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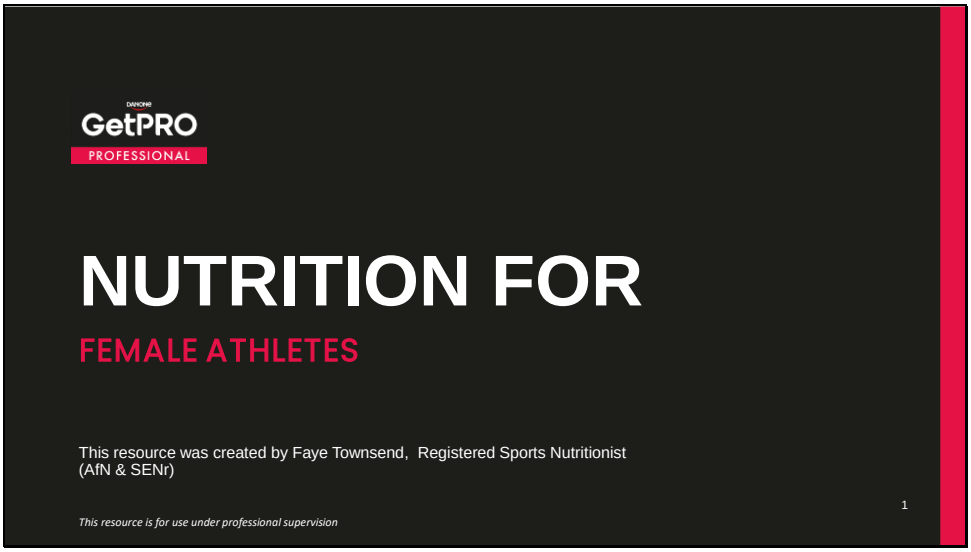
DANONE
GetPRO
PROFESSIONAL
NUTRITION FOR
FEMALE ATHLETES
This resource was created by Faye Townsend, Registered Sports Nutritionist (AfN & SENr)
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This resource is for use under professional supervision

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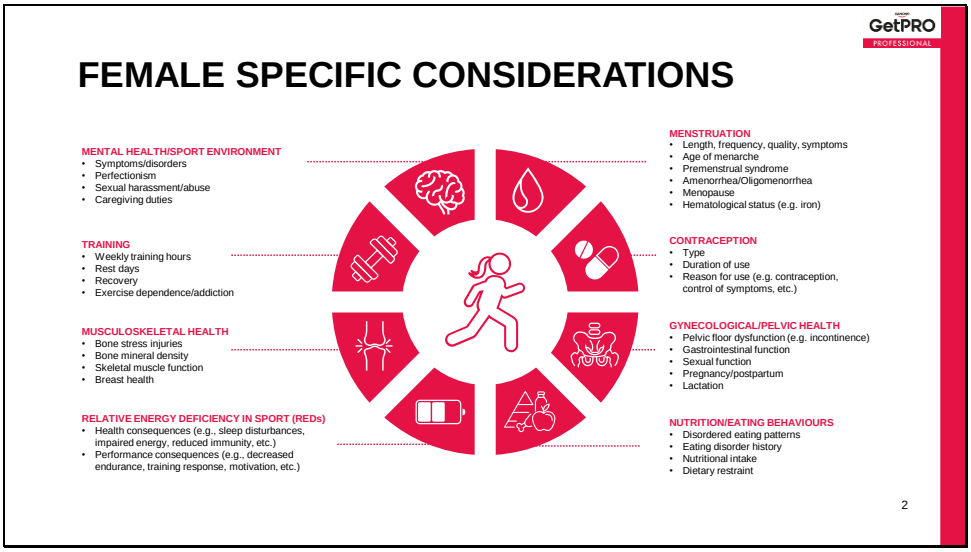

Female athletes make up nearly 50% of sports participants, yet research dedicated to optimising nutrition and performance specific to female physiology remains limited.
From 2014–2020, only 6% of sports science studies focused exclusively on female participants (*Cowley, 2021*). This lack of representation mirrors trends in other medical fields, where findings from male-centric studies are often misapplied to female populations, despite clear physiological and hormonal differences.

Female athletes face unique stressors both within and outside of sport, including:

- Sports inequities and systemic barriers.
- Violence and abuse.
- Body image concerns and disordered eating.
- Relative energy deficiency in sport (RED-S).
- Family planning challenges and hormonal fluctuations.
- Mental distress and emotional well-being issues.

To address these challenges, a holistic approach is essential. Care for female athletes must encompass physical health, fitness, strength, skill development, emotional health, and nutrition. By considering all these aspects, we can better support the health, performance, and well-being of female athletes.

Key reference

- Cowley ES *et al*. "Invisible sportswomen": the sex data gap in sport and exercise science research. Women Sport Phys Act J 2021; 29(2): 146-151. DOI:10.1123/wspaj.2021-0028.

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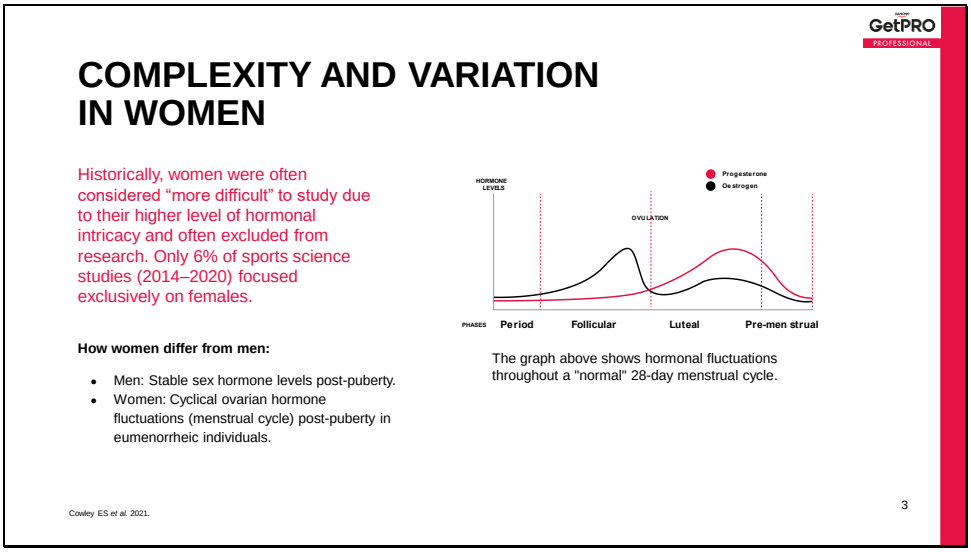

Why are women often left out of research?
Women are frequently excluded from sports and exercise science research due to the perception that their higher hormonal intricacy makes them "more difficult" to study.
How are women physiologically different from men?
One of the most notable differences between men and women is reproductive physiology. Following puberty, men experience relatively stable sex hormone levels, while women with eumenorrhea undergo cyclical changes in ovarian hormones (i.e., the menstrual cycle).
What is eumenorrhea?
Eumenorrhea refers to regular menstrual cycles lasting 21–35 days with a textbook cycle being 28 days. These cycles involve fluctuations in key hormones, oestrogen, progesterone.
The menstrual cycle’s phases:

- Early follicular phase (Menstruation): Both oestrogen and progesterone levels are low.
- Late follicular phase (Pre-ovulation): Oestrogen peaks while progesterone remains low.
- Mid-luteal phase: Both oestrogen and progesterone levels are high.
- Late luteal phase (Pre-menstrual): If no fertilisation occurs, oestrogen and progesterone levels drop.

