

Unit 4: Nutrition for Physical Performance

Level: **3**

Unit type: **Internal**

Guided learning hours: **60**

Approaching the unit

Nutrition within a sporting context is a combination of scientific underpinning knowledge and the planning and application of practical strategies to positively impact physical performances. To that end, the unit aims to enhance the learners' knowledge and understanding of the scientific processes around how the body digest and metabolises the food and drink we consume and develops an understanding of how these processes can be used to impact performance. It is crucial that learners have a broad understanding of these processes as well as being able to identify the energy requirements of different types of sporting activity, so the learner is in a position where they can apply their knowledge to a range of sporting environments.

This knowledge is then focused into the development of practical strategies that sports performers can utilise in relation to the physical demands of their sporting activity.

The development of these strategies is only possible if based on an objective analysis of current nutritional practices, so learners need to be able to effectively collect data from the performer, analyse the results and then develop some recommendations as to how the performer could enhance their performance from adapting their nutritional practices.

The resulting practical strategies will vary in accordance with the sports performers being supported, but will encompass their pre-competition and training nutritional approach, nutritional support during the performance (depending on the energy needs and opportunity) and how the performers can best recover their energy stores post competition.

The final area where sports performers could be further supported is in the area of anti-doping. As the supplements environment is largely non-regulated, it is a risk that performers taking supplements from non-reputable sources could be at risk of anti-doping violations. It is therefore important that the learners are aware of the legislation around anti-doping and the procedures currently in place to support performers should they be in a position to be tested

You could deliver this unit by using a mix of theory (to introduce learners to the topics listed in the unit content) visits and guest speakers (to enable learners to apply the theoretical concepts they have learned). Learners will need to be able to produce a written report and deliver presentations.

Delivering the learning aims

Learning aim A

Learners need to have a broad understanding of the scientific nutrition principles, which is the key feature of learning aim A. Learners will have a range of prior knowledge on some of these principles, so it is initially important to bring all learners to the same point. The initial focus would be on the structure and functions of macro and micronutrients. This will require more detail with regard to the microscopic structure, discussing the differences of the different sizes and types of carbohydrate, fats and proteins.

As with all scientific areas, the use terminology and abbreviations is important, so ensuring learners are comfortable in their understanding and usage of Dietary Reference Values and other associated terminology and abbreviations is an important grounding for future learning in the unit and application to the practical context.

Hydration is another key area that will be addressed practically in the unit, with the underpinning knowledge delivered within learning aim A. Appreciating the sources and functions of different types of fluid, along with when to drink them is important for learners to be able to advise which type of fluid is most appropriate for a given sporting and environmental situation. There is the opportunity for learners to experiment in making their own sports drinks here, as there are numerous recipes that can be found online to follow.

The concept of a balanced diet is relatively well known, so bringing learners up the same point with regard to their understanding and application is important in this area. It provides a more generic context to the nutritional principles, focusing on how nutrition affects healthy body functioning. This is of relevance to the sports performer as a healthy base level is the basis to build performance from. It is important here to grasp the concept that sports nutrition is only effective if the performer has strong basic health and meeting the nutritional needs of the body.

Having guest speakers from the Health Promotion field could be useful here to provide a non-sporting context for the learners. It is important to tie this content back to the nutritional principles and dietary reference values etc, introducing the concepts such as the Eatwell plate and food labelling which may be used within their practical sporting applications.

Once the details of the structure and function of the macronutrients, micronutrients and fluid have been covered, the next step is to consider how the body digests the different nutrients and stores them for use in energy production. The learners need to be aware of the organs involved in the digestive system and appreciate where the different nutrients are digested during the process, which could be delivered through interactive videos, models or websites.

Learning aim B

Balancing the nutritional principles against the energy demands of specific sports is a key piece of the jigsaw when developing a nutritional strategy. Therefore, learning aim B focuses on the concept of energy and how we can manipulate energy intake and expenditure to manage body weight. Some of this learning aim can be investigated practically, by considering concepts such as Body Mass Index and Basal Metabolic Rate with learners calculating their own values from their anthropometric measurements.

