

Training Considerations - Training, Performance and the Menstrual Cycle

http://concept2.co.uk/training/guide/menstrual_cycle

by Kareen Larkin

Women have always carried out heavy physical activity, but only relatively recently have they been allowed to compete in sporting activities to any great degree. As a result of this during the last 30 years increasing numbers of women have taken up regular participation in sport at a recreational and competitive level.

We have, thankfully, come along way from the times of Pausanias, 2nd century AD. He wrote 'On the road to Olympia.... there is a precipitous mountain with lofty cliffs.... the mountain is called Typaeum. It is a law of Elis that any woman who is discovered at the Olympic Games will be pitched headlong from this mountain.' Indeed women had a festival of their own at Olympia, Heraia, which were games held in honour of Hera. At these games there was only one event, the foot-race.

Religious conservatism has been stated as the probable reason why no other competitions were ever introduced for women at Olympia, but by the Christian era, most of the major Greek Games incorporated women's events. Spartan women were said to have undertaken the same athletic exercises as boys, for the reason that tough, strong mothers were believed to produce good Spartan soldiers.

There were no female events at the first modern Olympiad in 1896, they were first included in 1900 with tennis. Since then there has been a steady increase in participation by women (zero women participants in 1896 to 4,069 in the 2000 summer Olympics). With this increase in participation from women the level of interest in the effects of the menstrual cycle on performance have also grown, and some of the earlier myths regarding detrimental effects of exercise on the female reproductive system have been dispelled.

The Menstrual Cycle

Girls tend to start their adolescent growth spurt around the age of 11 years, about two years before boys. Menarche (the beginning of menstruation) generally occurs between age 12 and 14. A normal menstrual cycle varies between 23 and 35 days, the average being 28 days. The cycle represents a complex interplay of hormones and typically has three phases; the follicular phase where the follicle matures, the ovulatory phase in which the egg is released, and the luteal phase where the lining of the womb prepares for implantation of the fertilised egg. If implantation does not occur, the womb lining comes away and menstruation begins.

This cycle is regulated by luteinizing hormone (LH) and follicle stimulating hormone (FSH), secreted from the pituitary gland in the brain. This in turn is under the control of another pulsed hormone. Any disruption to this delicate balance of hormones can cause hypothalamic pituitary axis suppression (HPA) and result in oligomenorrhoea or amenorrhoea (irregular, or absence of, periods).

Menstrual Irregularities Associated with Exercise and Training

Menstrual abnormalities are extremely common in both athletic and non-athletic adolescents and women. Physically active females increase the likelihood of experiencing changes to their menstrual cycle such as delayed menarche (onset of menstruation), oligomenorrhoea (irregular menstruation occurring with only three to six cycles per year), and amenorrhoea.

Irregular menses have been reported to range from 1 to 66% among athletes, compared with 2 to 5% in the general population. The higher levels have been seen in groups such as distance runners.

The wide range of reported menstrual abnormalities stems from the different groups studied and the different criteria used to define the condition. Exercise related menstrual abnormality is linked with HPA dysfunction.

Many theories involving this hypothalamic pituitary axis suppression have been suggested as the cause of exercise-induced menstrual irregularities:

- Critical body weight.
- Critical body fat.
- Endogenous opioids.
- Nutritional deprivation.
- Rapid body weight changes.
- Training intensity/volume.

The interplay between nutrition, exercise intensity and volume, body mass index, and psychological stressors contribute to normal menstrual function. Individuals vary greatly in their ability to tolerate changes in these factors, which explains why two athletes of similar body composition may have different menstrual responses to the same training volume and diet, or why athletes of 'normal' weight may still experience menstrual dysfunction.

HPA is a diagnosis of exclusion i.e. other potential causes should be ruled out first. Apart from HPA suppression, other conditions that might cause oligomenorrhoea or amenorrhoea include pregnancy, thyroid abnormality, prolactinoma, polycystic ovary syndrome and premature ovarian failure. Many athletes find that not having periods is convenient and may not be concerned about this. However, the lack of oestrogen associated with HPA suppression can lead to osteopenia and osteoporosis i.e. bone thinning. There is much evidence to show that bone mineral density directly correlates with the duration and severity of menstrual dysfunction. Therefore, if you suffer from menstrual abnormalities you should seek medical assessment and advice. This should include a thorough evaluation for the 'female athlete triad' i.e. amenorrhoea, osteoporosis and eating disorders.

Bone mineral density assessment should be considered for any athlete who has been amenorrhoeic for more than a year or has had a stress fracture. Exercise related menstrual irregularity is not a reason in itself to stop training and regular exercise, however, it should trigger an evaluation of one's training schedule and diet. There are various treatment options depending on the abnormalities found, such as reducing training volume, increasing weight and maintaining an adequate energy intake until normal menses occur. Some studies advocate the benefits of the oral contraceptive pill.