Individual and cycle variation:
Hormonal levels during these phases can vary greatly both within the same woman across cycles and between different women.
Amenorrhea:
One critical aspect of menstrual health is the absence of a regular cycle, or amenorrhea. This condition, often linked to low energy availability, high training loads, or stress, poses risks for bone health, performance, and long-term wellbeing.
Why is this important?
A regular menstrual cycle with mild symptoms is an important marker of good health. It has been called an "extra vital sign," akin to heart rate or body temperature. Abnormal cycles can indicate underlying health issues, signaling disturbances in overall wellbeing or potential medical conditions needing treatment.

Key Reference:
- Cowley ES, Olenick AA, McNulty KL, Ross EZ. "Invisible Sportswomen": The Sex Data Gap in Sport and Exercise Science Research. Women Sport Phys Act J. 2021;29(2):146–151

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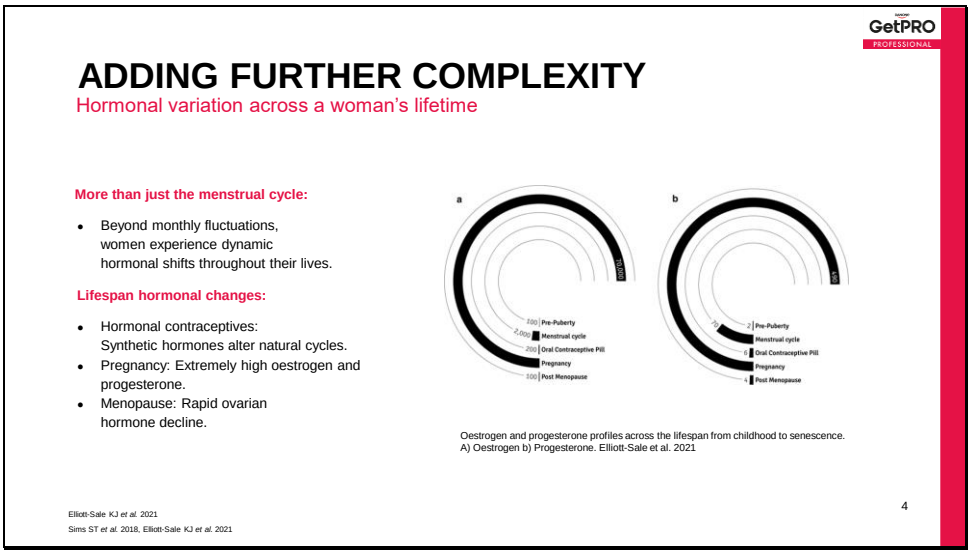

Why is studying women so challenging?

In addition to the within-cycle fluctuations of hormones, women experience vast differences in hormonal profiles across their lifetime:

- It was reported that 49.5% of female athletes take hormonal contraceptives(Sims et al, 2018). Synthetic hormones alter natural cycles.
- Pregnancy: Supraphysiological levels of oestrogen and progesterone.
- Menopause: Rapid declines in ovarian hormone concentrations.

Why does this matter?

These dynamic changes may influence:

- Nutrition
- Training
- Performance
- Overall health

The intricate and dynamic nature of female reproductive hormones highlights why more nuanced research is essential to optimise training, nutrition, and health strategies tailored to women.

Key Reference

- Sims ST *et al*. Hormonal contraceptive use in female athletes: Prevalence, types, and implications for performance. Int J Sports Physiol Perform 2018; 13(7): 926-933. DOI:10.1123/ijspp.2017-0338.
- Elliott-Sale KJ *et al*. Methodological considerations for studies in sport and exercise science with women as participants: a working guide for standards of practice for research on women. Sports Med 2021; 51(5): 843-861. DOI:10.1007/s40279-021-01435-8.

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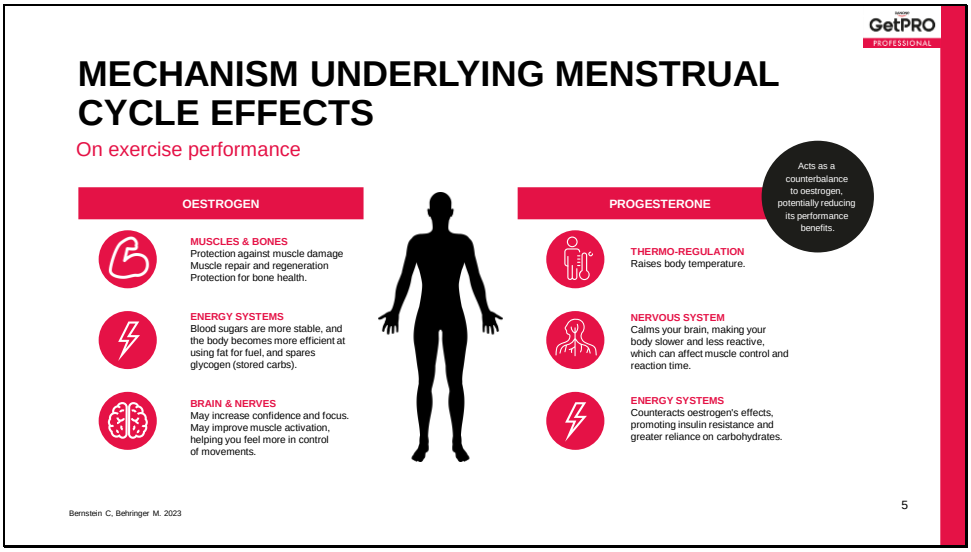

While the primary role of Oestrogen and progesterone is related to reproduction, their effects extend to multiple systems in the body, including cardiovascular, metabolic, respiratory, and nervous systems. These wide-ranging influences mean hormonal changes within the menstrual cycle and across a women's lifespan might impact athletic performance.

Key effects of oestrogen

- Oestrogen has anabolic effects which may contribute to increased muscle strength and bone mineral density
- Regulates substrate metabolism through increasing glycogen uptake and sparing glycogen stores
- Antioxidant and membrane stabiliser properties, which might offer protection against exercise-induced muscle damage and reduce inflammatory response
- Neuroexcitatory effects reduced inhibition and increased voluntary activation Influence on mood, confidence, and energy

Progesterone's role

- Acts as a counterbalance to oestrogen, with anti-estrogenic effects that can reduce some of estrogen's performance benefits.
- Increases basal temperature, which can influence thermoregulation and perceived exertion.

What does the review conclude....

- Despite these theoretical mechanisms, evidence remains inconsistent. Many studies show no significant differences in performance across menstrual phases.
- Much of the current understanding comes from animal studies or laboratory research, emphasising the need for high-quality, female-specific studies in athletic populations.

Key References:

- Bernstein C, Behringer M. Mechanisms underlying menstrual cycle effects on exercise performance: A scoping review. Women Sport Phys Act J 2023; 31(6) DOI:10.1123/wspaj.2022-0026.

