

Form Guides

Tailoring exercise and nutrition
to your menstrual cycle



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Hello, welcome and thank you for downloading this PDF. We're looking forward to sharing with you the latest research and advice on this important topic.

Let's start with some background and context. Did you know that most performance, training, and nutrition guidelines are largely based on research in men? That research on females is lacking? Do you know that because of this there are tons of female-specific performance and training factors that, for a long-time, have gone under the radar?

In this PDF we will break down one of the unique performance and training considerations for women — the menstrual cycle — through graphics, graphs, and illustrations that will help you more readily understand the basics, how they apply to you and what you need to do to tailor your own exercise and nutrition routine accordingly.



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Female-specific performance and training factors

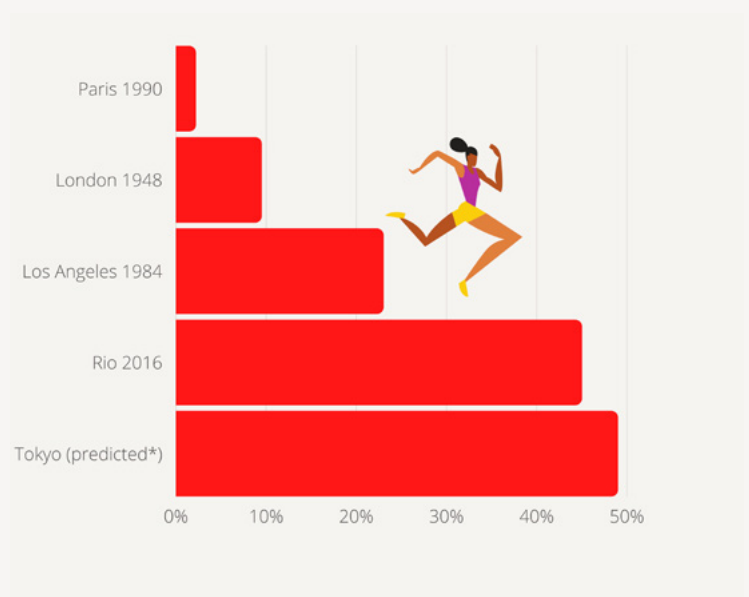
The rise of the sportswomen

Historically inequalities have existed in the inclusion of women participating in exercise. For example, during the early 1800s scientists cautioned women against physical activity, with concerns that “physical effort, like running and jumping, might damage female reproductive organs and make them unattractive to men”[1]. This view was also echoed within the elite sport environment with participation in the first modern Olympic Games limited to just men[2].

As the 20th and 21st centuries progressed, women gradually became an accepted part of sport and exercise, with the biggest rise in the number of women participating in physical activity and elite sport reported in the last three decades[3]. Specifically, the percentage of women competing at the Olympic Games increased from 26 percent in Seoul in 1988 to 45 percent in Rio de Janeiro in 2016[4]. And looking ahead to Tokyo, this is set to be the most sex-balanced Games in history, with the same number of medals available for men and women, with women participation in the Games set to rise to an all-time high of 49 percent[4].

With more women participating in sport and exercise, and women continuing to pursue high-levels of performance, we as coaches, practitioners, athletes, researchers need to know more about female physiology and how this might impact on the likes of performance and training. Because just like their male counterparts, female athletes want to get stronger, faster, achieve PBs and break world records.

Women's participation at the Olympic Games



Female-specific performance and training factors

Mind the gap!

Despite the increased rise of women participating in sport and the need to know more about female physiology and how this might influence performance or training, research on the female athlete still falls short of that carried out on men.

In a recent paper it was highlighted that studies exclusively on female participants account for only 8 percent of the published studies involving human participants in one academic journal[5]. Likewise, within the top-ranked 'sport science' category journals only 4-13 percent of the studies were conducted exclusively on females[6]. Therefore, research on women has not kept pace with the exponential rise in participation and what this means is that our ability to adopt an evidence-informed approach when working with female athletes is limited. This means that performance, training and nutritional guidelines are largely based on research in men.

While a lot of aspects of this research will benefit both men and women it would be naïve to assume that all research in men can be directly applied to women, given the anatomical, physiological and endocrinological differences between the sexes. As such, sportswomen will likely benefit from sex-specific research and guidelines, which consider the effects of their physiology, such as the menstrual cycle, on the likes of performance, training, and nutrition.

Sex distribution in studies of human participants published in The Journal of Physiology



8% Female



20% Male



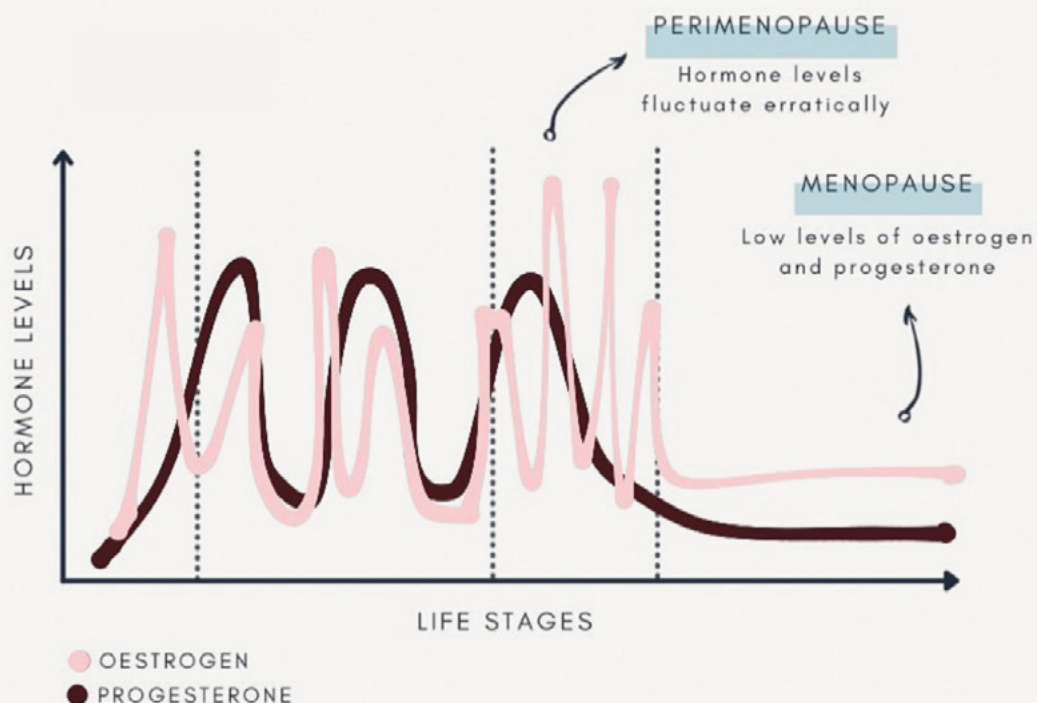
72% Mixed

Female-specific performance and training factors

What are the reasons for this exclusion?

