

# COACHING FEMALE RUNNERS

Jason Karp, whose doctorate is in exercise physiology, is a familiar author in *Track Coach*, much appreciated for his clear exposition of complex topics. He is the author of six books, including *Running For Women*, which this piece is adapted from.

BY JASON R. KARP. PHD

Men and women are from different planets. There are obvious differences between women and men in anatomy, physiology, hormones, and metabolism. So why do nearly all coaches and running books and articles take a one-sex-fits-all approach to training?

While a male's hormonal environment is pretty stable, a woman's hormonal environment is constantly changing. Any physiological changes resulting from menstrual cycle-induced fluctuations in estrogen and progesterone are exacerbated when running, especially if the workout is intense. When your female athletes run hard, the concentrations of estrogen and progesterone in their blood increase during both the follicular and luteal phases of the menstrual cycle. And that has many implications for how a female should train. The female runner's training should be strong enough for a man, but made for a woman.

## ESTROGEN AND THE MENSTRUAL CYCLE

Estrogen is the single biggest thing that differentiates your female athletes from the guys on your team. It's a powerful hormone, influencing many aspects of a woman's physiology, from metabolism to glycogen storage to lung function to bone health. Indeed, the amount of circulating estrogen has the greatest influence on a female runner's bone health. Any condition that lowers estrogen level significantly increases a female runner's risk for a stress fracture.

Since estrogen has such a big effect on bone health, the time of the month should be considered when increasing weekly volume. Avoid increasing weekly mileage during menses or the early part of the follicular phase and the latter part of the luteal phase of the menstrual cycle, as those are times of the month when estrogen concentration is low. Conversely, good times of the month to increase weekly mileage are during the latter part of the follicular phase and the mid-luteal phase, when estrogen concentration is high.

Avoid challenging workouts around menses, especially if your athletes don't feel well at that time or if they



feel bloated due to the rapid drop in progesterone as they transition from the luteal phase to the follicular phase. For example, if a runner has a 28-day cycle starting on Monday, and menses occurs on days 1 to 3 (Monday to Wednesday), plan their hard work out on Thursday or Friday that week.

If you have two workouts planned, schedule them on Thursday and Saturday, or schedule just one workout the week of menses and two workouts during the other three weeks of their cycle. If menses lasts five days (Monday to Friday), schedule one workout the week of menses and two workouts during the other three weeks of their cycle. For those lucky runners who are not adversely affected by their periods and don't experience much discomfort, it's okay to do the workouts and see how they respond.

## MENSTRUAL IRREGULARITIES

Many female runners who train hard and train a lot and who have a low body fat percentage often experience irregular or even absent menstrual cycles, which reduces estrogen levels. Women who start training before menarche (their first period) delay their menstruation for almost a year, compared to women who already have menstrual cycles when they start training. In other words, training, especially intense training, can cause a delay in menarche for up to a year. Once menstrual activity commences, its continued occurrence is also sensitive to training. In response to heavy training, the first change in menstrual cycle activity is a shortening of the luteal phase, followed by cycles without ovulation and, finally, cessation of menses called amenorrhea.

Amenorrhea (defined as 0 to 3 periods per year) results in constant low levels of estrogen and progesterone. A female runner with amenorrhea has about one third the estrogen concentration and about 10 to 20 percent the progesterone concentration of a normal menstruating woman. Thus, endocrinologically, the amenorrheic female runner experiences an estrogen-deficient state similar to that of a postmenopausal woman.

The incidence of menstrual irregularity or amenorrhea is variable—some female runners can train with high volumes and never disrupt or lose their menstrual cycle activity, while some women notice changes in cycle activity with relatively little training. High training volumes, low body weight, and endurance sports like distance running increase the incidence of menstrual irregularities.

Inadequate caloric intake to match caloric expenditure, rather than the stress of exercise, is responsible for the loss of menstrual activity. Consuming more calories to compensate for the large caloric expenditure from running can prevent amenorrhea. Therefore, if your athletes run a lot, they need to increase how many calories they consume throughout the day to keep up with the large number of calories they expend by running.

One of the biggest ramifications of menstrual irregularity or amenorrhea is its effect on your athletes' bones. Any disruption to the menstrual cycle can cause a decrease in their bone density, increasing the risk for osteoporosis and stress fractures.

Estrogen is extremely important in facilitating the absorption of calcium into bones. Female runners with irregular or absent menstruation have significantly lower bone density than those with regular menstruation, even compared to non-athletes. Furthermore, there is a significant loss in bone density, particularly at the lumbar spine, in amenorrheic athletes. A female runner with irregular menstrual cycles runs the risk of decreasing bone density to such an extent that stress fractures occur with only minimal impact to the bones.

