Relative Energy Deficiency in Sport (RED-S) in Rowing
–
Early Identification and Prevention

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overview

- Why topic is important
- **RED-S**
  - Basic definition & evolution from female athlete triad
  - Energy availability concept explain
  - Health consequences
  - **Performance consequences**
  - Early identification – signs
  - Prevention – **education of coaches & athletes**

- **Education**
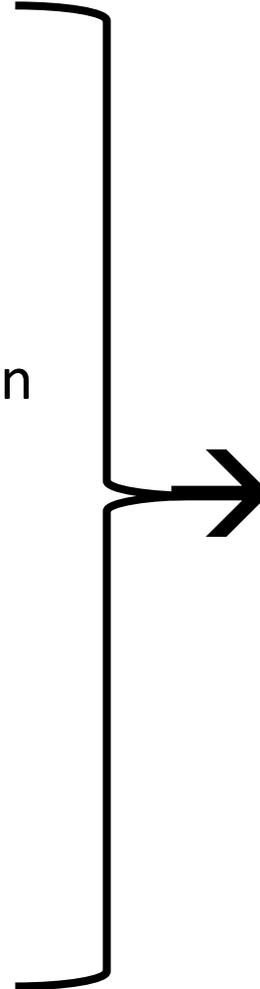 - Athlete nutrition pyramid (for rowers)

- Summary
- Questions

Why is RED-S an important topic for coaches?

❑ **Healthy athletes =**

  ➢ Reduced injury risk

  ➢ Increased training availability

  ➢ Improved concentration and attention

  ➢ Optimal mental health

  ➢ Better training quality

❑ **Maximising training adaptations**

❑ **Longevity in the sport**

performance gains

Relative Energy Deficiency in Sport

Definition:

*"A syndrome which refers to **impaired physiological functioning** caused by **relative energy deficiency** and includes, but is not limited to, impairments of metabolic rate, menstrual function, bone health, immunity, protein synthesis and cardiovascular health"*
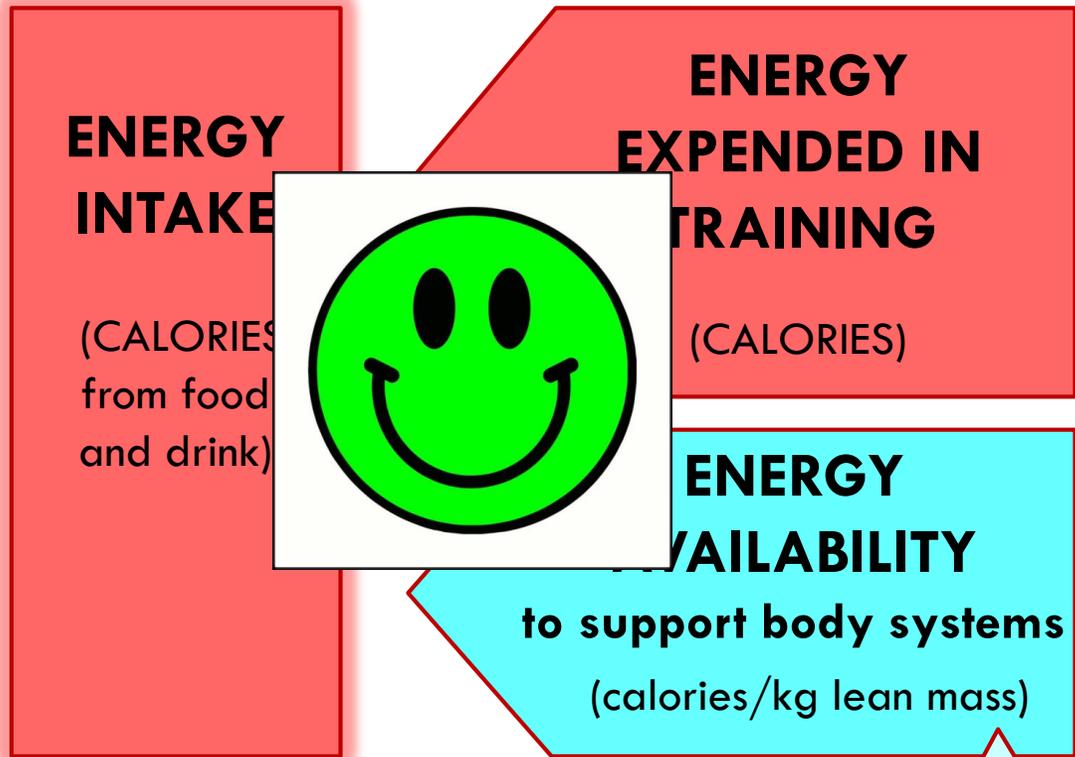
(Mountjoy et al, 2014)
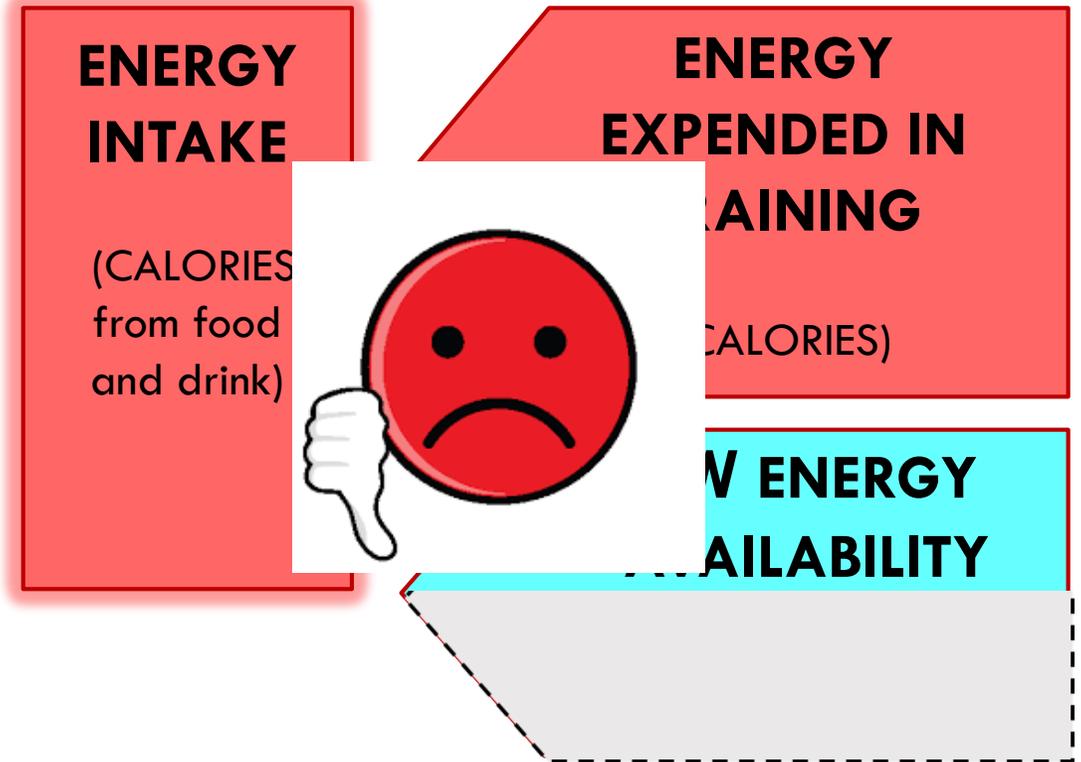
- *The underlying factor is* **low energy availability**

Put simply:

Athletes not eating enough to meet the demands of training, which results in a variety of physical problems

ENERGY INTAKE

(CALORIES from food and drink)

ENERGY EXPENDED IN TRAINING

(CALORIES)

ENERGY AVAILABILITY

to support body systems

(calories/kg lean mass)

- Growth
- Thermoregulation
- Cellular maintenance
- Reproduction etc.

