impact that nutrition and training could have on their growth and development.

The sample was initially selected via convenience sampling through contacts with the researcher that included parents and sporting teams and clubs that shared the questionnaire further with other parents and coaches.

This snowball effect used to reach appropriate audience for data gathering was further utilised via social media platforms including Instagram, LinkedIn, and Facebook, and enabled the study to further target parents and coaches due to these channels reaching a wide range of demographics from geographically further afield.

Initial sample size expectations for the study were estimated at $n=50$, with the final sample size being $n=57$, however 91% of participants were parents ($n=52$), with the hope of having more of a balance of parents and coaches participating in the study better understand and compare knowledge between these two groups. Similar studies as previously discussed in this paper had participant number varying from $n=18$ (Logue et al., 2021), to $n=300+$ participants (Jovanov et al., 2019). Therefore, the study sample size was deemed sufficient based on comparable studies.

Information on participants' location were not collected as part of the survey due to this additional line of questioning increasing the number included in the survey, which may have hindered participants' motivation to complete the survey due to the number of questions being asked. In hindsight, this information could have further added to the data analysis, allowing for more detail on geography of those participating and enabling further comparison within the sample. Additional questions collecting details on participants' highest educational qualification may have also allowed for further analysis, however by asking about their occupation, it allowed for a large majority of participants' educational training to be assumed if they worked within a specific profession, for example – healthcare.

The sample size may be considered small at $n=57$, and although no information on location of participants was collected, the data in relation to adolescents' age and sports that they participated in will hopefully demonstrate some information around current nutrition practices within this demographic and was therefore appropriate to the research and the level of study overseeing this piece of work.

Research Materials

As previously discussed, this study followed a qualitative questionnaire design to gather data and to reach a wide audience of participants. Similar studies were compared for viability alongside time-constraints for the participants that still allowed for appropriate data to be gathered and analysed.

The questionnaire was first created via Microsoft (MS) Word (n.d.) document to check for flow of questioning, spelling and grammar, and ensuring that questions being asked were appropriate for the study aim. Guidance from the research supervisor was sought for appropriateness of questions being posed, with conversations around the use of validated food frequency questionnaires discussed or the feasibility of asking participants to complete food diaries as additional data for the study. Questions were exported into MS Forms (n.d.), a software used by UWTSD for its research projects and is designed to be user friendly for the individual creating the survey and for those responding. Using this software further allowed for ease of sharing the questionnaire digitally across a number of platforms, which was done through the use of a shortened URL link and a QR Code for participants to access the survey.

In total there were 33 questions, with a mixture of multiple-choice questions aimed at collecting some specific data with the option for participants to add additional information via an 'other' option. A couple of Likert scales were used to gather opinion and confidence; and 11 questions were designed and aimed at collecting qualitative data through the use of open questioning and free text boxes for participants to answer freely to the questions. This tool was selected for ease of use by both researcher and participant, and ease of sharing across different platforms allowing for accessibility for participants. The way in which data is presented once the questionnaire is closed enables a simplified overview of the results for the researcher, this is done via the use of simple graphs, pie charts to display visually some key results, and word clouds to highlight key themes for qualitative data and results.

The questionnaire was closed when the participant sample size exceeded the $n=50$ expected, and due to time constraints in needing to analyse and write the paper for submission. The data was exported from MS Forms into a MS Excel Spread Sheet

(n.d.), this was aimed at having the data laid out in an accessible format for ease of manual thematic analysis and highlighting any key themes that came out of the survey. Manual counting and thematic analysis of the data was conducted by the researcher rather than the use of a software to do so due to the small number of open questions asked within the survey. The survey does not contain any questions from a previously used validated survey, as none suited the aim and approach of the study and questions needing to consider the demographic at the centre of the research aim, alongside the participants for the study.

Ethics

An application to the Ethics Panel at the University of Wales Trinity St David's (UWTSD) was sought prior to any data being collected. Approval was granted and no changes needing to be made to the survey before it was piloted with a small number of participants, ahead of it being shared further to gather data. Participants were made aware that by proceeding with the survey and participating, that this would be considered as consent to be a participant with the option of being removed should they wish to do so up to 2 weeks after they'd taken part. No participants asked to be removed once they'd completed the survey.

Along with the withdrawal clause as mentioned above, the following information formed part of the participant information section within the introduction to the survey, ensuring that participants were fully informed ahead of taking part in the study. Participants needed to be >18 years old and either a parent or a coach to adolescent athletes. Consideration was made in relation to questions when asking about current eating habits, with no mention of eating disorders or disordered eating used in the survey. No anthropometric information was collected in the survey as this data was not required for this study. Accredited and appropriate information by Sport Wales Athlete Support guidance (Sport Wales, 2026) was signposted to all participants who took part in the survey to help inform them on nutrition for this age group, with contact details made available for the research project supervisor should any participant need further help and support.

Results

The full results and raw data from the questionnaire can be found in the appendices. The total number of respondents to the questionnaire was n=57, and of those respondents 91% were parents (n=52) and 9% were coaches (n=5).

Occupations of those who responded included n=16 (28%) that had some form of healthcare training and included paramedic, occupational therapist, paediatric physiotherapist, dentist, doctor, paediatrician, neonatal sister, mental health support worker, optometrist, speech and language therapist and dietitians. Other occupations included a photographer, architectural technologist, civil servant, police officer, headteacher, directors, teachers, insurance broker, and cleaner to name a few.

The number of participants who answered yes to having some form of nutrition training or qualification. Was n=6, with n=3 having a dietetic or nutrition degree, n=1 nutrition specific to dentistry, n=1 with a medical degree and postgraduate exams in paediatrics, and n=1 with a BTEC NVG level 3 in nutrition hotel catering. No participants answered with knowledge of performance nutrition or paediatric specific nutrition or dietetics.

Parent participants reported that their adolescents ages ranged from 10-18-years-old, with coaches answering with a wider range of ages than needed for this study, with ages ranging from 7-19-years-old. Table 4 highlights that football was as answered the activity with the most participants by parents and coaches combined, closely followed by dance (all forms), strength & conditioning, other sports, netball and rugby. Other sports were reported as boxing, cricket, parkour, golf and water polo.

Table 4: The combined results of activities as reported by parents and coaches represented in the survey by adolescent athletes.