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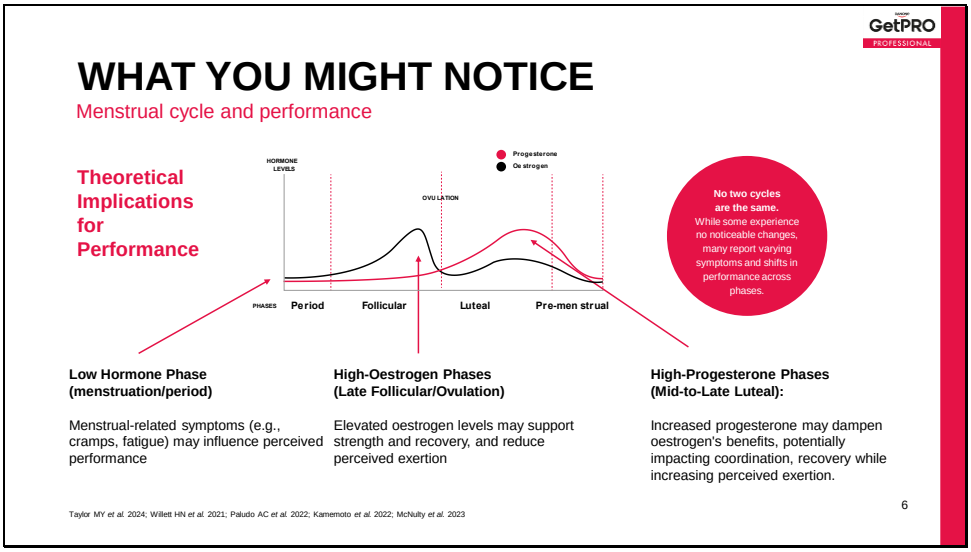

No two menstrual cycles are the same.
Each individual experiences unique variations from cycle to cycle, and significant differences exist between athletes. While some experience no noticeable changes, many report varying symptoms and shifts in performance across phases.

Possible phase-specific patterns (general trends)

- **Early Follicular Phase (Menstruation):**
  - Menstrual pain, affecting up to 90% of menstruating women, is caused by prostaglandins, which trigger uterine contractions.
  - Prostaglandins can also impact surrounding areas, leading to cramps, nausea, diarrhoea, and discomfort.
- **Late Follicular Phase (High Oestrogen):**
  - Many athletes feel more confident, energised, and motivated to train.
  - Recovery and high-intensity performance may improve.
  - Enhanced visual-spatial skills and openness to constructive feedback are common.
- **Mid-to-Late Luteal Phase (High Progesterone):**
  - Gastrointestinal changes like bloating, nausea, or altered bowel habits.
  - Reduced coordination and increased perception of "clumsiness."
  - Decreased confidence and a tendency to avoid risk.
  - Elevated body temperature can affect perceived exertion.
  - Sleep quality may decline, with increased wakefulness and lighter sleep.
- **Late Luteal Phase (Premenstrual):**
  - Symptoms like fatigue, headaches, and reduced motivation are more likely.
  - Greater susceptibility to illness and breast tenderness can occur.

Key References

- Taylor MY *et al*. Influence of menstrual cycle phase on sleep and recovery following high- and low-intensity training in eumenorrheic endurance-trained women: The Female Endurance Athlete Project. Int J Sports Physiol Perform 2024; 19(12): 1491-1499. DOI: 10.1123/ijspp.2024-0201
- Willett M *et al*. Influence of menstrual cycle estradiol-β-17 fluctuations on energy substrate utilization during aerobic endurance exercise. Int J Environ Res Public Health 2021; 18(13): 7209. DOI: 10.3390/ijerph18137209

- Paludo AC *et al*. The effect of menstrual cycle on perceptual responses in athletes: a systematic review with meta-analysis. Front Psychol 2022; 13(13): 926854. DOI: 10.3389/fpsyg.2022.926854
- Kamemoto K *et al.* Effects of menstrual cycle on appetite-regulating hormones and energy intake in response to cycling exercise in physically active women. J Appl Physiol 2022; 132(1): 224-235. DOI: 10.1152/japplphysiol.01117.2020
- McNulty KL, Ansdell P, Goodall S, Thomas K, Elliott-Sale KJ, Howatson G, et al. The symptoms experienced by naturally menstruating women and oral contraceptive pill users and their perceived effects on exercise performance and recovery time posttraining. Women Sport Phys Act J. 2023;32(1):1-14. doi: 10.1123/wspaj.2023-0016.

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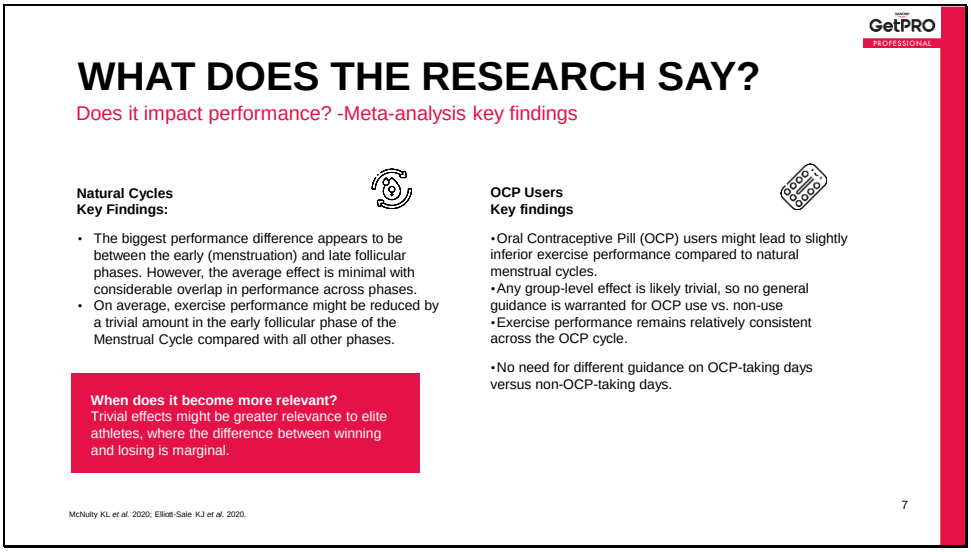

Natural cycles key findings

- The meta-analysis suggests that the biggest performance differences occur between the early follicular phase (when estrogen and progesterone are low) and the late follicular phase (when estrogen is rising). However, these differences are small and often show considerable overlap in performance across phases.
- On average, performance in the early follicular phase might be slightly reduced, but this is described as "trivial" and unlikely to affect most athletes significantly.
- It’s important to remember that while hormonal fluctuations can have theoretical effects, many women may not notice significant changes in their own performance.

OCP Users key findings

- For athletes using oral contraceptive pills (OCPs), research shows that exercise performance may be slightly inferior to those with natural cycles, but the difference is minor and not meaningful at a group level.
- Performance is consistent throughout the OCP cycle, meaning there is no need for different training or nutritional guidance on OCP-taking days versus non-OCP-taking days.
- Overall, athletes using OCPs can train effectively without needing phase-specific adjustments.

When does it become more relevant?

- While the differences are small and unlikely to impact recreational or sub-elite athletes, they could matter at the elite level, where the margins between winning and losing are extremely fine.
- For example, a small reduction in endurance or power output during critical events might influence outcomes in high-performance settings.

Takeaway for Coaches and Athletes

- This research reinforces the need for individual tracking of cycles and symptoms to identify any personal trends or phases where performance feels noticeably different.
- Encourage athletes to listen to their bodies and adapt their training and recovery strategies as needed.
- Highlight the importance of more high-quality research to develop better guidelines specific to both natural cycle athletes and OCP users.

Key References

- McNulty KL *et al*. The effects of menstrual cycle phase on exercise performance in eumenorrheic women: a systematic review and meta-analysis. Sports Med 2020; 50(10): 1813-27. DOI:10.1007/s40279-020-01319-3.
- Elliott-Sale KJ *et al*. The effects of oral contraceptives on exercise performance in women: a systematic review and meta-analysis. Sports Med 2020; 50(10): 1785-812. DOI:10.1007/s40279-020-01317-5.