ENERGY INTAKE

(CALORIES from food and drink)

ENERGY EXPENDED IN TRAINING

(CALORIES)

LOW ENERGY AVAILABILITY

=
sacrifice energy requiring functions

=
sacrifice body energy stores

1992: ORIGINAL "Female Athlete Triad"
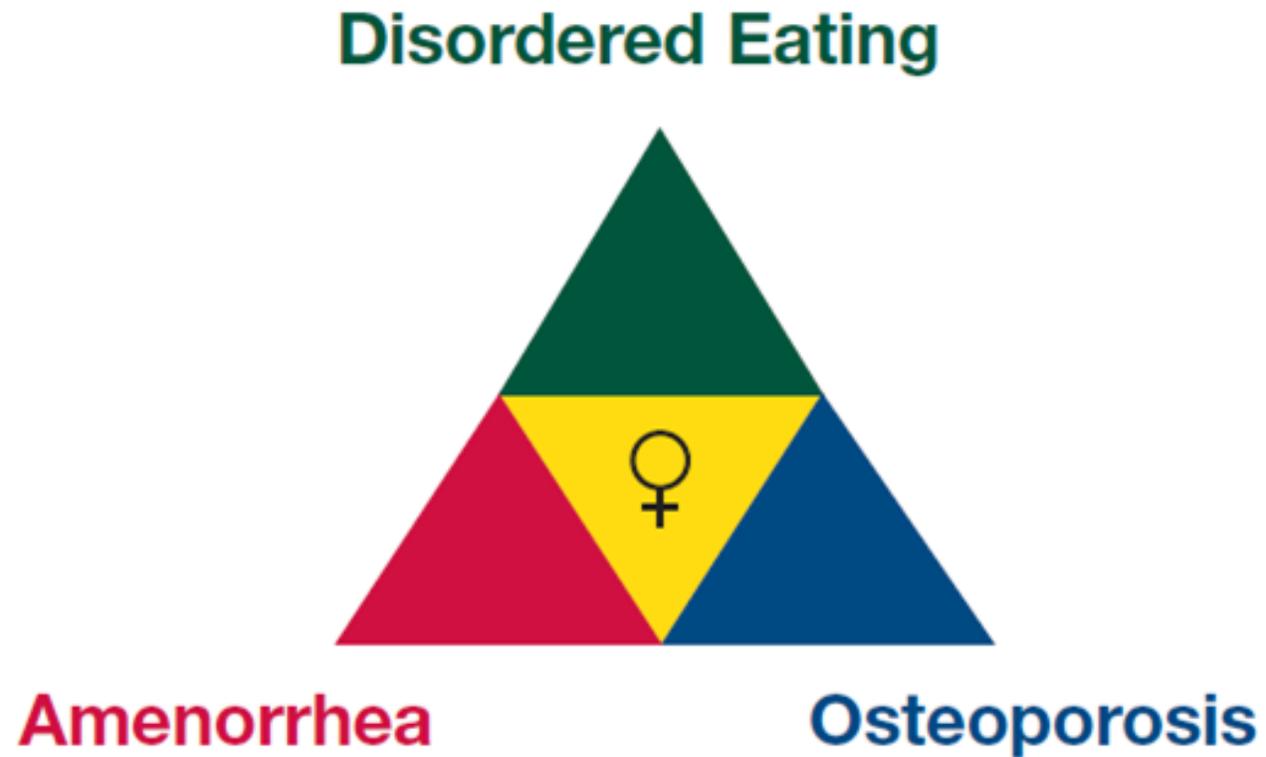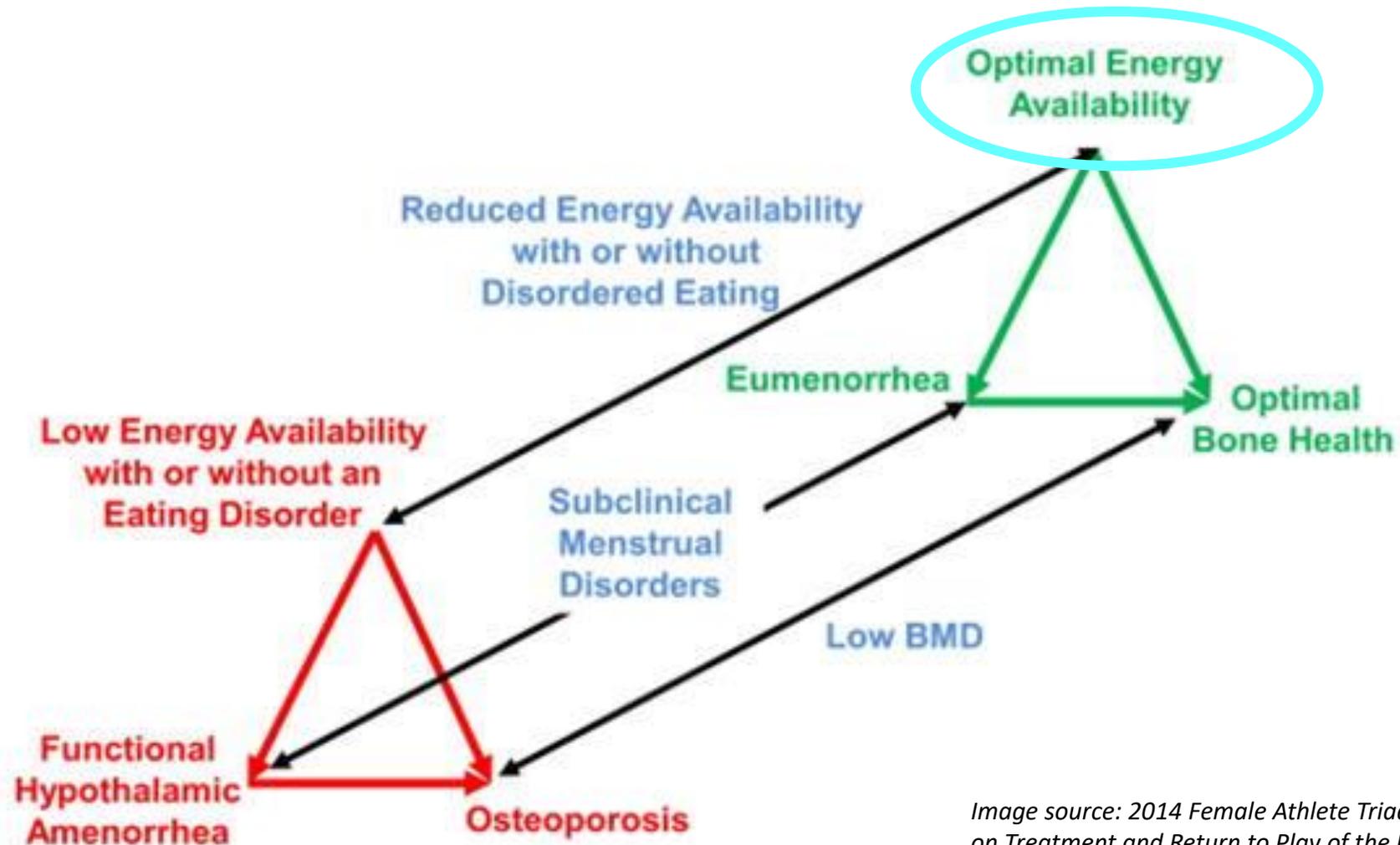
2007: Expansion of the "Female Athlete Triad"