Methods of assessing body composition should also be investigated, with the learners potentially able to use skinfold calipers or bioelectrical impedance to estimate body fat percentage. These practical measures would support the delivery of the concept of energy balance.

There may also be the opportunity to visit Higher Education establishments that may have hydrodensitometry or calorimetry measuring equipment which would support the tutor delivery.

Learning aim C

This learning aim may contain new content that may be outside the experience of teaching staff (depending on their exposure to high performance sport), so accessing resources from UK Anti-Doping (UKAD) and the World Anti-Doping Agency (WADA) would be recommended to support delivery. It would also be valuable to engage with sports performers and/or coaches that have had first-hand experience of drug testing procedures and protocols to share their experiences with the learners. This background content should include roles and responsibilities of these organisations that include their approach to legislation, monitoring, education, research and development, testing and investigation.

As well as the organisations setting the parameters of what is acceptable, the sports performers themselves have sole responsibility for their own practices, the scope of this should be explored along with the potential consequences of transgressing these rules and expectations. As well as conforming to the standards set by WADA and UKAD, sports performers have to engage with the testing process both within and out of competitions. The expectations in this regard should also be discussed, so a speaker from a sports performance background with first-hand experience could again add value and context to the learners.

The initial delivery of the learning aim should provide learners with an understanding of the organisations that are responsible for setting the anti-doping landscape in the UK and worldwide as this sets the scene for the rest of the delivery. The main aspects of the module are the coverage of the different types of performance enhancing approaches, substances and drugs, making the differential between which ones are allowable, and which are prohibited in competitive sport.

Sports nutrition plays a significant part in the allowable performance enhancement process, and these approaches should be highlighted, explaining how these can have a positive impact on performance in specific types of sports. This should include substances like caffeine that can have a positive impact in aerobic performance or creatine in explosive anaerobic sports. The potential risks should also be highlighted due to the non-regulation of the supplement industry with the potential for contaminated or counterfeit supplements. Learners should also be guided as to the steps they may take to secure certified batch tested supplements, using organisations such as Informed.

Learners should also understand the prohibited methods of performance enhancement, covering specific types of substances such as anabolic agents, hormone therapies and masking agents as well as prohibited methods such as blood doping and gene doping. There should also be discussion around the specific sports that have certain substances that are banned, such as the use of beta blockers in sports that require a high degree of accuracy.

Learning aim D

This learning aim looks to extend the theoretical information in the unit to practical applications, so as much of the content should be delivered practically where possible as this will offer the learners chance to experience the application of their knowledge. It may also be possible to link and apply content from other units to support the application of theory to practice.

The first step in this application is to be able to identify the nature of different sports and identify the energy requirements of training and competition. This is critical as it provides a basis for developing the strategy, as meeting the energy needs from appropriate nutrients is one of the fundamental criteria. This underpinning knowledge of specific sports is then built on by gaining a personal context as to the needs of the individual from their nutrition strategy. Having access to sports performers here could provide some sports specific context for the learners.

Once all this information is in place, learners can then start to pull together a nutritional plan, drawing on their knowledge of macro and micronutrients, and fluids and their sources to suggest some practical actions the performer may take before, during (if relevant for the sport) and after performance. Learners should be encouraged to apply their knowledge in the development of these strategies and be able to justify why they have made their recommendations, so they will be able to apply their knowledge to a range of different sports and activities.

Transferable skills

Preparing for work

- Understanding the role of a sports nutritionist and how they can support a sports performer
- Planning & undertaking a dietary analysis, and developing a plan for future improvement

Developing practical and technical skills

- Communicating with sports performers to understand their performance aims.
- Displaying appropriate skills and behaviours.
- Applying knowledge to real-life situations.
- Developing practical skills in measuring body composition

Legislation, regulations, policies and procedures

- Understanding anti-doping legislation
- Awareness of drug testing procedures and guidelines as well as the responsibilities of coaches, supports staff and sports performers with regard to anti-doping

Managing information

- Problem solving to ensure nutrition plans are aligned to individual performers aims.
- Management of information.
- Self-management and development.

