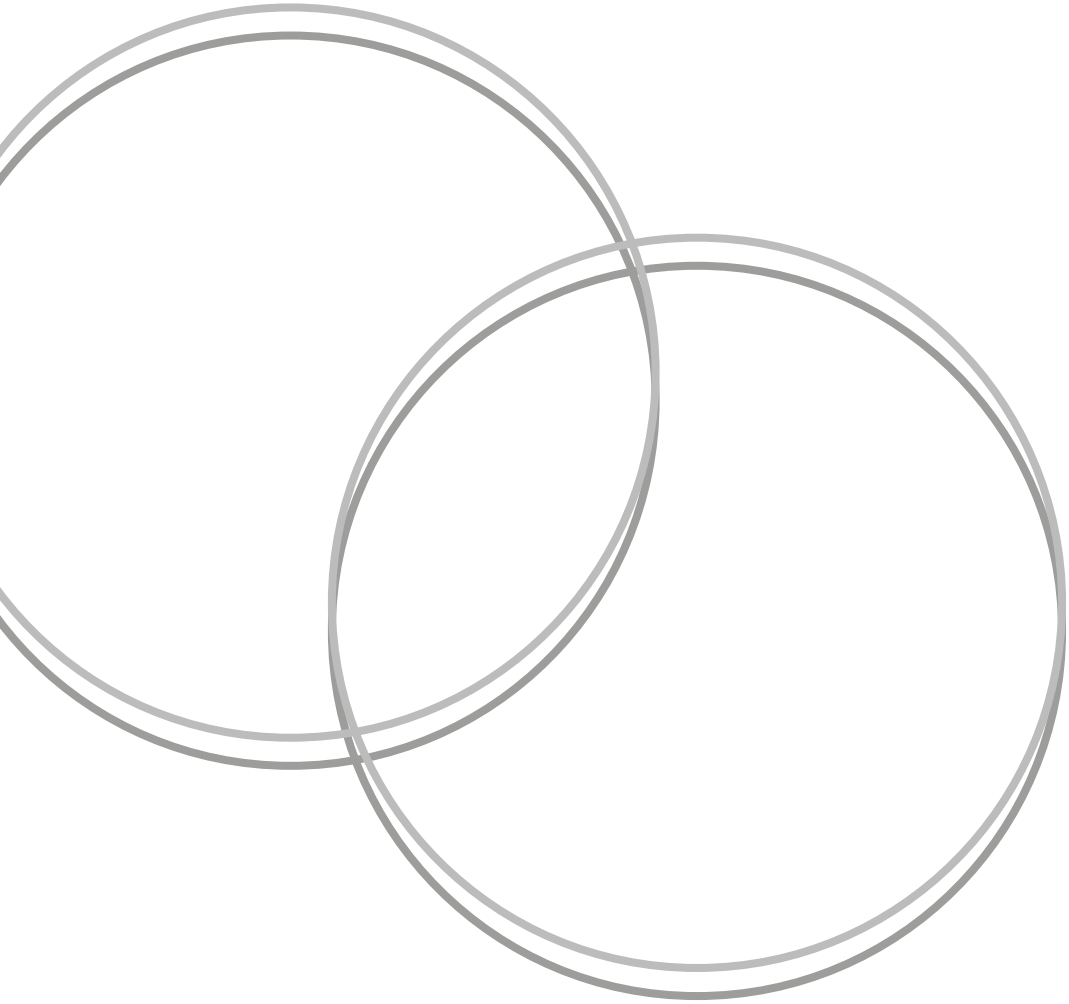
Oxford University Hospitals
NHS Foundation Trust

Relative Energy Deficiency in Sport (RED-S)