Image source: 2014 Female Athlete Triad Coalition Consensus Statement on Treatment and Return to Play of the Female Athlete Triad

2014: (low energy availability)

RED-S

HEALTH

PERFORMANCE

Health: Immunological, Gastro-intestinal, Menstrual Function, Bone health, Cardio-vascular, Triad, Endocrine, Psychological*, Growth & Development, Metabolic, Hematological

Performance: Decreased muscle strength, Decreased endurance, Increased injury risk, Decreased glycogen stores, Decreased training response, Depression, Impaired judgement, Irritability, Decreased coordination, Decreased concentration

Psychological Impact

□ Psychological problems can precede or be caused by low energy availability

□ Eating disorders are serious diagnosable mental health conditions that require treatment

□ The pathogenesis of eating disorders is multifactorial with cultural, familial, individual and genetic factors all playing roles

□ Athletes are a higher risk group for developing eating disorders
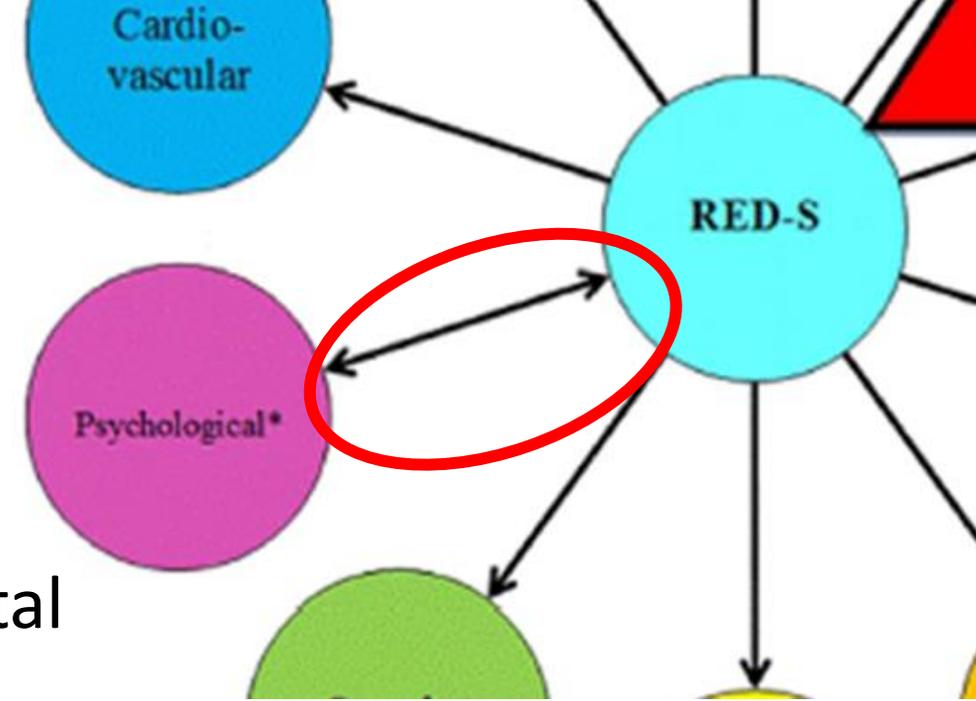
Suggested risk factors within athlete group

- *Performance pressure*
- *High drive for leanness*
- *Sudden increase in training*
- *Injury*
- *Team weigh-ins*

Low energy availability

Important to note

- Low EA can be found in athletes who are weight stable
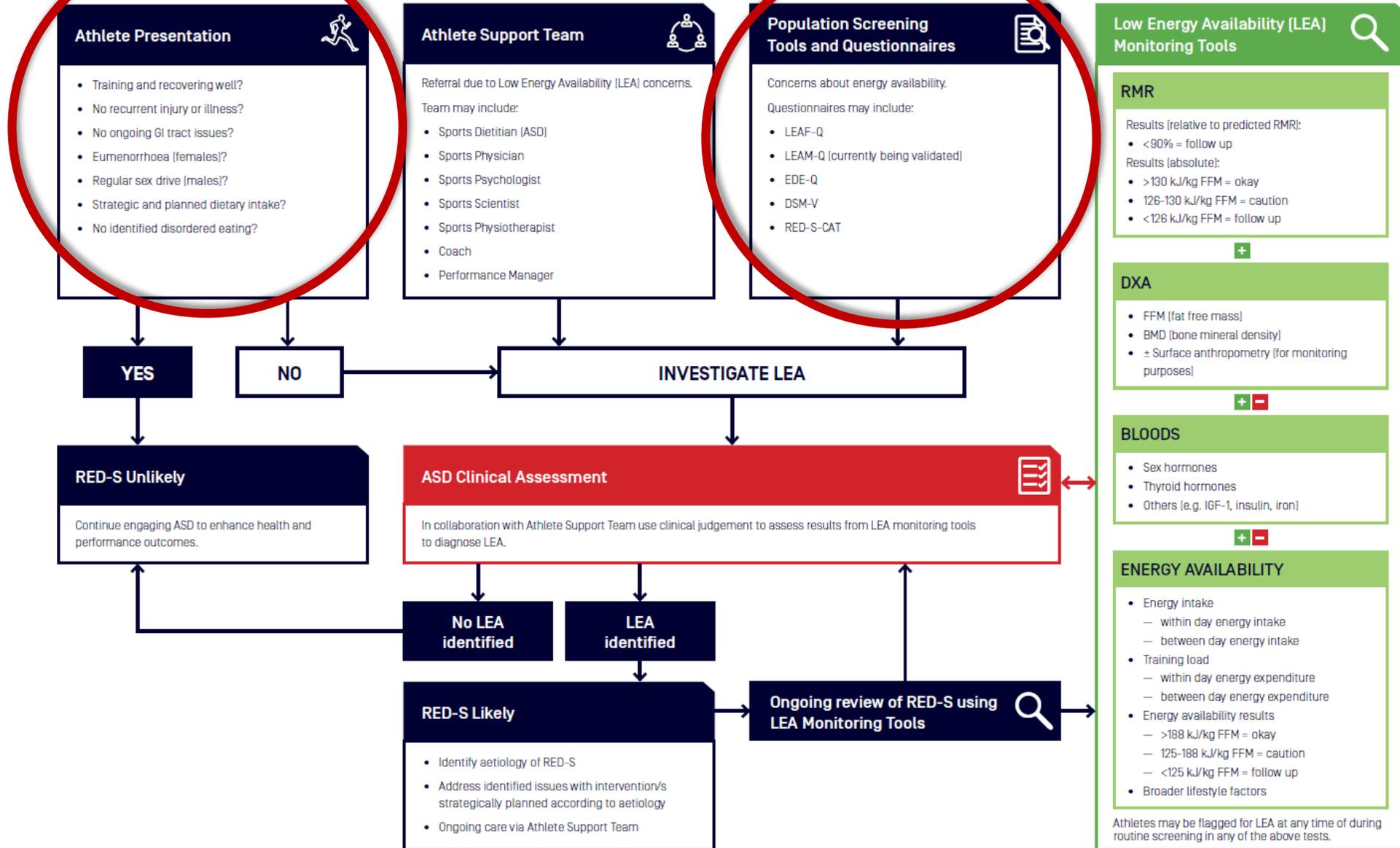
- Low EA does not mean that the athlete is lean