Key teaching areas in this unit include:		
Sector skills	Knowledge	Transferable skills/behaviours
- Understanding the role of a sports nutritionist and how they can support a sports performer - Undertaking nutritional analysis - Undertaking body composition measurement - Applying knowledge to real-life situations	- Understanding of nutrients & fluids - Anti-doping legislation, principles & procedures - Energy intake and expenditure - Methods of nutritional analysis	- Communication - Working with others - Thinking skills/adaptability - Problem solving - Management of information - Self-management and development

Employer involvement

This unit would benefit from employer involvement (face to face and or virtual) in the form of:

- links with local health education professionals, local sports clubs and nutritionists
- guest speakers from performance sport and/or health promotion
- development of assessment materials in partnership with health and sport professionals.

Assessment guidance

These are only suggestions, and assessor can utilise professional judgment, to support this please consider the selection cited within' key summary of the types of evidence used for BTEC Nationals' in Appendix 1 of the spec. Where unsure on use or considering different method utilise the 'ask the expert service'.

This unit is internally assessed. Learners will be required to produce two assignments. There is a maximum number of two summative assignments for this unit

The relationship of the learning aims, and criteria is:

Learning aims: A, B and C (A.P1, A.P2, A.P3, B.P4, C.P5, A.M1, B.M2, C.M3, AB.D1, C.D2)

Learning aim: D (D.P6, D.P7, D.M4, D.D3)

Example assessment strategies

Learning aim A, B & C - A detailed case study examining the energy, nutrition, hydration, diet, digestion and anti-doping for athletes and their importance in relation to sports performance.

Learning aim D - A audio recording with supplementary documents to justify a two-week diet and hydration plan for a selected performer undertaking a specific sport

Assessment strategies should include a range of activities that demonstrate the ability of the learners to apply scientific theory to practical sports nutrition scenarios.

Assessment 1 requires the learner to be able to apply generic nutritional principles to a specific sporting example, with Assessment 2 demonstrating the ability of the learner to apply the theoretical nutritional knowledge to practical guidance for a specific sports performer. Both of these assessments highlight the ability to transfer this knowledge and skills to other sports situations and ultimately enable a sports performer to be better prepared for their sporting performance.

Suggested assessment scenarios – working alongside a sports coach/as a member of a sports club/working with a sports scientist - you are looking to enhance the nutritional preparation and recovery of the sports performers in your team/club/representative squad

Delivering the unit: suggested activities

This provides you with a starting place for one way of delivering the unit, based around the recommended assessment approach in the specification.

Digital solution available

Aligned directly to support this unit [Sport 2019+](#)

Unit 4: Nutrition in Physical Performance	Modules	Features
	4 modules 64 topics	Check your learning (formative assignment) 1 End of module summary (reflection) 1 End of module assessment (Summative style)

Learning aims / topic areas	Suggested Activity	Suggested time allocation
A1 Nutrition	Introduce the concepts of nutrients and how these differentiate to macro and micronutrients. Learners can discuss their prior knowledge to gain a base level of knowledge for the group Consider the structure and function of carbohydrates whilst giving examples of sources. Offer food examples for the learners to examine, for example rice, pasta, cakes and biscuits. The teaching materials should include simple and complex carbohydrates as well as the three subtypes. Discuss with the learners their prior learning of proteins – learners to list food source examples. Discuss with the learners the key features of amino acids, examining essential and non-essential. Discuss with the learners their prior learning of fats – learners to list food source examples. Discuss with the learners the key features of triglycerides & fatty acids, examining saturated and unsaturated fats.	6 hours

