

REVIEW

A review of the nutritional guidance for athletes to prevent eating disorders

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Email: jonathanhilling@gmail.com**Handling Editor:** Le Grange, Daniel.**Abstract**

Since the 1980s eating disorders (ED) have gained increasing prevalence, with athletes proving to be at a higher risk compared to non-athletes. Eating disorders can significantly impact the health and performance of an athlete, however, certain guidelines are in place for prevention, treatment and management. NICE and UK Sport were two guidelines that were identified as being referenced within the UK. This paper aimed to evaluate their utility and establish whether modifications are required to prevent ED within athletic populations. A checklist was created based on peer-reviewed recommendations and used in conjunction with conceptualised case studies based on information sourced from proposed key informant interviews. Whilst both guidelines are extensive in the identification of symptoms associated with ED, they lack recognised recommended screening methods. Furthermore, although both contain some form of validated treatment, NICE recommends cognitive behavioural therapy despite acknowledging the lack of evidence supporting its beneficial application. In contrast to recommendations regarding physical therapy, NICE also states to avoid certain treatments, such as yoga, despite beneficial evidence of its treatment/rehabilitation for ED. When applied to case studies, both guidelines demonstrated the need for refinement and improvement in recommendations relating to weight loss and screening methods. To form an accurate critique of the guidelines, an assessment of their applicability and suitability in the prevention, treatment and management of ED in a practical sporting environment involving consenting participants is required.

KEYWORDS

athlete, eating disorder, guidelines, sport

Highlights

- More comprehensive screening tools are required to be used with or in place of SCOFF

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- The inclusion of physical activity in the prescribed treatment of EDs needs revising
- Nutritional advice is to be given by accredited professionals, non-expert advice can be detrimental to the athlete

1 | INTRODUCTION

The aetiology and prevalence of eating disorders (ED) initially became a research focus around the 1980s, inspired by press and media coverage of case studies (Joy et al., 2016). Early reports highlighted a particular significance for athletic (relative to non-athletic) populations, with studies highlighting risk for approximately one-in-five female athletes and, more variably, one-in-10 to one-in-twenty non-athletes (Bratland-Sanda & Sundgot-Borgen, 2013; Sundgot-Borgen & Torstveit, 2004). Since these publications, the combined prevalence of Anorexia Nervosa (AN), Bulimia Nervosa (BN) and Binge Eating Disorder (BED) appear to have risen significantly in both athlete and non-athlete populations (Stice et al., 2013). It is unclear if the observed increase could be explained by pressures that lead to dietary/training changes being implemented without adequate guidance; greater recognition of symptoms, improved diagnostic pathways, and reduced stigma associated with diagnosis or help-seeking behaviours. Estimates suggest that an average of 13.5% of athletes struggle with an ED (El Ghoch et al., 2013). Although, female athletes have a greater risk (up to 45% affected) linked to aspirations and/or unobtainable ideals portrayed in the media (Kong & Harris, 2015). An elevated risk of underestimation for prevalence and severity within male populations is apparent: Sundgot-Borgen and Torstveit (2004) estimate that as many as 32% of male athletes suffer from an ED. Tailoring of work, planned to address such issues, requires adaptation dependent on sporting discipline as well as the socio-demographics of those affected. Athletes participating in weight-dependent (e.g., wrestling) and aesthetic sports (e.g., gymnastics) for example, appear to have greater risk (42%) than those in endurance sports (e.g., distance running, 24% (Sundgot-Borgen & Torstveit, 2004)).

Elite athletes are assumed to be at the peak of physical health, however, attitudes and behaviours towards food inspired by false/under-evidenced media claims and/or promoted by uninformed coaches/athletes may induce harm (Birkenhead & Slater, 2015). Most will eat to achieve their target weight or performance goals, ideally, following guidance from a nutritionist or dietitian (Birkenhead & Slater, 2015). However, without supervised guidance, there is a myriad of factors that may influence food choices (Birkenhead & Slater, 2015). Those who

strive for and/or set performance-related goals without first seeking guidance or who integrate extreme training protocols are potentially at increased risk of ED (Wells et al., 2020). Unorthodox or extreme diets designed to be 'performance enhancing' often lack evidence to support their content and can potentially introduce risk through the promotion of negative behaviour changes (Birkenhead & Slater, 2015). For athletes who experience disordered eating, shorter careers marred by injury and inconsistent performances are expected (Bratland-Sanda, S., & Sundgot-Borgen, 2016). When allowed to pervade, clinically defined ED syndromes may be potentially detrimental to an athlete's health, performance and, in extreme cases, can prove fatal (Conviser et al., 2018).

Acknowledging the significant potential impact of EDs on an athlete, governing bodies have published guidelines to aid practitioners that work directly with athletes. These guidelines (NICE, 2017; UK Sport, 2007) include descriptions of each listed disorder's core symptoms, their potential consequences and recommended forms of "treatments" at different stages of the disorder. This project aims to revisit these guidelines, evaluating their utility from the perspective of those working with athletes, to establish whether modifications are required to help prevent EDs within athletic populations.