Historically, this lack of female specific research in sport and exercise can be attributed to historical guidelines and perceptions of women. Indeed, the sex bias in research dates back to before World War II, where medical trials were solely conducted on men. At the time women were deemed as "protected subjects", due to the overarching fear that any clinical testing could potentially harm unborn foetuses[7].

Today, one of the most frequently cited reasons for this exclusion is that women are perceived as being "too difficult", "time consuming" and/or "expensive" to study, as women are more physiologically variable than men[8]. Specifically, unlike men, women have a cyclical pattern of hormonal fluctuations, which means that our physiology is different across the cycle too. On top of this – also unique to women - are the changes in these hormonal profiles across our lifespan, as well as the ability to alter our hormonal profile by using the likes of hormonal contraception. And it is these changes in hormonal profiles which are considered as major barriers to the inclusion of women in research.



Female-specific performance and training factors

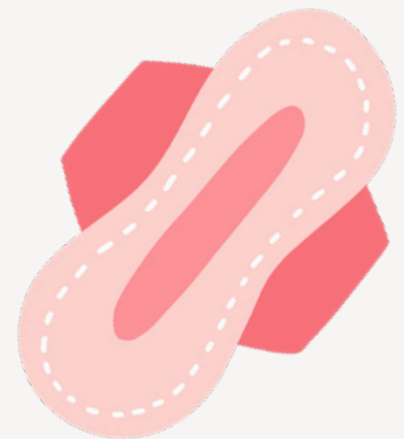
But what about the research that has been done?

It would be incorrect to suggest that there is currently no research available related to active females or the female athlete. Many experimental studies, narrative, and systematic reviews, as well as books have addressed this topic and recently there has been an increased appetite for this research. That said, an increase in quantity does not necessarily equate to quality, as often research in this area is conflicted – with some studies showing an affect and others not – and weakened by poor methodological design which limits our ability to further draw these evidence-based conclusions and recommendations[9].

The great global hush-up

Now it is not just the lack of research into women's health and performance that is the issue. There is also a lack of awareness which can be attributed to the fact that for a long-time women's health and education has been hushed-up and considered as taboo. As such, most of us grow up uneducated and ashamed about our bodies, especially our menstrual cycle.

Although this is improving, we need to strive for open conversations and increased awareness and education in this area. Having an appropriate awareness and a proper introduction to female physiology will stop us all from suppressing our biology which will not only help us in day-to-life but also in terms of our performance and training.



Female-specific performance and training factors

Performance and training considerations for females

Given that research has effectively ignored the complexity of female physiology, and that we do not receive the correct awareness and education on these topics, there are a lot of performance and training considerations specifically for females that have gone relatively under the radar, including:

- The menstrual cycle
- Hormonal contraception
- Breast health and support
- Pelvic floor health and incontinence, prolapse and dysfunction
- Pregnancy and post-natal
- Perimenopause and the menopause
- Female specific injury risk and injuries
- Female specific nutrition

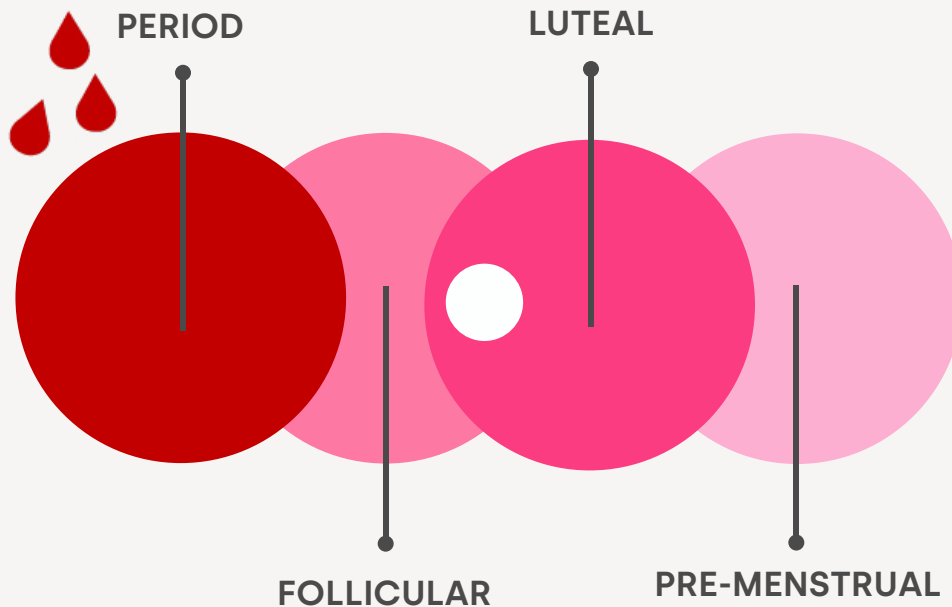
Therefore, to optimise performance and training – as well as health and well-being – in women, we need to be considering these factors so that we can work with, and not against, our own physiology.

Key takeaway

Together the lack of female participants in research and a great global hush-up in this area has resulted in clear gaps in our knowledge base particularly in relation to these female-specific factors. As such, there are numerous avenues of unexplored opportunities to improve female athlete performance – whether that is winning a gold medal at the Olympic Games or beating our 5k time at our local Parkrun.

In the next chapter, we will be taking you through one of these unique performance and training considerations for women – the menstrual cycle.

Menstrual cycle 101



If you are in need of a menstrual-cycle-101 then you are not alone. Knowledge and education around the menstrual cycle is poor and in 2019 a study by The Royal College of Obstetricians and Gynaecologists reported that women are uneducated about their physiology at all their life stages[1].

We'll breakdown the basics of the menstrual cycle, the hormones involved and what is **actually** going on at each phase.

Menstrual cycle 101

Back to basics

The menstrual cycle is the name given to the cycle of hormonal fluctuations that occur roughly every month in women of reproductive age (from menarche to menopause) for the purpose of allowing reproduction.

There is a common misconception that the length of a menstrual cycle is how long you bleed for, but your cycle is the time from the first day of your period to the day before your next period begins. A 'textbook' menstrual cycle lasts 28-days, but it is worth noting we are not all textbooks and only around 13 percent of us have a 28-day cycle[2]. As such, a 'normal' cycle length is considered somewhere between 21 and 35 days (or even up to 40 days in your early cycle/teen years). It is also normal for there to be some variation in the length of your cycle month-to-month by up to around eight days.

