Sport-Science Research on Female Athletes: Dealing With the Paradox of Concurrent Increases in Quantity and Quality

In September 2019, Iñigo Mujika and Ritva Taipale (Mikkonen) published an editorial in the *International Journal of Sport Physiology and Performance (IJSPP)* titled “Sport Science on Women, Women in Sport Science.” They noted that in the first 5 issues of *IJSPP* published in 2019, only 19% of all original investigations and brief reports included women, while only 4% were exclusively performed on female athletes. Based on the low number of scientific publications focusing on female athletes in *IJSPP*, but also in sport-science journals in general, they encouraged *IJSPP* authors to increase the amount of research conducted on female athletes. Collectively this effort would provide more knowledge about women’s sport physiology and performance. In the first 5 issues of *IJSPP* published in 2022, 28% of all original investigations and brief reports included female participants, while 12% were performed exclusively on women. So, although the number of publications including female participants is rising, the number of published studies performed exclusively on women is still extremely low.

In addition to increasing the quantity of studies, methodological guidelines aimed at improving the quality of research on sport and exercise science studies with female participants have recently been published. In short, these publications recommend that authors describe female participants based on standard terminology including specific details on their reproductive profile. For example, when reporting on a team of 25 female athletes, indicate that “10 participants were naturally menstruating, 2 were amenorrheic, and 13 were using hormonal contraceptives (10 monophasic oral contraceptive pill and 3 implants).” When the goal of the study is to investigate the effect of the menstrual cycle phases on sport physiology and performance, use the proposed phase definitions of Elliott-Sale et al—that is, early follicular phase (phase 1), late follicular phase (phase 2), ovulatory phase (phase 3), and midluteal phase (phase 4). The 3-step method should be used to verify menstrual cycle phases consisting of the calendar-based counting method, urinary luteinizing hormone surge testing (i.e., ovulation test), and determining serum estrogen and progesterone concentrations on the day of the exercise test. Participant data should be excluded when the expected hormonal concentrations are not reached. Finally, when investigating the effect of hormonal contraceptives on sport physiology and performance, women who use the same type of hormonal contraceptives (and formulation in case of oral contraceptive users) should be selected or grouped. In addition, it is important to decide if the hormonal contraceptive users are the experimental group (eg, comparison between hormonal contraceptive types or phases) or the control group to compare with a menstrual cycle group.

It is evident from these recommendations that if the goal of a study is to investigate the effect of a particular hormonal profile on sport physiology and performance, then verifying hormone concentrations should be prioritized. However, it is acknowledged that this type of research is costly and demanding for researchers and athletes. Since *IJSPP* focuses on research performed on athletes, strictly following the menstrual cycle verification guidelines might not always be compatible with real-world sports practice. In fact, maintaining the proposed high level of quality might limit the amount of research on women in sport science, which is opposite of what needs to be achieved.

So, how can we deal with this paradox as researchers in our field? First, we encourage all authors wanting to include female participants in their sport-science studies to familiarize themselves with these methodological guidelines. However, in recognition of the unique settings of many sport-science studies, *IJSPP* will also consider manuscripts that do not strictly follow all these guidelines, as long as researchers follow as many of the guidelines as possible. In general, the quality and applicability of many studies on female athletes can be easily improved through using easy-to-conduct methods, for example, including specific reproductive-profile questions in the participant prescreening. Collecting and reporting detailed information on menstrual cycle history and hormonal contraceptive use and type will assist in categorizing participants into groups with a relatively similar hormonal profile. If these groups are of sufficient size, then results can be analyzed and discussed separately. For example, in the case of the team of 25 female athletes mentioned earlier, the 10 naturally menstruating participants could be analyzed separately from the 10 oral contraceptive pill users, and relevant findings for each group can be discussed in more detail. The common mistake of combining females with different hormonal profiles into one group and potentially missing important findings can thereby be avoided. Finally, researchers need to be aware of the possible limitations of not verifying hormone concentrations, as well as the limited applicability of their findings to athletes with different hormonal profiles (such as the 3 participants with implants in the preceding illustration).

In summary, our overall message is that researchers should conduct more studies on female athletes and maintain the vital collaboration with sports practice. At the same time, authors can increase research quality and applicability through simple methods such as appropriate screenings and, when relevant and possible, further hormone verification.

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