To achieve this, the following objectives will be addressed:

- i) Create 'example' patient/athlete scenarios highlighting the risk of ED in specific sports groups;
- ii) Develop a checklist from which to review guidelines for the prevention and management of ED in athletes;
- iii) Review recommendations provided within the guideline

2 | METHOD

To identify published guidelines designed to prevent and treat EDs in athlete populations, a targeted search strategy was utilised. Initially, searches were conducted using PubMed and PsycINFO to identify guidelines applied by researchers in peer-reviewed literature. Searches focused on articles including the following words 'eating

disorder,' athlete,' AND (Boolean connector) 'guideline' in the title/abstract. A total of six references were identified in PubMed (Fredericson et al., 2021; Herbold & Frates, 2000; Joy et al., 2014; Knapp et al., 2014; Wells et al., 2020; Williams et al., 2017), eight in PsycINFO (Baker, 2012; Glick et al., 2012; Godoy-Izquierdo et al., 2021; Petrie et al., 2008; Powers & Thompson, 2007; Wise, 2018). Each reference was reviewed to identify any guidelines described/recommended for use within UK-based athlete groups and to facilitate a review of whether a gap in this resource is evident and considered necessary. Recommendations around the prevention and management of ED (through identification, prevention and treatment) within these papers were collated to form a checklist of essential practices for practitioners working directly with an athlete.

Next, a search of grey literature published by the National Institute for Health and Clinical Excellence (NICE), American College for Sports Medicine (ACSM) and UK Sport was initiated using Google. Limited practical guideline documents were identified: UK Sport '*Eating Disorders in Sport: A guideline framework for practitioners working with high performance athletes*' (UK Sport, 2007) and NICE guideline (NG69) '*Eating disorders: recognition and treatment*' (NICE, 2017). Both documents were obtained for appraisal to determine what athlete specific recommendations for the identification, prevention and treatment of ED were included and whether the listed management approaches differ for each ED. The Guidelines were summarised to showcase key recommendations for athletes and practitioners that form part of a support group for an athlete.

A further search was conducted through Google Scholar for literature critiquing the selected guidelines. One paper was sourced responding to UK Sport (Currie & Crosland, 2009). No paper was found critiquing the current NICE guideline; however, one paper was sourced critiquing a previous iteration (Wilson & Shafran, 2005). A final search through Google Scholar was conducted using the terms 'ED', 'athlete' 'coaches nutrition knowledge' and 'exercise'. After screening the titles/abstracts, six papers were identified and retained for review (Birkenhead & Slater, 2015; Carei et al., 2010; Cockburn et al., 2014; Conviser et al., 2018; Hausenblas et al., 2008).

To review the recommendations critically and appropriately and determine how prevention, treatment and management of ED within athlete groups are contained within the guidelines, case studies were conceptualised using information sourced from key informant interviews. Each interviewee provided insight into a specific sport with varying gender, ages and performance levels. Three individuals with variable

experiences and roles, all of which (arguably) require a degree of understanding about ED in sport were recruited (see Appendix 3 for reasoning and questions asked): a swimming club safeguarding lead, a student endurance athlete and a chairman of a south London based running club. Information obtained from these interviews was supported by details extracted from peer-reviewed literature (Bentley et al., 2021).

3 | CASE STUDIES

3.1 | Key informant interviews/Case study generation

Information from key informant interviews led to the creation of two case studies, both designed to reflect the key issues that are raised when ED risks are evident in athletes. This section describes the typical physical activity demands on the athlete linked to their primary sport only. Example cases are then outlined, detailing the need for guidelines to inform the process used by a Core multidisciplinary team (CMT) to aid the early detection and management of EDs.

The swimming club safeguarding lead described a typical training week for club members aged between 13 and 18 years (Appendix 2). Noticing the weight of a group of swimmers appeared to be significantly decreasing (from visually 'normal' to 'underweight'), concern was raised at a team management meeting. Coaches, however, had no concerns since performances were improving. Following general requests for feedback (members questioning whether their weight loss was desirable for optimum performance and their overall health; noting that some members had sought external help and returned to visually normal weight), the lead described the necessity for general feedback to all swimmers concerned that some of the female swimmers were experiencing amenorrhoea, despite returning to a visually normal weight.

The student endurance athlete shared aspirations of achieving specific times to qualify for elite-level races. The athlete observed the association between weight and performance of professional male elite athletes (50–60 kg) and described the desire to decrease their weight as a primary goal. They confided their weight loss aspiration with their local running club coach and had been advised to limit caloric intake to around 1000–1500 kcal whilst maintaining a 140 km training week (Appendix 1). The athlete reported their body fat percentage had reduced to 8.7%. The athlete described experiencing immense pressure linked to their performances and their self-worth defined by their performances.