Sport	Parents	Coaches	Total
Football	22	1	23
Dance	19	0	19
Strength & Conditioning	14	2	16
Other*	14	2	16
Netball	15	0	15
Rugby	13	2	15
Athletics	8	1	9
Swimming	6	0	6
Cycling	5	0	5
Gymnastics	5	0	5
Basketball	4	0	4
Triathlon	4	0	4
Hockey	2	0	2
Tennis	1	1	2
Trampolining	0	0	0

**boxing, cricket, parkour, golf and water polo.*

Table 5: Average time adolescents spent training per week reported by participants.

Hours spent training per week	Total number of participants
<6 hours	21 (37%)
8 hours	17 (30%)
10 hours	9 (16%)
12 hours	3 (5%)
15 hours	6 (10%)
17 hours	1 (2%)

Table 6: Average days adolescents spent training per week reported by participants.

Days spent training per week	Total number of participants
<2 days	5 (9%)
3-4 days	31 (54%)
5-6 days	21 (37%)
7 days	0

Table 5 details the average time spent training per week, with 37% answering between 6 hours or less per week and 30% answering around 8 hours per week. Table 6 further details how many days the adolescents were training per week; 37% of participants answered that their adolescent trained on average more than once per day (n=21), with this happening between 1-2 times per week and n=9 respondents answering that their adolescent trained 10+ hours per week. Some parents commented that adolescents were training more than once per day with one of these sessions being PE at school and then training with their sport or team before or after school. n=7 respondents answered that training would happen before and after school, with this happening twice per week. 45% of participants answered that training would happen in the afternoon/evening after school, 27% answered weekend in the morning, 20% answered weekend in the afternoon, and 8% trained in the morning before school.

Sports where adolescents trained more than once per day include Football, Rugby, Cricket, Athletics, Strength & Conditioning, Netball, Cycling, Swimming Triathlon and Dance. One coach commented that some players were training more than once per day or multiple times per week due to them playing for their club and county cricket teams, meaning multiple sessions per week for different teams.

When questioned if adolescents had some form of nutrition prior to training sessions, 85% of parents answered yes, with common themes seen in answers including carbohydrates and protein, with n=6 giving further details on what they provide and highlighting some confusion around health messages and what is appropriate for an adolescent to have prior to training:

“Some form of carb snack/more protein if it’s a strength session like Greek yog in addition to the carbs”
(ID 1)

“Pasta or protein bar depending on the practice time”
(ID 6)

“I always ensure my son has had a meal before training. I ensure this is high fibre, protein rich and minimally processed by cooking from scratch”
(ID 20)

“Not always. If a mealtime falls before session will have a meal, otherwise snacks (not always healthy but mostly carbohydrate based)”
(ID 21)

“Some type of protein or protein shake”
(ID 33)

One parent answered in detail for this question, highlighting how a previous dance teacher had influenced disordered eating behaviours:

“My daughter has trained regularly since she was 7 years old and it’s taken us a long time to get to a healthy balance: she was on the verge of ED behaviours at one point because of inappropriate relationships with food encouraged by an old-school ballet teacher”
(ID 48)

Of the 85% (n=46) who answered yes to fuelling prior to training sessions, 34 answered and detailed that they would have some form of carbohydrate, with common answers including pasta, toast, bagel wraps, cereal, and oats/flapjacks.

“Cereal (no milk) and yogurt early morning, early dinner if late training”
(ID 7)

“Carbohydrate rich breakfast or meal. Snacks in between school and training”
(ID 9)

“Meal 2-4 hours before and high energy snack 30-60 mins before”
(ID 10)

“Porridge/Weetabix with milk if morning or dinner if evening e.g. pasta with tuna and sweetcorn or jacket potatoes with a filling chilli con carne and cheese”
(ID 12)

“Pasta or bagel with topping”
(ID 13)

“We tend to have a combination of snacks or meals depending on the timing of the training”
(ID 22)

“Some sort of quick carbs usually. Cereal bar, banana”
(ID 25)

Of those parents who answered that no nutrition was taken on board by the adolescents prior to training, a common theme highlighted that they felt the adolescent had taken on board sufficient nutrition across the day:

“Would just eat usual 3 meals per day with some snacks”
(ID 37)

“Always eats 3 meals a day plus snacks but tends not to eat a main meal straight before training”
(ID 41)

Some answered sharing concern around lack of hunger prior to training or that the adolescent felt sick during training if eating too close to session:

“Normally straight to training first thing so not hungry. Try to encourage a balanced meal the night before”
(ID 8)

“...we have done some experiments with pre workout foods to see what works best for her. And if she has a really hard practice we make sure to do an *Fairlife* protein chocolate milk afterwards”
(ID 11)

“Feels sick training having eaten”
(ID 56)

When asked if athletes had some form of nutrition to have during training sessions, 44% answered yes, with a variety of snacks named including fruit, cereal bars, crisps, and drinks:

“Some do, mainly processed packaged food. I take strawberries to matches for players.”
(ID 9)

“Usually milk based (Nesquik chocolate shake) – gets stitch with food”
(ID 10)

“Usually some fruit or a protein bar”
(ID 18)

“Carbohydrate fuel in drink”
(ID 20)

“We encourage a snack for longer sessions but rarely eaten”
(ID 35)

“Cooked chicken, carrots, *Starbust* sweets”
(ID 35)

“Fruit based snack or carb based snack”
(ID 44)

“For longer training sessions, yes – my daughter trains for example from 10:30-14:00 on a Sunday, so takes a packed lunch with her (protein/carb rich), but most of her sessions are no more than 1.5 hours, and she doesn’t take a snack to these.”
(ID 48)

“Mini malt loaf bar and fruit (usually banana or apple) or cheese cubes and veggies”
(ID 50)

“Gym training sessions are 3.5 hours long so snacks can include fruit, soya yoghurts, oatly snack bars and chocolate”
(ID 53)

56% of participants answered no to athletes having some form of nutrition with them to have during training sessions, with n=8 citing that there’s no time during sessions to have a snack:

“Wouldn’t have time to eat it during the session”
(ID 3)

“Training session aren’t often over an hour long so don’t feel this is required”
(ID 19)

“Doesn’t usually have time to eat during training”
(ID 33)

n=6 cited that the athlete wouldn’t need a snack due to them having something before or straight after training:

“No – due to athlete being fuelled before and after the session.”
(ID 3)

“Usually has something straight afterwards”
(ID 7)

“Would usually have a snack afterwards”
(ID 32)

“Eats well and would usually have a snack before or after training but not during”
(ID 41)

N=7 cited that they would take onboard water during sessions:

“Just takes on water during training”
(ID 5)

“Only water, worried it may cause a stitch”
(ID 21)

“They drink water throughout but no food”
(ID 26)

N=5 mentioned that no snack was needed due to the training session’s length of time:

“Sessions are generally 60-90 mins”
(ID 15)

“Only water during. Longest session is 2 hours”
(ID 21)

“Sessions are only 90 minutes”
(ID 34)

When asked if there were any barriers that affected the ability of the adolescent having some form of nutrition prior to training, figure 3 below details reasons cited by parents, with 26% citing that early morning sessions and training straight from school as the biggest barriers.

