Avoiding the 'REDs Card'. We all have a role in the mitigation of REDs in athletes

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In many sports, a player or coach receiving a 'red card' is immediately dismissed from the field of play and cannot return to the competition: an event to be avoided! Another red card to be avoided occurs across all sports and levels of participation: the Relative Energy Deficiency in Sport (REDs) card.

Elite athletes often push the boundaries of activity considered to be healthy in the quest to maximise their athletic potential for success. For many athletes, the fine line between maintaining health while maximising sports performance is elusive when energy requirements are not met, sometimes resulting in reversible health consequences (eg, impaired reproductive function, impaired gastrointestinal function), irreversible health consequences such as permanent bone mineral density loss and failure to reach their athletic potential. Astrid Uhrenholdt Jacobsen, an Olympic Cross Country Skiing Gold Medallist, summarises the dichotomy between maintaining health and the motivation to improve performance from the athlete perspective:

> In order to be competitive in elite sports over time, I knew that good health was important for my sport success. As an athlete, it is often difficult to know exactly where the boundaries lie between balanced training and excessive load. Given that athletes have extreme motivation to see immediate progress, there is a risk of falling into a situation that is both unhealthy and inhibits performance in the long term. Athletes and their support teams need to know about REDs to ensure future incredible sport achievements while maintaining health during and after sport.

The multifactorial syndrome 'REDs' was introduced in 2014 in an International Olympic Committee (IOC)[1] consensus statement as an expansion of the Female Athlete Triad.[2] This consensus statement highlighted (1) that multiple body systems and performance parameters are affected by exposure to low energy availability (LEA) and (2) that male athletes were also vulnerable to the harmful outcomes of LEA. The first REDs clinical assessment tool (RED-S CAT) was published in 2015,[3] and a subsequent REDs-related science update was released in 2018.[4] Since then, scientists worldwide have published ~178 original research studies to address research gaps in the field of REDs in various athlete populations and methodological designs. As the science in the field has significantly evolved, so has our understanding of the nuances of LEA exposure on various physiological and psychological pathways, and the complex interaction of LEA with moderating factors and between body systems. Given the evolution in our knowledge of REDs, especially over the last ~5 years, the IOC commissioned an updated consensus statement to introduce new concepts and clinical applications related to REDs *(see page 1073)*. The consensus statement is featured in this current edition of the British Journal of Sports Medicine (BJSM), which is dedicated to REDs. Other supporting reviews in this special edition provide further context of the science that underpins the consensus statement, and an expansion of recommendations for clinical and research practice.

WHAT'S NEW?

To reflect the developments in the scientific literature, we define REDs as:

> a syndrome of impaired physiological and/or psychological functioning experienced by female and male athletes caused by exposure to problematic (prolonged and/or severe) low energy availability. The detrimental outcomes include but are not limited to decreases in energy metabolism, reproductive function, musculoskeletal health, immunity, glycogen synthesis, cardiovascular and haematological health which can all individually and synergistically lead to impaired well-being, increased injury risk, and decreased sports performance. *(see page 1073)*

Recent publications have identified the role of low carbohydrate availability in symptoms associated with REDs and the timeline of clinical signs and symptom responses to LEA indicative of maladaptation *(see page 1073)*. An overlap of the symptomology of Overtraining Syndrome and REDs has been recognised,[5] along with improvements in our knowledge of REDs in male *(see page 1066)* and para-athletes.[6] This BJSM REDs-dedicated edition also includes a narrative review of the science outlining the mental health outcomes of problematic LEA exposure *(see page 1127)*. Complementary to the updated conceptual REDs health and performance models, a new, dynamic REDs physiological model is introduced that provides a framework to demonstrate the biological complexity resulting from problematic LEA exposure *(see page 1098)*.

HOW WILL IT CHANGE WHAT WE DO?

Knowledge translation to stimulate desired changes in behaviour is an important outcome of consensus statements. This REDs-dedicated edition of the BJSM highlights three papers that provide clinical guidance for the prevention and management of REDs in athletes: (1) Mathisen *et al* summarise the principles of effective and safe body composition measurement as a means of preventing unhealthy practices that can result in REDs *(see page 1148)*; (2) a new REDs Clinical Assessment Toolersion 2 (REDs CAT2) *(see page 1109)* is introduced to provide clinical guidance for screening, identifying severity and risk stratifying REDs; and (3) primary (education), secondary (early identification and diagnosis) and tertiary (treatment)

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prevention principles for REDs using a multimodal approach are summarised in a supportive narrative review *(see page 1119)*. To address the lack of standardisation of research methodologies in the scientific literature, methodological guidelines for REDs research are also proposed *(see page 1136)*.

AVOIDING THE 'REDS CARD'

Avoiding the 'REDs card' to protect athlete health while maximising sports performance requires a team effort from members of the entire ecosystem around the athlete. Sports organisations should consider the health impacts of sport rule changes that may affect an athlete's decision-making around eating and training loads to reach sport performance goals (eg, safer weigh-in rules). Athletes, coaches, officials and the entire athlete health and performance team play an important role in promoting a 'health-first, performance-second' cultural shift to prevent erroneous pressure to strive for unhealthy body composition goals or unsustainable physiques *(see page 1148)*. The athlete's healthcare team should be equipped with a clinical approach to the secondary (early identification and diagnosis) and tertiary (treatment) prevention of REDs *(see page 1119)*. Finally, athletes should be knowledgeable about implementing healthy nutrition and periodised training loads to prevent REDs.

We all have a role to play. Educate yourself and act through your role of influence in sport to prevent, recognise and mitigate the outcomes of REDs in your athletes. Avoiding the 'REDs card' will ultimately result in improved short-term and long-term athlete health and well-being, as well as safe optimisation of sports performance.

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Acknowledgements The authors would like to thank the International Olympic Committee and the British Journal of Sports Medicine for prioritising and supporting athlete health and well-being.

Contributors All authors were involved in the final manuscript's conception, revising and approval before submission. MM was responsible for leading and coordinating the editorial.

Funding The International Olympic Committee supported the logistics for the related in-person consensus meeting in Lausanne, Switzerland.

Competing interests MM is a Deputy Editor of the BJSM and a member of the BJSM IPHP Editorial Board. KEA is a Deputy Editor of the BJSM and an Associate Editor of the BJSM IPHP. EV is an Associate Editor of the BJSM, an Associate Editor of the BJSM IPHP and Editor in Chief of BMJ Open Sports and Exercise Medicine. RB is the IOC Medical and Scientific Director. LE is the IOC Head of Science Activities and an Editor of BJSM IPHP. UE is an IOC member and the Chair of the IOC Medical and Scientific Commission.

Patient consent for publication Not applicable.

Ethics approval Not applicable.

Provenance and peer review Commissioned; externally peer reviewed.

To cite Mountjoy M, Ackerman KE, Bailey DM, *et al*. *Br J Sports Med* 2023;**57**:1063–1064.

Accepted 26 June 2023

Br J Sports Med 2023;**57**:1063–1064.
doi:10.1136/bjsports-2023-106749

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