The running club chairman provided general accounts of various groups, male and female, within the club. They reported several occasions when club members were unable to train or compete due to fatigue or through medical instruction and recalled that these athletes were a mix of visually normal weight and extremely thin, which was considered a 'natural' result of training. During club events, the chairman described certain members lacking focus and athletes who were unwilling to perform typical everyday tasks. On occasion, members were observed to be averse to the food or drink on display and some would persistently avoid the events. Having noticed members of the club becoming visually underweight, the club employed a nutritionist and physiotherapist to work alongside the coaches to provide a resource for athletes when required.

3.2 | Case study: Endurance runner

The conceptualised athlete is a 24-year-old Caucasian male runner, an example weekly training regime can be found in Appendix 2. The athlete is a university student aiming to compete at a higher level alongside their studies. He associates sporting success with weight loss, observing the lower body mass of elite athletes relative to his size. The stress associated with a university degree paired with the unassisted attainment of a lighter physique resulted in low energy levels, frequent mood swings, avoidance of social situations and stress fractures. The club the athlete was associated with had access to professionals that would form a CMT, however, these were only accessible at the athlete's expense.

3.3 | Case study: Swimmer

The conceptualised athlete is a 15-year-old Asian female swimmer, an example weekly training regime can be found in Appendix 2. Alongside the pressures of sporting performance, the athlete may also experience academic and social pressures associated with their age bracket. The athlete experienced weight loss that, at first, appeared beneficial to their performances along with their social standing and was not identified as being abnormal by their coach. It later resulted in amenorrhoea, a reluctance to compete following diminished performances at competitions and indications of a decline in mental health: Difficulty communicating with family and friends, avoidant behaviour regarding social events and anxiety-associated behaviours.

4 | CHECKLIST FOR GUIDELINES

Following the literature review, a series of criteria were identified as important aspects to include within ED guidelines. The rationale used to explain the necessity for each section/area is outlined and then highlights the reasons why each section is necessitated and the potential risk associated with its omission.

4.1 | Core Multidisciplinary Team (CMT)

Expertise gathered from a range of individuals is necessitated for athlete care when an ED presents/is indicated. At the most basic level, this should include three members, each with a defined task/purpose aligned to their role, forming a CMT (CMT). The CMT could include a sports physician, a dietitian and a psychologist (Fredericson et al., 2021; Joy et al., 2014; Wells et al., 2020). The principle aims of this team must relate to the prioritisation of the athlete's health and well-being. Whilst patient confidentiality should remain paramount throughout, communication of management strategies outlined in collaboration between the CMT and coach must have transparency, reflection and communication for the benefit of the unique needs of each athlete and a clear case-dependent treatment strategy.

4.2 | Symptom identification (risk indicators)

Every form of ED is complex and presents in varying ways, dependent on a myriad of factors ranging from psychological aspects, such as self-esteem, to association with specific performance (Wells et al., 2020). Whilst there are warning signs whereby a combination of presenting symptoms can be used to identify an ED, see Appendix 3, each form of ED will manifest in differing diagnostic criteria or core symptoms. For example, athletes suffering from AN weight loss and low body fat could be explained by a restrictive energy intake, potentially due to distorted body image or associating performances with a lighter physique. Conversely, weight gain associated with BN, resulting from recurrent binge episodes, could manifest in a preoccupation with food coupled with excessive secretive exercise (Wells et al., 2020). A full description of diagnostic criteria and core symptoms for the recurring forms of ED can be found in Appendix 2.

4.3 | Support signposting

The warning signs, symptoms and screening methods recommended for the identification of EDs within the literature can be found in Appendix 3. Further assessments required include a nutritional assessment conducted by a qualified dietitian including ED screening questionnaires and interviews, diet history, consideration of special diets, an energy availability assessment and an evaluation of risk factors (Fredericson et al., 2021; Joy et al., 2014; Wells et al., 2020). Regarding nutritional needs for an athlete, the eating practices must: meet physical/mental health needs, be adaptable (ensuring intakes meet specific sporting demands), have flexibility around eating (encouraging consumption within social settings), remove restrictive behaviours and promote a healthy body image (Wells et al., 2020). When considering psychological assessments according to the DSM-V, interview protocols are well suited to evaluating behaviours relating to eating and beliefs (American Psychiatric Association., 2013; Fredericson et al., 2021; Joy et al., 2014). The EDE and EDE-Q are suggested methods and should be used in conjunction with the Mini International Neuro-Psychiatric Interview (Knapp et al., 2014; Wells et al., 2020).

5 | GUIDELINES

Both NICE (2017) and UK Sport (2007) guidelines include the most prevalent types of ED found within sporting environments and provide similar definitions matching those found in the Diagnostic and Statistical Manual of Mental Disorders (DSM) (American Psychiatric Association, 2013). However, UK Sport (2007) was published prior to the revised DSM-V and did not include the criteria for recognising EDs that are included in DSM-IV (Call et al., 2013).