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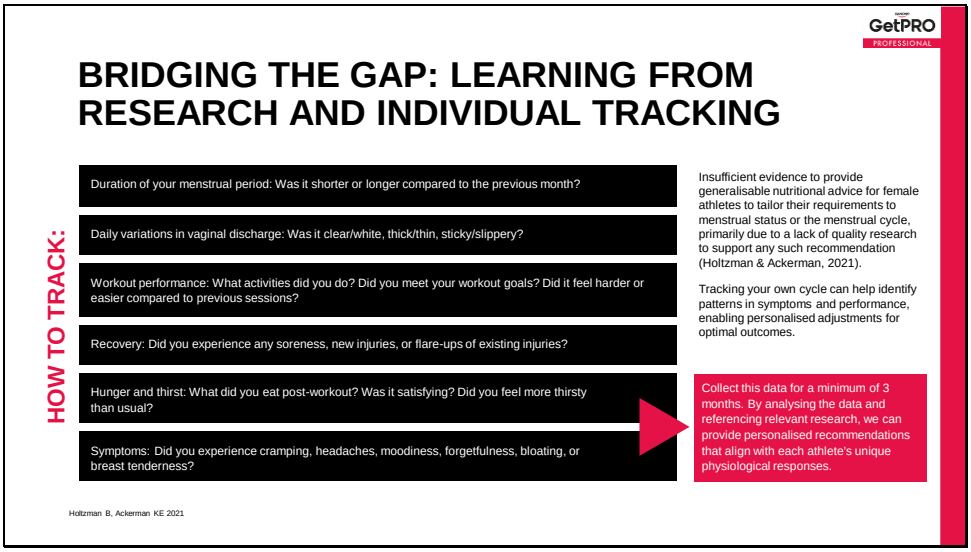

Lack of female-specific research:

- Currently, there is insufficient evidence to provide generalised nutritional advice tailored to female athletes' menstrual status or cycle phases.
- This is largely due to the lack of high-quality, female-focused research addressing these needs.

Male-focused guidelines:

- Historically, training and nutrition guidelines for women have been adapted from studies on men, without questioning whether these findings are applicable to female physiology.
- As we learn more about the differences in anatomy, biomechanics, physiology, and endocrinology between men and women, it's clear that male-based findings can't always be directly applied to women
- While there is a growing need for female-focused research, we don't need to discard all existing sports and exercise science.
- Much of the existing research remains valuable and can serve as a strong foundation for tailoring guidelines to female athletes.

The role of individual tracking:

- In the absence of definitive guidelines, female athletes can take control by tracking their own cycles.
- Monitoring how hormones influence symptoms, mood, energy levels, and performance can help them understand their individual patterns.
- This personalised data allows athletes to adapt their training and nutrition strategies to maximise performance and enhance recovery.

The path forward:

- By layering female-specific insights on top of existing research and incorporating individual tracking, we can bridge the current gaps in knowledge.
- This approach ensures that female athletes benefit from research while minimising risks and maximising their outcomes in sport and life.

Key reference:

- Holtzman B, Ackerman KE. Recommendations and nutritional considerations for female athletes: health and performance. Sports Med 2021; 51(Suppl 1): 43-57. DOI:10.1007/s40279-021-01508-8.

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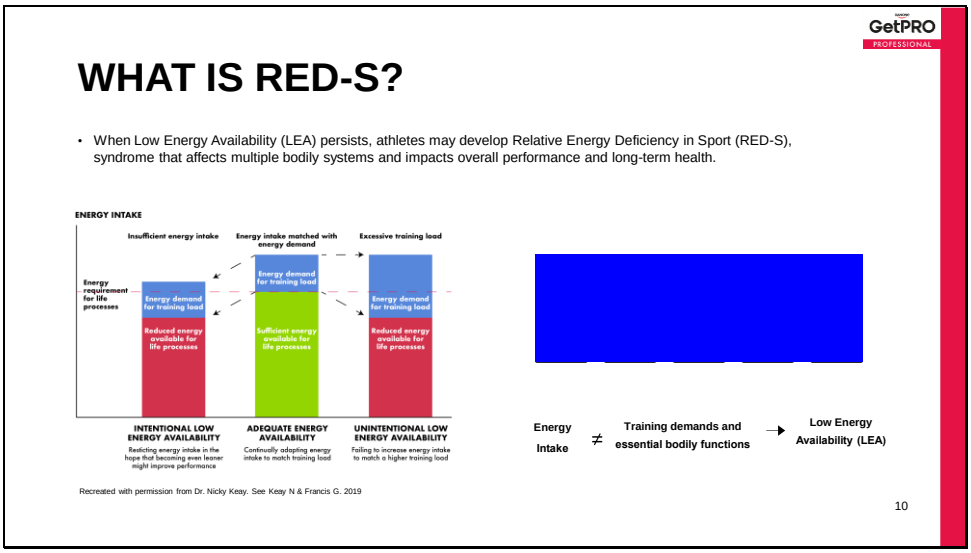

Definition of RED-S
Relative Energy Deficiency in Sport (RED-S) is a syndrome caused by insufficient energy availability to support both training demands and essential bodily functions. It affects multiple bodily systems, compromising health, performance, and recovery.

Consequences of RED-S
When LEA persists, it can lead to RED-S, which impacts:
Multiple bodily systems, including hormonal, cardiovascular, and bone health.
Overall performance, with slower recovery, fatigue, and reduced capacity to train.

Low Battery Mode
RED-S is like your body going into **low battery saving mode** on a phone. When you don't eat enough, your body conserves energy by shutting down non-essential functions (like reproduction) to keep basic ones running. You might be able to still function, but not at your best—compromised health, low energy, poor performance, and slower recovery. To get out of "low power mode," you need to recharge with enough fuel!

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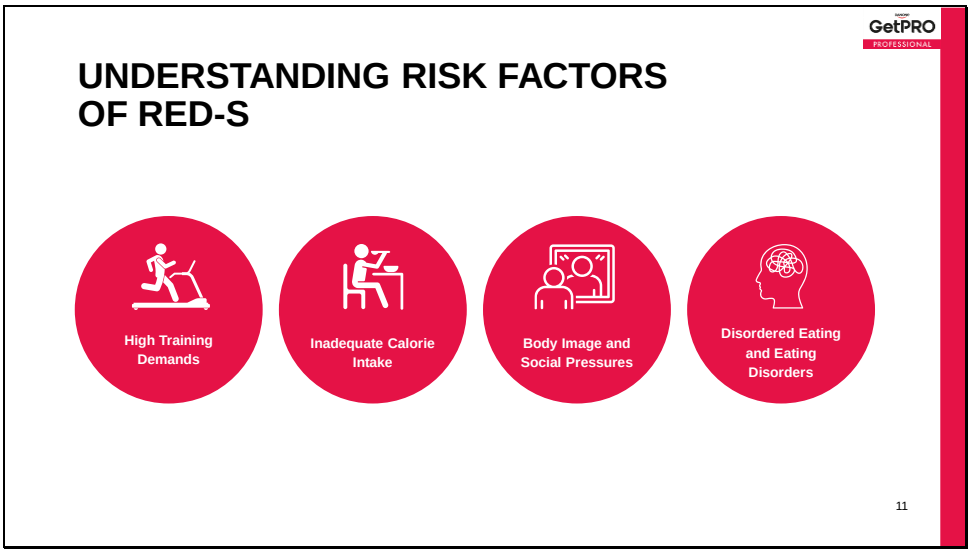

Why athletes are vulnerable to RED-S LEA….