Along with the other two characteristics of the female athlete triad—osteoporosis and disordered eating—menstrual irregularities greatly increase a female runner's risk for stress fractures. Therefore, if you coach a team of female runners who are at risk for menstrual irregularities, the runners' bone density should be checked on a regular basis and you must take extra care in planning their training program so they don't increase their running volume or intensity too quickly. At-risk athletes need to do everything they can to strengthen their bones and prevent a stress fracture, including adequate intake of calcium and vitamin D and strength training. They may also want to take oral contraceptives, which supply them with estrogen.

## **METABOLISM**

Perhaps the most significant effect of estrogen is a shift in a woman's metabolism to a greater reliance on fat and less on carbohydrate. Women use about 75 percent more fat than do men while running at 65 to 70 percent  $\dot{V}O_{2\max}$ . Women get about 39 percent of their energy from fat during exercise at 65 percent  $\dot{V}O_{2\max}$ , while men get about 22 percent of their energy from fat. However, the percentage of energy derived from fat varies significantly from person to person because factors such as training status, muscle fiber type, muscle glycogen content, and mitochondrial density all play a role.

Because humans' carbohydrate stores are limited, this metabolic shift gives female runners an advantage for very long endurance activities, during which there is a greater need to conserve carbohydrate and a greater use of fat because of the slower pace.

## **GLYCOGEN**

Women don't increase muscle glycogen as much as men in response to consuming more carbohydrate in their diets. However, when women increase their total caloric intake as they also increase the amount of carbohydrate in their diets, they increase their muscle glycogen content by a similar amount as men. From a training perspective, while men simply need to increase the percentage of their calories coming from carbohydrate in order to carbo load and store more glycogen, women need to also increase the total number of calories in their diets to get the same effect.

## **BODY TEMPERATURE**

Body temperature changes rhythmically throughout the menstrual cycle, peaking during the luteal phase in response to the surge in progesterone. Progesterone acts on the brain's hypothalamus (the temperature control center), which increases set-point temperature. A higher body temperature during the luteal phase makes it harder to run in the heat during this phase, as runners don't begin sweating to dissipate heat until they have reached a higher body temperature.

Estrogen has the opposite effect on the hypothalamus, decreasing body temperature, which explains why body temperature is lower during the estrogen-dominant follicular phase. Female runners also have a decreased ability to dilate the small blood vessels under the skin, which compromises their ability to release heat to the environment.

Hyperthermia—an increased body temperature—is one of the factors that cause fatigue during prolonged exercise. Thus, long, intense workouts and races in the heat, such as 10,000 meters, half-marathons, and marathons, can be more difficult during the luteal phase of the menstrual cycle. The increased body temperature during the luteal phase can also put a runner at an increased risk of developing heat illnesses like heat exhaustion and heat stroke.

## **MUSCULAR STRENGTH**

Since muscular strength and power are proportional to muscle size, female runners can't get as strong or as powerful as the male runners on the team since men typically have bigger muscles and more testosterone to make those muscles bigger. But women can cheat the system a bit if they alter their training based on their hormones and

capitalize on being female. Although women are not any stronger at certain times of the month than they are at any other, their menstrual cycle can influence how they respond to their workouts. For example, a study in

*International Journal of Sports Medicine* found that weight training with 3 sets of 12 reps every second day during the follicular phase of the menstrual cycle and once per week during the luteal phase increased maximal quadriceps strength by 32.6 percent compared to just 13.1 percent by training once every third day over the whole menstrual cycle. It appears that doing more training in the estrogen-dominant follicular phase and less training in the progesterone-dominant luteal phase leads to greater strength gains.

## ANEMIA

When females bleed a lot during menstruation, their blood's hemoglobin concentration can decrease, which can negatively impact their ability to transport oxygen in the blood. Since iron is an important component of hemoglobin, iron loss often accompanies a lot of bleeding. If this happens, your athletes may need to supplement their normal diet with iron. Many female runners exhibit athletic anemia (low blood iron levels due to physical activity), especially if they lose a lot of blood during menstruation. Athletic anemia is very common among female runners, especially those training at altitude.

Jason Karp, PhD, is the 2011 IDEA Personal Trainer of the Year, **2014** recipient of the President's Council on Fitness, Sports & Nutrition Community Leadership award, and creator of the Run-Fit Specialist certification. He has more than 200 published articles in international running, coaching, and fitness magazines, is the author of six books, including *Running for Women* and *Running a Marathon for Dummies*, and speaks around the world.

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