Aside from the three typical EDs (AN, BN, BED), the DSM-V also includes two other branches for atypical forms of disorders where, despite evidence of a problem, they do not meet the requirements to be classified as a clinical condition, these are included under the umbrella terms 'other specified feeding or ED' (OSFED) and eating disorder not otherwise specified (Appendix 2). Any professional working in partnership with athletes should understand the different forms of ED, their risk factors and core symptoms for appropriate identification.

NICE is a world-leading professional body in the field of health and medical care committed to ensuring the provision of up-to-date, national guidance and advice to improve health and social care. UK Sport is an organisation tasked with leading sport in the United Kingdom

to promote world-class success (Currie & Crossland, 2009), achieved through the management of funding ensuring elite athletes are provided with the highest quality of logistical and technical support. The UK Sport guideline includes guidance in key areas of concern such as screening and early detection, recommended preventative methods, appropriate treatment for the different types along with a return to training and competition following adequate recovery.

5.1 | Identification

Both NICE (2017) and UK Sport (2007) emphasise the importance of early identification of an ED to minimise the degree of potential harm. Individuals suspected of being at risk of an ED should therefore be identified and treatment administered at the earliest opportunity. The risk of developing an ED for young adults is at its peak between 13 and 17 years, however, early identification of an ED is paramount in minimising the degree of harm regardless of age (NICE, 2017). NICE recommends utilising the SCOFF questionnaire, a form of EDE-Q, as the sole screening tool for appropriate practitioners (Morgan et al., 1999). Athletes are required to answer a series of questions relating to their perception of eating control or self-image, with yes responses to two or more questions indicative of an ED. When a potential ED case is identified, both guidelines suggest an athlete CMT comprising a nutritionist/dietitian, physiologist, sports physician, coach, psychologist and physiotherapist. Before any recommendation in the handling and management of an ED case, safeguarding is considered only by NICE (2017).

5.2 | Treatment

NICE (2017) provides specific guidance for the treatment of each ED. Individuals with AN are advised to attain a healthy body weight for their age, as decided by the support team. When handling BN, psychological treatments will have a limited impact on body weight and composition, therefore treatment incorporating self-help through ED materials supplemented with support sessions is advised.

Psychological treatments integrating various forms of eating-disorder-focused cognitive behavioural therapy (CBT-ED) are recommended for all forms of ED, and in the case of AN, Maudsley Anorexia Treatment for Adults or Specialist Supportive Clinical Management as alternative psychological treatments is also recommended (NICE, 2017). Recognising that these approaches may not be universally suitable, guidance is provided on how to

proceed if they are found to be unacceptable, contraindicated or ineffective. If the athlete is a minor a family-focused CBT-ED should be deployed whereby the onus is on creating a supportive environment for recovery for example, (NICE, 2017).

Dietary counselling is recommended only as part of a multidisciplinary approach, encouraging ingestion of oral multi-vitamin/mineral supplements to meet recommended dietary reference values. The use of physical therapies, such as transcranial magnetic stimulation, acupuncture, resistance training or yoga, is not recommended (NICE, 2017).

In contrast, UK Sport (2007) does not give specific ED-type recommendations or treatment. Instead, it proposes rules to be applied as and when appropriate, under the assumption that the athlete has a proficient CMT who can identify the most suitable approach. An example situation given in UK Sport guidelines is 'making weight'. Recommendations suggest that methods employed should consider the rate of weight loss, preventing goals for weight loss above 1 kg per week due to the detrimental side effects associated with excessively restrictive diets or exercise due to the potential loss of lean muscle (UK Sport, 2007). The recommended energy deficit to achieve appropriate weight loss stated by the guidelines is 500–1000 kcal per day. No general level for the minimum energy intake that must be maintained is provided, instead, it suggests athletes will likely require a minimum of 1500–2000 kcal per day highlighting that further reductions could hinder the athlete's capacity to train (UK Sport, 2007). The guidelines suggest that additional exercise could be introduced to assist in weight loss at the athlete's choice.

6 | DISCUSSION

EDs are prevalent in both athlete and non-athlete populations, with the former carrying a higher risk factor (Sundgot-Borgen & Torstveit, 2004). An undiagnosed or untreated ED can be significantly detrimental to an individual's health and, in the case of an athlete, their performance (Conviser et al., 2018). The aim of this paper was to evaluate and critique the suitability and applicability of recommendations in the prevention, treatment and management of ED contained within identified guidelines, NICE (2017) and UK Sport (2007).