	Consolidate this information by asking the learners to examine a small selection of food and note the vitamins and minerals in each. Discuss with learners the role of vitamins and minerals including types and their functions. Present information on the common terminology and abbreviations involved within nutrition. Learners to create a glossary of terms and research the amounts of nutrients for each term (eg the RDA for adults and children).	
A2 Hydration	Discuss with learners the common signs and symptoms of dehydration, hyperhydration and hypohydration. Learners to consider how this applies to different sporting situations, using a range of different sports examples. Learners could then produce a poster on the dangers of dehydration Practical activity for learners to appreciate dehydration. Collect a urine poster of colour in relation to hydration. Make several bottles with varying levels of apple juice (diluted as shown by the pictures). Learners to reflect on resources handed out about urine colour. Learners to make a sports drink from a recipe sourced from the internet. Small-group discussions on the ingredients and the impact on performance Discuss with learners fluid intake pre, during and post event. Learners to then establish a list of possible drinks that athletes could use for their intake, providing information on the difference between using water and sports drinks. Invite a guest speaker (from a sports performance environment) to discuss hydration and the impact on performance.	6 hours
A3 Diet	Introduce the concept of the balanced diet and its components, including % amounts of the different nutrients. Discuss examples of meal choices, then ask learners to design their own. If possible, access the local medical resource centre and collect their interactive activities for nutrition Discuss the influence of nutrition on health, including statistics: obesity, cholesterol, cancer risks and heart disease.	6 hours

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	In small groups, learners could prepare a presentation on two influences of nutrition on health to consolidate the influence of nutrition on health Learners could complete a research activity, looking at a range of guidance on how to achieve a balanced diet (including the Eatwell plate, food pyramids, food labelling etc), with the learners feeding back their thoughts to the rest of the group Discuss examples of the nutritional and hydration needs of a range of different sports performers, and encourage the learners to analyse the key features of each Encourage learners to reflect on the performance benefits from their diet choices as well as the impacts if the athlete does not maintain nutritional and hydration requirements.	
A4 Digestion	Introduce the digestive system using interactive methods (such as models, interactive diagrams/animations etc) and discuss the route of food from buccal cavity to anus, including digestive juice and enzyme activity on the way. Learners could use playdough or plasticine to recreate the digestive system on a piece of paper and include labels of the various structures to consolidate their learning Learners could also produce a story of a food's journey through the digestive system, correct anatomy used through the journey as well as digestive juices and enzymes.	2 hours
B1 Energy	Introduce to the learners the terms used to measure energy as well as sources of energy from nutritional intake. Consider how each of the macronutrients is metabolised by the body and how this influences the types of nutrients required for different sports Introduce the concept of body composition and the different ways it can be measured/estimated. Learners to practice using the different equipment available to estimate body composition, including using height and weight measure to calculate BMI, using skinfold calipers and bioelectrical impedance analysis equipment (eg Bodystat, or body fat scales etc) to estimate body fat. Investigate the possibility of attending a local HE institution that might have access to underwater weighing technology Learners to analyse their data generated by comparing against norm values	4 hours

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B2 Energy balance	Learners to work in pairs to investigate the term basal metabolic rate including the factors affecting BMR. Learners to present their findings in a poster or PowerPoint presentation Discuss with learners the considerations around the energy intake, expenditure and performance implications of selected athletes or sports (including predominantly aerobic, anaerobic and team/racket sports)	2 hours
C1 Performance enhancing substances and drugs	Working in groups, learners can research the World Anti-Doping Agency (WADA) & UK Anti-Doping (UKAD), explaining their purpose, roles and responsibilities Discuss the rules on anti-doping within sport, including the athlete's responsibility as well as other personnel involved in their training and performance. Identify and explain the range of prohibited substances and methods, discussing why these can have a performance benefit to the performer along with the risks to health. Consider inviting a guest speaker from a local sports club (performer or coach/support staff) to discuss with learners their experience of drug testing. Ask that the performer shares their strategies of making sure they do not violate drug testing rules and regulations. Learners asked to make a list of medication taken by the learner now or in the past. Using the website Global DRO ask learners to research their medication and categorise into banned and allowed. Learners to share their findings with the group and discuss the implications for the sports performer. Discuss with learners the role nutritional supplements within performance sport and debate contamination of supplements and counterfeit supplements	6 hours
C2 Anti-doping legislation and guidance	Discuss the range of anti-doping violations for athletes & support staff along with the potential financial social and physical consequences of being accused and found guilty of anti-doping offences. Consider using guest speakers or case studies to highlight and discuss the ethical considerations around cheating, high performance, health and the potential rewards of elite performance	4 hours
C3 testing	Introduce the testing process, using interactive guides/videos to illustrate the urine sample	2 hours