Information for patients

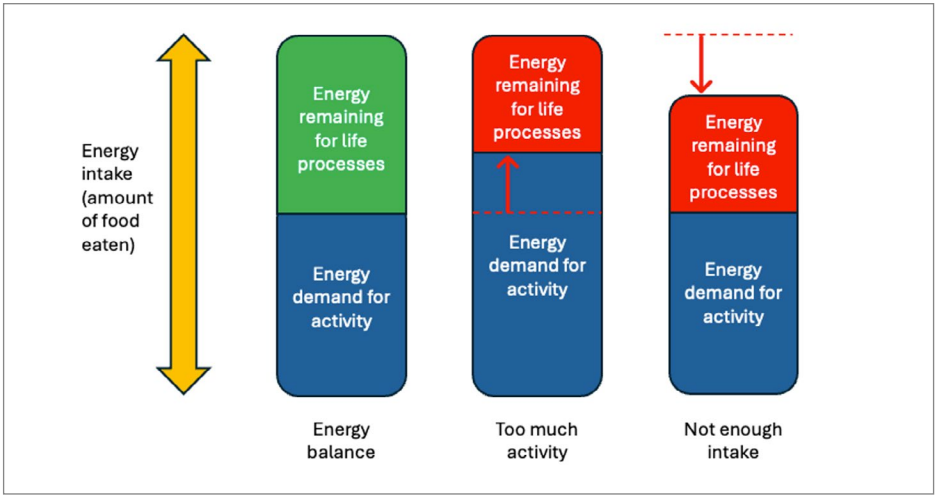


What is RED-S?

Relative Energy Deficiency in Sport (RED-S) is a condition which affects both health and performance. It occurs when there is **Low Energy Availability (LEA)**, meaning a person is not consuming enough energy from food to support both the amount of exercise they are doing and normal body functions.

ENERGY AVAILABILITY = ENERGY INTAKE – EXERCISE ENERGY EXPENDITURE

LEA can happen when someone is not eating enough to support their activity level. This can be accidental. When this imbalance persists, the body begins to conserve energy by slowing down or shutting off functions that are not essential for immediate survival. This can affect hormones, bone health, immune function, mood, gut health, and athletic performance. Recognising and addressing RED-S early is important both for long-term health and success in sport. Think of RED-S as like running constantly on a low battery.



Problematic LEA can lead to:

Health effects

- Tiredness/fatigue
- Reduced ability to concentrate at school/work
- Increased anxiety and low mood
- Delayed puberty and growth
- Irregular or no periods in females
- Low libido (sex drive)
- Low testosterone levels in males (reduced morning erections)
- Poor bone health including osteoporosis and stress fractures
- Nutritional deficiencies like low iron
- Impaired immunity with frequent illness

Performance effects

- Decreased endurance
- Decreased muscle strength
- Decreased energy (glycogen) stores
- Increased injury risk
- Increased irritability
- Reduced response to training
- Reduced coordination
- Decreased concentration
- Decreased judgement

Nutrition Guidance for Energy Restoration

If you've been told you may have RED-S, or think you're at risk, the most important step for recovery is to restore your energy balance. This means making sure your body is getting enough food for both your training and daily life. In some cases, you may need to reduce or even pause your training for a while to protect your health and support recovery.

Remember, it's not just formal exercise that uses energy. Everyday activities like walking the dog, cycling to work, or having a physically active job also increase your energy needs — and these should be factored into your energy demands.

Your strongest tool for recovery is to nourish and fuel your body back into balance.

Eating enough overall

As a general starting point, females need to eat at least 2000 kcal per day, and males need at least 2500kcal per day. People with RED-S may need much more than this because they are likely to be more active and may need to make up for a lack of calories over time.

For example, a 60kg female with 20% body fat who is doing exercise that burns 500kcal per day should be eating at least 3100kcal per day to maintain normal function.

Nutrient timing

Fuelling correctly requires planning and preparation to make sure it can be fitted into busy schedules.

Here are some tips and tricks to get started:

- Aim to eat every 2-4 hours with 3 main meals and at least 3 snacks per day
- Fuel your training with a carbohydrate-rich meal or snack beforehand
  - o Jam toast
  - o Banana
  - o Oat bar/flapjack
  - o Fruit loaf
- Replenish your body immediately after training sessions with a meal or snack that contains protein and carbohydrate
  - o Peanut butter bagel
  - o Fruit and yoghurt
  - o Cheese on toast
- Consider having a protein-rich drink or snack before bed to increase total calorie intake and fuel muscle recovery whilst you sleep
  - o Hot chocolate with full fat milk
  - o Protein porridge or overnight oats

Avoid fasting

Fasting can increase stress hormone levels and drain energy stores in the body, which can make it harder to train well and recover properly. If your body doesn't have enough energy available — even for short periods during the day — it can increase the risk of RED-S. Always start training well fed by fuelling morning sessions with some carbohydrates, and make sure to eat at regular periods throughout the day.