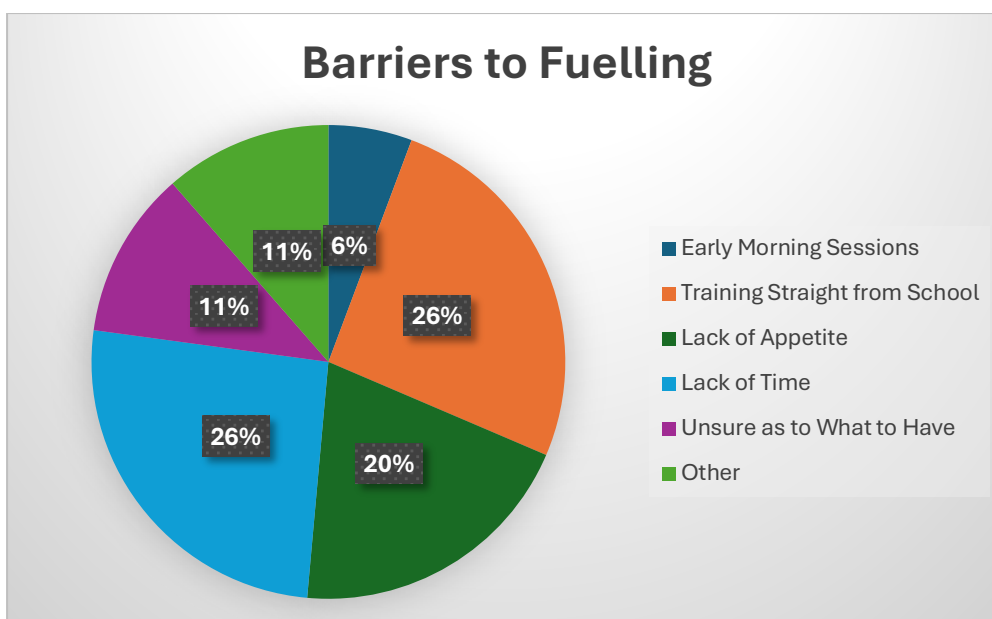


Figure 3: Reasons cited by parents on barriers to fuelling prior to training for adolescents.

Of the 11% who cited other reasons, further comments were shared on the barriers experienced:

“There just isn’t a lot of time at the moment between when she gets home from school to decompress then eat then get ready for practice”
(ID 11)

“Preference of the teenager, food available that they want to have”
(ID 35)

“Not now, but previously her old ballet teacher used to comment that she could see by her stomach that my daughter had eaten and would draw attention to it, so my daughter would avoid eating to avoid comments”
(ID 48)

“Doesn’t like food before dancing”
(ID 55)

“Doesn’t like to eat much before dance”
(ID 57)

When asked if adolescents took any form of vitamin/mineral supplement, n=28 answered no, that their adolescent didn’t take any form of vitamin/mineral supplement:

“No”
(ID 1, 6, 11, 15, 20, 27, 33...)

“Try encourage but not keen”
(ID 8)

“No. Consistently eats a variety of fruit and veg”
(ID 21)

n=23 answered that they took a multivitamin or some form of vitamin or mineral supplement:

“Yes. Vit D, multivitamin, omega 3 & probiotic”
(ID 9)

“Yes a multivitamin with Vit D and omega 3 however reluctant to take it”
(ID 12)

“Cod liver oil tablet”
(ID 24)

“Just an age-appropriate multivitamin chew-tablet”
(ID 26)

“Yes, multivitamin every morning”
(ID 28)

“Multivitamin plus an additional calcium with vitamin D supplement as child has a milk allergy”
(ID 53)

N=4 cited sport supplements that their adolescent would have:

“Protein powder on average every other day”
(ID 4)

“Electrolytes when needed”
(ID 13)

“Occasionally protein shakes”
(ID 39)

“B vitamins and on comp days hydration gummies”
(ID 46)

Likert scales was used to measure confidence of participants on 2 topics; the first (figure 4) asked for them to rate how confident they felt at knowing if an adolescent has had sufficient nutrition prior to a training session:

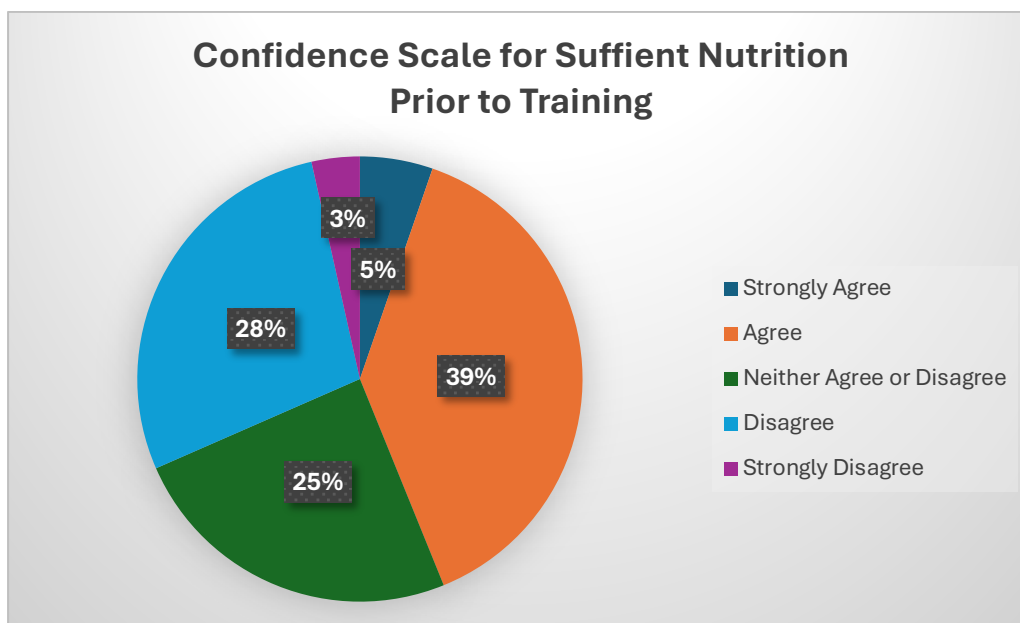


Figure 4: Likert scale used by participants to rate their confidence in knowing if an adolescent has had sufficient nutrition prior to training.

