Fuelling the saddle.

Nutrition for cycling

Evan Lynch B.Sc./PG Dip/RD

Introduction

- Former international racewalker (5km-20km)
- B.Sc. Food Science & Health (UL)
- PG Dip Dietetics (UM)
- M.Sc. Sports & Exercise nutrition (UU)
- Worked with AAI & Munster Athletics
- Cycling Ireland Junior Athlete Development Program
- Work with professional/international athletes across a wide range of sports – high jump, powerlifting, boxing, mid-distance, marathon, triathlon, cycling, rowing, race-walking, soccer & rugby

Areas we can work on

- Maximize recovery
- Race day nutrition (endurance guys especially)
- Deciding when fat fuelled workouts are appropriate
- Getting adequate protein (muscle mass & immune function)
- Managing stomach issues (if they arise)
- Periodizing our carbohydrates to training
- The supplement lists
- Food relationships…
- Etc.

Athlete needs

- Increased fluid needs (increases with every hour of training)
- Endurance training will zap through your glycogen stores, leading to much higher carbohydrate demands, depending on time of year and work load, the metabolic pathways worked differ, leading to periodized needs.
- Higher mileage leads to elevated levels of foot strike haemolysis, endurance athletes need more iron than a normal person.
- Higher mileage also leads to an increase in muscle turnover, endurance athletes need more protein than a normal person.
- What is a normal person?
- The average person only gets 7 hours sleep, has little to no physical activity, are overweight and struggle to eat their 5 a day.
- RDA & NRV values are based on "normal people"

Carbs

In training:

- These vary quite a lot
- Baseline 30g CHO/hr
- Rest day (3-4g/kg/day)
- 6% solution easy on tummy (Sports drink)
- <60 mins training (approx. 5g/kg/day)
- Anyone with IBS avoid **FRUCTOSE**
- 60-180 mins training (6-10g/kg/day)
- >180 mins training (8-12g/kg/day)
- Carb loading prior to race (unwarranted)

Burke et al, 2019

Carbs

- Pre training (within 60 mins prior to session) getting approx. 30g carbs
- During training aiming to get approx. 30g/hr
- Post training (within 20 mins) sugar rich snack 0.5g/kg
- 1-1.5g/kg/carbs meals post training
- ½ carb portions on rest days

What do the numbers look like??

15g carbs:

- Glass juice/milk
- 150g yogurt with honey/Rice pudding
- ½ English muffin/bagel/crumpet
- ½ cup peas/beans/lentils
- Small portion fruit/cup berries
- Slice pizza
- Tbsp. honey/syrup

30g carbs:

- ½ pack microwave grains
- 150g egg noodles
- Slice toast with jam
- 40g cereal
- Medium potato
- 75g rice/pasta/spaghetti
- 40g quinoa/couscous
- Banana/mango/papaya portion
- Handful dried fruit
- Natural confectionary/Haribo
- Bagel

60g carbs:

- 220g microwave grains
- 300g egg noodles
- Raisin bagel with jam
- 70-80g oats/cereal
- 300g potato
- 150g pasta/spaghetti/rice
- 80g couscous/quinoa
- 3 x medjool dates

During training

- INEOS 1.59, Breaking 2…
- Events 10km + benefit from taking on fluids + CHO during event
- 6% solution (commercial sports drink) and below are all well tolerated by the gut, aiming higher is often necessary.
- Plan to take a mouthful at set time intervals, programmed over Ad libitum results in higher fluid intakes (twice as much).
- Avoid products with polyols (sorbitol/mannitol/xylitol)
- Try to opt for 2:1 source *(maltodextrin: fructose)*
- Max absorption rate of 90g/hr during exercise*
  - GLUT5 can transport 30g fructose (pentose sugars)
  - SGLT can transport 60g of glucose/maltodextrin (hexose)
  - IBS sufferers will struggle to reach max intake values*

(Goulet & Hoffman, 2019; Stellingwerff & Cox, 2014)

During training

BEST WAY TO OPTIMIZE FUEL/HYDRATION TACTICS AND TO LIMIT GUT ISSUES?

Practice!!