The EDE is regarded as the gold standard screening tool for the general population with the EDE-Q also suitable for use when applied as part of a comprehensive assessment. Wells et al. (2020) reported that SCOFF is not listed as a primary or secondary screening tool, merely a guide to be used in partnership with other more specific or

expansive screening tools, such as a nutritional assessment combined with the EDE. NICE (2017) and UK Sport (2007) insinuate that the SCOFF questionnaire is sufficient in identifying cases. UK Sport (2007) highlights that it is not uncommon for athletes to influence their answers in more complex screening tools, the EDE included. If another screening tool isn't available, considering EDs share similar symptomologies, factors to be considered alongside the SCOFF questionnaire to improve identification could include abnormal BMI, rapid weight loss, excessive dieting or restrictive eating practices, social withdrawal, persistent and problematic chronic diet affecting illnesses such as diabetes, menstrual/endocrine disturbances, unexplained gastrointestinal symptoms, unexplained electrolyte imbalances and abdominal pain. BMI may be appropriate for cases of AN in re-establishing a healthy weight it is a flawed measure for athletic populations (Lichtenstein et al., 2022). Furthermore, as certain weight-dependent sports heavily focus on body composition utilising frequent anthropometric measurements, using a basic measure such as BMI may compound any psychological body dysmorphia issues an athlete may have (Torres-McGehee et al., 2009). UK Sport states the SCOFF questionnaire is designed to be sensitive in identifying BN and AN and accurately identifies 100% of cases, however, it also has a false positive rate of 12.5% meaning a significant number of individuals are unnecessarily misdiagnosed. Research by Lichtenstein et al. (2022) compounded the false positive findings of the SCOFF questionnaire (12%) along with a false negative of 6%. While ED questionnaires have demonstrated success in identifying EDs in athletic populations, they lack the diagnostic interview questions to accurately verify the diagnosis. Accurate identification of EDs through questionnaires in real-world scenarios requires validation through clinical interviews by a certified practitioner (Martinsen & Sundgot-Borgen, 2013). However, there is a need for a sport-specific screening tool to increase sensitivity and knowledge around EDs in sports. The self-completion element also increases the likelihood of deception/truth distortion. Further highlighting the need for SCOFF to be paired with clinical interviews to minimise misidentification. Both guidelines highlight the need for a CMT to be in place around the athlete. As previously defined, the key roles within a CMT team should include as a minimum, a sports physician, a (sports) dietitian and a psychologist. UK Sport (2007) and NICE (2017) recommendations for CMT practitioners also include a physiologist and a physiotherapist, with inclusions of this expertise likely to be explained by risk imposed by ED to injury (presentation and recovery). For AN where the risk of injury may be increased, a case could be made that their inclusions may be warranted for treatment or management, however, there is a lack of

research to suggest that physiotherapy would be beneficial for BN, where osteoporosis is unlikely to present due to an increased caloric intake (Machado & Ferreira, 2014). Therefore, indicating the inclusion of such expertise in the CMT could be argued as irrelevant. Furthermore, Arthur-Cameselle and Quatromoni (2014) reported factors that hinder recovery from an ED, lack of support (81%) and professional negligence (61%) were the top responses. It could be argued that the two factors can be the same as support provided to the athlete is largely from their MCT. Both NICE and UK Sport highlight the importance of an MCT, however, neither place emphasis on the experience or qualifications needed by the MCT, highlighting the need for a sensitive and tailored approach to ED treatment.

When attempting to lose weight, it is crucial that the long-term health of the athlete is prioritised, and that any strategy employed is tailored to ensure suitability to the individual. UK Sport (2007) acknowledges that a general figure cannot be applied to all athletes, instead opting to provide a minimum energy requirement range. However, this does not provide any recommendation or link to any method recommended to enable coaches/sporting groups to accurately provide the correct individualised minimum energy requirement. This leaves the rightfully stated range of intake values open to interpretation and enhances risk linked to less informed practitioners prescribing an energy level that is too low for an athlete. The inclusion of demographically appropriate adjustments will facilitate improved utility of energy equations. Based on the calculated energy requirements in the swimmer case study, 2114 kcal/day, the minimum energy requirement range would be a suitable recommendation, however, if that swimmer was participating in another sport on the two 'rest days' outlined (Appendix 4), this could be inaccurate. Equally, dependent on their age/state of development, adjustments to micronutrient requirements could be necessitated. The energy requirement of the runner case study exceeded 3000 kcal/day, intake levels which could either further compound existing issues associated with an ED or, if avoidant/restrictive eating behaviours are observed, create more harmful complications. Furthermore, in contrast to the NICE (2017) guideline, by not including a reference to weight-, height- or body mass index-for-age within the UK Sport (2007) guideline, this could elevate the potential for an incorrect assessment which could also manifest in further harm. Had the runner case study been able to access nutritional advice (i.e., if financial barriers to the qualified professional were removed), the club coach may have been able to provide more complete advice. However, a study involving 163 ball sport UK coaching certified coaches found that despite only 25% having previously attained an accreditable nutritional qualification 57% provided nutritional advice to

athletes (Cockburn et al., 2014). If an athlete does not have access to a CMT and is solely reliant on a coach, the athlete may likely receive inappropriate and potentially harmful advice.