The second Likert scale (figure 5) asked participants to rate their confidence at knowing if an adolescent is having sufficient nutrition for healthy growth and development alongside their training:

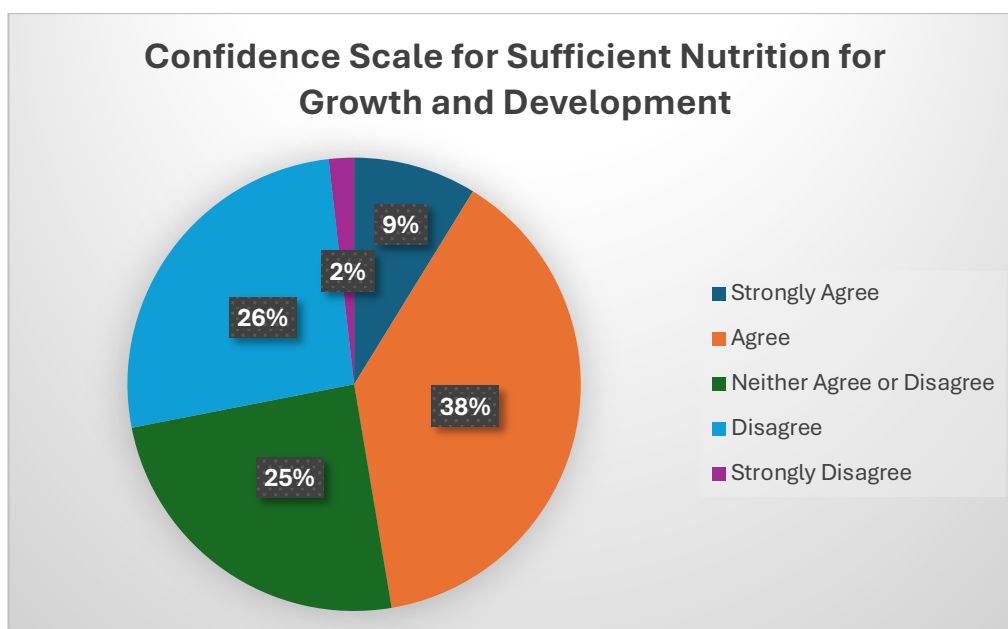


Figure 5: Likert scale used by participants to rate their confidence in knowing if an adolescent is having sufficient nutrition for healthy growth and development alongside their training.

When asked if participants had researched nutrition in relation to adolescent athletes, n=21 answered yes. Of those who hadn't research nutrition, 95% (n=36) said that they would be interested on having information on nutrition for adolescent athletes. The n=21 participants who had researched nutrition were also asked to share further information on the research that they'd done, n=14 had searched online and mentioned specific websites or accounts on social media platforms where they got their information:

"Nutrition pages on Instagram and British Nutrition Foundation"
(ID 57)

"The information on nutrition for adolescents can be found through the British Athletics Website for anyone to view"
(ID 3)

"Struggled to find information for hockey specifically – looked online and found some Australian guidance"
(ID 8)

"BDA, Association for Nutrition, Nutrition Resources, Journals"
(ID 10)

Other sources cited included attending webinars or having nutritionists deliver sessions in school or to teams/clubs:

"Also other good resources are found on coaching courses through British Athletics and through the RED-s forums which give real like advise from athletes who have suffered RED-s, how it can be avoided and how we can give sufficient fuel and nutrition to young athletes for their sport"
(ID 3)

"Nutritionist visiting school. Sports development programme support"
(ID 17)

"I have attended nutrition workshops in the past"
(ID 22)

"Royal ballet nutrition webinar"
(ID 51)

"My other child is an ice hockey player and attends ice hockey camps where they always have a session on sports nutrition from a nutritionist"
(ID 53)

When asking parents if they'd spoken to a dietitian or nutritionist for support for their adolescent athlete, 93% of parents answered no. Of those who answered yes, further details collected were parents naming specific professionals and individuals:

"Kind of, I am a dietitian but not paed's nor sports..."
(ID 7)

"I saw a paediatric dietitian and we will be doing more work with a food diary next year"
(ID 22)

"Nutrition coach used by parents of adolescent gave advice. Importance of fuelling the body to train and recover post training. Importance of maintaining a good level of protein intake for growth and muscle recovery".
(ID 23)

When asking the coaches who participated if they'd spoken with a dietitian or nutritionist, n=2 answered yes:

"Have spoken to lecturers, sports scientists and dietitians on the importance of fuelling for all athletes. The common feedback is that all athletes need to be fuelled for a plethora of reasons and it is even more imperative for younger developing athletes to fuel more for their energy demands and growth"
(ID 3)

"I have looked for general info myself. More 'easy read' basic info available to sporting clubs to circulate. Too much information is overwhelming. The club is based in an area of high deprivation so would be useful to have relevant information as to their budget/resource need (thinking food bank produce). Even when coaching gymnastics, food and nutrition wasn't covered as part of training information. Needs to be built into all sports clubs."
(ID 8)

Participants were asked if they'd heard of the term RED-S (Relative Energy Deficiency in Sport), n=48 (84%) answered that they hadn't heard of this term, and n=3 answered maybe. Of the 5 coaches who took part in the survey, n=4 answered that they hadn't heard of the term RED-S before. The n=6 participants who answered yes were asked to give further detail of their understanding of the term, 1 of the participants is a coach, the other 5 are parents:

“RED-S stands for relative energy deficiency in sport. This is where an athlete has insufficient energy for the demand that the athlete puts on their body. This can be serious. The symptoms vary from person to person. It is more common in females than males but with males the symptoms are harder to detect”
(ID 3)

“It’s a lack of nutritional support calorically to support intense athletic performance I think it more generally applies to woman and can cause long term fatigue, poor performance, etc.”
(ID 11)

“When an individual consistently fails to meet demands of exercise/activity in the body by inadequately nutrition and fuel can lead to long term problems and physiological disturbances.”
(ID 37)

“Chronic fatigue/low energy in athletes, possibly due to burnout and other factors like inflammatory diseases that are not well understood.”
(ID 41)

When asked if participants would like to have access to relevant information on nutrition to support adolescent athletes with their training and alongside growth and development, n=56 answered yes (98%).

