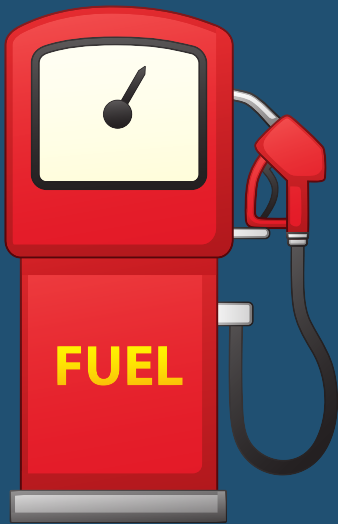


LET'S TALK ABOUT LOW ENERGY AVAILABILITY

RELATIVE ENERGY DEFICIENCY IN SPORTS
REDS & DANCE (RED-D)



ANGELA JACKSON &
LUCY GILLBANKS

DO THEY EAT ENOUGH FOR WHAT THEY DO?

Traditionally we have associated injuries with doing too much, but that does not explain why some kids get injured and others doing the same amount, or intensity of sport remain injury free.

Many non contact injuries occur when we exceed the current capacity of the body. That may be doing more than they have trained for, but can also be due to a drop in capacity due to inadequate sleep, nutrition or recovery and they may not be able to tolerate their usual activity level.

Adolescents who participate in sports often need more energy intake to optimise wellness, growth and performance than their non-athletic peers, but they are not always aware of that fact.

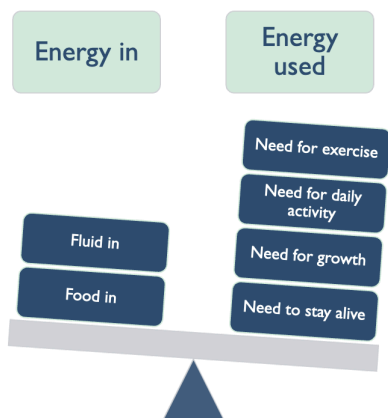


IF WE DO NOT PUT SUFFICIENT FUEL IN THE CAR, WE WON'T REACH OUR DESTINATION. YOUNG ATHLETES ARE JUST THE SAME. IF THEY DON'T EAT ENOUGH FOR WHAT THEY DO, THEY WILL BE AT GREATER RISK OF BREAKING DOWN WITH AN INJURY OR ILLNESS.

DO THEY EAT ENOUGH FOR WHAT THEY DO?

We can get energy through both food and drink sources and getting a balanced intake of all the food groups is essential. Recent studies have highlighted the importance of carbohydrates for bone health, performance and wellness.

Energy is needed for the basic survival needs of our body, for the routine things we do day to day and in sporty adolescents for growth and the sport and other activities they do.



If we do not consume or absorb enough to meet all those needs, it is termed low energy availability (LEA). This occurs when there is a mismatch between an athlete's energy intake (diet) and the energy expended. In other words, energy availability after taking account for exercise, is not adequate to support the functions required by the body to maintain hormonal balance, optimal health, growth and performance.

ENERGY AVAILABILITY (EA)

Energy availability (EA) occurs on a continuum, meaning athletes can at different phases of training or development an athlete can have normal or low energy availability. An athlete may be in short term LEA but take the necessary steps to reverse this before developing adverse performance or health outcomes.

LOW ENERGY AVAILABILITY (LEA)

Low energy availability can occur either due to:

1. Decrease in energy intake for the same level of exercise
2. Increase in volume or intensity of exercise creating increase energy expenditure without an increase in energy intake.

Either route means you are not getting enough fuel for the level of activity you do.

WHO MIGHT BE AT RISK OF LEA

Let's consider 2 similar case studies involving children of the same age. Both children have developed low back pain and both have experienced a recent spike in intensity and volume of activity.

The male athlete is a cricketer and has had a recent rapid growth spurt. He misses breakfast and lunch most days as he gets up too late. He plays sport at lunch time at school and by the time practice is over he is rushing to get to lessons and relies on grabbing what is left in the school canteen which he rarely likes.

The other child is a female dancer who was recently adopted a low carbohydrate diet and started a high intensity exercise programme with a desire to lose weight. The child had gone through puberty a year previous but in the last 2 months since the diet began she has stopped having periods.

Both kids are not fuelling adequately for what they do but for different reasons. One is intentionally or consciously restricting energy intake and one is unaware of just how much they need.

