Men perspire, women glow

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Women have to work harder than men in order to start sweating, while men are more effective sweaters during exercise, according to new research published in the journal *Experimental Physiology*.

The study by Japanese scientists at Osaka International University and Kobe University looked at differences between men and women's sweating response to changes in exercise intensity. The researchers asked four groups of subjects (trained and untrained females, trained and untrained males) to cycle continuously for an hour in a controlled climate with increasing intensity intervals.

The results showed that men are more efficient at sweating. While exercise training improves sweating in both sexes, the degree of improvement is greater in men, with the difference becoming even more pronounced as the level of exercise intensity increases. The untrained females had the worst sweating response of all requiring a higher body temperature than the other groups (or work intensity) to begin sweating. In other words, women need to get hotter than men before they get sweaty.

The study's coordinator Yoshimitsu Inoue commented: 'It appears that women are at a disadvantage when they need to sweat a lot during exercise, especially in hot conditions.'

Previous studies have demonstrated that men have a higher sweat output than women, in part because testosterone is believed to enhance the sweating response. Physical training is known to decrease the body's core

temperature threshold for the activation of the sweating response, which works to the athlete's advantage and allows them to perform longer. This is the first study, however, to investigate the sex differences in the effects of physical training on the sweating response during exercise.

The findings have implications for exercise and heat tolerance in humans, including shedding light on why the sexes cope differently with extremes of temperature like heat waves.

Inoue believes there may be an evolutionary reason why men and women have evolved to sweat differently. 'Women generally have less body fluid than men and may become dehydrated more easily,' he explains. 'Therefore the lower sweat loss in women may be an adaptation strategy that attaches importance to survival in a hot environment, while the higher sweat rate in men may be a strategy for greater efficiency of action or labour.'

Inoue says future studies will look more closely at the relationship between reproductive hormones and the sweating response as well as the effectiveness of different kinds of sweat (sweat that evaporates and cools versus sweat that drops off).

In the meantime, Inoue advises women should take more care than men in hot conditions. But he adds, 'Both men and women can acclimate themselves better to heat if they exercise regularly before a heat wave comes.'

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