Participants were asked how they would like to receive information for adolescent athletes, with a range of options available for them to select and the ability to select more than one, alongside the opportunity to share other suggestions (figure 6).

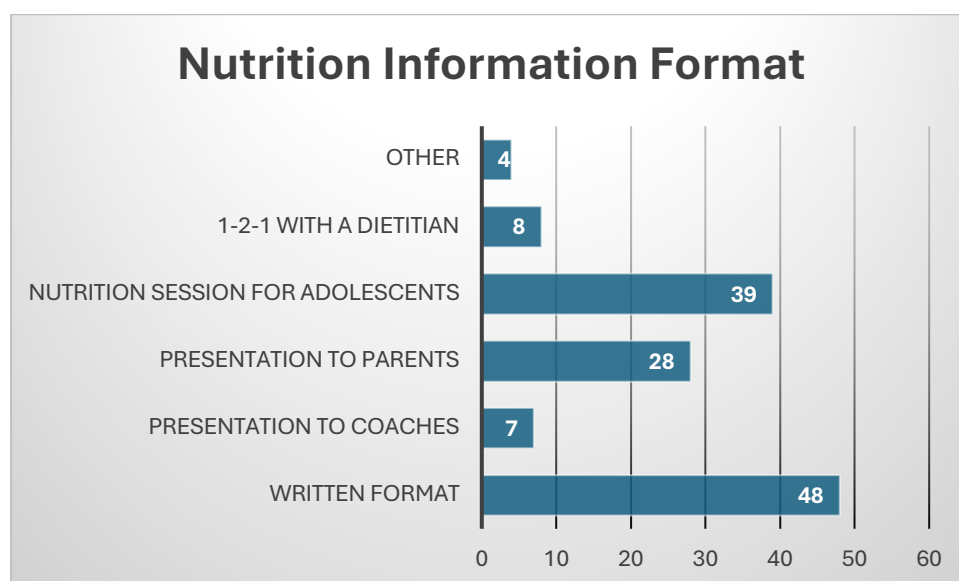


Figure 6: Nutrition information formats selected by participants to access.

When asked for other suggestions, key themes noted were:

“The sessions to all involved are useful, but equally useful is being able to access information when needed”
(ID 7)

“It would depend on what level of sporting participation. I am currently producing player/coach/parent handbooks and would be useful to include a fact sheet. Video presentations are useful for visual tools as sometimes a fun engaging video has more impact”
(ID 8)

“Focused plan including my child’s opinions”
(ID 46)

“Nutrition session for athletes and parents together”
(ID 48)

Discussion

The results from the questionnaire showed some positive knowledge and awareness by participants around nutrition for adolescent athletes, and consideration of their growth and development. However, some themes were highlighted in relation to knowledge, misinformation on the perceived needs for this demographic, and some concern highlighted around disordered eating practices. Overall, there seemed to be an appetite for more accessible information in general for this age group but also for specific sports that all involved can access, suggesting that advice to support athletes should be developed to meet the varying nutritional literacy of those accessing the information, from adolescents to parents and coaches.

The anticipated respondent number for the study was n=50 with n=57 completing the questionnaire when it was closed for analysis. The use of convenient sampling and snowball effect helped to achieve the anticipated sample, however of the n=57, only n=5 were coaches, meaning that 91% (n=52) of those who participated were parents. Although the response rate for coaches was low, their contribution to questions directed specifically to coaches specific still gave insight into what is known and what else could be considered to support their role as coaches, and individuals who have the potential to influence adolescent athletes.

The response rate by parents allowed for insight into their knowledge and awareness on the topic, and the ability to raise concerns in current practices seen in a variety of sports participated in by UK adolescents.

As reported, occupations of participants were varied with 28% working within healthcare, and n=6 with some nutrition or dietetic training. Assumptions can be made that those who are qualified within nutrition and/or dietetics understand the needs of athletes and adolescents, however these participants shared that even with their training and background, they weren't confident in the nutritional needs of adolescent athletes. Paediatric dietetics is a specialism within the dietetic profession, with additional modules required by qualified dietitians to support their ongoing development and knowledge in this area (BDA, 2026). The same can be applied for performance nutritionists, with a requirement for additional qualifications at postgraduate level to reach the required level of knowledge to support individuals with their nutritional needs within sport and performance (BDA, 2026). Supporting adolescent athletes requires substantial training and experience, and access to these individuals can mean additional costs to families should they require the support, making access difficult for many. This supports the need for having trusted evidence-base information available to access by all, something that is currently lacking in the UK as discussed previously (Smith and Jeukendrup, 2013). Some sporting disciplines and organisations like Sport Wales do share advice via social media platforms and for athlete who have access to their support with nutrition, but this isn't accessible to all and isn't sport specific (Sport Wales, 2026).

When gathering data on which sports adolescents were involved, all 13 out of a possible 14 sporting activities that were noted on the questionnaire were represented, with an additional 5 added via the 'other' option and included boxing, cricket, parkour, golf and water polo, with trampolining being the only sport from the original questionnaire list not selected, and taking the total number of sports represented to 18. The results from the questionnaire show that football and dance of all forms were selected by the highest number of participants. Strength & conditioning, netball and rugby were close behind, with smaller numbers representing the other 13 sports demonstrating a wide variety of activities represented in the study.

N=34 participants selected more than 1 sport, however it's unknown if the participant was answering on behalf of 1 adolescent or more than 1, and in which sports the individuals participated. Participants weren't asked any questions in the relation to the gender of their adolescents(s); this additional data may have given further insight into nutrition practices for a variety of sports and is a consideration for future research within this area. This additional data could also have contributed towards considerations of tailored nutrition advice for boys and girls within the same sport as information on the differing recommendations on micronutrients vary for this age group (DH, 1991).