- Low EA can be found in athletes with moderate/high body fat

Weight change and appearance are

often <u>not</u> reliable indicators

CLINICAL MANAGEMENT OF RELATIVE ENERGY DEFICIENCY IN SPORT (RED-S)

Athlete Presentation

- Training and recovering well?
- No recurrent injury or illness?
- No ongoing GI tract issues?
- Eumenorrhoea (females)?
- Regular sex drive (males)?
- Strategic and planned dietary intake?
- No identified disordered eating?

Athlete Support Team

Referral due to Low Energy Availability (LEA) concerns.

Team may include:

- Sports Dietitian (ASD)
- Sports Physician
- Sports Psychologist
- Sports Scientist
- Sports Physiotherapist
- Coach
- Performance Manager

Population Screening Tools and Questionnaires

Concerns about energy availability.

Questionnaires may include:

- LEAF-Q
- LEAM-Q (currently being validated)
- EDE-Q
- DSM-V
- RED-S-CAT

## Low Energy Availability (LEA) Monitoring Tools

RMR

Results (relative to predicted RMR):
- <90% = follow up

Results (absolute):
- >130 kJ/kg FFM = okay
- 126-130 kJ/kg FFM = caution
- <126 kJ/kg FFM = follow up

DXA

- FFM (fat free mass)
- BMD (bone mineral density)
- ± Surface anthropometry (for monitoring purposes)

BLOODS

- Sex hormones
- Thyroid hormones
- Others (e.g. IGF-1, insulin, iron)

ENERGY AVAILABILITY

- Energy intake
  — within day energy intake
  — between day energy intake
- Training load
  — within day energy expenditure
  — between day energy expenditure
- Energy availability results
  — >188 kJ/kg FFM = okay
  — 125-188 kJ/kg FFM = caution
  — <125 kJ/kg FFM = follow up
- Broader lifestyle factors

Athletes may be flagged for LEA at any time of during routine screening in any of the above tests.

YES → **NO** → **INVESTIGATE LEA**

RED-S Unlikely

Continue engaging ASD to enhance health and performance outcomes.

ASD Clinical Assessment

In collaboration with Athlete Support Team use clinical judgement to assess results from LEA monitoring tools to diagnose LEA.

No LEA identified | **LEA identified**

RED-S Likely

- Identify aetiology of RED-S
- Address identified issues with intervention/s strategically planned according to aetiology
- Ongoing care via Athlete Support Team

Ongoing review of RED-S using LEA Monitoring Tools

Opportunity for early intervention

Athlete Presentation

- Training and recovering well?
- No recurrent injury or illness?
- No ongoing GI tract issues?
- Eumenorrhoea (females)?
- Regular sex drive (males)?
- Strategic and planned dietary intake?
- No identified disordered eating?

YES

NO

If answer NO to one or more.... → investigate Low energy availability

ity [LEA] concerns.

Population Screening Tools and Questionnaires

Concerns about energy availability.

Questionnaires may include:

- LEAF-Q
- LEAM-Q (currently being validated)
- EDE-Q
- DSM-V
- RED-S CAT

INVESTIGATE LEA

Barriers to rowers eating enough

Youth Rowers

- Don't know
- Don't care
- Don't understand

Other common barriers:

- Low appetite *(? result from RED-S)*
- Too fatigued to prepare/eat *(? result from RED-S)*
- Limited opportunity / time
- Not organised or prepared
- Low finance $$
- Fear of weight gain

Education for coaches and athletes
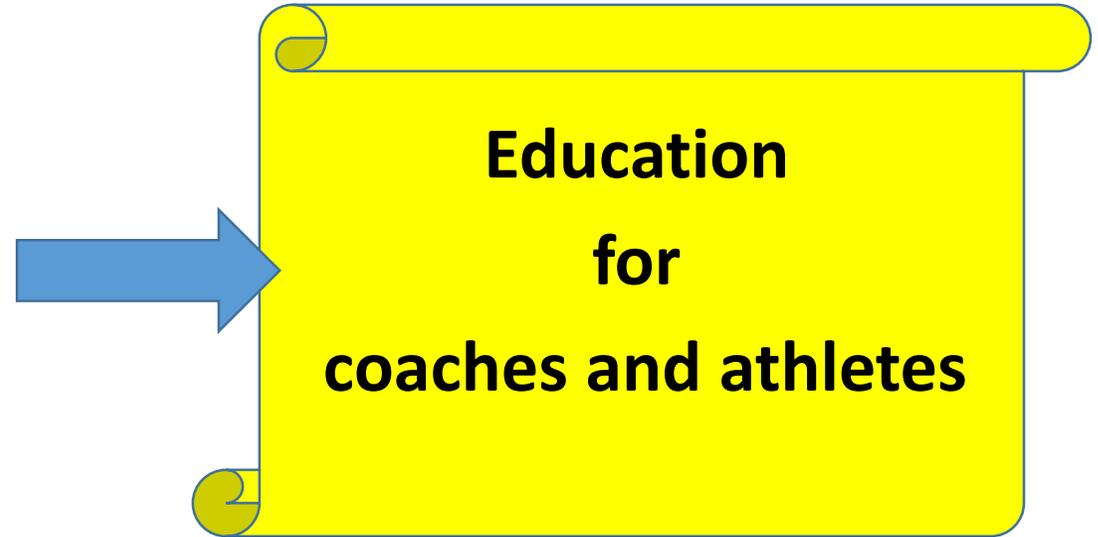
my approach to
sports nutrition education