UNINTENTIONAL LEA

Our male athlete is time poor, blissfully unaware that they need more fuel intake, going through a rapid growth spurt and burning through their energy. Sporty kids often go hard as they want to get picked and become better at their sport. They only know one pace, and that is flat out at 100%. Just like a car being driven in first gear will burn more fuel than cruising in fifth gear, so do kids.

Other causes of unintentional low energy availability include dietary needs such as those with food intolerances, those with digestive disorders such as celiac disease, vegans and children who are fussy eaters who may have to work harder to meet their nutritional energy demands.

UNINTENTIONAL LOW ENERGY AVAILABILITY

- Lack of awareness
- Growth spurts
- High intensity effort
- Vegan
- Fussy eater
- Food intolerances
- Digestive disorders



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INTENTIONAL LOW ENERGY AVAILABILITY



- Sport & dancers
- Social media
- Body image
- Body composition testing
- Weight categories
- Peer or coach pressure

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INTENTIONAL LEA

The young dancer is intentionally and consciously restricting energy intake and critically here, missing vital carbohydrate energy sources from their diet in the belief that this may lead to improvements in performance. In her desire to improve performance, she may become addicted to training or become more concerned about weight gain, aesthetics and body image.

There are so many confusing messages still surrounding athletes from out of date coaches, parents and health and exercise professionals. Messages aimed at runners like “lighter is faster” “go hard or go home” fuelled many athletes to limit food intake and push themselves beyond their current capacity. Intentional LEA is commonly seen in endurance sports, in sports where kids have to meet weight categories such as rowing and boxing, and is highly prevalent in sports where aesthetic appearance is judged such as dance and gymnastics. Social media and societal pressures can fuel beliefs.

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DISORDER EATING

It is important to remember that not all low energy availability is a result of disordered eating, but it can be. Athletes in their desire to improve performance may become addicted to training or become more concerned about weight gain, aesthetics and body image.

Disordered eating (DE) sits on a spectrum between optimised nutrition and an eating disorder (ED)

Athletes may exhibit unhealthy attitudes and behaviours such as skipping meals, short-term restrictive diets, compulsive eating, anxiety around self-worth or body image and weighing ingredients but without fully meeting the criteria for an ED. This may be accompanied with an addiction to exercise and a belief that they have to earn food by exercising first.

Eating disorders are diagnosed by a medical professional using the DSM-5 diagnostic tool to identify mental health disorders, including eating disorders such as anorexia nervosa, bulimia nervosa, binge-eating disorder, and avoidant/restrictive food intake disorder.” If you are worried about your child’s eating habits, or you think you may need support to change your attitude to nutrition, please do consult your doctor.



When energy intake is inadequate to meet the needs of our body for essential processes, the body thinks it is under threat of starvation. It takes measures to survive by switching into standby mode and down regulates non-essential hormonal processes such as growth hormone, and reproductive hormones such as oestrogen and testosterone. These hormones drive positive bone health, muscle growth and immunity and can therefore lead to injury and illness.

POWER SAVING MODE

This cascade of hormonal reactions can be explained in terms of a mobile phone. The human body in low energy availability, is like a mobile phone in power saving mode. When the phone battery reaches a critical level, it prioritises where to allocate the remaining energy. It restricts high energy usage apps such as video games ensuring that what energy is available is given to emergency actions such as texting or phoning Mum to say they have missed the bus. The only way to restore full functionality is to plug the phone in to an energy source in much the same way as children need recovery and fuelling to top up energy reserves needed for wellness and performance.

Hormones are responsible for:

BONE HEALTH

REPAIR

PROTEIN SYNTHESIS - MUSCLE GROWTH

GROWTH

**LOW ENERGY AVAILABILITY & LACK OF RECOVERY
LIMIT THE ABILITY TO ADAPT TO TRAINING. YOU
TRAIN, BUT WITHOUT GETTING FITTER & STRONGER**

POWER SAVING MODE



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It is not just low energy availability that can affect hormonal balance. Hormones are stimulated during sleep and recovery and failure to schedule recovery into your training plan can also limit the potential of the body to adapt to the training stimulus and affect performance. In addition, when children are feeling psychologically stressed, it can impact hormonal balance and despite training hard, they don't build muscles, growth may slow, and performance often drops.

Female hormone health

In female athletes, regularity of the menstrual cycle is a simple barometer of healthy hormones. When energy availability is good, girls usually experience more regular periods and conversely, if energy availability is low, periods may become irregular or stop. If the child has previously started their periods and they become irregular (less than 9 per year) or if they stop, they should see a medical practitioner to investigate the source as not all menstrual irregularity is caused by energy deficits.