On average most participants answered that their adolescent would train between 6-8 hours per week (n=38), n=12 reported to train between 10-12 hours per week, and the remaining n=7 reported to be training for 15+ hours per week. Some participants answered additionally that this could be a mixture of sports that happen within school and after school, for different sporting disciplines outside of school, or for the same sport but for different teams – school team, club team and county team representation highlighted for sports like cricket and rugby. This data is potentially highlighting that some adolescents are highly active around school academic commitments, which could have an impact on their growth and development if nutrition isn't considered for the demands of training 15+ hours per week during the academic year. This amount of training coupled with insufficient fuelling could be a cause for concern that may have short- and long-term health implications, but also could affect the adolescents' ability to perform to the best of their ability within their sporting and academic activities, with the risk of illness or injury a concern if energy needs aren't considered and met through nutrition, and the risk of RED-S affecting the individual (Kontele and Vassilakou, 2021). Micronutrient deficiencies can also play a part in injuries and prolonged recovery as discussed by Desbrow (2018), who highlighted the need for further research into particularly vitamin D deficiency in adolescent athletes.

Further questions that are gender specific alongside anthropometric questions may have given further data in relation to concerns linked to RED-S, however as highlighted previously, the prevalence of eating disorders within this age group, regardless of gender is of a concern, with some sports' culture linked to the importance of body composition which can have further negative impact on an individual who may already

be struggling with their mental health. (Currie, 2010; Mountjoy et al., 2023). No specific questions were asked about any conditions or concerns relating to eating disorders and body composition, however some participants did share their concern around how some previous coaches would draw attention to their adolescent around their eating and their body composition when in training. This is a concern highlighted by Currie (2010) and Bean (2022) around the aesthetics and perceived physiological advantages associated with weight and certain sports, which can cause disordered eating and mental health issues (Mountjoy et al., 2023). Although there were no anthropometric questions in the survey, participants were asked if they had heard of RED-S, with n=48 answering that they had not hear of this term. Of the remaining participants, n=3 answered that they may have heard of this term before, and n=6 answered that they had heard of RED-S. Those participants who had heard of the term were asked to briefly give details of what it means; this was aimed at gauging their understanding of the term, which generated a mixture of responses from the participants and an insight into their comprehension.

Of the n=6 who answered yes, n=3 were able to give a comprehensive explanation of what RED-S is and how it can occur in an individual. Out of the remaining n=3, 1 participant simply answered *“under fuelling”* which gives us an insight that they are aware that RED-S can be brought about by insufficient nutrition for training demands, or over-training therefore putting the athlete in an energy deficient state. 1 participant who is a nutrition lecturer seemed to have misunderstood the question and answered stating that *“Students have chosen as a topic for assessment and research”*. The final participant explained that RED-S was in relation to chronic fatigue and linking this to *“burnout and other factors that are not well understood”*. This answer demonstrates some understanding as to the signs and symptoms, but potentially they aren't aware of the cause of the chronic fatigue. It was noted that n=2 coaches mentioned that RED-S was more prevalent in females, with 1 participant stating that the term applies more to women and another coach stating that RED-S is more common in females than males, but that symptoms are harder to detect in males. This shows some misunderstanding on RED-S and how it impacts genders differently, with the loss of the menstrual cycle a symptom that can lead to a diagnosis of RED-S in females, however it does not solely apply to females, current data tells us that between 15-70% of male athletes may be at risk of RED-S, with potentially 24% of active males at risk

of low energy availability (LEA) (Briggs et al., 2020; Todd et al., 2022; Stenqvist et al., 2023). As highlighted by Currie (2010) and Bean (2022), some sports are at higher risk of disordered eating which can be intentional or unintentional, with still further research needing to be undertaken to better understand the effects of RED-S on male athletes in general (Mountjoy, et al., 2023).

Of the n=5 coaches who took part in the study, n=4 answered that they had not previously heard of RED-S. This is potentially a cause for concern that coaches who train adolescents aren't aware of RED-S, how it can occur and the signs and symptoms to look for in their athletes. Assumptions can be made that as coaches knowing about RED-S is something that they would have covered when training to be a coach, however according to UK Coaching (Thompson and McIlroy, 2017) and the Sport Volunteering Network (Griffiths and Armour, 2010), between 52-75% of coaches in the UK are volunteers, with 15% of those surveyed getting involved as their child participated in the sport. Qualifications required for coaching in the UK include safeguarding and DBS checks and first aid training, with different Governing Bodies that are sport specific also encouraging coaches to gain coaching qualifications, and ongoing training with continuous professional development (CPD) with topics including mental health awareness, equality, diversity and inclusion (EDI), and further first aid training for concussion and sudden cardiac arrest. In another question later in the survey when asking coaches about nutrition information, 1 coach reported that when coaching gymnastics food and nutrition wasn't covered as part of training and that they felt strongly that it should be built into training for all sports and their clubs. Some governing bodies may also provide additional training around more common areas that may be seen within specific sports that could include basic nutrition. From the results of this small survey, a recommendation of some accessible eLearning on RED-S for coaches' access could be a way of informing them of what RED-S is and why it's important to be aware of the signs and symptoms when coaching athletes of any age, but especially adolescent athletes. This would allow for further support to be put in place aside from what a GP can provide in the awareness of symptoms and spotting these early before too much damage is done to the individual (Todd et al., 2022). Further research could be conducted concentrating on coaches' knowledge and skills to identify strengths and gaps which could be shared with governing bodies to help them when considering training or additional CPD.

Some positive data was collected around information on if adolescents had eaten some form of nutrition prior to training, with 85% of participants stating that their adolescent athlete would have some form of fuel prior to any form of activity or training. Although this isn't statistically significant, this can give an insight into the fuelling practices of adolescent athletes. Food reported by parents included some good sources of carbohydrates to help fuel the adolescents and included foods such as crackers and cheese, banana, cereal and yogurt, pasta or bagel to name a few. Some reported more substantial meals, whereas others reported fuel as a snack, especially if training occurred close to the end of the school day and time was poor for anything more substantial.

Some parents cited the use of sport supplements as a form of nutrition to fuel their adolescent prior to training, with protein powders mentioned as one source used before training to fuel their activity, and another participant mentioning protein bar as fuel prior to training. As previously highlighted, there is a lack of evidence for the use of such supplements within those aged 10-18 to support physical activity, and a concern that misinformation and a lack of nutritional literacy is being used by parents to fuel their children, which could lead to them being misinformed about what type of foods that are appropriate to be eaten prior to training. A food first approach would be recommended for athletes of any age, with any supplements being used if there was a need to supplement the diet, or that a supplement can be used safely and legally to aid performance such as caffeine (Smith and Jeukendrup, 2013).