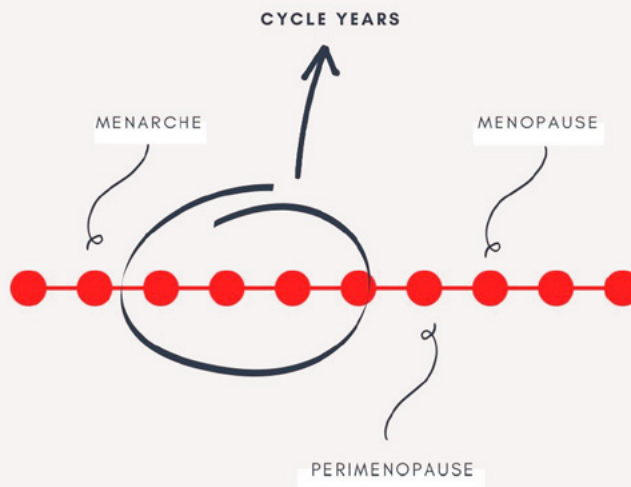
There are two main events in our menstrual cycle: menstruation (commonly referred to as a 'period') and ovulation. A period is what happens when the endometrial lining of the uterus is shed, and this typically lasts between two to eight days. Ovulation, on the other hand, refers to the release of an egg from the ovary and usually happens mid-way through our cycle (so day 14 in this 'textbook' example), although this varies greatly within and between women. These two events are controlled by hormonal fluctuations which are governed by the hypothalamus-pituitary-ovarian axis or the HPO axis for short.

Your hormones

Put simply, your hormones are chemical messengers which travel in your bloodstream sending messages to target sites in your body in order to cause a specific response.

Women have two predominate sex hormones – oestrogen and progesterone – although, there are many other hormones involved in our cycle such as: 1) gonadotropin-releasing hormone (GnRH); 2) luteinizing hormone (LH); 3) follicle-stimulating hormone (FSH); and 4) testosterone.

Across this 'textbook' 28-day cycle these sex hormones rise and fall, giving the cycle its distinct phases. Typically, the menstrual cycle can be broken down into two phases: the follicular phase and the luteal phase, separated by ovulation. Let me take you through these now.



Menstrual cycle 101

The follicular phase

The follicular phase runs from day one of your period until ovulation. This phase can be subdivided into two parts because of the changes in hormonal concentrations:

Phase 1: The period phase

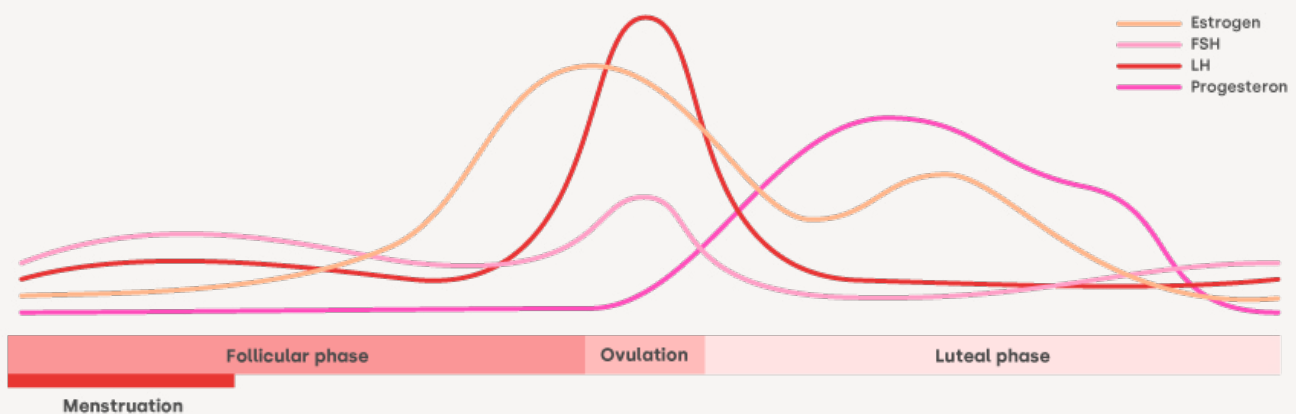
At the start of your cycle your endometrial lining – which has built up over your previous cycle – sheds and leaves your body via your vagina. This is your period and during this time, you might experience a wide range of symptoms such as period pain.

While some symptoms which are mild and manageable are normal, if your symptoms around this time are making it difficult for you to go about your day-to-day life then please do not just suffer in silence and go speak to a healthcare professional as soon as possible. At this point in your cycle your levels of hormones – oestrogen and progesterone – are at their lowest.

Phase 2: The late follicular phase

Following your period one of your hormones – oestrogen – starts to increase (usually around day five in this 'textbook' example) in response to the release of FSH and LH which are preparing your body for the egg to be released from the ovary. Oestrogen is responsible for rebuilding the endometrium in preparation of potential pregnancy during this new cycle.

Eventually, oestrogen reaches its peak (around days 11/12 in this 'textbook' example) just prior to ovulation which occurs roughly at the mid-point in the cycle i.e. day 14 in this 'textbook' example. So, at this point in your cycle oestrogen is high while progesterone remains low.



Menstrual cycle 101

The luteal phase

The luteal phase runs from ovulation through to the day before your next period arrives (interestingly, the luteal phase of the cycle is the same in most women, with a duration of around 14 days and therefore it is the follicular phase that varies more in length), and like the follicular phase can be subdivided into two parts:

Phase 3: Early/mid-luteal phase

Immediately following ovulation oestrogen levels begin to temporarily fall before they rise to reach a secondary peak (although lower than this first initial peak) at roughly the mid-point of the second phase of the cycle (around days 20 to 23 in this 'textbook' example). Additionally, at this time progesterone – which started to rise after ovulation – also reaches its peak. Progesterone's main role is to ensure that your endometrial lining is fully ready for the possible arrival of a fertilised egg. Therefore, at this point in the cycle both oestrogen and progesterone are high.

Phase 4: Pre-menstrual phase

Following this, if pregnancy does not occur, both oestrogen and progesterone begin to decline and because your endometrium is no longer supported it begins to shed. This is your period, and your cycle begins again. You might also notice you experience symptoms during this phase, known as premenstrual syndrome (PMS). There are around 150 reported symptoms of PMS, with the most common ones being breast pain, reduced mood, fatigue, anxiety, and bloating.



Menstrual cycle 101

Menstrual cycle variations

It is important to note that the above description refers to a 'textbook' menstrual cycle, however every woman's experience of the menstrual cycle is unique. Indeed, there is a lot of variation in hormonal concentrations across the menstrual cycle between women so expect your cycle to be different from your sister or best friend.

Additionally, there is also a lot of variation in hormonal concentrations within the same woman across her lifespan from menarche to menopause. It is not unusual to see a change in your cycle across your lifespan. And don't forget, your cycle can also be influenced by your lifestyle, with nutrition, stress, sleep and exercise all potentially playing a part.