Carbohydrate quiz

STAND UP

Carbohydrate quiz

HIGH (>20g)   :   hands on your HEAD

MEDIUM (10-19g)   :   hands on your SHOULDERS

LOW (<9 g)   :   hands on HIPS

glass of milk
(200 mL)

12 g carbohydrates

MEDIUM

glass of
orange juice
(200 mL)

20 g carbohydrates

HIGH

1.4 g carbohydrates

LOW
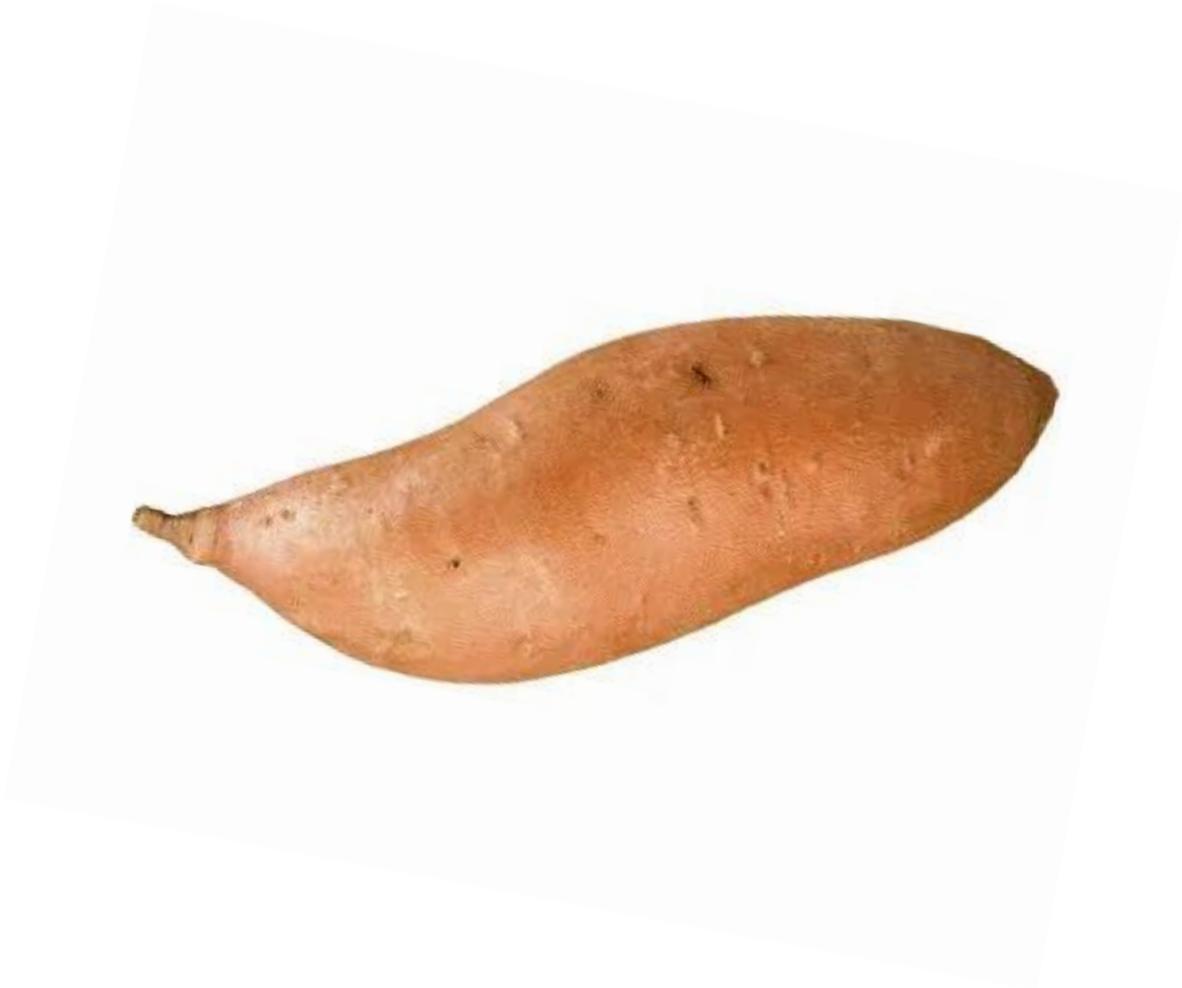
1 sweet potato

25 g carbohydrates

HIGH

35 g carbohydrates

HIGH

Mantou (3 buns)

36 g carbohydrates

HIGH

Tin Tuna

0 g carbohydrates

LOW

0.6 g carbohydrates

LOW

1 cup boiled white rice

58 g carbohydrates

HIGH

snack tub flavoured yoghurt

(150 g)

29 g carbohydrates

HIGH

0.6 g carbohydrates

LOW

CARBOHYDRATE FOOD SOURCES

CARBOHYDRATES

(_____ + _____ in food)
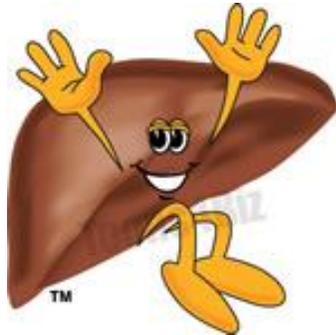
⬇

_____ in blood

⬇   ⬇

in LIVER   in MUSCLES

© S Encarnacion
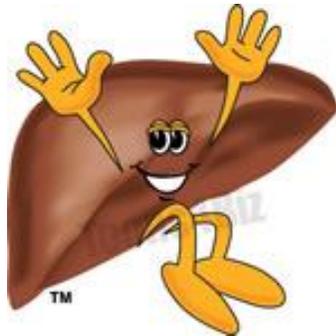
CARBOHYDRATES
(**starches** + **sugars** in food)

GLUCOSE in blood

GLYCOGEN
in LIVER

GLYCOGEN
in MUSCLES

Athlete Nutrition Pyramid

4) SUPPLEMENTS

3) TRAINING NUTRITION

2) THE BASICS

1) ATTITUDE TO FOOD & BODY

1) ATTITUDE TO FOOD & BODY

All food fits
- Positive attitude towards food
- Fuel AND enjoyment
- Non-judgemental
- 'Everyday foods' & 'Sometimes foods'

Flexibility in food choices
- Sustainable long term approach

Pay attention to body signals & cues *and TRUST them*
- Appetite awareness, energy levels, concentration, fatigue

Body respect
- Accept natural build & physique
- Be realistic when considering performance related body composition goals