•**High Training Demands:** Intense or prolonged exercise raises energy needs, often exceeding intake.
•**Inadequate Caloric Intake:** Unintentional or intentional undereating due to:

- Limited nutritional knowledge.
- Restrictive diets or food insecurity.
- Time constraints or lack of food access.

•**Body Image and Social Pressure:** Sport-specific and societal expectations promote restrictive eating to achieve a desired physique, especially in aesthetic or weight-class sports.
•**Disordered Eating and Eating Disorders (EDs):** Psychological, cultural, and competitive factors can lead to disordered eating behaviours or clinical EDs, disrupting energy balance.

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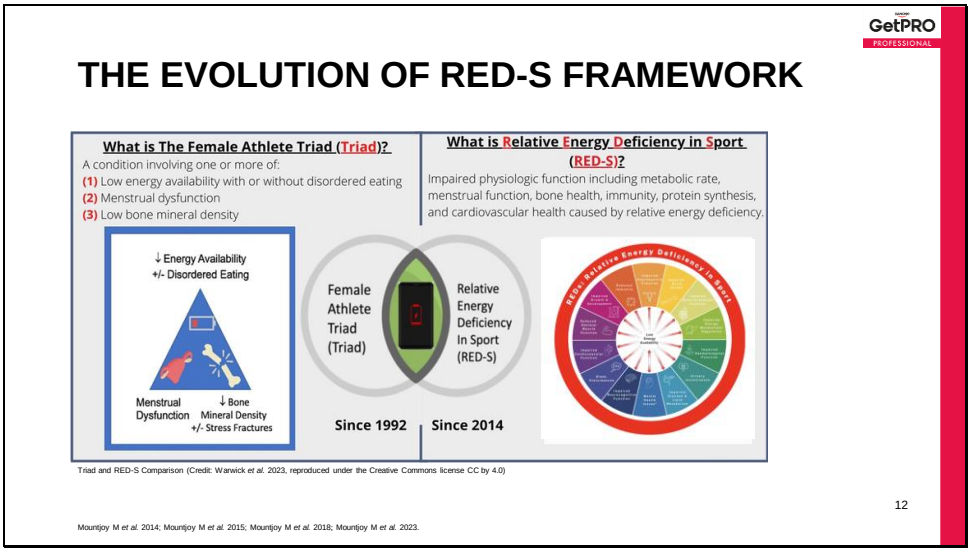

Origins of RED-S: From the Female Athlete Triad to a Broader Framework
Relative Energy Deficiency in Sport (RED-S) developed from the concept of the Female Athlete Triad, which focused on three key health issues in female athletes: disordered eating, menstrual dysfunction, and low bone mineral density. While the Triad highlighted important concerns, its scope was narrow, excluding male athletes and overlooking a wider range of health and performance effects.

The Development of RED-S
In 2014, the International Olympic Committee (IOC) expanded the framework with RED-S, which highlighted the broader consequences of low energy availability (LEA). RED-S acknowledged its impact on multiple physiological systems, including metabolism, cardiovascular health, immune function, and psychological well-being. Importantly, it recognised that energy deficiency affects athletes of all genders, impairing performance, increasing injury risk, and compromising long-term health.

Updates to the RED-S Framework
The 2018 IOC Consensus Statement refined the definition of RED-S, incorporating new research and providing practical guidance for identifying, preventing, and managing the condition. In 2023, further updates integrated the latest scientific insights and introduced the enhanced RED-S Clinical Assessment Tool (CAT).

The Role of the RED-S Clinical Assessment Tool (CAT)
The RED-S CAT was created to offer healthcare professionals a structured method for evaluating and managing athletes at risk of RED-S. The tool supports:

- Screening: Identifying at-risk athletes using questionnaires or clinical interviews.
- Assessment: Determining the severity and impact of RED-S through medical history, physical examinations, and laboratory tests.
- Return-to-Play Decisions: Employing a risk stratification model to guide safe re-entry into training and competition.

The RED-S CAT2, launched in 2023, incorporates updated evidence and underscores the importance of a multidisciplinary approach. Collaboration among physicians, dietitians, psychologists, and coaches is central to this model, ensuring a comprehensive evaluation and

recovery process. By standardising care, the CAT2 facilitates a safer and more effective pathway to health and optimal performance for affected athletes.

For more information on REDs, including the diagnosis criteria and return to play guidance:

The IOC consensus statement: beyond the Female Athlete Triad—Relative Energy Deficiency in Sport (RED-S):
Mountjoy M, *et al*. The IOC consensus statement: beyond the Female Athlete Triad—Relative Energy Deficiency in Sport (RED-S). Brit J Sports Med, 2014. 48(7), 491–7. DOI: 10.1136/bjsports-2014-093502

IOC consensus statement on relative energy deficiency in sport (RED-S): 2018 update:
Mountjoy M, *et al*. IOC consensus statement on relative energy deficiency in sport (RED-S): 2018 update. Brit J Sport Med, 2018; 52(11): 687–97. DOI: 10.1136/bjsports-2018-099193

2023 International Olympic Committee's (IOC) consensus statement on Relative Energy Deficiency in Sport (REDs): Mountjoy M, *et al*. 2023 International Olympic Committee's (IOC) consensus statement on Relative Energy Deficiency in Sport (REDs). Brit J Sport Med, 2023; 57(17): 1073–97. DOI: 10.1136/bjsports-2023-106903

The Relative Energy Deficiency in Sport Clinical Assessment Tool (RED-S CAT) :
- Mountjoy M *et al*. The IOC relative energy deficiency in sport clinical assessment tool (RED-S CAT). Brit J Sports Med 2015; 49(21): 1354. DOI: https://doi.org/10.1136/bjsports-2015-094873
- Stellingwerff T *et al*. Review of the scientific rationale, development and validation of the International Olympic Committee Relative Energy Deficiency in Sport Clinical Assessment Tool 2 (IOC REDs CAT2): a review by a subgroup of the IOC consensus on REDs. Brit J Sports Med 2023; 57(17): 1109-1118. DOI: 10.1136/bjsports-2023-106914

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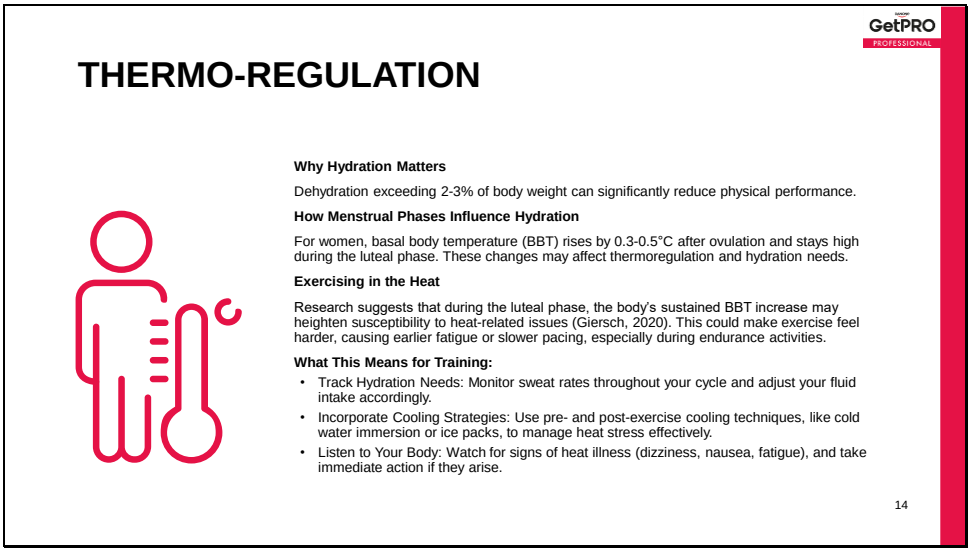

Hydration and Performance

- Maintaining adequate hydration is crucial for optimal performance. Dehydration greater than 2% of body weight can significantly impair performance.