If a female has not started their 1st period by the age of 15 there is a higher risk of bone stress injuries in athletes and it is recommended that the child see a doctor to do some blood tests and understand why there is a delay.

Male hormonal health

In boys who have gone through puberty, a drop in testosterone levels may result in a loss of motivational drive, a drop in libido, and fewer morning erections. Maybe grumpy, exhausted teenagers, are actually just not getting enough energy for the activity they do. Next time they are grumpy, try fuelling them better and increasing sleep and recovery and observe what happens.

It is critical that conversations around hormone health are normalised with teen athletes. Other metrics such as heart rate are tracked and we need to encourage all members of the coaching team to encourage feedback if they observe any signs of change in hormonal health.

BONE HEALTH & HORMONES

Bone constantly goes through a cycle of bone being laid down and resorbed to make sure it adapts to the loads applied and promotes and maintains peak bone mass needed for strong, healthy bones. That is, if energy availability is adequate.

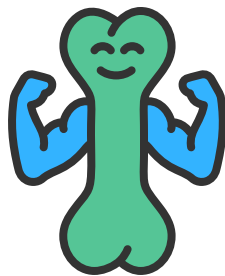
If energy availability is inadequate, **IT CAN SLOW DOWN** bone turnover with:

1. Less bone being formed
2. Lower bone mineral density
3. Greater risk of bone stress injuries and fractures.

IF ENERGY AVAILABILITY IS ADEQUATE

=

PEAK BONE MASS MAINTAINED



HOW DO WE RECOGNISE THE SIGNS OF THE BODY EXCEEDING IT'S CAPACITY?

**NIGGLY
INJURIES**

**PERIODS
STOP**

**SLEEP
QUALITY**

**RECURRENT
SORE THROATS**

**LOW
MOTIVATION**

**STRESSY &
GRUMPY**

FATIGUE

**DROP IN
PERFORMANCE**



Relative Energy Deficiency in Sport (REDS) or Dance (RED-D)

It is not just growth and reproductive hormones that become imbalanced in low energy availability. The term Relative Energy Deficiency in Sport (REDS) or dance (RED-D) has been introduced to describe the diverse adverse consequences of sustained low energy availability on all aspects of health and athletic performance (Mountjoy et al. 2015).

A condition of low energy availability affecting male and female athletes of all levels and ages affecting all body systems

There are both psychological and physical impacts to LEA. Athletes may present with digestive dysfunctions, poor healing time, low mood, struggle to build muscle despite training, recurrent viruses and lots of injuries. Everyone is different so the presentation of RED-S varies across individuals.

WHAT ARE THE EFFECTS OF LOW ENERGY AVAILABILITY?

PHYSICAL SYMPTOMS

BONE STRESS INJURIES	RECURRENT INFECTIONS	REPRODUCTIVE SYSTEM HEALTH
CARDIOVASCULAR SYSTEM HEALTH	DROP IN PERFORMANCE	DIGESTIVE SYSTEM HEALTH
DELAYED HEALING TIME	DROP IN PROTEIN SYNTHESIS	FATIGUE



IT'S NOT ALWAYS REDS OR RED-D

What is important is that not every adolescent athlete who has a drop in performance, gets recurrent infections or irregular periods has REDs or RED-D. There are many reasons for these types of symptoms and so if a child starts to experience persistent symptoms it is worth seeing a doctor and getting some blood tests done.

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WHAT ELSE MIGHT BE WRONG?

THYROID
DISORDERS

ADRENAL
DISORDERS

DIABETES

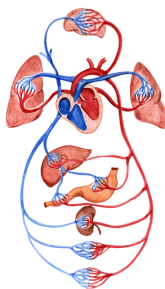
ANAEMIA

INFECTION
OR VIRUS

VIT D
DEFICIENCY

GYNAE
DISORDERS

CARDIAC
CONDITIONS



MANAGEMENT

The aim of treatment is to restore optimal energy availability through changes to diet or changes in exercise level or intensity. In some athletes, learning to fuel more effectively and introduce more low intensity training days with adequate planning for recovery may be enough to restore balance. If an athlete has developed persistent low energy availability, it can take some time to restore an equilibrium. A strong message for a faster recovery is to stop exercising but eat as though they were still training.