2) THE BASICS

- **Regular eating pattern (6+ occasions)**

- Food group **variety**

- Meeting ⬆ **energy** needs due to ⬆ **training** load

    ➢ Understanding macro nutrients (big)
    - CARBOHYDRATES +++
    - PROTEIN ++
    - FAT +

    ➢ Understanding micro nutrients (little)
    - VITAMINS & MINERALS

- Hydration
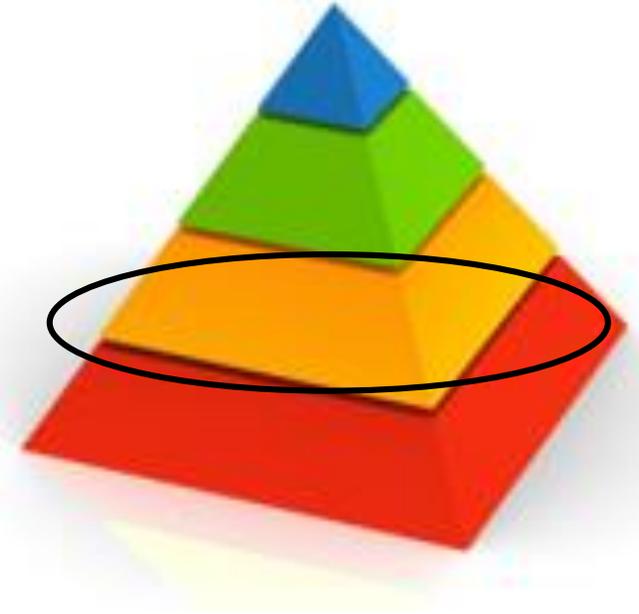
carbohydrate requirements

This is a guide only

CHO (g / kg of BW / day)	Activity level
1	V. little aerobic activity possible
2	Sleeping, watching TV, sitting
3	Daily chores, light activity
4 – 5	Moderate training, recreational (~6 – 8 hrs/wk)
5 – 7	Serious amateur sports, bodybuilding (~10 – 12 hrs/wk)
7 – 9	Serious professional sports, endurance (12 + hrs/wk)

Cardwell, G. (2012). *Gold Medal Nutrition* (5th ed.). Lower Mitcham, SA: Human Kinetics.

protein requirements

Group	Protein requirements (g / kg body wt / day)	85 kg male (g protein/day)
Adults, non-athletes	**0.80**	68
Recreational athletes	**1.0**	85
Strength athletes (steady state)	**1.0 – 1.2**	85 - 102
Strength athletes (early training)	**1.5 – 1.7**	127 - 145
Power sports, football	**1.4 – 1.7**	119 - 145
Endurance athletes	**1.2 – 1.4**	102 - 119
Elite endurance athletes	1.6	136
Adolescent athletes	*~2.0*	170g

