

Physiology and Performance Research in Female Athletes: Bridging the Gap Between Opportunity and Evidence-Based Support

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Watching the marathon as the final event of the Summer Olympic Games is a captivating and inspiring experience. This iconic race showcases the extraordinary abilities of world-class runners and serves as a fitting conclusion to over 2 weeks of elite performances by athletes from all over the world. The 2024 Paris Olympics made this final event even more special, as, for the first time, the women's marathon closed the Games. It is hard to imagine that it was only 40 years ago, at the 1984 Los Angeles Olympics, that the women's marathon was introduced. To achieve this, women had to fight for many years against the belief that they were not physically capable of running long distances, let alone a marathon.

It is encouraging to see the progress in women's sport culminate in the 2024 Paris Olympics with not only the scheduling of the women's marathon but also the achievement of gender parity. For the first time in history, the International Olympic Committee allocated the same number of quota places to female athletes as to male athletes. Beyond the Olympics, interest in women's sport has been steadily growing. In Australia, for example, professional leagues for women now exist in traditionally male-dominated sports such as Australian football, rugby league, rugby union, cricket, and soccer. Given these developments, one might be tempted to believe that female athletes are thriving and performing at their best.

Most female athletes are competing in sport throughout their reproductive years and are exposed to either endogenous or exogenous female-sex steroid hormones. The fluctuations in endogenous estrogen and progesterone throughout the menstrual cycle, along with the effects of various types of hormonal contraceptives, create unique and often unpredictable physiological conditions in female athletes. Given this complexity, it is perhaps not surprising that much of the traditional research in sport physiology and performance has been conducted with male participants. While research on the menstrual cycle has increased, conflicting findings and inconsistent methodologies have made it difficult to draw definitive conclusions about its effects on performance. Even less is known about the impact of hormonal contraceptives on performance. It is clear that we still lack the robust evidence base needed to fully support female athletes in optimizing their performance.

The *International Journal of Sports Physiology and Performance (IJSPP)* has been encouraging further research with female athletes for several years now. In their editorial in 2019, Mujika and Taipale¹ pointed out that 19% of all original investigations and brief reports published in *IJSPP* in the first 5 months of that year included women and only 4% focused exclusively on female athletes. Three years later an editorial by Noordhof et al² showed

that these number had increased, with 28% including female participants and 12% focusing exclusively on women. When looking at these same data for the second half of 2024, we found that 30% of all original investigations and brief reports included women, and still only 12% focused exclusively on women. These details from *IJSPP* show that despite some increase in research including both men and women, the research focusing exclusively on women is still very limited.


This editorial, therefore, again encourages and reminds researchers in sport physiology and performance to at least include women in their studies and preferably start focusing on female-specific research. There are so many research topics that need further investigation in female athletes. First, we need to better understand the potential effects of estrogen and progesterone on physiological systems during exercise and recovery. Second, the effects of these hormones on all aspects of performance need further investigation. Furthermore, the possible influence of female hormones on chronic adaptations to training is an important research topic to improve performance. Finally, research can move toward adapting training programs to fluctuations in female hormones to optimize training responses. And, for all these research questions, we need to consider not only the potential effects of endogenous female steroid hormones but also those of the many different types of exogenous hormones in contraceptives.

Evidently, it is not enough to simply increase the research on female athletes and publish manuscripts just to improve the earlier mentioned statistics.³ It is even more important that methodological recommendations for research with female participants be followed to ensure high-quality research.^{3,4} The increase in quality research focused exclusively on women will provide a better understanding of the unique female sport physiology and both acute and chronic adaptations to training. While we are working on further developing this knowledge base, we need to make sure that at the same time we educate colleagues, practitioners, and athletes about female steroid hormones and encourage open communication about this topic. We urge everyone to contribute to quality research in this area so that, hopefully less than 40 years from now, we will be able to achieve gender parity in sport physiology and performance research and apply this evidence base to fully support female athletes to improve their performance. We can only imagine what outstanding performances by female athletes we will witness at the 2064 Olympic Games.

References

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