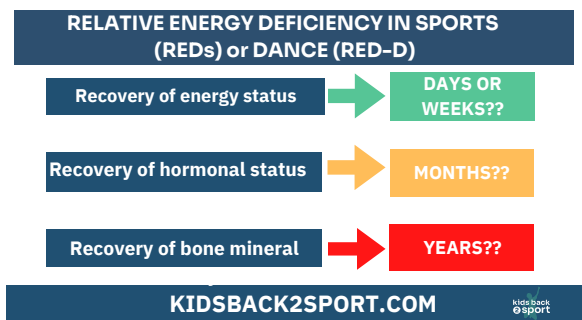
In athletes who are unintentionally under fuelling, once they understand the impact of under fuelling on performance they are much more motivated to change and effects can be quite quickly reversed.

In children who have greater psychological drivers for low energy availability and have developed either disordered eating or a clinical diagnosis of an eating disorder, or who have greater psychological symptoms as a result of their LEA, may need support from appropriately trained health professionals.

It can take many months to restore hormonal balance and a year or more to restore adequate bone mineral density so a return to sport programme has to be planned with a clinician who can guide safe loading levels.

MANAGEMENT

There may be some resistance in some athletes to making changes to either diet or exercise but through education it can be emphasised that maintaining positive energy balance is pivotal for long term wellness and performance.



The International Olympic Committee have introduced a scoring system using a a four-colour traffic-light system to grade severity and risk categorisation.

If after being assessed, the athlete has positive energy availability, and are injury free they will be given the green light to build back up training and competition gradually.

In those athletes who need further interventions, some athletes may be restricted in how much they can do and will need strict monitoring and support to return to play.

If you develop the symptoms of REDs, or are worried about your energy levels, please seek medical advice early from a Sports Medicine Doctor, a Sports Nutritionist or an MSK Physiotherapist who should then be able to sign post you to the next steps in diagnosing and managing the symptoms.

There are many excellent resources available to help you learn more:

BASEM Health 4 Performance site
The Reds project
Train Brave
Red N Sport

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CREATING POSITIVE ENERGY BALANCE IN POSITIVE ENVIRONMENTS

Messages need to be reinforced that athletes need to eat a balanced diet with good portions of complex carbohydrates, fats and proteins especially at breakfast. No food should be demonised, or feel like it must be earned. Banter should be avoided that focuses on weight, size or looks.

Fuelling cars and kids have many similarities. If we play hard and fast, or drive hard and fast we burn through more fuel. However, parents rarely consider adjusting the energy input on days when children are competing at higher intensity or for more prolonged bouts of exercise. During growth spurts or busy weeks, pack an extra protein based sandwich for break time and make sure that they have energy rich snacks to eat before after school clubs and activities.

It is all about finding the right balance. Too much stress on the body is not sustainable and affects performance. A lot of what happens to an athlete can be out of their control i.e. results, weather, equipment, and growth, however their fuel combined with their recovery for their sport is something which is within their control. Once they learn to appreciate how effective fuelling can enhance their athletic ability and performance, they may feel better able to cope when faced with things they cannot control.

Helping athletes to plan training, & recovery days and to listen to their body when it is struggling is important in maintaining optimal wellness & performance.

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IF YOUR PAIN DOES NOT SETTLE WITHIN A FEW WEEKS OR AFFECTS YOUR SLEEP, SEEK THE HELP OF A QUALIFIED HEALTH PROFESSIONAL.

Angela Jackson was a young athlete who had an injury that ended her sporting dreams. That has fuelled a passion to deliver high-quality diagnosis and treatment for all young athletes in a career as a physiotherapist spanning 35 years. She has helped athletes of all ages and abilities achieve their potential including supporting her own 2 children to international success.

For almost two decades, she has worked as the Physiotherapist to the Cheshire Cricket Board and advises Premier League Football Academies across the globe.

As a passionate educator, Angela lectures internationally, is the author of multiple online courses, and advocates for a specialised approach to rehabilitating injured young athletes through the platform, "Kids Back 2 Sport."

LUCY GILLBANKS

Lucy Gillbanks was a light weight rower who competed internationally and had symptoms of REDs. Since recognising the symptoms in herself, she then went onto to study REDs at Oxford University and has published multiple academic papers on the topic.

Lucy continues with sports like rowing, running and skiing now without any symptoms of REDs.

Lucy works as a physiotherapist guiding athletes of all ages with their rehab and symptoms of REDs.