Fat

Protein quiz

HIGH **(>10g)**   :   hands on your HEAD

MEDIUM **(5-10g)**   :   hands on your SHOULDERS

LOW **(<5 g)**   :   hands on HIPS

Tin Tuna

21 g protein

HIGH

250 mL

9 g protein

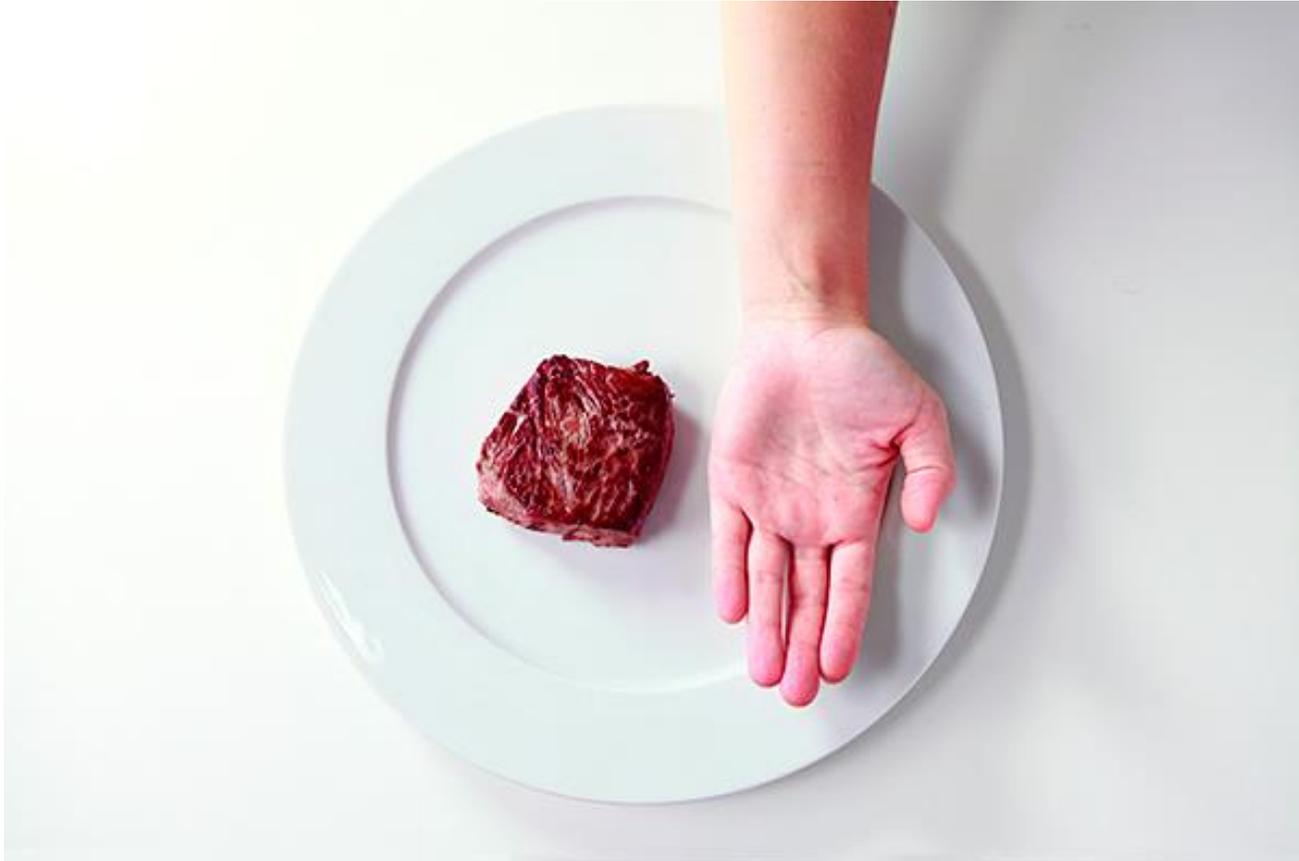**MEDIUM**

250 mL

1.5 g protein

LOW

11 g protein

HIGH

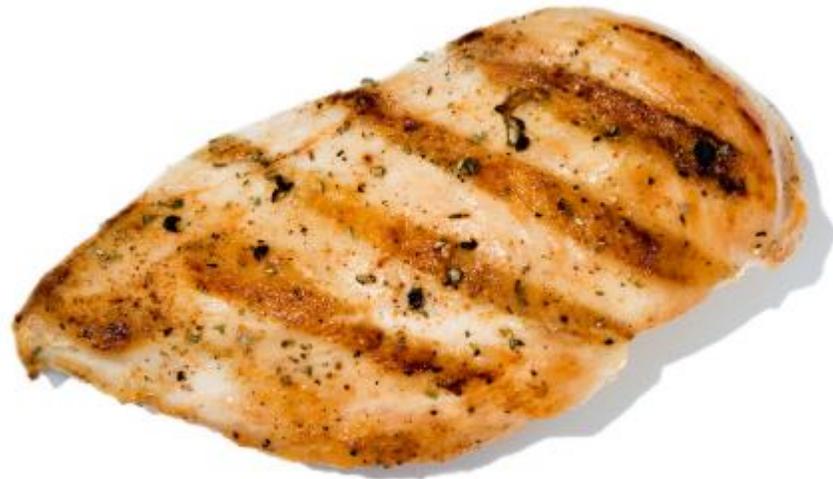Beef (100 g)

32 g protein

HIGH

**100 g
serve**

18 g protein

HIGH

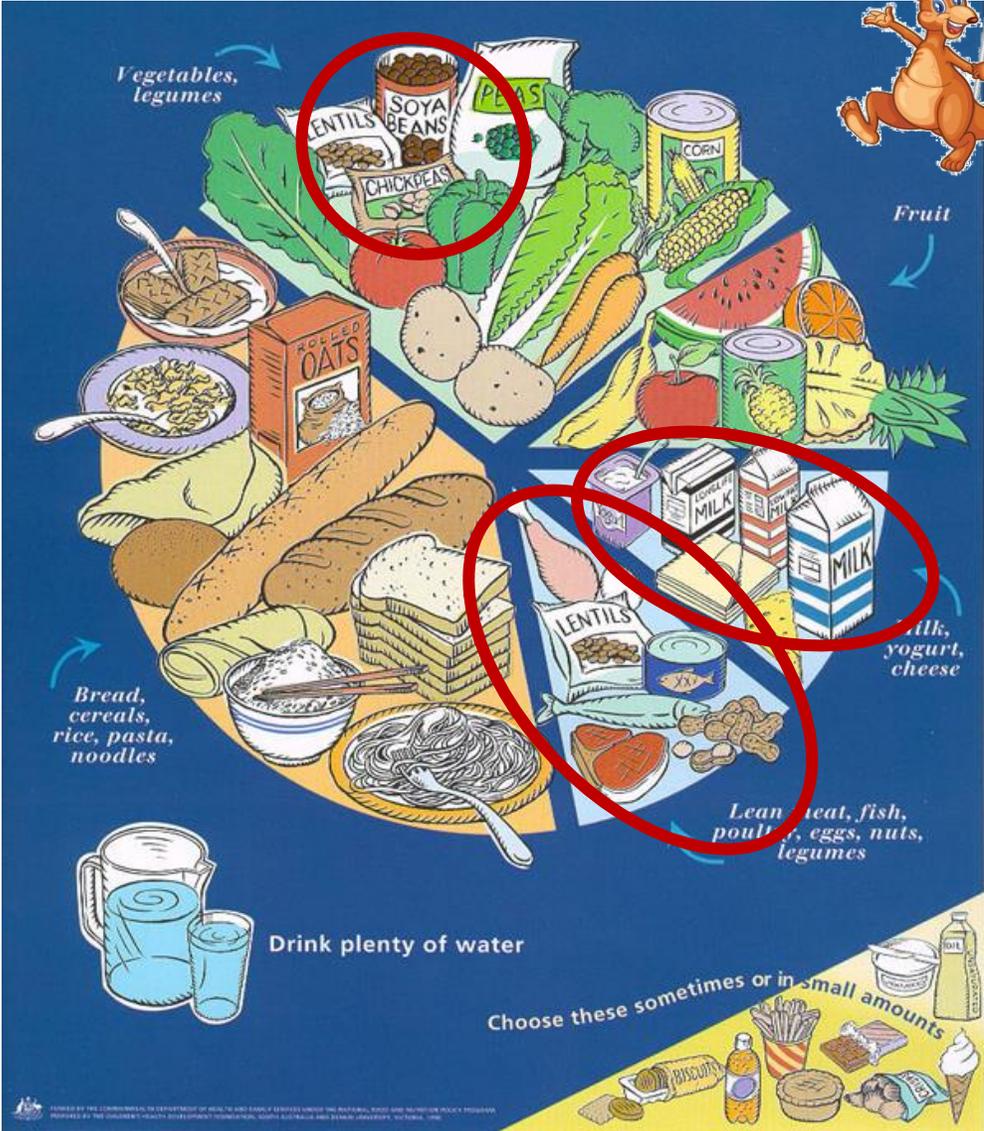Chicken (100 g)

27 g protein

HIGH

6 g protein

MEDIUM

PROTEIN FOOD SOURCES

3) TRAINING NUTRITION

Pre training

- Priority: carbohydrate

- Consider timing & amount

During training

- Hydration & electrolytes

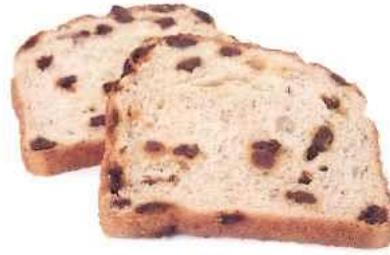- Carbohydrate top-up as needed

Recovery post training

- **REFUEL** glycogen: carbohydrate

- **REPAIR** muscles: protein

- **REHYDRATE** sweat losses: fluid

Pre training

- **Fruit + muesli bar**

- **Raisin toast or olive bread**

- **Crackers with tomato / avo**

- **Creamed rice**

LIQUID options

- **Smoothie**

- **Flavoured milk/ soy milk**

- **Coconut water**

- **Fruit juice + water**

- **Sports drink**

- **Pasta / rice meal**

- **Cereal / porridge + milk**

- **Baked beans**

- **Spaghetti on toast**

- **Sandwich / roll**

Amount depends on individual needs, appetite, timing

Recovery post training

Snacks/Drinks examples

- Yoghurt and fruit

- 300 – 600 mL flavoured milk

- Homemade fruit smoothie

- Trail mix

- Sandwich/wrap/roll/rice cakes
  - with egg/tuna/meat/chicken & salad

Meal examples

- Eggs + rice/toast + vegetables

- Muesli/cereal with milk/yoghurt and fruit

- 100-200g+ chicken/meat/fish + 2-3 cups carbs (rice/noodles/pasta/cous cous/potato) + veg