Beyond reproduction

While the main function of the menstrual cycle is to support reproduction, because we have receptors for oestrogen and progesterone all over our bodies (i.e. in our muscles and in our brain) the fluctuations in these hormones across the menstrual cycle can impact on various other aspects of how our body works, and subsequently affect things like our mood, motivation, energy levels, sleep quality, libido, confidence, focus, appetite, cravings, and how you respond and adapt to exercise. So, you know, quite a lot...

Key takeaway

Hopefully, from this chapter you can see that your menstrual cycle is more than just your period and instead is a brilliant cycle of hormonal fluctuations. By paying attention to what is going on in your own body each month you can learn how to live and work with your own individual cycle to get the best out of yourself.

In our next chapter, we will be taking you through how you can do just that, starting with how you might tailor your exercise to your menstrual cycle.

Tailoring exercise performance & training to your menstrual cycle

For decades, female athletes have hinted that the menstrual cycle has the potential to influence performance and training. For example, Olympic athletes Heather Watson, Paula Radcliffe, and Jessica Ennis-Hill have all spoken openly to the media regarding the effects of their menstrual cycle on their performance.

Importantly for me and you, these effects are not limited to elite athletes, with research reporting that on average 50 to 90 percent of sportswomen believe that their menstrual cycle affects their ability to perform or train[1-5].

Despite these statistics, for a long time the menstrual cycle has been treated as a taboo and something we don't openly discuss as women, especially in sport and exercise. For instance, a recent study by Strava and FitrWoman revealed that 81 percent of women have never discussed their menstrual cycle with their coach[6].

If we cannot talk about our menstrual cycle, we will never know what is normal and not normal (which can lead to women suffering in silence and not getting the help they need to overcome any issues) and we will also never know how our menstrual cycle can potentially influence our performance and training. On top of this, education is lacking, with 72 percent of women reportedly not receiving any education about their menstrual cycle in relation to how it might affect performance and training[6].

With this in mind, does our menstrual cycle affect our performance and training? And if so, how? What can we do with this information to work with and not against our physiology? In this chapter we'll answer these questions.



50 - 90% of sportswomen believe that their menstrual cycle affects their ability to perform or train



81% of women have never discussed their menstrual cycle with their coach



72% of women reportedly not receiving any education about their menstrual cycle in relation to how it might affect performance and training

Tailoring exercise performance & training to your menstrual cycle

The menstrual cycle and performance & training effects

Aside from their role in reproduction, your sex hormones can influence many other physiological systems. In fact these hormones are known to influence our cardiovascular system, our respiratory system, our metabolic system, and our neuromuscular system[7], and because of this they can subsequently affect our performance and training.

These effects might not necessarily be negative, and by understanding these effects, alongside tracking our menstrual cycles, we can gain a better understanding of where we are in our cycle and the physiology at that point, as well as how we might adjust our performance and training accordingly. Let us see how we can do just that.



Tailoring exercise performance & training to your menstrual cycle

Phase 1

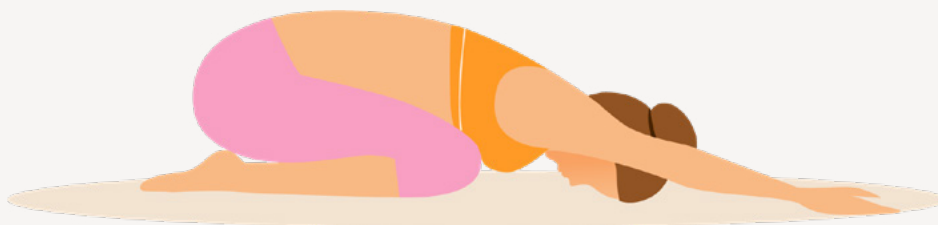
Physiology: At the start of the menstrual cycle – the early follicular phase – you will remember that oestrogen and progesterone levels are at their lowest. During this time, your period occurs, and some women might experience associated symptoms, such as period pain, nausea, and low mood.

Some of these symptoms can be attributed to not only low concentrations of oestrogen and progesterone but also to prostaglandins, which are hormone-like chemicals that help our uterus to contract to shed our endometrial lining. While we need prostaglandins to have a healthy period, too many of these prostaglandins can cause intense pain. On top of this they can escape into nearby areas and make us feel sick, dizzy, and have diarrhoea.

What might this mean for exercise performance and training? If you are experiencing these symptoms then you might not be up for a big training session or performance, and this has been shown in some recent research which highlights that the prevalence of menstrual cycle symptoms and their frequency are linked to changing or missing training[1].

But this does not mean you need to avoid exercise during your period, as exercising at this time might be beneficial to you. For instance, there is evidence to suggest that the anti-inflammatory and antioxidant properties of moderate intensity exercise, as well as activities like yoga can help ease the symptoms associated with menstruation and can also make you feel better emotionally thanks to the release of endorphins[8-14].

The key takeaway here is that there is no right or wrong way to exercise while on your period. Instead it's important to listen to your own body and adapt exercise if you feel it is necessary.



Tailoring exercise performance & training to your menstrual cycle

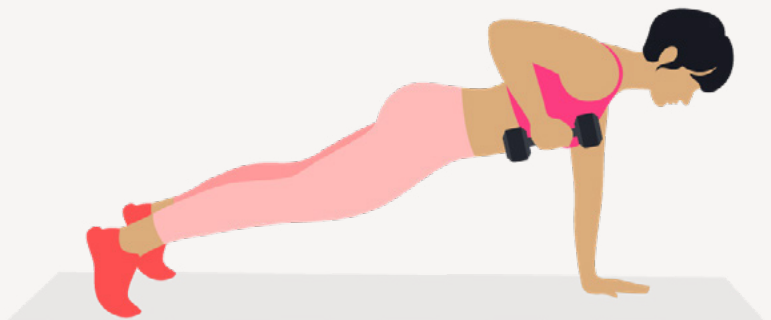
Phase 2

Physiology: During the late follicular phase, oestrogen begins to rise, and reaches its peak just before ovulation, whereas progesterone remains low. Oestrogen can have lots of different physiological effects on the body. For instance, it is known for its anabolic and muscle-building effects[15-16], its excitatory effects on neuromuscular signalling[17] and is thought to have a protective function against muscle damage by reducing the likes of muscle soreness and swelling[18-23]. Additionally, it is a feel-good hormone which can influence your motivation to perform and train in a positive way[24].

What might this mean for exercise performance and training? Given this information it could be theorised that now might be a good time to switch your focus to strength training[25-26] and some evidence suggests that follicular phase-based resistance training (i.e. strength training more in your follicular phase than any other phase of your cycle) is better than regular or luteal phase-based training for developing strength and muscle mass[25-26].