You can't always trust your appetite

Training sessions can suppress appetite so you may have to eat when you are not hungry. On high training days especially, you will need to eat beyond hunger. At times like this you can think about eating as part of your training- helping your body recover, get stronger and adapt to the exercise you're doing.

Be mindful of micronutrients

People who exercise a lot have higher needs of some micronutrients than usual recommendations – so make sure that you are eating an energy-dense balanced diet

- **Calcium**
  - o Aim for 3 servings of calcium containing foods per day (milk, yoghurt, or fortified plant-based alternatives)
- **Iron**
  - o Red meat, dark green leafy vegetables, fortified breakfast cereals each day
- **Vitamin C**
  - o Include a variety of fruits and vegetables to get your vitamin c and lots of other antioxidants
- **B Vitamins and Fibre**
  - o Include pulses and wholegrain carbohydrates each day
- **Vitamin D**
  - o At risk adults in the UK should be supplementing with vitamin D, particularly in the winter months

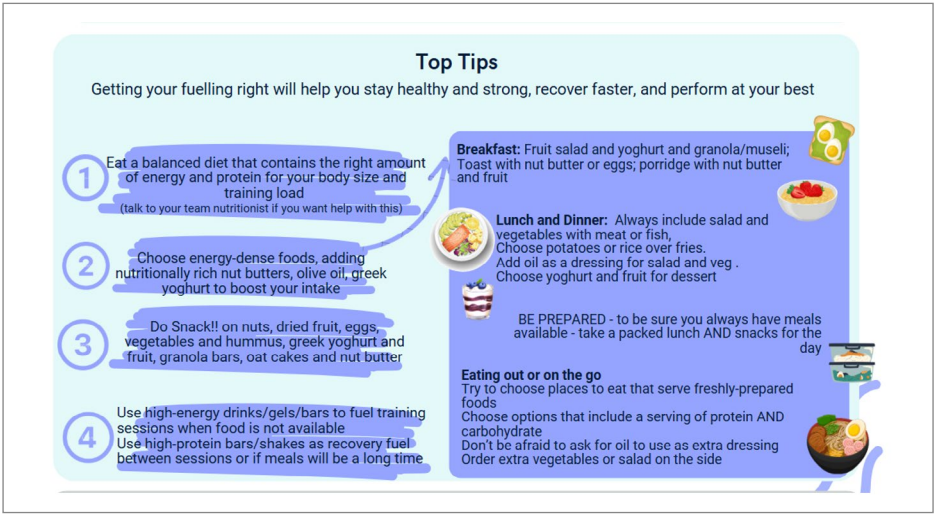
Resources

https://reneemcgregor.com

https://red-s.com

Health4performance.basem.co.uk

https://yourgafa.com



Managing Stress

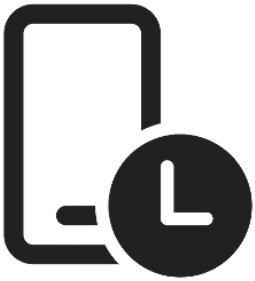
Psychological stress can play a significant role in the development and persistence of RED-S through its effect on hormonal balance. Stress can arise from many sources – such as work, studies, relationships, finances, or even the pressure to perform in sport. Managing stress is an important part of recovery, as high stress levels can interfere with both physical healing and hormonal regulation. Finding strategies that work for you is key.