Considering each ED results in varying physiological and psychological complications, the acknowledgement within NICE (2017) guidelines for different ED-dependent psychological treatments appears logical. However, despite consistently recommending the use of psychological treatments, a section included in the latter stages of the guidelines proves to be confusing and contradictory. It stated that very few studies have been conducted into the valuable application of CBT and highlights that there is no evidence to suggest that CBT-ED is more effective than self-help or group CBT (NICE, 2017). NICE stating the necessity for randomised control trials to be performed suggests there is no reliance on this method.

NICE (2017) stated that the use of physical therapy, including weight training and yoga, was not to be employed in the treatment of an ED. This is contrasting to the literature as several clinical trials have demonstrated the valuable application of physical therapy for individuals with psychological and mental health disorders (Danielsen & Bjørnelv, 2018; Hausenblas et al., 2008). However, although numerous studies have been carried out into the beneficial effects of exercise in cases of ED (30–60 min), recommendations made by Hausenblas et al. (2008) were targeted at the general population and there is an absence of randomised controlled trials in athletic populations (Ströhle, 2019). For competitive athletes exercise of this duration is likely to fall short of their typical training requirements, as shown in Appendix 4. Randomised controlled clinical trials demonstrated the implementation of yoga as a 12-week treatment for EDs with significantly decreased overall EDE scores (2.06 at week 0–1.70 at week 12), food preoccupation (1.41 at week 0–1.10 at week 12) while not harming the participants BMI (Carei et al., 2010). While the NICE (2017) guidelines take a stance on a variety of advisable and non-advisable treatments, UK Sport (2007) instead includes a set of generic rules, assumed to apply to all forms of EDs applied only in the presence of a CMT. The lack of recommendations permits open interpretation and the potential for unintentional harm.

With the peak age for developing an ED between 13 and 17 years (NICE, 2017) the need for appropriate safeguarding should be reflective of the law. In 1989 The Children Act was passed and later updated in 2004, to ensure the protection and welfare of children (Matters, 2006). The Safeguarding Vulnerable Groups Act (2006) was introduced to prevent those unsuitable from working with children and vulnerable adults

(Hughes, 2009). Younger athletes require careful handling, if there isn't communication between adults/guardians it can lead to unnoticed ED symptoms, emphasising the importance of a CMT at any age (Wells et al., 2020).

The UK Sport (2007) recommendation for additional exercise for weight loss in cases of ED could increase the risk of an athlete associating excessive exercise with weight loss and performance, especially if introduced in conjunction with an energy-restricted diet, increasing the risk of orthorexia. This demonstrates another example of a recommendation contained within the guideline that contradicts the literature. Additional exercise prescribed to an athlete suffering BN could enable a free license, resulting in excessive secretive exercise (Wells et al., 2020). Implementing food diaries would help to ensure appropriate advice from a dietitian, however, falsified logs may occur if the athlete has already made a connection between restricted diets and performance (Currie & Morse, 2005). Regardless of the weight loss method, it is vital that athletes understand the process and how the results are to be interpreted to promote beneficial health and performance. Transparency would build trust between athlete and their CMT; however, it must be made clear that the interpretation of the results is not up for interpretation by the athlete and must be accompanied by expert advice (Conviser et al., 2018).

The current paper focused on work performed in the UK against locally used guidelines, however, the burden of ED is fairly consistent across Europe/Worldwide and although pharmacological treatment options have been reviewed and recently updated (Aigner et al., 2011) there is a commonality in treatment approaches observed elsewhere across Europe (Hilbert et al., 2017).

Since the completion of the project, the Medical Emergencies in ED report (MEED) was published (Nicholls et al., 2022), replacing the junior and senior Management of Really Sick Patients with AN (MARSIPAN) (Marikar et al., 2016). The report was formulated by expert psychiatrists of EDs with support from nutritionists, dietitians and physicians. The report reviewed and synthesised existing UK and international guidelines for the prevention, management and treatment of EDs. The report was critical on the impact of Covid-19 on the increasing prevalence of ED for all age groups. The MEED report was not only critical of several points also highlighted in the current study, such as the use of physical therapy as a treatment and the limitations of CBT-ED, it also recommended a traffic light system indicating risk to life for each domain and factor relating to EDs (Nicholls et al., 2022). The traffic light system ranks green factors as an indication of low risk to life, amber as the incorporation of a clinician due to an impending risk to life and red as a high risk to life

(Nicholls et al., 2022). The report is keen to highlight that while patients with BN are not underweight and may display few symptoms it does not reduce the severity or potential risk to life. The traffic light tool was designed to aid practitioners and CMT members in emergency management and admission decisions.