It is interesting to think that we could potentially make the most of our physiology at this point in our cycle to gain these types of advantages. However, at the moment there are only four studies which have investigated this, and there is a difference in findings between these studies, so be cautious when directly applying this research to your own practice. There is also evidence to suggest that our ability to recover from performance or training is improved at this point in our cycle, although research is scant. Finally, there is some research which highlights the role oestrogen might play in ligament laxity which could increase injury risk[27-28]. Indeed, a recent review suggests that knee ligament laxity and ACL injury might be increased during the ovulatory phase of the menstrual cycle[29].

That said, the research in this area still remains inconclusive. As such, there is no reason not to train or perform in this part of your cycle, but if you are going to be doing exercises which require a rapid change of direction or impact, like football or netball, or if you're someone who notices slight niggles and a tendency for injury at this point in your cycle, then this might mean you need to make sure you are adequately prepared before starting your exercise.



Tailoring exercise performance & training to your menstrual cycle

Phase 3

Physiology: After ovulation, oestrogen levels (which initially dropped off) start to rise again alongside an increase in progesterone. This means that both hormones are now high and usually at their peak at the mid-point of this phase. Progesterone is thought to inhibit the effects of oestrogen, as well as having its own physiological effects like promoting good mood, reducing anxiety and improving sleep. Additionally, progesterone is known to influence your body temperature (which rises by approximately 0.3 C [0.5 F] in this point of our menstrual cycle)[30] and can affect metabolism (some research highlights that we might be better able to use fats as fuel in this part of our cycle compared to any other point[31]).

What might this mean for exercise performance and training? Although this rise does not sound like much, it could mean that some women might feel hotter during training which can make them stop, slow down or perceive exercise to be harder during this point in their cycle[32]. This might be even more relevant for performance in longer endurance events especially in the heat or humid climates[32], and you might also find the likes of hot yoga makes you feel more uncomfortable during this phase of your cycle.

As such, some women might benefit from the use of cooling strategies and staying adequately hydrated during this time of their cycle. Because your body is better able to use fats as fuel in this part of our cycle compared to at any other point[31] this might be beneficial for the likes of endurance training, such as long, steady-state runs or cycles when saving carbohydrate stores (i.e. glycogen), and instead using fat can prevent 'hitting the wall' so you can potentially keep going for longer without fatiguing. Finally, some women might find that recovery takes longer as the beneficial effects of oestrogen are offset by progesterone. As such, focusing on your recovery strategies, such as optimising your nutrition and sleep and potentially adding more rest days into your program could be beneficial.



Tailoring exercise performance & training to your menstrual cycle

Phase 4

Physiology: In the final part of the cycle both oestrogen and progesterone begin to decline, and this rapid decline in hormones can cause a lot of the different premenstrual symptoms we experience at this point in our cycle such as headaches, bloating, breast tenderness, anxiety, and irritability.

What might this mean for exercise performance and training? Again, just like during our period these symptoms might reduce motivation to perform and willingness to train, as well as make our perception of effort during exercise greater[1]. Having said that, if you're feeling up to it, light to moderate intensity exercise might help with premenstrual symptoms and have mood improving effects[33-34]. But again, there is no guide here, so you do you, and adapt your activities to suit.



Tailoring exercise performance & training to your menstrual cycle

Giant caveat

Please note that most of the research in this area is conflicting and largely of low-quality[7]. Therefore, there is a lack of consensus on whether performance and training are affected by menstrual cycle phase, or not. On top of this, every woman's experience of the menstrual cycle is different, and this can change across her lifespan. So, if we start to add this up, this means there are currently no evidence-based guidelines for active women or elite female athletes around managing their performance and training across their cycle.

Key takeaway

Although the science is currently conflicting, an absence of evidence is not evidence of absence, and only you know how your body is feeling. Therefore, the best advice for now is to take a personalised approach, whereby your individual experiences of the menstrual cycle inform how you might adjust performance or training[7].

To do this I would recommend tracking your cycle and seeing if any of the above applies to you. And if it does, then you can start to make small changes and tweaks to get the best out of yourself on any day of your cycle.

Finally, sometimes it is just nice to know that it is not all in your head and there might be a plausible reason why maybe you cannot lift as much, or you are not achieving your usual 5k times at certain points in your cycle.

In the next chapter, we will be taking you through how you might tailor your nutrition to your menstrual cycle.

The menstrual cycle and nutrition

As highlighted in our previous chapter, and as Dr Stacy Sims states: “women are not simply smaller versions of men which means we simply cannot shrink and pink our guidelines”[1]. And this statement also holds true when considering nutrition.

What is the role of nutrition when it comes to performing and training?

Nutrition plays a vital role in providing us with the energy we need to not only go about our day-to-day lives but to be able to perform or train, and recover, in response to these activities. In addition, it plays a role in body composition, bone health, mood and motivation, and illness and injury[2].

Do women need to fuel differently?

There is an overwhelming volume of sports nutrition information out there, but it is important to remember that not all the info might be relevant to the recreationally active or elite female athlete. Specifically, very little time has been spent on investigating the role and importance of female sex hormones on not only fuelling for day-to-day life but also performance and training (usual caveat: we need more research)[2].

This means that most of the information out there has been based on male needs. However, with female participation in sport and exercise rising is it vital that we look into these sex-specific nutritional needs.



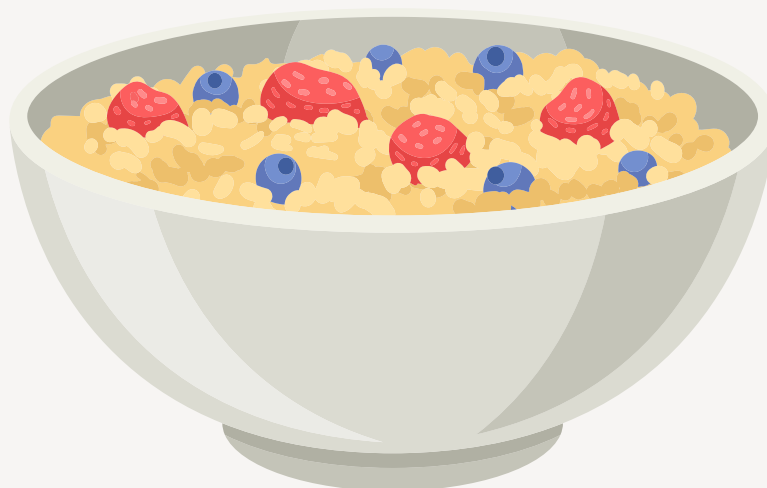
The menstrual cycle and nutrition

Why your low-fat and/or low-carb diets might not be working for you

We have almost become scared of eating fats or carbohydrates due to the associations with an unhealthy diet. But, eating essential fats from foods like olive oil, avocado and nuts is key for female-hormone production as essentially our hormones are made from cholesterol. This is one of the reasons why a low- or no-fat diet might not work for women as it means your body is not getting the necessary ingredients it needs to make these hormones (i.e. oestrogen and progesterone), which can have consequences for your health[1].