Sex Differences in Thermoregulation

- **Sweat Gland Differences:** There are notable differences between men and women in the size and density of sweat glands. In women, the thermoregulatory system undergoes continuous changes throughout the menstrual cycle.

- **Thermoregulatory Changes Across the Menstrual Cycle / lifespan**
  - In women, the thermoregulatory system undergoes continuous changes throughout the menstrual cycle. For example, as the concentrations of reproductive hormones change, so does the core temperature, along with potentially modifications to the onset thresholds and sensitivity of automatic heat loss responses.
  - Throughout the menstrual cycle, basal body temperature (BBT) fluctuates, increasing by approximately 0.3 to 0.5 degrees Celsius after ovulation and remaining elevated throughout the luteal phase. BBT then drops at the onset of menstruation and stays lower during the follicular phase.
  - Women are also more likely to experience changes in thermoregulation system function across their lifespan (e.g. during pregnancy and after menopause)

Implications for Exercising in the Heat

- **Underrepresentation of Women in Thermoregulation Research:** Women have been underrepresented in thermoregulation studies, leading to inconsistent findings and the need for further research.
- **Luteal Phase and Heat Regulation:**
  - One study showed that increases in BBT during the luteal phase are maintained during and after exercise.
  - This could theoretically make women more susceptible to heat illness during the luteal phase.
  - **Impact on Exercise Performance:**
    - Elevated body temperature during this phase could affect exercise performance, particularly during prolonged endurance exercise in the heat.
    - Women may also be more likely to perceive exercise as harder or experience a desire to slow down or stop during this phase.

Practical Implications

- **Personalising Hydration Needs:** Monitor sweat rates across different cycle phases to tailor hydration strategies for individual needs.
- **Pre- and Post-Cooling Techniques:** Consider using pre-cooling and post-cooling techniques to manage heat stress.
- **Listen to Your Body:** Be aware of the signs and symptoms of heat illness. If they occur, stop exercising and seek a cool environment to recover.

Key References

- Gagnon D, Kenny GP. Does sex have an independent effect on thermoeffector responses during exercise in the heat? J Physiol 2012; 590(23): 5963-5973. DOI: 10.1113/jphysiol.2012.240739
- Stephenson LA *et al.* Esophageal temperature threshold for sweating decreases before ovulation in premenopausal women. J App Physio 1999; 86(1): 22-28. DOI: 10.1152/jappl.1999.86.1.22
- Charkoudian N, Stachenfeld N. Sex hormone effects on autonomic mechanisms of thermoregulation in humans. Auton Neurosci 2016; 196: 75-80. DOI: 10.1016/j.autneu.2015.11.004
- Giersch GE *et al*. Menstrual cycle and thermoregulation during exercise in the heat: a systematic review and meta-analysis. J Sci Med Sport 2020; 23(12): 1134-1140. DOI: https://doi.org/10.1016/j.jsams.2020.05.014

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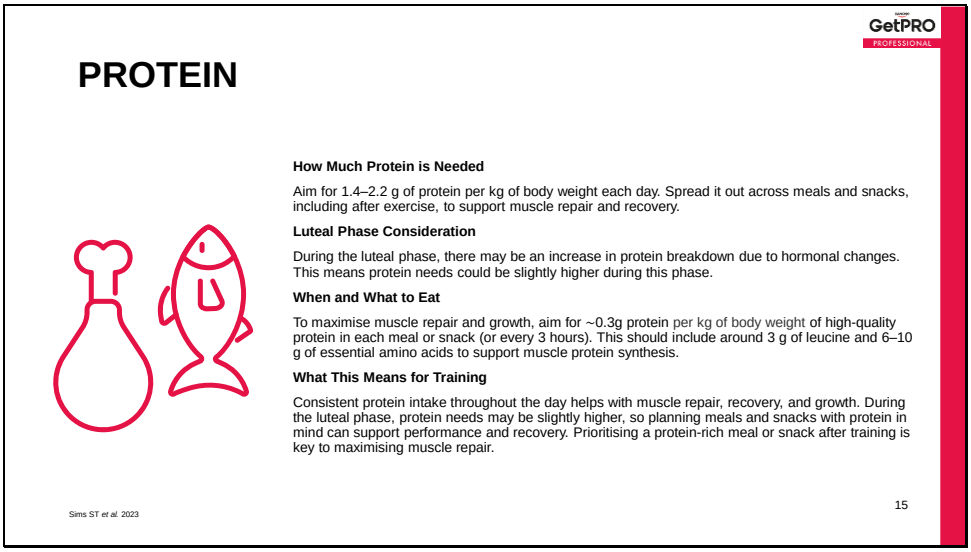

For female athletes, protein intake is crucial for supporting muscle repair, recovery, and overall performance. While the general Recommended Dietary Allowance (RDA) for protein is 0.8 g/kg/day, active women at all stages of menstrual function (pre, peri, and post-menopausal), should consider aiming for a daily protein intake that falls within the mid-to upper ranges of current sport nutrition guidelines (1.4 – 2.2 of protein per kg of body weight)

Unique physiological factors, such as menstrual cycle fluctuations, can impact protein needs. Protein requirements may be higher in the luteal phase of the cycle due to elevated progesterone levels, which increase protein catabolism. In the follicular phase, an intake of at the lower end of the recommendations may be adequate, while the luteal phase may call for slightly higher intake to counteract increased breakdown rates.

In addition to total protein intake, timing and quality are important. Consuming ~0.3g protein per kg of body weight or approx. 20–30 g of high-quality protein per meal, providing around 3 g of leucine and 6–10 g of essential amino acids (EAAs), is recommended to maximise muscle protein synthesis.

Key Reference

- Sims ST *et al*. International Society of Sports Nutrition position stand: Nutritional concerns of the female athlete. J Int Soc Sports Nutri 2023; 20(1): 2204066.
  DOI: 10.1080/15502783.2023.2204066

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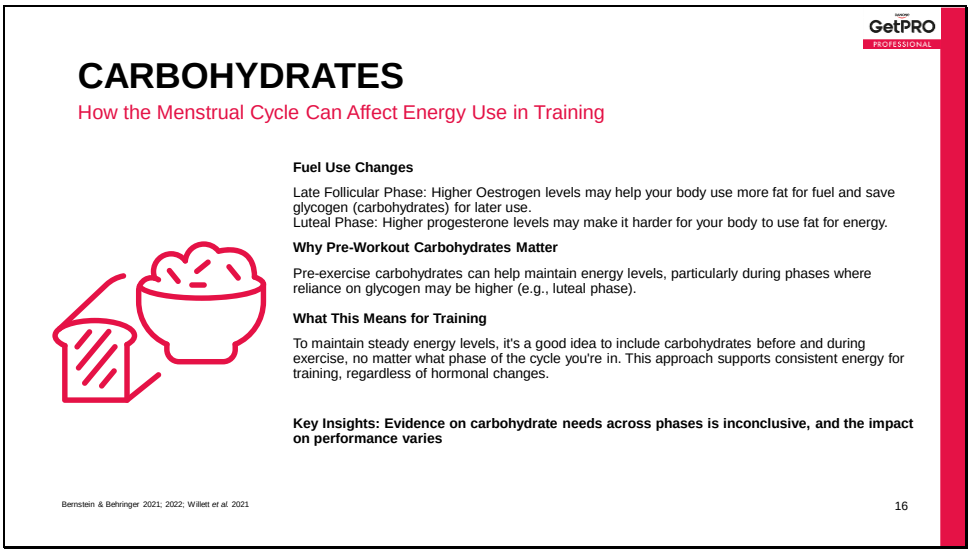

Fuel Use Changes

Hormonal fluctuations across the menstrual cycle may influence how the body uses energy during exercise.

