

Endurance exercise and bone density in male athletes

It's well known that endurance exercise can play havoc with female athletes' hormones, leading to menstrual irregularities and, long-term, to compromised bone density. But is there a similar syndrome for male athletes? There's growing concern among sports scientists that intensive training could be having an adverse effect on the bone mass of the less-fair sex.

Unfortunately, there's not a lot of high-quality research on the issue. A group of Australian scientists got together recently to review what is known so far, and to see if any consistent patterns could be identified from the data available ('Effect of altered reproductive function and lowered testosterone levels on bone density in male endurance athletes', Bennett, Brukner & Malcolm, Br J Sports Med 1996, Vol 30, pp 205-208).

The review identified a number of studies where endurance exercise had been associated with reduced bone density, including the following:

- 1 Male distance runners averaging 92km per week were found to have a 9.7% lower bone density at the lumbar spine (the lower back) than a group of non-runners
- 2 Negative correlations were found for running distance and lumbar spine, thigh-bone and total body bone density in male runners, ie, the longer the distances run, the poorer the bone mass
- 3 A study which compared male runners with sedentary controls found that bone density of the trunk tended to be lower in those running more than 40 miles per week. Tibial bone density was greater in those running 15-20 miles per week, and tended to be lower in those who ran further than this.

The story isn't completely consistent, however. An investigation comparing rowers to controls found that the rowers had higher spinal bone density. And an analysis of male triathletes showed that they had similar bone density to controls.

So it seems that certain types of endurance exercise may increase the risk of bone-thinning. Why should this be? An obvious candidate is testosterone - similar to the female hormone oestrogen in that it's involved both in sexual maturation and controlling bone mass. There's some evidence that endurance exercise decreases the amount of testosterone cruising around in the blood.

However, taken overall, studies attempting to link testosterone levels with exercise come up with a mixed bag of results. Some appear to show a convincing dip in testosterone for athletes, while others show no such link. The reviewers conclude that 'some male athletes who train intensively may experience reductions in testosterone levels, although this is not a consistent phenomenon'.

That's one way of making sense of apparently conflicting evidence. Another is to look in more detail at what the individual studies actually did. After all, research results are only as good as the methodology that created them. When the reviewers put some of the studies under the microscope, they found a number of potential causes for confusion.

Firstly, testosterone concentrations vary throughout the day; thus the time of day when samples are taken could be critical. Most studies took single samples at differing times of day - this could confuse the results.

Secondly, much of the research only looked at total testosterone levels. This doesn't take into account the complexity of how testosterone actually works in the body. For a start, testosterone exists in three different forms - in two cases, it's bound to proteins, in the third, there's a 'free' form. The free form of testosterone is the most biologically active; however, few of the studies specifically measured this.

Similarly, testosterone is converted into another related hormone called dihydro-testosterone - this has a greater effect on bone mass than testosterone. Again, precious little of the available research provides data on this more potent hormone. The authors therefore suggest, 'it's possible that some male athletes have reduced biological activity of testosterone despite normal circulating levels, and this may lead to bone loss'.

So although the research indicates that there may be cause for concern, there isn't enough detail to get specific about which type and duration of exercise could cause problems for bone density, and quite how this would come about. Factors other than testosterone could be relevant, such as calcium intake, weight loss, psychological stress and low body fat.

It's not all doom and confusion, however. Tucked away in the review is the conclusion that 'sporting participation has little effect on sexual maturation in males'. The authors also end with the reassurance that the effect of exercise on the male reproductive system does not appear to be as extreme as that which can occur in female athletes, and any impact on bone density is not nearly as evident. The most resounding conclusion is: 'More research needed'. Watch this space.