In summary, the NICE (2017) and UK Sport (2007) guidelines include useful descriptive summaries of the symptoms relating to various EDs and attempt to recommend 'easy and cost-effective' solutions in the screening of an ED. However, neither include nor mention any 'gold standard' screening tools or full guidance to enable considered appraisal of any other method mentioned within the literature. Furthermore, they make claims to avoid certain practices in the treatment of an ED that are contrary to recommendations found within the literature suggesting that updates are needed. Despite the lack of evidence in the beneficial application of CBT-ED, it is a form of treatment that carries minimal risk of further harm. The capacity of research groups to observe the application of guidelines in real-life scenarios, facilitating an accurate assessment of their true applicability to prevent, treat or manage EDs in various sporting contexts is needed. To ensure the provision of "useful information for key groups including GPs, local government, public health professionals, social care professionals and members of the public" (the goal reported by the National Institute for Health and Care Excellence on their 'About Us' pages), tailoring of such advice using case studies specific to sport – the highest risk group for ED presentation – is necessitated.

AUTHOR CONTRIBUTIONS

Jonathan Jesse Hilling: Conceptualization; data curation; formal analysis; investigation; methodology; writing (original, review and editing). **Claire Robertson:** Supervision.

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CONFLICT OF INTEREST STATEMENT

There were no conflicts of interest to disclose.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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APPENDIX A

TABLE A1 Key informant roles relating to inclusion and interview questions.

Key Informant	Reason for Selection
Swimming club safeguarding lead	<ol style="list-style-type: none"> 1. First point of contact regarding a swimmer's concerns 2. Handle education system regarding swimmer energy requirements
Endurance runner	<ol style="list-style-type: none"> 1. Experience of competing in a high ED risk sport 2. Experience of communication between athlete and coaches/practitioners
Running club chairman	<ol style="list-style-type: none"> 1. Oversees the handling of an athletics club 2. Able to provide an insight into what is fed up from athletes to coaches and coaches to senior staff
Interview Questions	
Current sport/Role relating to sport?	
Typical training week in relating sport?	
Steps taken to improve sporting performance?	
Instances/scenarios of abnormal behaviour?	
Steps taken following identification of abnormal behaviour?	
Outcome of observed abnormal behaviour?	

TABLE A2 Example weekly training log for case study athletes in swimming and running created from information sourced from key informant interviews, complete with estimated energy expenditure.

	Typical weekly swimming training (15-year-old Asian female; weight 38 g; height 1.56 m)	Typical weekly running training (24-year-old Caucasian male; weight 59 g; height 1.79 m)
Monday	Pre-pool injury prevention (15 min) 200 m warm up; 400 m drills; 10 × 100 m; 10 × 50 m; 200 m warm down (~2300 m)	20 km aerobic (~90 min)
Tuesday	Land training exercises (15 min) 200 m warm up; 400 m drills; 8 × 200 m; 200 m drills; 200 m warm down (~2600 m)	20 × 400 m anaerobic volume 8 sets of drills ^a (~60 min)
Wednesday	Rest day	15 km aerobic (~60 min)
Thursday	Pre-pool injury prevention (15 min) 200 m warm up; 400 m drills; 16 × 100 m (medley focused); 200 m drills; 200 m warm down (~2600 m)	10 × 20 s hill sprints 10 × 200 m anaerobic 8 sets of drills ^a (~45 min)
Friday	Pre-pool injury prevention (15 min) 200 m warm up; 400 m drills; 2 × 150 m; 4 × 150 m; 2 × 150 m; 200 m warm down (~2000 m)	20 km aerobic (~60 min)

(Continues)

TABLE A2 (Continued)

	Typical weekly swimming training (15-year-old Asian female; weight 38 g; height 1.56 m)	Typical weekly running training (24-year-old Caucasian male; weight 59 g; height 1.79 m)
Saturday	Pre-pool injury prevention (15 min) 200 m warm up; 400 m drills; 4 × 150 m; 2 × [4 × 100m]; 4 × 50 m; 200 m warm down (~2400 m)	4 × 5 min lactate threshold (~60 min)
Sunday	Rest day	25–30 km aerobic
Total weekly volume	11,900 m	~140 km
Energy expenditure	2114.8 kcal (Henry 2005 = 1224 kcal) (Physical activity level 1.7)	3060.9 kcal (Harris and benedict 1919 = 1611 kcal) (Physical activity level 1.9)

Note: The Harris and Benedict equation has been found to report energy expenditure totals closest to that of European and American populations aged 21–70 years old, while the Henry equation has proved most accurate within European American and Asian populations (Fuentes-Servin et al., 2021).

^aDrills: A-Skip, B-Skip, Carioca and Strides.

TABLE A3 Warning signs and recommended screening tools in the identification of eating disorders in athlete populations.