process and whereabouts	collection process, to highlight the security and the scientific rigour of the process. Cover alternative methods of testing Discuss the challenges around competition and out of competition testing and the relevance of the athlete whereabouts approach applied by UKAD	
All content in Learning aims A,B & C	Assessment (8 hours): learners should be given an assigned assessment for the content in Learning aim A, B & C. They should use these sessions to produce the assessment - A detailed case study examining the energy, nutrition, hydration, diet, digestion and anti-doping for athletes and their importance in relation to sports performance.	8 hours
D1 Activities	Revisit the session on energy from B1 and apply to the sporting situation by asking learners to split a selection of sports into aerobic and anaerobic activities. Consider the roles that the macronutrients play for the different types of sports Discuss with learners the relevance and importance of timing of food for season and event performers and how they might structure their nutritional plans to accommodate different times of the season and training/competition loads. Learners to create a 'timeline' of a performer's sporting year showing the timing of diet and hydration considerations during training, competition and pre-season.	2 hours
D2 Planning diets	Provide learners with a range of case study examples and ask them to decide their needs when considering their diet – emphasise importance of considering the sport they perform. Consider a range of options for interviewing a performer on their diet and future dietary needs to be discussed and allocated. Elite, professional, semi-professional and amateur performers can be used. Learners to produce a questionnaire to secure the appropriate information needed during the interview to meet the assessment expectations. Discuss with learners the dietary requirements if an athlete wanted to: gain weight, lose weight, gain muscle, gain or lose fat as well as carbohydrate loading, detailing the areas that could be manipulated in the diet to achieve the aims. Learners to develop a food diary template for their performer to complete alongside the questionnaire. The focus of the food (& drink) diary is to collate data on their current diet, types	6 hours

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	as well as amounts of fluids as well as needs for the future.	
All content in Learning aim D	Assessment (2 hours): learners should be given an assigned assessment for the content in Learning aim D. They should use these sessions to plan and or produce the assessment - A justified two-week diet and hydration plan for a selected performer undertaking a specific sport	6 hours

Details of links to other BTEC units and qualifications

Several other units from this qualification complement this unit. These include:

- Unit B: Health, Wellbeing and Sport
- Unit D1: Applied Coaching Skills
- Unit E: Research Project in Sport
- Unit 9: Fitness Training.

Resources

The 2019 qualifications are industry-focussed, and it is key that learners maintain up to date understanding and also visibility of key developments and influences within the market.

Social Media

Add here named examples and types of individuals/bodies to follow. Collate under platform headings (i.e. twitter, Instagram, podcasts etc)

Twitter

@foodgov
@BNFEvents
@basesuk
@eis2win
@ukantidoping
@wada_ama
@ScienceinSport
@Herbalife

Instagram

Foodgov
britishnutritionfoundation
eis2win
bases_uk
samwarbs

Websites

<https://sport.wetestyoutrust.com/> Informed Sport supplement certification

<https://www.gssiweb.org/en/sports-science-exchange/All> – Gatorade Sports Science

Exchange, providing information of hydration

<https://www.eis2win.co.uk/service/nutrition/> - English Institute of Sport Nutrition resources