- Increased gastric tolerance
- Mouth feel and mouthfuls
- Increased intestinal receptors
- Increase fluid viscosity

(Jeukendrup 2017)

Supplement needs

- Whey (Myprotein offers value for money)
- Creatine monohydrate (8-10g/day)
- Carb gels/powders (tough/long sessions & race day)
- Caffeine gels (race day prep)
- Iron/B-complex (as bloods dictate)
- Vit D (as bloods dictate)
- Omega 3 fish oil/krill oil (if diet is lacking)

Protein needs

- Power athletes need approx. 1.2-1.4g/kg/d
- Weight loss & injury aiming for 2.2-2.4g/kg/d
- For optimal levels of MPS, aim for 25-30g protein every 3hrs
- Aiming to get high quality protein (essential AA's + good leucine dose)
- Let's do a worked example

- **80kg man, walker healthy & non-injured (80 x 1.4 = 112g/day)**
- Breakfast: 1 x wholemeal bagel (10g) + 2 scrambled eggs (14g) **(24g total)**
- Mid-morning snack: Piece fruit-cake+ handful nuts (5g) **(5g total)**
- Lunch: Wrap with med. chicken breast (30g) + handful grated cheese (10g) **(40g total)**
- Dinner: Small salmon fillet (23g) + 200g wholegrain rice (8g) + 3 handfuls greens (12g) **(43g total)**
- **Total 112g**

Protein needs
(special considerations)

Food	Limited Amino Acid	Complement
Beans	Methionie	Grains, nuts, seeds
Grains	Lysine, threonine	Legumes
Nuts/seeds	Lysine	Legumes
Vegetables	Methionine	Grains, nuts, seeds
Corn	Tryptophan, lysine	Legumes

- Getting a full compliment of amino acids at each meal
- Leucine dose reached with dairy, meat, poultry & egg servings
- Whey protein and hard cheeses safe for lactose intolerant individuals
- People with IBS may encounter bloating from certain protein bars or diet blends due to polyol content

Protein sources

PLANTS

- Kidney beans (7g/100g/91kcal)
- Chickpeas (7.2g/100g/114kcal)
- Baked beans (5g/100g/80kcal)
- Lentils (8.8g/100g/103kcal)
- Greens (6.7g/100g/78kcal)
- Seeds (2.9g/tablespoon/68kcal)
- Handful mixed nuts (7.1g/30g/174kcal)
- Bagel (8.2g/avg. bagel/220kcal)
- Oats (1g/tablespoon/37kcal)
- Grains (4.7g/100g/104kcal)

DAIRY

- Fat free Skyr (10g/100g/71kcal)
- Fat free Greek (10.6g/100g/56kcal)
- Milk (3.4g/100ml/64kcal)
- Protein milk (5.1g/100ml/48kcal)
- Whey concentrate (23g/scoop/120kcal)
- Soft cheese (4.2g/tablespoon/28kcal)
- Fulfil bar (21g/55g bar)
- Hard cheese (5.6g/matchbox/92kcal)

MEAT

- Chicken (37g/avg. fillet/175kcal)
- Turkey (18g/avg. burger/120kcal)
- Salmon (23g/avg. fillet/205kcal)
- Cod (10.8g/small fillet/45kcal)
- Lean mince (22g/100g/125kcal)
- Tuna (22.4g/half tin/98kcal)
- Tofu (9g/quarter block/97kcal)

Myth alert

- **Does the 30 minute window (anabolic window) matter?**
- No, overall protein intake is the most important factor.
- **Can I only absorb 25g of protein at a time?**
- No, but the dose response for protein intake & MPS tops out here.
- **High protein diets are bad for you, right?**
- Not necessarily, studies have shown that up to 3.3g/kg/day over a year is actually fine… RDA is 0.8g/kg for context

Fat intake

Fat shouldn't exceed 30% energy needs
PUFA should be around 10% energy needs
Athletes need twice the Omega 3's intake
Trans fats should be avoided at all costs

- Add 2 teaspoons of extra virgin olive oil to meals
- Include 2-3 teaspoons of chia/flax seeds per day
- Aim for a handful of nuts per day
- Full fat dairy (if not trying to lose weight)
- 1-2 eggs per day
- Avoid frying in oil & deep frying
- Avocado to bulk up smoothies & meals

Afterthought:

Atkins, low carb, paleo, ketogenic diets??