Additionally, it is important to note that quite often low-fat alternatives usually have more added sugar and sweeteners. A high intake of saturated fats however should be avoided and instead enjoyed in moderation. Likewise, carbohydrates are the main source of energy for our bodies and therefore not getting an adequate amount of carbohydrate because of a low- or no-carbohydrate diet will likely lead to fatigue, changes in mood and – you guessed it – changes in your female sex hormones, which can disrupt your menstrual cycle[2].

Therefore, instead you should focus on getting good-quality, complex carbohydrates into your diet from foods such as rice, oats, and potato, as well as beans and lentils.



The menstrual cycle and nutrition

The menstrual cycle and your nutrient needs

The main aspect to consider when looking at these sex differences in nutrition is the influence of the menstrual cycle. Specifically, there is some research that highlights that our nutrient needs might change across the cycle. As such, by knowing where you are in your cycle, and the physiology at that point, it will help you to understand how you might adjust your nutrition accordingly. Now, let us see how we can do just that.

Phase 1

Physiology: At the start of the menstrual cycle – the early follicular phase - oestrogen and progesterone levels are at their lowest.

What this might mean for fuelling: Carbohydrates are still essential during this time so ensure a regular distribution of carbohydrates throughout the day and in particular around training. You might also want to make sure you are getting enough iron in to replace losses (especially if you are a heavy bleeder)[2].

Importantly get these from food sources first (before rushing to supplement with iron please get your iron levels checked by a healthcare specialist first) such as fortified cereal and green leafy veg and consuming these alongside vitamin C can aid absorption. Finally, increasing your intake of anti-inflammatory (such as Vitamin D, calcium and Vitamin B) and antioxidant (such as strawberries, raspberries, blueberries and blackberries) foods might also help with menstrual cycle symptoms[2].



The menstrual cycle and nutrition

Phase 2

Physiology: During the late follicular phase, oestrogen begins to rise and reaches its peak just before ovulation, whereas progesterone remains low.

What this might mean for fuelling: Again, it's important to not ditch the carbs, and instead ensure a regular distribution of carbohydrates throughout the day, and in particular around training. Specifically, in the hours before training make sure to prioritise carbohydrates as these will be your main source of energy.

Likewise, following exercise you should rapidly consume carbohydrate (roughly within 30 minutes post-activity) to help replenish your energy stores and protein to help you recover and adapt to training. This becomes even more important if you're training more during this phase of your cycle to assist recovery. Additionally, foods that are anti-inflammatory and rich in antioxidants have been found to help reduce muscle soreness and optimise recovery.



The menstrual cycle and nutrition

Phase 3

Physiology: After ovulation, oestrogen levels (which initially dropped off) start to rise again alongside an increase in progesterone, which has been quiet so far. This means that both hormones are now high and usually at their peak at the mid-point of this phase.

What this might mean for fuelling: With these hormones being high they can affect your basal metabolic rate[2-3]. As a result, you might notice a change in appetite and cravings, with more cravings for both sweet and salty foods. To overcome this, ensure a regular intake of carbohydrates and protein to regulate your blood sugar levels by eating roughly every 3 hours[2]. This will also help with your recovery from training.

An additional factor to consider is that if exercising for long periods, you will need to keep carbohydrate stores topped up as during this phase our bodies are less efficient at using stored carbohydrate as a fuel source (meaning your extrinsic carbohydrate source is going to be more important here)[2].

Muscle breakdown might also be increased during this time so ensure you are consuming protein before and after training[3]. Finally, progesterone can also influence digestion by slowing it down which can contribute to increased bloating and constipation during this phase[1]. To help with this make sure you are staying well hydrated and consuming enough fibre. Additionally, if you are exercising in the heat be mindful of hydration requirements and how these might change throughout certain phases[1].



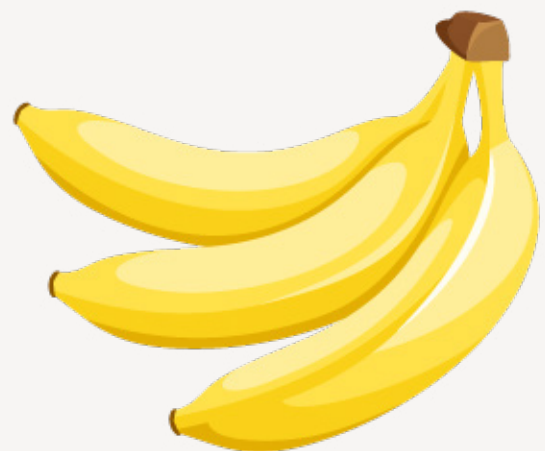
The menstrual cycle and nutrition

Phase 4

Physiology: In the final part of the cycle both oestrogen and progesterone begin to decline. What this might mean for fuelling: Increased appetite and cravings are likely again as we come towards the end of our cycle[4]. Additionally, binge-eating, and emotional eating as well as a preoccupation with body weight are also highest before your period[5]. If you couple this with a strict and restrictive diet it is likely to add to this psychological strain of being hungry ALL. THE. TIME.

Instead, it's important to listen to your body here and fuel correctly and often, but importantly be adaptable to suit the natural rise and fall of your hormones and be kind to yourself. Also, at this point in your cycle increasing your Vitamin B (from foods such as bananas, and almonds) intake might reduce pre-menstrual symptoms (PMS)[6] and Omega-3[7], as well as your intake of anti-inflammatory and antioxidant foods might also help with menstrual cycle symptoms[2]. Although it is important to consider this throughout your entire cycle and not just in this final phase.

Finally, sleep is reported to be more disturbed at this point in our cycle[8] – but try not to reach for extra caffeine as there is some evidence that caffeine elimination fluctuates across the menstrual cycle with women experiencing longer and more intense effects of caffeine at this point in our cycle[3].