In the late follicular phase, when oestrogen is elevated and progesterone remains low, some studies suggest that the body's ability to use fat as fuel increases, leading to a reduced reliance on glycogen and carbohydrates.

During the luteal phase, when both oestrogen and progesterone are elevated, progesterone appears to counteract some of oestrogen's benefits. This can reduce the body's ability to use fat as fuel and increase reliance on carbohydrates for energy, particularly in fasted or energy-depleted states.

It's important to note that while these mechanisms are suggested in the literature, evidence on carbohydrate needs across phases remains inconclusive, and individual responses vary significantly.

Why Pre-Workout Carbohydrates Matter

Given the potential for increased reliance on glycogen during the luteal phase, consuming carbohydrates before and during exercise can help maintain energy availability. This strategy can reduce the risk of early fatigue and support performance.

At the same time, carbohydrates are beneficial across all phases of the cycle, as the impact of hormonal changes on metabolism isn't fully clear and consistent.

What This Means for Training

The key takeaway is that while there are suggested shifts in fuel use across the cycle, these changes are not definitive, and the effects on performance are still uncertain.

Athletes should focus on consistent fuelling strategies, including adequate carbohydrate intake to support energy demands during exercise, regardless of cycle phase.

Understanding personal patterns through tracking and adjusting nutrition can help athletes optimise energy levels and performance.

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1. Bernstein C, Behringer M. Mechanisms underlying menstrual cycle effects on exercise performance: a scoping review. Women Sport Phys Act J, 2023; 31(6). DOI:10.1123/wspaj.2022-0022. Willett HN *et al*. Influence of menstrual cycle estradiol-β-17 fluctuations on energy substrate utilisation-oxidation during aerobic, endurance exercise. Int J Environ Res Public Health, 2021; 18(13): 7209. DOI:10.3390/ijerph18137209.

3. Oosthuyse T, Bosch AN. The effect of the menstrual cycle on exercise metabolism: Implications for exercise performance in eumenorrheic women. Sports Med 2010; 40(3): 207-27. DOI: 10.2165/11317090-000000000-00000

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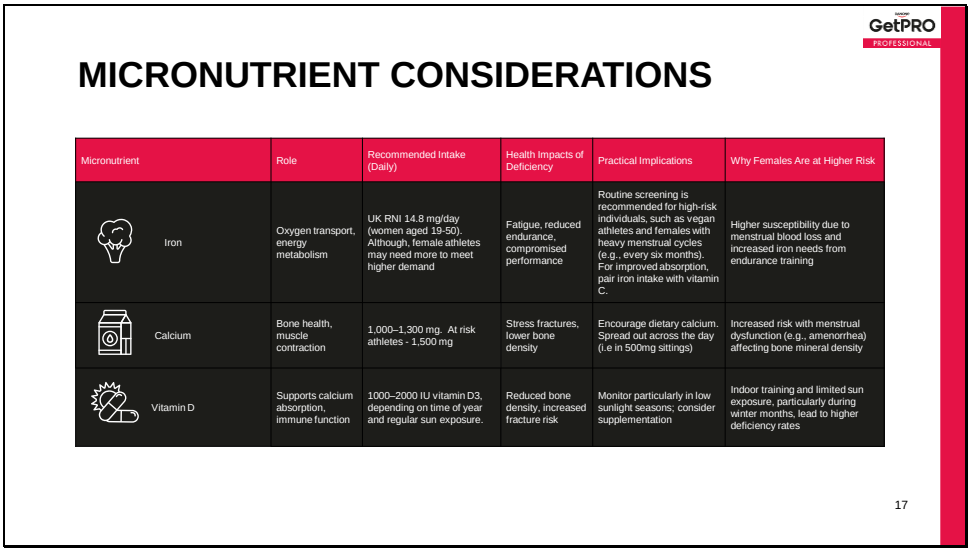

When considering **iron, calcium** and **vitamin D** supplementation**, females** are **well represented** in the literature (71%), likely due to the higher rates of deficiencies evident in women (Smith et al., 2022).

Once primary macronutrient needs have been addressed, optimising micronutrients can occur. In the setting of low EA, micronutrient deficiencies can occur due to overall inadequate nutritional intake. Deficiencies in iron, vitamin D, and calcium are common in female athletes; nutritional strategies should be adapted to prevent these deficiencies.

Iron, calcium, and vitamin D are critical for female athletes, particularly due to unique physiological demands and risk factors. Low energy availability can lead to micronutrient deficiencies in these athletes, with iron deficiency affecting up to 50% due to factors like menstrual loss, restrictive diets, and endurance sports. Iron deficiency progresses in stages, from depleted iron stores (ferritin <35 ng/mL) to iron deficiency anaemia (ferritin <12 ng/mL and haemoglobin <11.5 ng/dL), impacting performance significantly.

Calcium is essential for bone density, especially for athletes with menstrual dysfunction, such as amenorrhea, who are advised to increase intake to 1,500 mg daily. This helps counteract bone density loss from parathyroid-stimulated calcium release when dietary intake is low. Vitamin D supports calcium absorption and bone health but is often deficient in athletes with limited sun exposure, particularly in northern latitudes. Deficiency can increase bone injury risk, and female athletes are encouraged to maintain 25(OH)D levels above 50 nM, which may require supplementation of 1,000–2,000 IU during low-sunlight seasons.

These considerations underscore the need for tailored dietary approaches to support the unique health and performance needs of female athletes.

Key Reference:

- Holtzman B, Ackerman KE. Recommendations and nutritional considerations for female athletes: health and performance. Sports Med. 2021; 51(Suppl 1): 43-57. DOI: 10.1007/s40279-021-01508-8.