Think about this

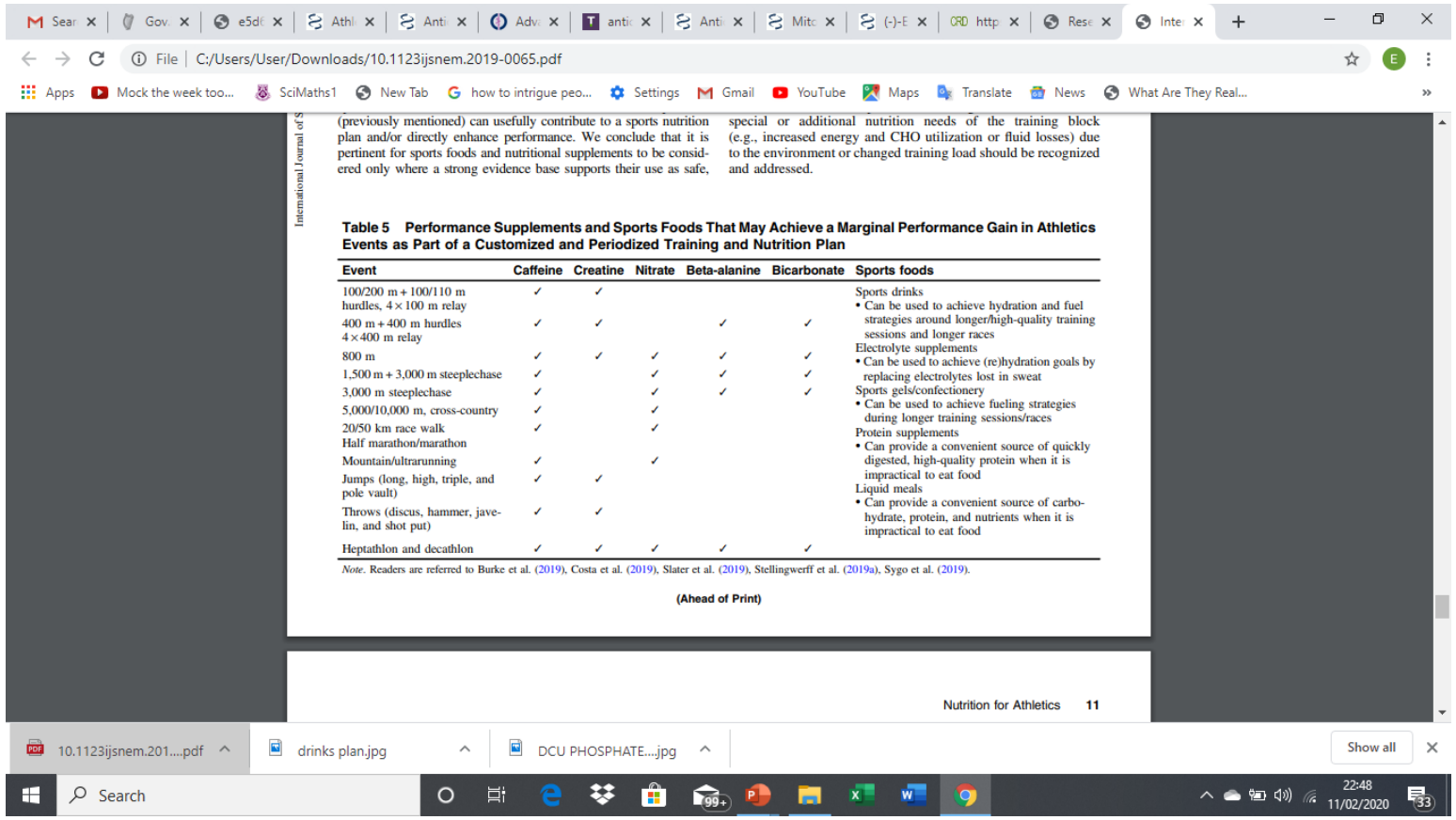
- Fat oxidation peaks at 65% VO2 max (most endurance events fall somewhere between 75-85% VO2 max)
- High fats diets & meals can lead to acute reductions in ability to metabolise carbs during exercise
- Consuming carbs essentially steers your body away from fat metabolism
- With all this in mind, does a hight fat dietary approach make sense for you?

