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HOW DOES LOW ENERGY INTAKE AFFECT YOUR BODY AND PERFORMANCE?

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Many athletes find themselves in a tough situation when in comes to eating for optimal performance. Although they are encouraged to consume the proper sources of energy for performance they often face self- or team-imposed weight restrictions.

Athletes need enough energy to fuel their body and enhance training effects to perform at their best. Low energy (calories) intake can lead to muscle loss, menstrual dysfunction, low bone density, high risk of fatigue, injury, longer recovery, and illness. If there aren't enough calories to meet the athlete's needs, fat and lean tissue will be broken down for energy.

Lean tissue loss leads to loss of endurance and strength, lowered immune system, hormonal disruption, and decreased muscle and joint function. Long-term low-energy intake can disrupt the body's metabolism and lower the resting metabolic rate.

RELATIVE ENERGY DEFICIENCY IN SPORTS (RED-S)

You may be familiar with the condition previously know as the "Female Athlete Triad", a serious medical syndrome seen in female athletes that consists of disordered eating, menstrual dysfunction, and osteoporosis. It is seen mainly in sports that emphasize lean bodies or use subjective scoring. The International Olympic Committee (IOC) now recognizes that a broader, more comprehensive term is needed to take into consideration that male athletes are also affected. The term "Relative Energy Deficiency in Sports" (RED-S) is now used to refer to the syndrome that is caused by an energy shortage when considering the energy the athlete needs for healthy daily living, growth, development, and sport performance versus the energy consumed.

Energy balance = energy intake – energy expenditure

Energy balance occurs when energy intake (the amount of energy from food, fluid, and supplements) is equal to energy expenditure.

THE HEALTH RISKS OF LOW ENERGY INTAKE

Athletes need to meet their energy requirements in order to train and recover effectively as well as to maintain appropriate body weight and body composition.

Athletes who restrict their energy intake, cut out food groups, have inadequate nutrients, or who use severe weight-loss techniques are at a higher risk of harmful health effects including:

- Nutrient deficiencies (e.g. anaemia)
- Chronic fatigue
- Inadequate recovery
- Increased risk of infection
- Increased risk of illness
- Medical complications
  - Gastrointestinal
  - Hormonal
  - Reproductive
  - Kidney
  - Bone
  - Heart
- Psychological stress
- Depression
- Lowered metabolic rate
- Decreased growth and development

Energy expenditure takes into account the basal metabolic rate (the amount of energy used while at complete rest), the thermic effect of food (the energy needed to digest and absorb food), and the energy used for physical activity. Energy expenditure for different types of exercise depends on the duration, frequency, and intensity of the exercise as well as gender, heredity, age, body size, Fat Free Mass and nutritional status.

Energy availability = Energy intake – Energy cost of training/competition

The body can adapt to small changes in energy availability, but significant deficits over time will reduce its ability to function properly for optimum health and performance. The general minimum energy requirement for athletes is 30 calories per kg FFM Fat Free Mass (FFM), which is the athlete's body mass minus body fat. (Nutrition Working Group of the International Olympic Committee, 2012). There are three situations that are typically associated with chronic low energy availability.

1. **Eating disorders (anorexia nervosa and bulimia) and disordered eating**:
   - These require early intervention and help from specialists.
2. **Excessive restricted eating for weight control or loss or body fat:**
   - Fast weight-loss often increases health risks and decreases performance.
3. **Not adapting to higher energy needs during different training periods:**
   - Food intake may not increase enough when there is a sudden increase in exercise load.

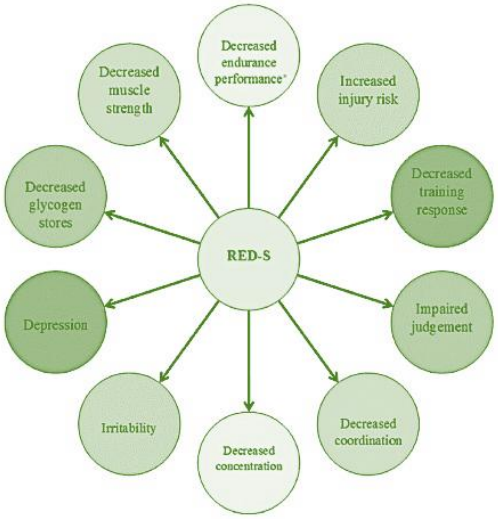

FIGURE 1. Adapted from Mountjoy M, et al. Br J Sports Med 2014

THE EFFECTS OF RED-S ON SPORTS PERFORMANCE

Studies have shown that athletes with a ***700 calorie per day intake lower than required, showed a 10% decline in performance times while those who fuelled adequately showed an 8 % improvement over 8 weeks*** (Vanheest et al., 2014).

The body also has an adaptive response to energy deficits as it goes into "starvation mode" causing metabolism to decrease and fat storage to increase. ***Energy deficits greater than 300 calories in elite athletes have been associated with higher body fat percentage*** (Duetz et al., 2000). Other potential effects of relative energy deficits on sports performance are shown in Fig. 1.

Body composition and weight

An individual's optimal body fat percentage depends on sex, age, and heredity and may be sport specific.

- Although the **minimum adult healthy level of body fat is 5% for men and 12% for women**, the best body fat percentages for an athlete may be much higher and should be assessed individually.

- Maintaining optimal body composition and body weight are two of the many factors that contribute to potential success in a sport. Body weight can impact speed, endurance and power, while body composition can affect strength, responsiveness and appearance.

BOTTOM LINE

Athletes need to meet their energy requirements to maintain appropriate body weight and body composition while training for a sport. If energy intake doesn't meet their needs, fat and lean tissue will be broken down for energy. Long-term low-energy intake can cause nutrient deficiencies like anemia, lower the body's resting metabolic rate, and may increase body fat percentage. Low energy intake will not allow an athlete to sustain heavy training.

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