4) SUPPLEMENTS

Medical supplements

EXAMPLES:
- Iron
- Calcium
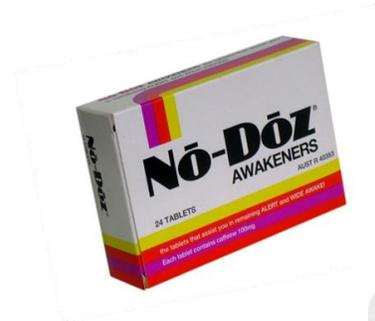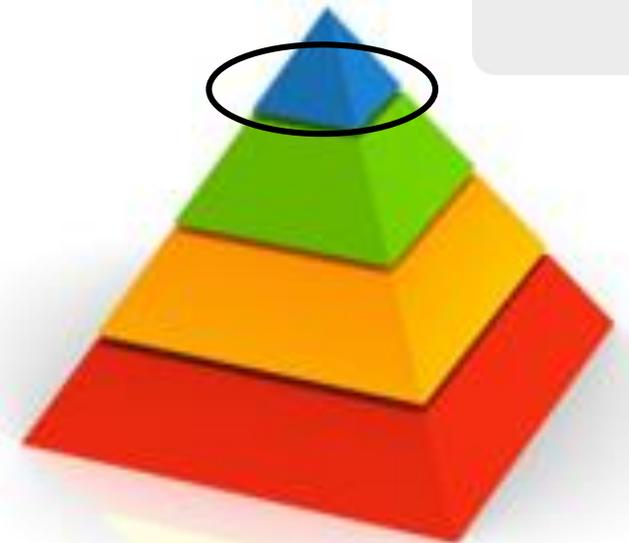- Multivitamin
- Probiotics

Sports foods

EXAMPLES:
- Sports drink
- Electrolytes
- Sports gel
- Protein bar
- Protein powder

Performance supplements
- Creatine
- Caffeine
- Beta alanine
- Bicarbonate
- Beetroot juice

Nō-Dōz AWAKENERS

Beta Alanine

- **Safe?**
- **Legal?**
- **Effective?**

INFORMED-SPORT .com
Trusted by sport

Total Cost to Fuel the Machine!

Guide to Energy Requirements across different levels of athlete

Group	Approx. Age (years)	Average body weight LW - HW (kg)			Daily Base Energy Needs (calories)			Approx. Training Hours (per week)	Estimated Total Daily Requirements (calories)		
School Rowers (M)	16	65	-	80	2100	-	2500	10	3000	-	3600
School Rowers (F)		52	-	70	1700	-	2000	10	2400	-	3000
Elite Jnr/U21 Rowers (M)	19	70	-	90	2260	-	2700	20	4200	-	5200
Elite Jnr/U21 Rowers (F)		57	-	76	7500	-	9000	20	3350	-	4200
Elite U23/Snr Rowers (M)	23	70	-	95	2260	-	2740	25	4650	-	6000
Elite U23/Snr Rowers (F)		57	-	82	1800	-	2100	25	3700	-	4900

Example Training Week

	MON	TUES	WED	THUR	FRI	SAT	SUN
Pre training							
	ROW 1 h	ROW 1/1.5 h	ROW 1 h		ROW 1.5 h	ROW 1 h	
between							
	ROW 1h		ROW 1 h		RUN 30 min	ROW 1 h	
Breakfast							
						Cycle 1 h	
Snack							
						GYM	
Lunch		-					
Snack							
	GYM	ERGO	GYM	ERGO	GYM		
Recovery							
		CYCLE		CYCLE			
Dinner							
Supper							

Example Training Day

85 kg male

Energy cost of training
+
Energy needs

	TUESDAY
Training:	2 h aerobic row
Energy cost	**1500 cal**
Training:	1 h ergo (easy)
	700 cal
Training:	1 h cycle (easy)
	400 cal
Total training:	**2500 calories**
Baseline needs:	2500 calories
Total daily energy cost	**5000 calories**

HIGHER energy day (eg. Tuesday ~5000 calories)

Pre train	Banana, 3 tbsp Sustagen + 200mL milk	450 cal
During:	600 mL Gatorade, Turkish delight	360 cal
Post train	250g yoghurt, fruit, oats	330 cal
Breakfast	3 eggs + 4 slices toast mushroom, spinach, tomato	900 cal
Snack	Apple, strawberries, almonds	200 cal
Lunch	150g Lamb 1.5 cups quinoa + salad (avo, brocc, tom, spin) 200mL 100% orange Juice	900 cal
Pre train	2 slices raisin toast + jam	250 cal
Recovery	muesli bar + choc milk	250 cal
Dinner	180g Salmon, 2 cups cooked rice + vegetables	900 cal
Supper	Smoothie (blueberries, protein, yoghurt)	400 cal

Energy: 5000 calories

Carbs: 700g (56%)
Protein: 240g (20%)
Fat: 135g (24%)

Fibre: 55 g
Iron: 27 mg

LOWER energy day (rest day ~2,700 calories)

Breakfast	2 eggs + 1 slice toast mushroom, spinach, tomato cappucino
Snack	Apple, strawberries, biscuits
Lunch	Chicken + salad (avocado, beans, corn) + rice
Snack	Yoghurt, almonds
Dinner	Steak, vegetables, 2 potatoes, 1 slice bread
Supper	ice cream, blueberries

Energy: ~2,700 calories

Carbs: 290g (42%)
Protein: 150g (22%)
Fat: 100g (33%)

Fibre: 40 g
Iron : 18 mg

Summary

If the coach values nutrition & supports a sensible nutrition approach focused on fuelling, recovery & performance

→ athlete more likely to value impact of nutrition on health & performance

- Be considerate in language and messaging around food and bodies
  - Young, high-achieving athletes are a vulnerable group for disordered eating practices

- Encourage athletes to seek individual support if this is accessible
- Organise group education by qualified nutrition professional that provides practical, simple messages

- Consider how the training environment can best support adequate nutrition

thank you

contact:

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References

- Mountjoy M, et al. IOC consensus statement on relative energy deficiency in sport (RED-S): 2018 update. Br J Sports Med 2018; 52:687-697.

- Mountjoy M, Sundgot-Borgen J, Burke L, et al. The IOC consensus statement. Beyond the Female Athlete Triad - Relative Energy Deficiency in Sport (RED-S). Br J Sports Med 2014; 48:491-497.

- Burke L, et al. Swifter, Higher, stronger: What's on the menu? Science 2018; 362: 781-787.

- Joy E, et al. 2016 Update on eating disorders in athletes: A comprehensive narrative review with a focus on clinical assessment and management. Br J Sports Med 2016; 50:154-162.

- Mukherjee S, Chand, V, Wong XX, et al. Perceptions, awareness and knowledge of the female athlete triad amongst coaches – are we meeting the expretations for athlete safety? Int J Sports Sci Coach 2016; 11: 545-51.

question time

spare slides