Effects of the Menstrual Cycle on Training and Performance

The female sex hormones exert a range of physiological effects on many metabolic, thermoregulatory, cardiovascular and respiratory parameters that may influence athletic performance. For example, oestrogen has been shown to have:

- Effects on the cardiovascular system:
 - altered blood stickiness.
 - cholesterol level changes.
 - vascular smooth muscle changes.
 - regulation of substrate metabolism (body fuel).
- Effects on regulation of substrate metabolism:
 - increased liver and muscle glycogen storage and uptake - possibly increasing endurance performance.
 - glycogen-sparing through increased lipid (fat) production, muscle lipid breakdown, and greater use of free fatty acids.
 - decreased insulin-binding ability-decreased glucose tolerance and insulin resistance. i.e. Low levels of oestrogen (in the follicular phase) favour the break down of the muscle glycogen for high intensity training and racing, whilst high levels of oestrogen (in the luteal phase) favour fat burning, lower lactic acid concentrations and glycogen sparing. For this reason during the follicular phase high intensity work may feel slightly easier whilst long low intensity sessions may be more difficult. During the luteal phase long low intensity workouts may feel easier whilst high intensity workouts will feel harder. This does not mean that you should avoid long duration

low intensity training during the follicular phase and high intensity training in the luteal phase but you should be aware that there is a reason that you may not feel as good as usual whilst training.

Other effects:

- Deposition of fat in breasts, buttocks and thighs.
- Increased blood pressure.
- Increased calcium uptake in bone.
- Changes in neurotransmitters (brain chemicals) - possible improved cognitive function and memory.

Progesterone has been shown to have the following actions:

- Increased core body temperature 0.3 to 0.5C.
- Increased minute ventilation, and enhanced ventilatory response to low blood oxygen and high blood carbon dioxide i.e. During the week before menstruation and the week after ovulation increased levels of progesterone stimulate the brain's respiratory centre and cause an increase in breathing rate making exercise feel more strenuous, but not necessarily affecting performance.
- Post-ovulatory fluid retention via effects on the kidneys' hormone system.
- Actions on insulin receptors leading to peripheral insulin resistance.
- Metabolic effects, resulting in a greater dependence on fat as a substrate.

Although the above physiological effects have been shown to occur, results from studies so far varies, and there is, as yet, no convincing evidence that performance is significantly affected, positively or negatively, at any particular stage of the menstrual cycle. Some anecdotal evidence from athletes on differences in performance, particularly in the pre-menstrual or menstrual phases, has not been confirmed by scientific studies. World best performances have been recorded at all stages of the menstrual cycle.

Dysmenorrhoea (Painful Periods)

Painful periods is a common phenomenon, most prevalent in the teenage years and later 30s age group. For most women the symptoms are mild and easily treated with the use of simple painkillers if needed. For some women the painful cramps, and often heavy blood flow, can adversely affect training or competition. There are beneficial treatment options available that can be discussed with your doctor.

The Pre-Menstrual Syndrome (PMS)

'The presence of emotional and/or physical symptoms occurring cyclically, commencing some days prior to menstruation and disappearing with the onset of menstruation', may include anxiety, depression mood swings, headaches, fluid retention, breast soreness/enlargement. Exercise may indeed reduce the severity of PMS. These should be discussed with your doctor and careful consideration of the International Olympic Committee (IOC) list of prohibited substances should be adhered to if training and performing at a high level.

Manipulation of the Menstrual Cycle

Those women/competitors who are, or perceive that they are, adversely affected by the pre-menstrual or menstrual phases may wish to manipulate the menstrual cycle to avoid that stage of the cycle coinciding with a major event. This should really be reserved for major events. This can most effectively be done using the oral contraceptive pill in a particular pattern, under the guidance of a doctor.

References and Recommended Reading:

- **G Harmon Kimberly MD, *Evaluating and Treating Exercise-related Menstrual Irregularities***
The Physician and Sportsmedicine 30 (3);, 2002

- **RJ Frankovich and CM Lebrun, *Menstrual Cycle, Contraception, and Performance***
Clinical Sports Medicine 19 (2): 251-271
- **K Bennell, *The Female Athlete***
Clinical Sports Medicine by P Brukner and K Khan
McGraw-Hill Education - Europe
ISBN: 0074711083
- **Judith Swaddling, *The Ancient Olympic Games***
British Museum Press, 1999
ISBN: 0714121614
- **Elzi Volk, *Planet Estrogen Part III: The Menstrual Cycle and Athletic Performance***
<http://www.thinkmuscle.com/articles/volk/planet-estrogen-03.htm>