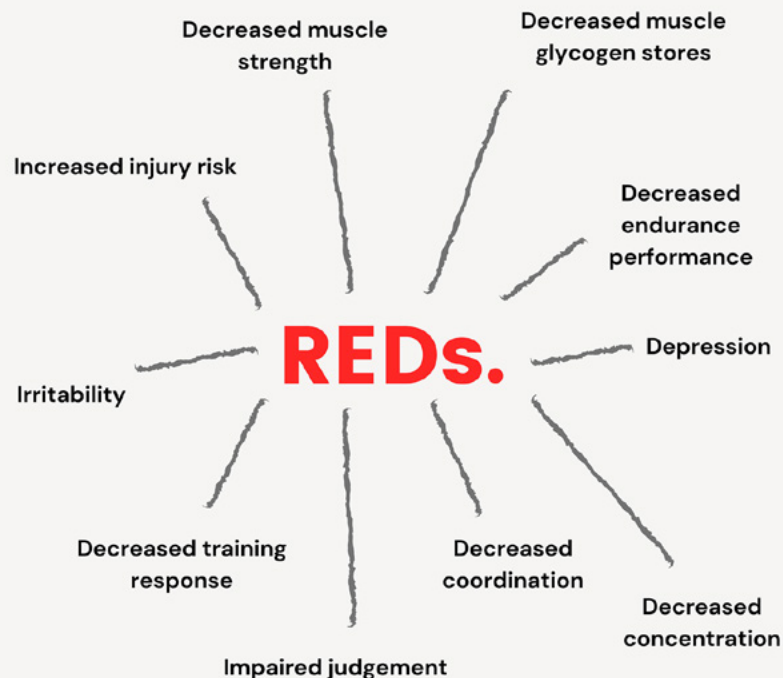
The menstrual cycle and nutrition

Relative energy deficiency in sport (RED-s)

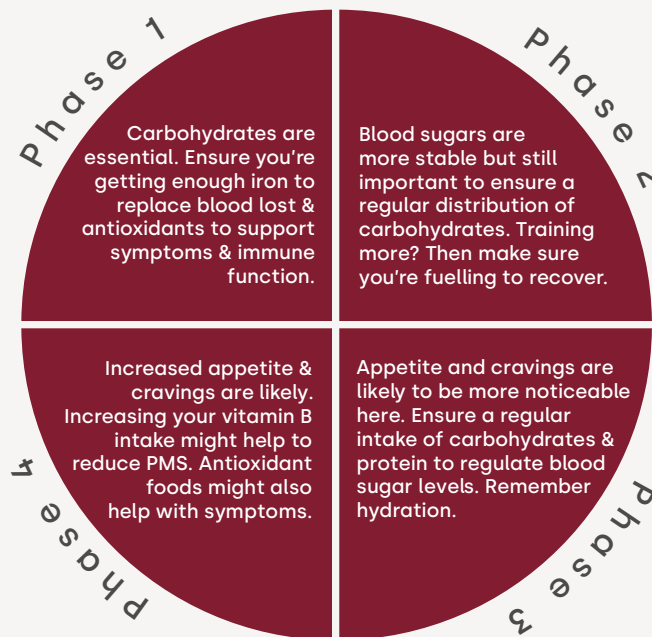
A primary goal for women should be achieving adequate nutritional intake to match that going out to support not only your day-to-day life but also your performance and training goals[3]. But it is known that many of us are not achieving this. This is referred to as relative energy deficiency in sport, or REDs, and can have severe consequences for both our health and performance.

For example, not having a menstrual cycle can negatively affect our bone health which can increase the risk of the likes of stress fractures[9-10]. Additional signs to look out for include increased illness, fatigue, decreased performance, not seeing any adaptation despite the training you are doing, disturbed sleep, decreased coordination, irritability, and depression[9-10].

Generally addressing lifestyle factors such as nutrition, exercise and stress management can all have a positive impact, but please do not ignore these signs and seek the help and support you need from your doctor, GP, or other medical staff.



The menstrual cycle and nutrition



*Adapted from McGregor, R. The Female Athlete Training Diary

Key takeaway

Fuelling correctly does not have to be complicated. The most important thing is to find a balance between consuming all the key ingredients your body needs, so that we are able to carry out all our essential functions while also enjoying a slab of chocolate cake when you want it.

A great place to start is to keep a basic food diary to help you determine if there is a link between your diet and any symptoms experienced, as well as your exercise performance and training and day-to-day life. If you do notice changes then consider making small changes to your diet accordingly. Importantly, this should be done in conjunction with professional nutritional advice.

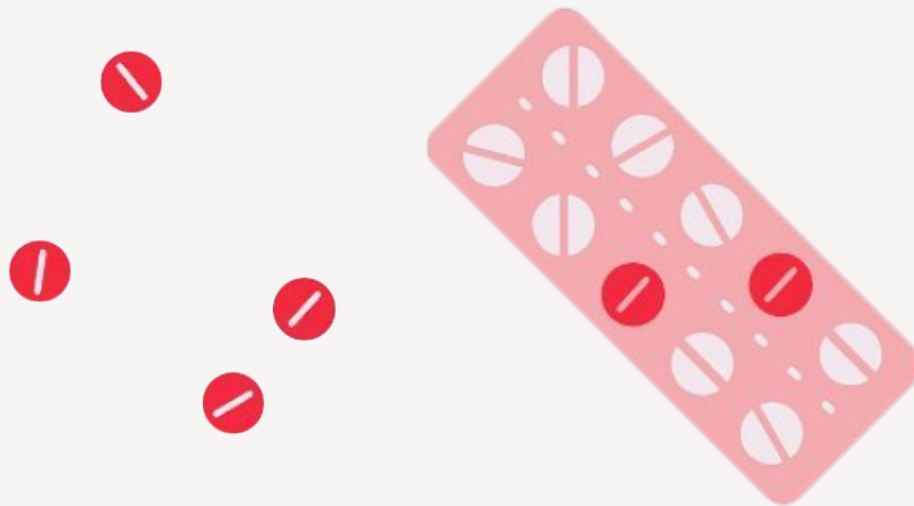
In our final chapter of this PDF, we are moving on to discuss hormonal contraception including how it works, the different options available and the positive and negative implications of each type.

Hormonal contraception

We have walked through what the menstrual cycle is and how we can potentially tailor both our exercise and nutrition to this. But what if you're using some form of hormonal contraception? Well this chapter is for you.

What are hormonal contraceptives?

Hormonal contraceptives is an umbrella term given to a range of different forms of contraception which are primarily designed to prevent an unplanned pregnancy[1]. On top of this, it is also known that many of us use contraceptives for other reasons such as manipulating our cycles (i.e. if we are going on holiday, travelling or have an important competition or event)[2], relief from symptoms such as period pain and heavy bleeding, or for other medical reasons[1].



Hormonal contraception

How do they work and what are the options available?

All hormonal contraceptives work by altering our bodies natural production of hormones[1]. For instance, by taking hormonal contraception what this means is that instead of having your natural hormones rise and fall across the menstrual cycle (as I described in Email 2), your natural levels of oestrogen and progesterone change depending on what type of hormonal contraception you are using.

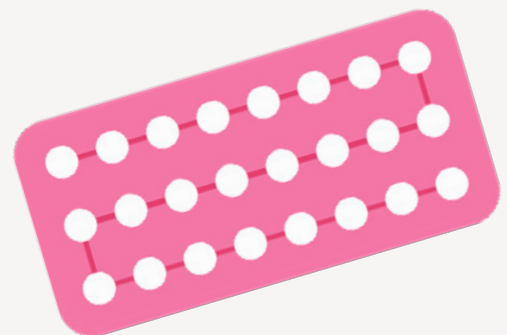
When we hear the term 'hormonal contraception' we often think of 'the pill'. While this is the most common form of hormonal contraception, there are *actually* lots of different types of hormonal contraception which can make choosing which contraception to use seem like a bit of a minefield. Let me take you through them.