Ergogenic aids & supplements

Supplement	Dosage	Timing	Notes
Creatine *monohydrate*	8-10g/d maintenance 20g/d loading	Irrelevant	Not applicable only for individuals with pre-existing kidney conditions or high creatinine levels.
Caffeine	0.5mg/kg	30 mins pre event	Can cause GI upset, possible to develop sensitivity, ideally kept for key sessions and races. Avoid at night. Can increase glycogen repletion post exercise.
Beta alanine	Approx. 5-6g/day 4 wks	Irrelevant	Helps with lactic acid buffering but can cause stomach issues and paraesthesia
Nitrate (beetroot juice)	6-8mmol nitrate	60-90 mins pre event	Can cause GI problems, tastes disgusting and is less effective the more trained you are.
Sodium bicarbonate	0.2-0.4mg/kg	48hrs pre event	Can cause gastric issues, splitting into smaller doses over longer period of time would work best

(Loureiro et al. 2018)

Ergogenic aids & supplements



(previously mentioned) can usefully contribute to a sports nutrition plan and/or directly enhance performance. We conclude that it is pertinent for sports foods and nutritional supplements to be considered only where a strong evidence base supports their use as safe, special or additional nutrition needs of the training block (e.g., increased energy and CHO utilization or fluid losses) due to the environment or changed training load should be recognized and addressed.

Table 5 Performance Supplements and Sports Foods That May Achieve a Marginal Performance Gain in Athletics Events as Part of a Customized and Periodized Training and Nutrition Plan

Event	Caffeine	Creatine	Nitrate	Beta-alanine	Bicarbonate	Sports foods
100/200 m + 100/110 m hurdles, 4 × 100 m relay	✓	✓				Sports drinks • Can be used to achieve hydration and fuel strategies around longer/high-quality training sessions and longer races
400 m + 400 m hurdles 4 × 400 m relay	✓	✓		✓	✓	Electrolyte supplements • Can be used to achieve (re)hydration goals by replacing electrolytes lost in sweat
800 m	✓	✓	✓	✓	✓	Sports gels/confectionery • Can be used to achieve fueling strategies during longer training sessions/races
1,500 m + 3,000 m steeplechase	✓		✓	✓	✓	Protein supplements • Can provide a convenient source of quickly digested, high-quality protein when it is impractical to eat food
3,000 m steeplechase	✓		✓	✓	✓	Liquid meals • Can provide a convenient source of carbohydrate, protein, and nutrients when it is impractical to eat food
5,000/10,000 m, cross-country	✓		✓			
20/50 km race walk Half marathon/marathon	✓		✓			
Mountain/ultrarunning	✓		✓			
Jumps (long, high, triple, and pole vault)	✓	✓				
Throws (discus, hammer, javelin, and shot put)	✓	✓				
Heptathlon and decathlon	✓	✓	✓	✓	✓	

Note. Readers are referred to Burke et al. (2019), Costa et al. (2019), Slater et al. (2019), Stellingwerff et al. (2019a), Sygo et al. (2019).

(Ahead of Print)

Nutrition for Athletics 11

Burke et al, 2019

Peeling et al, 2019

Ergogenic aids & supplements

- Athletes need twice as much Omega 3 fatty acids (DHA/EPA), supplementing with Krill oil, Omega 3 oil sometimes essential
- Calcium, Vitamin D & Iron required in higher amounts by athletes, supplementation dependant on dietary preference, season + clinicals
- Collagen & Vitamin C may help with connective issue injury
- Whey Protein or equivalent if needs are high (they likely are)

Fluid needs & hydration

- Baseline 35ml/kg/day
- 500-600ml/hr/exercise
- Sports drinks with Sodium/Carbs lead to better water absorption
- 2-3% dehydration leads to increase perceived effort + stroke volume
- Sports dehydration is classed as hypertonic hypovolemia
- How do we measure levels of hydration?
- Urine colour? (vasopressin already working to reabsorb water)
- Research into college athletes using urinary Osm of 700mOsm/kgH20 shows over half were dehydrated, whereas serum levels disagreed.
- Thirst? (Delayed response to serum Osmolity changes and angiotensin)

(Hew Butler et al. 2018; Leib et al. 2018)