<https://www.who.int/news-room/fact-sheets/detail/healthy-diet>

World Health Organisation Healthy diet

<https://happyforks.com>

Free to access nutritional analysis website

<https://www.nutritionvalue.org/>

Free to access nutritional analysis website

<http://www.foodnutritiontable.com/>

Food tables for manual nutritional analysis

<https://www.globaldro.com/home/index>

Global Drugs Reference Online

<https://www.wada-ama.org/>

World Anti-Doping Agency

<https://www.ukad.org.uk/>

UK Anti-Doping

Textbooks

Bean A, *The Complete Guide to Sports Nutrition (Complete Guides): 8th edition*
Bloomsbury Sport, 2017 ISBN 978-1472924209

Bean A – Sports Supplements (A&C Black, 2007) ISBN 9780713682595

Journal of the International Society of Sports Nutrition – (Springer Nature) – Open access journal that focuses on sports nutrition and supplementation strategies

Definition of key terms

Dietary Reference Values – this is an umbrella term that includes a series of estimates of the amount of energy and nutrients needed by different groups of healthy people in the UK population. There are a number of specific reference values that include:

- **Recommended Daily Allowance (RDA)**
 - This is the average daily dietary intake level that is sufficient to meet the nutrient requirements of nearly all (97–98%) healthy persons of a specific sex, age, life stage, or physiological condition
- **Reference Daily Intake (RDI)**
 - This is the daily intake level of a nutrient that is considered to be sufficient to meet the requirements of 97–98% of healthy individuals in every demographic
- **Optimum Daily Intake (ODI)**
 - This is a dietary guideline that suggests the level required to meet optimal nutrition, instead of the bare minimum required for the body to function healthily
- **Safe Intake (SI)**
 - This value is the amount suggested to be sufficient for almost everyone, but below a level that could have undesirable effect
- **Estimated Average Requirements (EAR)**
 - This value is an estimate of the levels required to meet the requirement of half the healthy individuals in a specific population group.

Essential nutrients – These nutrients (carbohydrates, proteins, fats, vitamins, minerals, fibre and water) provide nourishment that is essential for growth and healthy body function.

Non-essential - These nutrients are required by the body for healthy body functioning, but not essential in the diet as the body can synthesise them. These include non-essential amino acids (such as Alanine & Arginine) and Vitamin D

Hypertonic sports drinks – This is a sports drink that contains a higher concentration of salt and sugar than the human body.

Hypotonic sports drinks - This is a sports drink that contains a lower concentration of salt and sugar than the human body

Isotonic sports drinks - This is a sports drink that contains similar concentrations of salt and sugar as in the human body.

Balanced diet – This refers to eating a wide variety of foods and drink in the right proportions to achieve and maintain a healthy body weight. It incorporates the essential and non-essential nutrients

Eatwell plate – This is a graphical representation that shows how much of what we eat overall should come from each food group to achieve a healthy, balanced diet.

Food pyramids – This is also a visual representation of how different foods and drinks contribute towards a healthy balanced diet. This concept was developed into the Eatwell plate

Skinfold analysis – This is a method of estimating of the total amount of body fat using skinfold caliper measurements.. This method is based on the hypothesis that the body

fat is equally distributed over the body and that the thickness of the skinfold is a measure for subcutaneous fat.

Bioelectrical impedance analysis - This is another method for estimating body composition, in particular body fat and muscle mass. The method sends a weak electric current through the body and the resistance to the current is measured in order to estimate the different body composition measurements.

Hydrodensitometry – This is another method for measuring the density of the human body working on the principle that the amount of liquid a submerged object displaces is equivalent to the volume of the object. Fat is lighter than muscle & bone, so density can be used to calculate body fat percentage. If underwater weight is heavy, it indicates a lower body fat percentage, and vice versa.

Body Mass Index (BMI) – This is a value that can be compared against norm values to estimate whether body weight is deemed healthy in relation to height. It is calculated from the mass (in kilograms) and height (in metres).

Basal Metabolic Rate (BMR) – This is the number of calories required to keep your body functioning at rest. This is the energy required for functions such as temperature regulation, organ function and all metabolic functions.