N=28 answered that their adolescent didn't take any form of supplements when questioned specifically if they had any vitamin or mineral supplements. N=3 answered and specified vitamin d, and n=16 specified multivitamins. As recommended, a balanced diet should help meet micronutrient needs, however vitamin D is a recommended supplement in the UK between October and April due to the low levels of sunlight, but those who don't go outside much during the year or have dark skin should consider taking 10µg daily to support its levels in the human body (SACN, 2016). This recommendation is important for all age groups and populations, and especially important for adolescents due to how vitamin D aids with bone and muscle health and development, something that goes through rapid growth and development

during adolescence (Desbrow, 2018). A future consideration would be to investigate serum 25 (OH) vitamin D levels in adolescent athletes who participate in sports that predominantly train indoors, as Ercan (2018) highlighted in their study that those who do train indoors are at a higher risk of lower levels. These sports would include dance of all forms, gymnastics, trampolining and swimming to name a few, which are often being undertaken by females who are also at an increased risk of lower levels.

Diets poor in iron rich foods is common amongst adolescents which can cause further complications for those who are active, due to the increased needs of athletes with iron and especially females, vegetarians and vegans. Females' requirements are highest from puberty to post-menopause at 14.8mg (DH, 1991), with males' needs at their highest when they are 11-18 years old at 11.8mg (DH, 1991). There is also a link with reduced hunger associated with a diet poor in iron, something that is associated with individuals who have restricted eating tendencies and again could be a cause for concern if these individuals are active (SACN, 2010), and something that n=14 participants mentioned was a barrier for their adolescent for not fuelling prior to training. This would require further research into those who report lack of appetite and their diet to see if there was a correlation between lack of appetite and an iron poor diet. The perpetual circle of iron poor diet, affecting appetite, insufficient fuelling prior to changing, training and growth demands on the body and iron needs not meeting requirements, which was discussed in Vicente et al.'s 2023 study on low calcium and iron in a gymnastic cohort. This is where supplementation with a multivitamin that meets the increased needs of adolescents could be considered if diet is iron poor and there is a concern with appetite and hunger cues ahead of training. Some assumptions can be made with the data collected in this study as to why some are fuelling, are they getting enough to meet their needs, and the concern with micronutrient deficiencies in this age group and how if those needs aren't met then this can cause further cause for concern with increased training needs on top of growth demand on the body (Desbrow and Leveritt, 2015).

There may be a correlation with those who answered around their confidence in knowing if their adolescent was sufficiently fuelled for training. 38% of participants answered that they agreed with the statement that they felt they were confident knowing if their adolescent was sufficiently fuelled prior to training.

No further questions were asked in relation to this Likert scale to gather further insight into how participants knew if their adolescent was sufficiently fuelled, however a question was asked if participants felt confident in knowing if their adolescent was sufficiently fuelled for growth and development, with 39% of participants saying that they agreed with this statement. No further questions were asked in relation to how participants knew if their adolescent was fuelled appropriately for growth and development to gather further insight into this knowledge.

A further question was asked to the parents who reported that their adolescent doesn't have some form of nutrition prior to training to find out what the barriers were to fuel before their activities. Lack of time was cited as one reason, either due to training being early in the morning or straight from school (n=2), lack of hunger was another factor reported (n=2), alongside feeling sick during training if has anything to eat prior was another barrier reported by parents (n=1). N=2 parents responded to say that they felt that their adolescent was having enough fuel from their regular 3 meals and some snacks per day and that nothing additional was needed. These themes are commonly cited across the lifecycles by athletes as reasons that individuals don't sufficiently fuel prior to training. Lack of awareness and understanding around what is needed in relation to the training load alongside what is needed for growth and development, and parents' own bias and their own upbringing can influence how they support their children with food choices and education around this topic. As mentioned previously there's a concern within this age group of insufficient energy intake and micronutrient deficient diets (Ercan, 2018), this could lead to health complications when coupled with a demanding training schedule and school commitments, which in turn could impact expected growth by delaying the onset of puberty in both girls and boys (Cooke and Lowdon, 2019).

When asked in relation to if adolescents would have any snacks during training sessions, n=32 answered that their athlete wouldn't have anything to hand for sessions. A concern would be raised sessions last more than >60 minutes and are regular across the week, alongside intensity of these sessions. N=3 participants who answered no to this question went on to say that their adolescent only has water as sessions only last 60-90 minutes or 2 hours at the most. The recommendation would be that any training that last longer than 60-90 or is intense should be supported with

some form of carbohydrates to help with performance outcomes. This can be some simple carbohydrates like a banana, malt loaf, homemade sports drink, homemade energy bar or a simple shop bought alternative. Water should be adequate to support the athlete, but a homemade sports drink would give some additional benefits in the form of simple sugars (Bean, 2022). If fuelling is difficult for these sessions, then ensuring that something is had prior and immediately after the session that is easy to digest like chocolate milk afterwards as this has a good ratio of carbohydrates to protein, is easily digested and will contribute to hydration needs due to the electrolyte benefits in milk (McGregor, 2015).

N=21 participants reported to have research nutrition in relation to adolescent athletes, with some trusted resources mentioned when accessing information and included a talk by registered dietitians of qualified nutritionists, and eLearning or webinars which can be accessed flexibly by anyone who's interested in the resource. Only n=2 coaches answered when asked a similar question to parents around research into nutrition and this age group and activity level, however both coaches have a different viewpoint to the discussion and highlighting some important consideration. The 1st coach discussed their own research into the area and stating that they'd spoken to lecturer, sport scientists and dietitian on the importance of fuelling, the 2nd coach shared that they'd been looking for some good basic resources to circulate within their sporting club as they felt that too much information could be overwhelming. They also shared that due to the geographical location of the club and it being in an area of high deprivation, they were keen on having information with considerations to suit those families on tight budget, and even suggested ways that knowing what to do with food bank produce would benefit the families who access their club and training.

98% of participants (n=56) would like clear guidance on how to support adolescent athletes. Only 1 participant answered that they didn't want guidance to support their adolescent. Although the survey sample can be considered small, this data is significant and can be used to evidence that there's a need for information to be readily available to access to support athletes, their families, and the coaches who train the athletes. Participants reported to preferring to have this information in written form, but group sessions lead by a dietitian or performance nutritionist with an interest in this area was also suggested. Sessions for adolescents only and joint sessions with

parents involved too to help with sharing of information and support. Evidence for learning supports the social aspect of being in groups with similar demographic as it forms a community of support, which is especially important when supporting adolescents, and comes naturally to team sports and clubs where there's often a community support network established.