Fluid needs & hydration

- **What to do?**
  - Pre-empt dehydration, always carry a bottle on hand
  - Sprinkle salt on some of your meals
  - Get your fruits and veggies in (approx. 10% fluids)
  - Never compensate on race day with fluid needs
  - Sports drinks when training

- 1% dehydration will stimulate thirst
- 2-3% dehydration will result in vasopressin action
- Every 1% dehydration results in a 0.25° Celsius rise in core temp
- Cognitive function drops, less blood flow to muscles, lower stroke volume

(Vandermark, 2016; Backes et al, 2016)

Getting the most out of your session

Session	Before	During	After (within 20 mins)
GYM	Piece of fruit (30g carbs) Caffeine & creatine	Water/Iced coffee	0.5g/kg carbs + coffee
Tough session (tempo/TT)	Double portion meal before	30g+/CHO/hr Caffeine hit @80% completion	0.5g/kg carbs + coffee
Recovery ride or cross training <60mins	Low CARB Caffeine + Protein 2hrs pre	Water	1g/kg carbs + coffee
Long ride 1. off season 2. Race season	1. Low CARB Caffeine pre 2. Double portion meal before	1. Start CHO feed @ ½ way 2. 30g+/CHO/hr	Protein shake + 1g/kg carbs + coffee

Managing gut issues

- Aversion of fibre/fat in meal & snack closest to training
- Low fibre/residue diet (opposite of healthy eating) 2-3 days pre race
- Avoiding sugar alcohols/carbonated beverages pre training/race (mannitol/sorbitol/xylitol)
- **Being hydrated**
- Fuelling as outlined + **practicing in training**
- Caution with caffeine
- Trial probiotics (multi-strain 1/day) & L-glutamine (10g dose 2 hrs prior to key sessions only)

Race day

- High carb breakfast 3-4 hours pre event (1.5g/kg)
- Piece fruit + protein shake 2 hrs pre event
- Sip sports drink over 60 mins pre event
- 500-600ml fluid with 30g+ carbs per hour racing
- Caffeine gel or strong coffee before warming up
- Sugar rich snack ASAP (haribo) + protein shake
- Get to a meal ASAP

Injury/illness management

Injury

- Oily fish/chia/flax/omega 3 eggs/cod liver oil help to manage any excess inflammation
- ALL the fruit and veg (cherryactive if you're a picky eater)
- Collagen and vitamin C supplementation for connective tissue injury
- 2.4g/pro/kg/day

Illness

- Garlic
- Ginger/red onion
- Vit C + Zinc
- Fluids
- NOT taking iron

Alcohol

- Dehydrates you (1-2% leads to 20-30% performance reduction for 2-3 days)
- Diuretic effect leads to dehydration, leading to reduced blood flow capacity (less 02 & fuel to muscles)
- Alcohol will also effect focus, co-ordination & ability to metabolize energy
- Alcohol disrupts sleep architecture, results in poor muscle growth & recovery
- NOT within 10 days of a game
- For men, 14 units per week (7 pints)
- For women, 7 units per week (7 glasses)

Travelling

Don’t drink tap water or share bottles
Avoid using ice in restaurants
Salads, paté and steak tartare would be unwise
Peel fruit or veg if consuming them
If possible, avoid buffet style setups
Bring provisions of dried fruit, nuts, seeds, protein bars & powders
Start a traveller’s probiotic approx. 3 days prior to travel (Lactobacillus acidophilus, Saccharomyces boulardii & Bifidobacterium bifidum)
Hand sanitizer