Ideas for stress management:

- Mindfulness practice
- Apps such as Calm or Headspace
- Gentle yoga
- Deep breathing techniques
- Social support, whether through friends, family or a support group

Possible lifestyle adjustments:

- Limiting stimulant intake such as caffeine
- Sleep hygiene
- Maintaining a regular schedule
- Creating a relaxing bedtime routine
- Ensuring a comfortable environment to sleep in
- Minimising blue light exposure
- Reducing screen time and time on social media



Resources

Youngminds.org.uk

www.rcpsych.ac.uk/mental-health/parents-and-young-people

Adjusting Training and Active Recovery

Taking time out of training can feel challenging – especially when you're enjoying it or seeing progress. There's often a belief that more training equals better results, and external pressures from coaches, teammates, or social media can reinforce the idea that you should always be doing more. However, research clearly shows that rest and recovery are essential for performance improvement. The benefits of training – known as adaptation – occur during periods of rest, not during the training itself.

Rest days allow your body and mind to recharge, helping to boost energy, motivation, and reduce the risk of burnout or injury. It's also crucial to maintain proper nutrition on rest days. Your body still needs energy and nutrients to repair, recover, and prepare for the next session. Prioritising recovery is not a sign of weakness – it's a key part of long-term athletic success and health. Be active about prioritising recovery time.

Contraception

Even if you are not having regular periods, you still need contraception if you are having sex with a male partner and don't want to get pregnant. This is because it is unpredictable when you might ovulate. This includes if you have been offered hormonal replacement therapy (HRT) to protect your bones.

Hormonal contraception includes long-acting methods (such as the implant, injection or the intra-uterine device) and methods you take regularly (for example the progestogen-only pill, or combined hormonal contraceptive pill, ring or patch). However, hormonal contraception can change your bleeding pattern. The bleeding you may have with hormonal contraception is not a true period, it is your body's response to the contraceptive hormones. It can be regular, irregular or you may have no bleeding at all, but because this is not a true period it cannot be used as a marker of recovery from RED-S. For this reason, barrier methods such as male or female condoms, or non-hormonal methods such as the copper coil may be recommended, to allow monitoring for the return of menstruation.

In RED-S, bone health is often affected, leading to low bone density (weaker bones) and increased risk of fractures.

This means caution is needed with certain contraceptives:

- Depot medroxyprogesterone acetate (e.g. Depo-Provera injection)
  - o Not recommended, as it can further lower bone density, especially in people already at risk
- Combined oral contraceptive pill (COCP)
  - o Not beneficial for bone health and may be detrimental
  - o The withdrawal bleed is not a true period so it should not be prescribed to 'regulate' or restart periods
  - o Should be avoided in RED-S if possible
- Progesterone only pill (POP)
  - o There have been no studies specifically looking the effects of the progesterone only pill on bone density, so we don't know whether it is detrimental to bone health

If you have any concerns or questions about contraception, you can discuss these with your GP or arrange an appointment with Oxfordshire Sexual Health Service.

Resources

https://www.contraceptionchoices.org/

https://www.sexualhealthoxfordshire.nhs.uk/

References

https://health.cornell.edu/sites/health/files/pdf-library/RED-S.pdf

https://www.mdpi.com/2673-396X/2/3/20

https://www.rhreproductivehealth.com/post/overcoming-ha-a-holistic-approach-to-hypothalamic-amenorrhea-recovery

https://bjsm.bmj.com/content/57/17/1073

https://pmc.ncbi.nlm.nih.gov/articles/PMC5983157/

https://www.fsrh.org/Public/Documents/fsrh-ceu-guidance-young-people-mar-2010.aspx

https://www.fsrh.org/Public/Documents/fsrh-ceu-statement-contraception-for-women-with-eating-disorders.aspx

https://theros.org.uk/media/1veaitxx/depo-provera-and-osteoporosis-fact-sheet-april-2017.pdf

Further information

If you would like an interpreter, please speak to the department where you are being seen.

Please also tell them if you would like this information in another format, such as:

- Easy Read
- large print
- braille
- audio
- electronic
- another language.

We have tried to make the information in this leaflet meet your needs. If it does not meet your individual needs or situation, please speak to your healthcare team. They are happy to help.

Author: Carys Webster
September 2025
Review: September 2028
Oxford University Hospitals NHS Foundation Trust
www.ouh.nhs.uk/information

Leaflet reference number: OMI 115727