Warning Signs	Screening Tools
Behavioural changes: <ul style="list-style-type: none"> • Preoccupation with food, calories, body shape and weight • Polarised thinking • Avoidance of food-related social activities • Restrictive eating • Bathroom visits post meal • Binge eating evidence • Restriction followed by binge episode • Secretive food/exercise related behaviour • Increased rigidity/inflexibility in situations 	<ul style="list-style-type: none"> • Eating disorder examination 17.0 (EDE 17.0) (gold standard) • Eating disorder examination questionnaire 6.0 (EDE-Q 6.0) • Athletic milieu direct questionnaire v.2 (with PST) • Brief eating disorder in athletes questionnaire v.2 • Eating attitudes Test-26 • Low energy availability in females questionnaire (female athlete triad) • Eating disorder inventory (EDI-64) (bulimia and anorexia nervosa) • Female athlete screening tool (FAST) • Bulimia test-revised (BULIT-R) • Physiologic screening test (PST) • The health, weight, dieting, and menstrual history questionnaire • College health-related information survey (CHRIS-73) • Brief eating disorders in athletes questionnaire (BEDA-Q) • Female athlete triad specific questionnaire (with PPE) • Preparticipation physical evaluation (PPE) • Periodic health evaluation (PHE) • Bone mineral density (BMD)
Physical changes: <ul style="list-style-type: none"> • Wearing concealing clothes • Excessive exercise • Exercise despite of an injury • Bone stress injury • Hormone imbalance • Frequent illness or injury • Low body fat • Dehydration • Bad breath, sore gums or loss of teeth enamel • Swelling localised around jaw • Skin effects • Unexpected and/or rapid weight loss or gain 	
Psychological changes: <ul style="list-style-type: none"> • Persistently poor/declining mental health • Increased attention to body criticism • Sense of loss of control regarding food • Body image dissatisfaction/distortion 	

Source: Adapted from material sourced in: Baker (2012); Fredericson et al. (2021); Glick et al. (2012); Godoy-Izquierdo et al. (2021); Herbold et al. (2000); Joy et al. (2014); Knapp et al. (2014); Petrie et al. (2008); Powers and Thompson (2007); Wells et al. (2020); William et al. (2017).

TABLE A4 Clinical diagnosis and/or core symptoms of prevalence forms of eating disorders.

Classification	Diagnostic Criteria	Core Symptoms
Anorexia nervosa	<ol style="list-style-type: none"> 1. Restrictive energy intake resulting in significant weight loss in context of age, sex, developmental trajectory and physical health 2. Intense weight gain fear 3. Disturbance in body image/shape 	<ul style="list-style-type: none"> • Expected weight less than 85% • Fear of weight gain • Body dysmorphia • Decreased performance • Amenorrhoea (female only)
Bulimia nervosa	<ol style="list-style-type: none"> 1. Recurrent discrete binge episode with a lack of control (at least once a week for 3 months) 2. Recurrent inappropriate compensatory weight gain behaviours 	<ul style="list-style-type: none"> • Frequent binge eating episodes • Compensatory purging behaviour (fasting, exercise) at least twice per week • Weight/shape influencing self-esteem/self-worth • Decreased performance
Binge eating disorder	<ol style="list-style-type: none"> 1. Recurrent discrete binge episodes with a lack of control 2. Associated with three or more: <ul style="list-style-type: none"> • Rapid eating • Eating until uncomfortably full • Eating large quantities when not physically hungry • Eating alone due to embarrassment • Distress, disgust, depression or guilt 3. No inappropriate compensatory behaviours 	<ul style="list-style-type: none"> • Rapid consumption of large food quantities in a specific time frame • Sensation of loss on control of eating behaviour • Eating when not hungry • Eating until uncomfortably full • Eating alone or in secrecy • Depressed, disgusted, ashamed, upset or guilty about eating behaviour • Frequent dieting, possibly without weight loss
Avoidant restrictive food intake disorder	<ol style="list-style-type: none"> 1. Eating/feeding disturbance manifested by failure to meet nutritional needs, one or more present: <ul style="list-style-type: none"> • Significant weight loss • Dependence on enteral feeding/oral supplements • Interference with psychosocial functioning • Not exclusive of AN or BN 2. Disturbance not due to lack of food 3. No evidence of body dysmorphia 4. Not attributable to concurrent medical condition 	<ul style="list-style-type: none"> • Refusal to eat certain foods • Fear of vomiting/choking • Unapparent loss of appetite • Slow eating • Difficulty eating in certain situations • No weight gain, increased weight loss • No growth or delayed growth
Anorexia athletica	N/A	<ul style="list-style-type: none"> • Expected weight is 95% or less (muscularity maintains weight above anorexic threshold) • Fear of weight gain • Body dysmorphia • Restricted caloric intake • Planned binge episodes • Excessive exercise • Gastrointestinal complaints • Menstrual dysfunction (female only)
Female athlete triad	N/A	<ul style="list-style-type: none"> • Disordered eating behaviours • Oligomenorrhoea or amenorrhoea • Osteoporosis/ osteopenia • Decreased performance

(Continues)

TABLE A4 (Continued)

Classification	Diagnostic Criteria	Core Symptoms
RED-S	N/A	<ul style="list-style-type: none">• Disordered eating behaviours• Weight loss• Lack of normal growth and development• Menstrual dysfunction• Recurrent injuries and illnesses• Decreased performance• Alterations in social behaviour

Note: Adapted from: American Psychiatric Association, D.S. and American Psychiatric Association, 2013.