Conclusion and Future Considerations

Future considerations for further research into this topic could include conducting interviews with coaches on their knowledge of nutrition and their understanding of the needs of the adolescent athlete could impart further data as to current practices. This study could be further segmented into genders due to the differing needs of males and females as they transition through puberty alongside training and competition, and the impact of the school environment could be a factor to research further with this specific demographic, looking into the current education provision available to pupils within upper primary years and secondary years alongside the foods that are served within the catering outlets on site during the school day.

This study has concentrated on nutrition and what is current practice and known, further work can be considered on hydration in adolescent athletes, and the impact that the school environment can have on athletes drinking enough during the day post-training early morning, and/or in readiness for training after schools, as hydration is often impacted during the secondary school day due to toilet facilities hygiene standards or anti-social behaviour by some pupils within toilets creating barriers for pupils to feel that they're unable to use toilets freely during the day, which has an knock-on effect of the amount of fluids drunk by pupils so as not having the need to use the toilet. In adults, dehydration at just 2% (McGregor, 2015) can impact performance outcomes, something that needs further research for adolescents, and linking back to hydration practices across the day and week.

Further considerations on the research method could be asking participants to complete a food frequency questionnaire or to keep a food diary alongside their training – this would need to be done by an adolescent to capture the most accurate information, however concerns may be raised due to the mental impact of this exercise on disordered eating habits, especially within this age group, which can be further

exasperated depending on their field of sport, which has been discussed extensively in this paper. Consideration on better understanding of parents' knowledge on growth and awareness of which signs and symptoms could be a cause for concern if their adolescent wasn't fuelling appropriately.

Another consideration for future research is the impact that neurodivergence and how this can impact food intake in some adolescents due to sensory preferences and dislikes with food and the potential that this could impact intake due to restrictions that the individual may have with certain foods. Children and young people are often encouraged into sports when diagnosed with a neurodivergence due to how being active can help with their energy expenditure. An active neurodivergent adolescent with a restrictive diet could be further cause for concern for energy and micronutrient deficiencies and is an area that needs further research and support for parents, caregivers and coaches.

In conclusion, the results from this survey show that parents and coaches have a range of understanding as to what fuel, and the amount is appropriate for adolescent athletes, with some misunderstanding as to what fuel is best to support athletes around training. There is a concern in relation to the awareness around RED-S, as knowledge on this topic was lower than anticipated, with 4 out of the 5 coaches who participated in the survey having not heard of the term, and therefore potentially unaware of the signs and symptoms in relation to spotting RED-S in young players under their care. As outlined above, future considerations are broad however this is needed to ensure that adolescent athletes and adolescents in general are supported to help meet their needs and circumstances to enable them to grow and thrive.

The aim of this paper was to gather nutrition knowledge of parents and coaches in relation to adolescent athletes, and although furthermore in-depth studies have been highlighted to add to what is already known, this survey has shown and is evidence to support a consensus for Nutritional Requirements and guidance for adolescent athletes that should be readily available for all to be accessed.

These guidelines could be shared with schools and clubs for parents to access, with training for coaches and school health and wellbeing representatives and PE teachers and departments alongside additional resources and eLearning to support their role with adolescents further, linking to mental health and nutrition training as part of their continued professional development and career pathway. More information could be gathered through further in-depth interviews with parents, coaches and adolescents separately, to build a better picture of what is known, and how best they would like to access the information.

END.

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Appendix

A link to access the questionnaire via MS Forms:

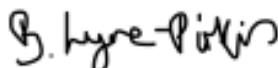
[Perceived Nutritional Requirements for Adolescent Athletes – Fill in form](#)

A link to access the full results from the survey:

https://uowtsd-my.sharepoint.com/:x:/r/personal/2213564_student_uwtsd_ac_uk/_layouts/15/doc2.aspx?sourcedoc=%7B5dde7e55-82ed-4074-8402-ec5d0d4df2ad%7D&action=edit&activeCell=%27Sheet1%27!AH37&wdinitialsession=2faf6af9-b15c-44c6-6c5f-01a662d5b911&wdrlsc=4&wdrlsc=1&wdrlsc=AccessTokenExpiredWarningUnauthenticated%2CRefreshin

A copy of the approved and signed ethics application form in support of this study:

SECTION K: Declaration

	The information which I have provided is correct and complete to the best of my knowledge. I have attempted to identify any risks and issues related to the research activity and acknowledge my obligations and the rights of the participants.	
	In submitting this application I hereby confirm that I undertake to ensure that the above named research activity will meet the University's Research Ethics and Integrity Code of Practice which is published on the website: https://www.uwtsd.ac.uk/research/research-ethics/	
1	Signature of applicant: 	Date: 23/08/2025

For STUDENT Submissions:

2	Director of Studies/Supervisor:	Dr Chris Cashin	Date: 22/09/2025
3	Signature:		

For STAFF Submissions:

4	Academic Director/ Assistant Dean:		Date:
5	Signature:		

Checklist: Please complete the checklist below to ensure that you have completed the form according to the guidelines and attached any required documentation:

☒	I have read the guidance notes supplied before completing the form.
☒	I have completed ALL RELEVANT sections of the form in full.
☐	I confirm that the research activity has received approval in principle
☐	I have attached a copy of final/interim approval from external organisation (where appropriate)
☐	I have attached a full risk assessment (where appropriate) ONLY TICK IF YOU HAVE ATTACHED A FULL RISK ASSESSMENT
☒	I understand that it is my responsibility to ensure that the above named research activity will meet the University's Research Ethics and Integrity Code of Practice.
☒	I understand that before commencing data collection all documents aimed at respondents (including information sheets, consent forms, questionnaires, interview schedules etc.) must be confirmed by the DoS/Supervisor, module tutor or Academic Director.

RESEARCH STUDENTS ONLY

Once complete, submit this form via the **MyTSD Doctoral College Portal** at (<https://mytsd.uwtsd.ac.uk>).

RESEARCH STAFF ONLY

All communications relating to this application during its processing must be in writing and emailed to pgresearch@uwtsd.ac.uk, with the title 'Ethical Approval' followed by your name.

STUDENTS ON UNDERGRADUATE OR TAUGHT MASTERS PROGRAMMES should submit this form (and receive the outcome) via systems explained to you by the supervisor/module leader.