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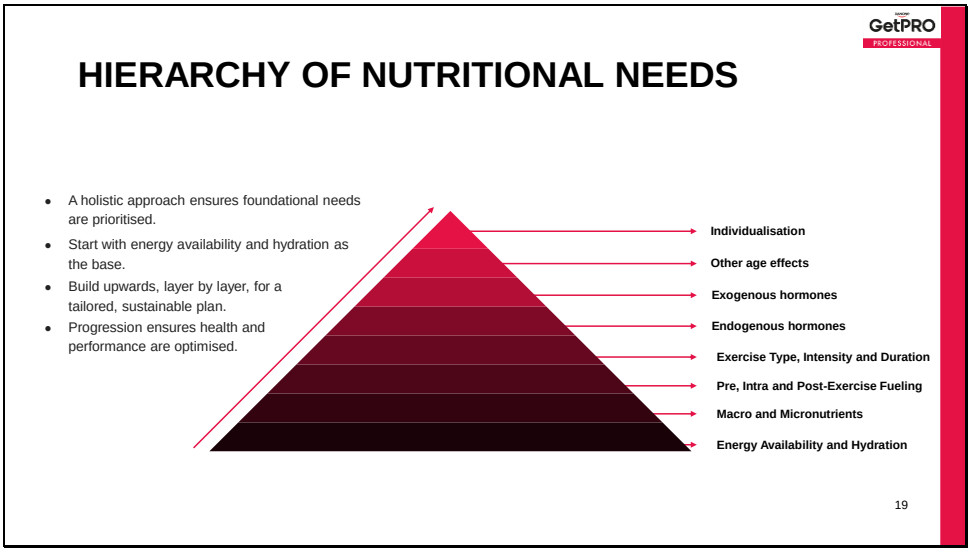

While many resources emphasise isolated components of nutrition for female athletes, such as macronutrient distribution or micronutrient requirements, a comprehensive, layered approach is essential when designing a fuelling plan. This approach recognises that all elements of nutrition are interconnected and should be built on a solid foundation to ensure optimal performance and health.

The hierarchy approach suggested by Holtzman & Ackerman

- Energy Availability (EA) and Hydration
  - At the foundation of any nutrition plan is ensuring sufficient energy availability (EA) and hydration.
  - Without adequate energy to support basic physiological functioning, optimising nutrient composition based on factors like menstrual cycle phase is ineffective.
- Macronutrient and Micronutrient Composition
  - Once caloric needs are met, attention shifts to the quality of those calories, focusing on:
    - Macronutrients: Carbohydrates, proteins, and fats.
    - Micronutrients: Vitamins and minerals
- Timing of Nutritional Intake
  - Nutrition timing should be optimised:
    - Throughout the day to maintain energy and metabolic stability.
    - Before, during, and after exercise to fuel performance and recovery.
- Exercise Variables
  - The length, intensity, and type of exercise influence the athlete's specific nutritional needs.
- Endogenous Hormonal Fluctuations
  - For female athletes, the cyclical hormonal profile associated with the menstrual cycle can then be factored into the nutrition strategy.
  - Hormonal shifts in oestrogen and progesterone may affect metabolism, energy utilisation, and recovery needs.
- Exogenous Hormone Use
  - Hormonal contraceptives or other synthetic hormones may modify natural hormonal patterns and influence energy metabolism, nutrient needs, and performance.
- Age-Related Effects

    - Age-related changes in metabolism, muscle mass, bone density, and hormonal levels should be incorporated into the plan, particularly for athletes nearing menopause.
- Individualization
    - Finally, the plan must be tailored to the specific athlete based on personal preferences, tolerances, and goals.

Graduated and Adaptive Planning

- As nutrition plans move up the hierarchy, they become more prescriptive and detailed, reflecting the athlete's experience level and training demands.
- Adherence is key: The most effective plan is one that the athlete can consistently follow. Overcomplicating or rushing the progression of a nutrition strategy can overwhelm the athlete, just as an overly advanced training plan might lead to injury.

This hierarchical model provides a structured framework for designing nutrition plans, ensuring that all foundational needs are met before incorporating more specific and advanced strategies. Just as athletes progress their training plans over time, nutrition strategies should evolve to match their growing experience and changing physiological demands.

Key Reference:

- Holtzman B, Ackerman KE. Recommendations and nutritional considerations for female athletes: health and performance. Sports Med 2021; 51(Suppl 1): 43-57. DOI:10.1007/s40279-021-01508-8.

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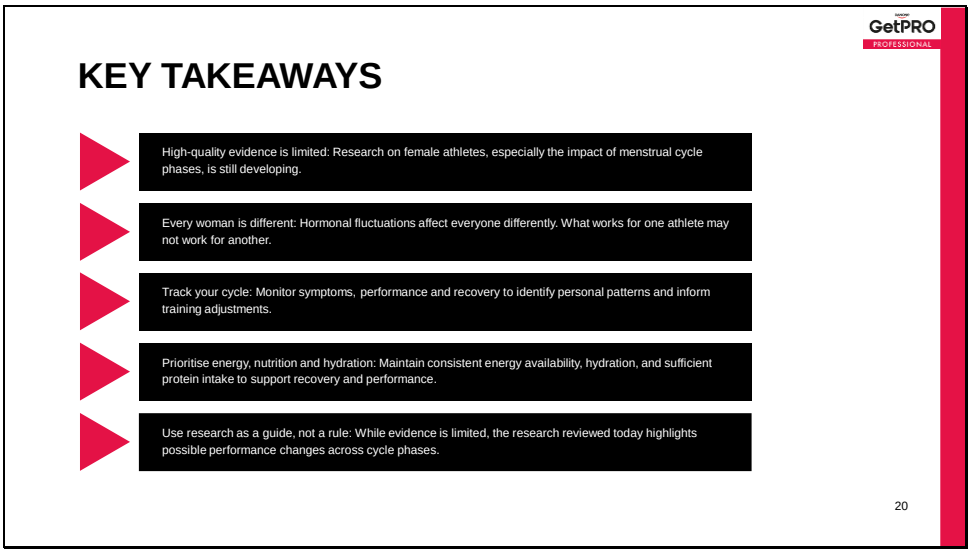

1. **High-Quality Evidence is Limited**
   High-quality evidence on female athletes and how menstrual cycle phases impact performance is still developing. The research in this area is growing, but for now, we have to recognise that much of the available information is emerging and not fully conclusive.
2. **Every Woman is Different**
   Every woman's experience is different. Hormonal fluctuations impact everyone in unique ways. For example, one athlete might feel energised and strong during the luteal phase, while another might feel more fatigued or sluggish. And that's completely normal. What works for one athlete may not work for another, which is why personalisation and self-awareness are so important.
3. **Track Your Cycle**
   One of the most actionable takeaways: track your cycle. By tracking symptoms, performance, recovery, mood, hunger, and sleep, you can start to notice patterns. Over time, you'll be able to see what's affecting you at different phases of your cycle. The goal here is to spot trends that help you make better decisions about training, recovery, and nutrition. You can track your cycle using apps, journals, or spreadsheets, whatever method works best for you.
4. **Prioritise Energy, Nutrition, and Hydration**
   Regardless of your cycle phase, it's important to prioritise energy availability, nutrition, and hydration. Ensuring you're eating enough calories, staying hydrated, and getting sufficient protein are key to optimising recovery and performance. For example, hydration needs might increase during the luteal phase due to a rise in body temperature, so being mindful of fluid intake is essential. This isn't about making big changes for each phase; it's about maintaining a strong nutritional foundation every day.
5. **Use Research as a Guide, not a Rule**
   While we've shared research-backed insights today, it's important to remember that research is a guide, not a rulebook. The evidence on cycle-based nutrition and training is still developing. Many studies have small sample sizes, do not account for specific cycle-phases, or don't fully reflect the real-world experience of athletes. So instead of treating research findings as hard rules, think of them as useful tools to try out. You can experiment with ideas like adjusting nutrition or recovery tactics at different phases but only stick with what actually works for you.

The most powerful tool you have is your own data. By tracking, learning, and adapting, you can create a personalised plan that works just for you. Take ownership of your process and trust that small, consistent improvements will add up over time.

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About the author: Faye Townsend worked in collaboration with the GetPRO Professional team to produce this presentation. She is a leading Performance Nutritionist (SENr) with a background working in the NHS and extensive experience supporting competitive recreational athletes in private practice.