

#REDS (Relative Energy Deficiency in Sport): time for a revolution in sports culture and systems to improve athlete health and performance

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Changing a sport system requires the appointment of new leaders or a grass roots cultural revolution. 'I got caught in a system designed by and for men, which destroys the bodies of young girls,' said Mary Cain as she cast light on her toxic coach/athlete relationship and exposed unhealthy coaching and nutrition practices. Her candour has inspired a social media movement calling for changes to women's sport.¹ In the following days, major news publications followed up with similar reports of athletic women being body shamed.²⁻⁴

It is time for a drastic paradigm change in women's sport, coupled with education at all levels to improve the long-term health and athletic achievement of female athletes. The shift needs to include:

1. Raising awareness of the negative effects of chronic low energy availability (LEA) (calorie restriction) so athletes

can make wise choices for their own long-term health.

2. Updating and developing best-practice protocols and safe standards for monitoring body composition/weight.
3. Eliminating toxic training environments featuring abusive body shaming.

Overexercising or underfueling, occurring consciously or subconsciously, can cause Relative Energy Deficiency in Sport (RED-S). RED-S is the 'impaired physiological functioning caused by relative energy deficiency, and includes but is not limited to impairments of metabolic rate, menstrual function (for females), bone health, immunity, protein synthesis and cardiovascular health.'⁵ Chronic LEA (over many weeks to years) leading to RED-S can limit training adaptation⁶ and substantially increase injury risk.^{5,7,8} It cripples performance in both female⁶ and male athletes.⁵ It can occur

unknowingly without a diagnosed eating disorder.⁷

There is good news: there are opportunities to mitigate the occurrence and effects of RED-S through system-wide education including prevention/awareness interventions and by optimising energy intake. One of these system opportunities to address RED-S was spearheaded in Canadian elite sport when B2ten—a philanthropic group—sponsored a 3-day meeting of 30 key stakeholders in November 2019. At the table were internationally renowned topic experts, Canadian coaches from at-risk sports, and athlete support staff representing both sport science and medicine, all of whom work in Canadian, American or British sport. This group examined the science, sport cultures, gaps and opportunities associated with RED-S. Some of the key themes developed included:

Prevention

- We need to implement awareness education adapted to female and male athletes of all ages and sport levels, and tailored for support staff, coaches and parents. Educational initiatives should underscore the positive aspects of energy, namely, that food is fuel; and fuel is needed for performance. Content should include RED-S signs/symptoms; positive communication around menstrual cycles and body image; appreciation of athletes/sports at higher risk; and best practices pertaining to body composition/weight assessment protocols. We developed a conceptual

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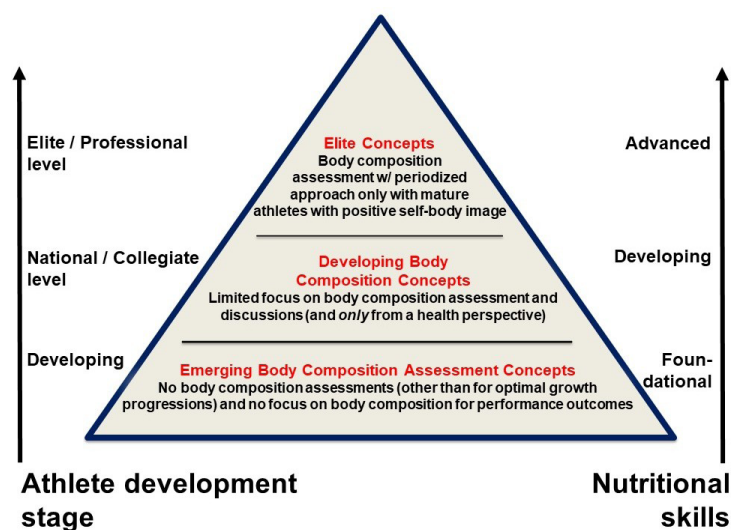


Figure 1 A conceptual framework on the implementation of body composition assessments (e.g. height, weight, anthropometrics, skinfolds, etc.) within the context of athlete stage of development and their nutritional preparation skills. BC, body composition; LTAD, long-term athlete development model; TBD, to be determined.

framework outlining when, and when not, to implement these methods (see figure 1).

Diagnosis

- Multicentred research is required to develop and validate a diagnostic tool for RED-S.
- RED-S-associated diagnostic factors may include: chronic dietary restriction and/or extreme diets, drive for thinness, large changes in body weight or composition in short time periods, training inconsistencies, prolonged fatigue, decreased libido, oligo-amenorrhoea (missing three or more menstrual cycles in 6 months), two or more career bone stress injuries and low bone mineral density for age (Z-score < -1.0).⁵

Treatment

- We must ensure athlete access to a referral network of RED-S and eating disorder experts, including sport and exercise medicine physicians, registered sport dietitians and sport psychologists, within each country.

The working group also identified that certain sports have physiological and energetic requirements that dictate that certain athlete phenotypes may be successful. There was much discussion about methods to safely improve performance while ensuring athlete physical and mental health. Elite athletes may need to manipulate energy availability for short periods to change body composition and improve their power/force profiles for critical performance windows. On the other hand, the working group

emphasised that prolonged LEA impairs health and performance.

Modeling the work in sport concussion, we call for national policies requiring sports to have RED-S prevention, diagnosis and treatment protocols, targeting athletes, coaches and the athlete entourage. Media and sponsors can raise awareness and support research in the field. Empowering athletes to identify and protect themselves from toxic cultures, and to understand the importance of energy/food as it relates to RED-S, is paramount.

As signs and symptoms of RED-S are present in ~2%–60% of female and male athletes, depending whether athletes are in endurance, aesthetic, weight categories and power/sprint sports,^{5–7} we believe that a revolution in sport culture and awareness regarding energy availability can transform the physical and mental health and performance of athletes globally.

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