Combined oral contraceptive pill

This is self-administered meaning you take a pill on certain days at the same time. In fact, these typically mimic the natural 28-day menstrual cycle by having 21 pill-taking days followed by 7 pill-free or placebo pill days (during this time you experience a withdrawal bleed, and it is important to note this bears no physiological resemblance to the natural period). The combined pill contains both a synthetic oestrogen and progestin, and works by suppressing ovulation as well as thicken the cervical mucus, making it a less friendly environment for sperm.

The progestin-only pill

Like the combined pill, this is self-administered and taken each day at the same time. Where it differs from the combined pill is that it only contains one synthetic hormone – progestin - and that you take it for 28 days without any break between pill packs. The progestin-only pill works by thickening cervical mucus and thinning the lining in the uterus, stopping sperm from reaching the egg. It also suppresses ovulation, but not consistently. Many women have no bleeding at all whilst taking this type of pill, whereas some will have irregular bleeding.



Hormonal contraception



The contraceptive patch

This is a small patch which is stuck onto your skin and releases oestrogen and progestin - the same hormones as the combined pill - to prevent pregnancy. It does this by stopping ovulation, thickening the cervical mucus to make it hard for sperm to mobilise as well as thinning the lining of the uterus preventing a fertilized egg from implanting. Every patch lasts seven days, so you can replace the patch each week for three weeks and on the fourth week take a break (this is when you might experience your withdrawal bleed).



The contraceptive injection

This is medically administered and once in, lasts around 3 months. This type of contraception contains only one active synthetic hormone, progestin, and works by preventing ovulation, but it can also thicken the cervical mucus preventing sperm from swimming easily, and by thinning the lining of the womb to stop implantation. One thing to note here is that the contraceptive injection has been linked to bone thinning which can lead to osteoporosis and a greater risk of fractures[3].



Vaginal rings

This is a small, soft, flexible ring made from plastic that is designed to be placed inside the vagina. The ring is self-inserted and left in for 21 days before removing it for 7 days (during which time you might experience a withdrawal bleed). Like the patch, vaginal rings contain both hormones — a synthetic oestrogen and progestin — and work by stopping ovulation, thickening cervical mucus, and thinning the lining of the womb to prevent implantation.



The implant

This is a small cylindrical flexible plastic implant which is medically administered under the skin in your upper arm. This contains only one active ingredient – a synthetic progestin - and works in the same way as the many other progestin-only forms to prevent pregnancy.



The hormonal coil

This is a small, T-shaped device made of plastic that is medically administered into your uterus and can last 3 to 5 years before needing to be replaced. It releases the hormone progestin (not to be confused with the copper coil which is a non-hormonal form of birth control) and works predominantly by thickening the cervical mucus and thinning the lining of the womb. It can also reduce the likelihood of ovulation occurring, but most women continue to ovulate.

Hormonal contraception

Be clued up on contraception

It is reported that up to 50 percent of active women and female athletes are using some form of hormonal contraception[4]. Each type of contraception has its own unique pros and cons – no one method is perfect. As such, it is important as active women or female athletes that we are informed regarding the choices available to us, how each of these options influence our physiology, as well as the potential risks and benefits of each method, so that we can make an informed decision.

By knowing the potential risks and benefits of each method we will also be more aware of when a certain method might not be working for us. Remember if you are trying a different type of contraception listen to your body and pay attention to any changes. If you do not feel it is the correct form for you, stop and try something different.

It is likely that you have heard your fair share of both horror and success stories from friends and in the media about certain types and this will have possibly shaped your view on which types might be suited to you. But it is important to keep in mind that we are all different and what works well for someone else might not work well for you, so it's good to keep an open mind. And remember there is no better way to choose contraception than face-to-face with a healthcare professional.

4 reminders about hormonal contraceptive use for female athletes

1. Withdrawal bleeds

Any bleeds whilst on hormonal contraceptives are not real periods and instead are withdrawal bleeds.

2. REDs

Relative energy deficiency in sport can be masked by hormonal contraceptive use.

3. Performance

Hormonal contraceptive users can still notice side effects and performance and training can also be affected.

4. Cycle regulation

Hormonal contraception cannot regulate or bring back your natural menstrual cycle.

Hormonal contraception

Hormonal contraceptives and performance and training effects

Not only do you need to be aware of the different types, how they alter your physiology and the pros and cons associated with this, but there are additional factors to take into consideration when choosing a type of contraception, including age, lifestyle, medical history, potential plans for future pregnancies, and current medication. And if you are an active woman or female athlete, you might also want to consider what effect hormonal contraception might have on your performance and training.

Because hormonal contraception results in an altered hormonal profile that differs significantly from the menstrual cycle, hormonal contraceptive use can influence all kinds of things from your mood, motivation, energy levels, confidence, focus, as well as how you respond and adapt to exercise again[5].

When it comes to performance and training, there is some evidence to suggest that performance might be reduced in oral contraceptive pill users compared to naturally menstruating women[5]. There is also research which suggests that strength training adaptation might be affected. In particular, it is thought that androgen suppressing forms of hormonal contraception might limit a woman's ability to respond and adapt to the likes of strength training when compared to those taking a hormonal contraception with androgenic actions or naturally menstruating women[6-7]. Although research is scant and more studies are needed[8].

Recovery might also be affected with a large study which looked at athletes preparing to go to the 2016 Olympics highlighting an increased elevation of stress markers such as, cortisol, oxidative stress, and inflammation in those taking a hormonal contraception compared to naturally menstruating women[9].

Hormonal contraception has the potential to impact on our psychology, mood, and emotions. For example, some studies have highlighted that hormonal contraceptive users were more likely to suffer from depression[10-11]. However numerous other studies have found no link at all[12-13]. Therefore, while there appears to be an interplay between female sex hormones and mental health, we cannot be entirely sure who will be affected and to what extent. It is also important to note that the psychological impact of an unplanned pregnancy should not be played down[14-15].

Tailoring exercise performance & training to your menstrual cycle

Giant caveat

Again, this is highly individualised whereby, some women will be affected, and others will not be. Additionally, this research is still not definitive, and we need a lot more high-quality research before we can make generalised guidelines for women.

Key takeaway

There is no one-size-fits-all choice when it comes to hormonal contraception and instead depends on your body and circumstances. Choosing hormonal contraceptives is an entirely personal choice and requires a tailored approach. The best way to make an initial decision is based on the information you have researched and advice from a healthcare professional. Finally, if you are an active woman or female athlete you might also want to keep a track of your use to see how this might - or might not - affect your performance or training.

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