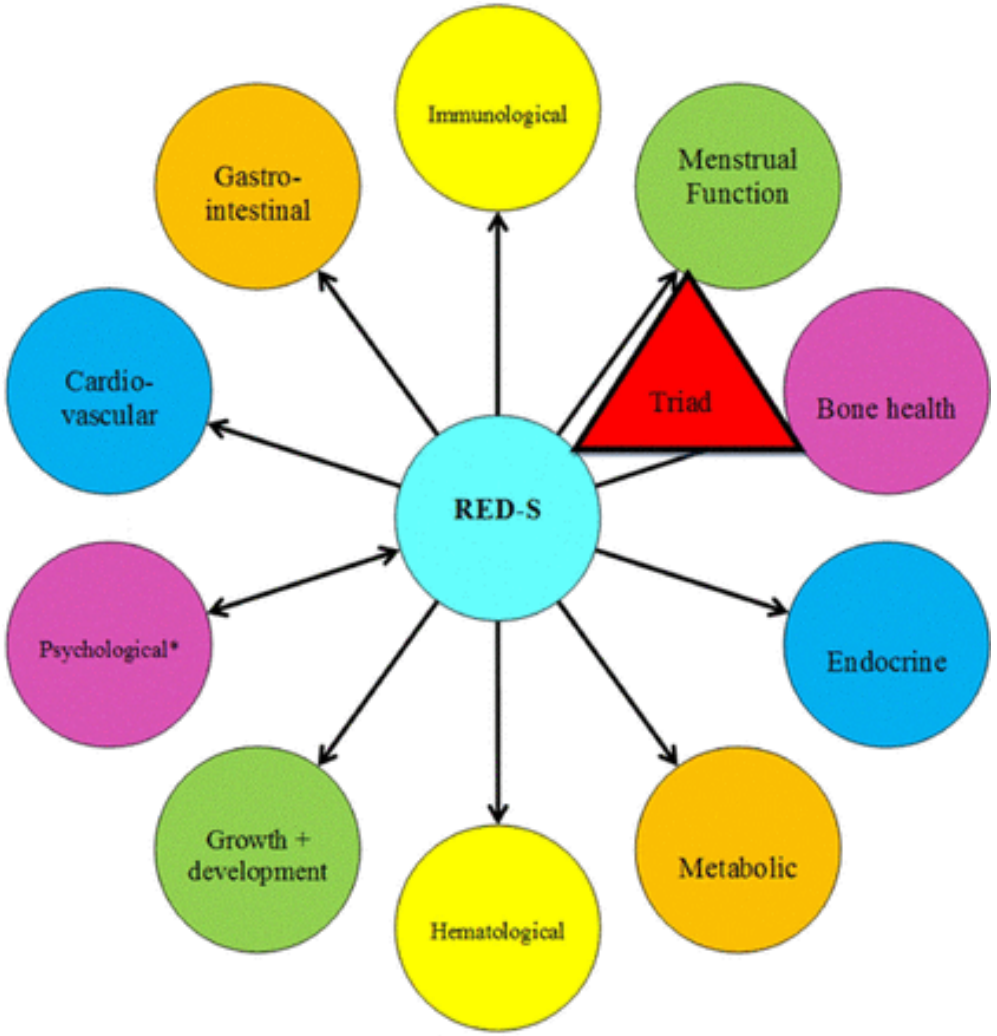
JET LAG + FLYING

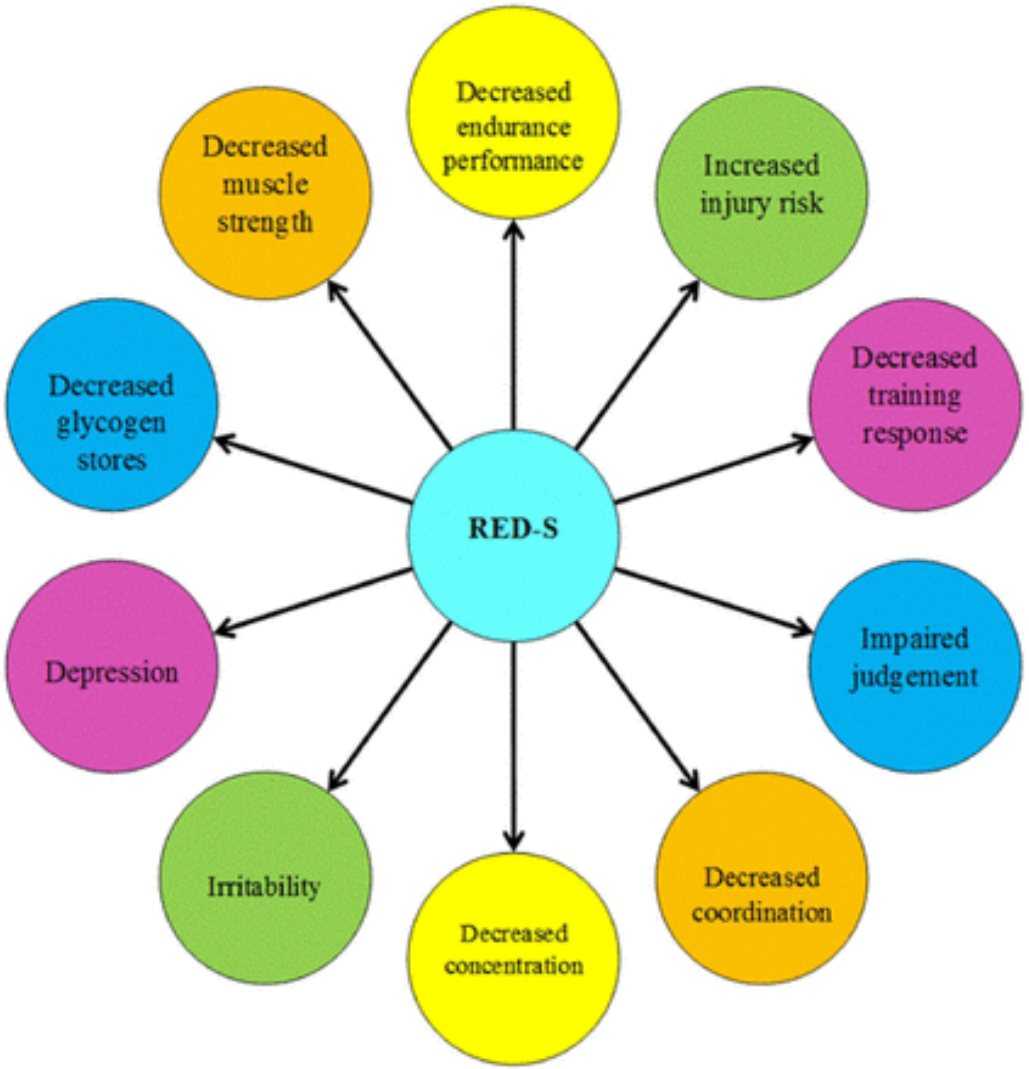
- Work back from local time in travel destination
- Caffeine: between 6-12 noon local time, limit after 3pm
- Melatonin: 8-10pm local time OR carb/tryptophan rich snack (fruit + pistachios)
- Try avoid airliner foods

A little about eating behaviour

- What are some things athletes are *supposed* to do?
- Cultural and social media expectations play a part…
- Aesthetics does not equal performance (except in bodybuilding)
- Disordered eating behaviour can lead to low energy availability, this puts an athlete at risk of low BMD, stress fractures and loss of menstrual function due to cortisol mediated inhibitions of oestrogen activity
- Female athlete triad & RED-S affect both men and women
- Risk when total intake of calories less than 30kcal/kg ffm/day
- Risk diminishes at 45kcal/kg ffm/day

(Mountjoy et al, 2018; Logue et al, 2018)





(Mountjoy et al, 2018)

Plan B options

- Snack: Fulfil bar + milk based coffee
- Snack: Small bag cashews + piece of fruit
- Meal: Deli counter wholemeal wrap (lean protein, 3 x salad + low fat sauce)
- Meal: Juice + salad bowl with lean protein & beans

- Protein: Fulfil bar, Avonmore protein milk, Biltong jerky, milk based coffee.
- Fats/Fibre: Any type mixed nuts, cliff bar.
- Carbs: Fruits, juice, smoothie.

Thanks for listening

- Any questions?

References

- https://journals.humankinetics.com/view/journals/ijsnem/29/2/article-p73.xml
- https://journals.humankinetics.com/view/journals/ijsnem/29/2/article-p198.xml
- https://journals.humankinetics.com/view/journals/ijsnem/29/2/article-p73.xml
- https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5812394/
- https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5957508/
- https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4993146/
- https://opencommons.uconn.edu/cgi/viewcontent.cgi?article=7449&context=dissertations
- https://bjsm.bmj.com/content/52/11/687
- https://www.ncbi.nlm.nih.gov/pubmed/28983802
- https://assets.gov.ie/41141/e5d6fea3a59a4720b081893e11fe299e.pdf
- https://www.ncbi.nlm.nih.gov/pubmed/30659500
- https://www.ncbi.nlm.nih.gov/pubmed/24951297
- https://www.ncbi.nlm.nih.gov/pubmed/29345166
- https://www.ncbi.nlm.nih.gov/pubmed/28332114