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Sport, exercise and the menstrual cycle: where is the research?

G Bruinvels,^{1,2,3} R J Burden,^{2,3,4} A J McGregor,⁵ K E Ackerman,⁶
M Dooley,⁷ T Richards,¹ C Pedlar^{2,6}

Despite a decreasing gender gap in exercise participation, there still remains a significant under-representation of women included in sport and exercise medicine research studies.¹ A review of 1382 sport and exercise research studies involving over 6 million participants, from 2011 to 2013, found the representation of women to be 39%.¹ The complexities of the menstrual cycle are considered major barriers to the inclusion of women in clinical trials.

Historically, partially due to concerns of potentially damaging unborn fetuses, medical trials—including drug trials—were conducted solely in men. Further, women were perceived as more physiologically variable, therefore utilising only male participants would allow meaningful results with fewer participants and less funding. Since men were viewed as adequate proxies for women, the years of exclusion of female participants from research were considered inconsequential. However, it is now known that women can respond very differently to drug

treatments than men. Evidence suggests that women are almost twice more likely to have an adverse reaction to a drug than their male counterparts, and 80% of drugs withdrawn from the market are due to unacceptable side effects in women.²

When research involving exercise metabolism includes women, participants are often tested in the early follicular phase of their menstrual cycle, when hormone levels are at their lowest, in order to minimise the possible impacts oestradiol and progesterone may have on the study outcomes.³ This type of research practice leaves much ambiguity around how such hormones may influence the unique physiological processes in women, from blood pressure to substrate metabolism, thus perpetuating the significant gap in understanding how the menstrual cycle impacts exercise performance. Sheel⁴ recently described a number of sex differences in the physiological response to exercise, likely caused in part by ovarian hormones, highlighting a lack of understanding and a need for further research.

We recently reported that 41.7% of exercising women believe their menstrual cycle has a negative impact on exercise training and performance.⁵ However, largely due to the dearth of sports and exercise research in women, explanations for this are lacking. Heavy menstrual bleeding with unknown or undiagnosed

iron deficiency could be a cause but this is speculative.

There is a clear need to gain better understanding of female physiology and to define the effects of the cyclical variations in hormones, both positive and negative, on athletic performance. Also, a greater understanding of the menstrual cycle is needed to address the reported negative impacts on exercise training in order to encourage participation and avoid further disparity in gender representation.

Twitter Follow Georgie Bruinvels at @gbruinvels and Richard Burden @rich_burden, Charles Pedlar @pedlarcr

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REFERENCES

- 1 Costello JT, Bieuzen F, Bleakley CM. Where are all the female participants in Sports and Exercise Medicine research? *Eur J Sport Sci* 2014;14:847–51.
- 2 Rademaker M. Do women have more adverse drug reactions? *Am J Clin Dermatol* 2001;2:349–51.
- 3 Oosthuysen T, Bosch AN. The effect of the menstrual cycle on exercise metabolism: implications for exercise performance in eumenorrhoeic women. *Sports Med* 2010;40:207–27.
- 4 Sheel AW. Sex differences in the physiology of exercise: an integrative perspective. *Exp Physiol* 2016;101:211–2.
- 5 Bruinvels G, Burden R, Brown N, *et al.* The prevalence and impact of heavy menstrual bleeding (menorrhagia) in elite and non-elite athletes. *PLoS ONE* 2016;11: e0149881.

¹University College London, London, UK; ²St Mary's University, Twickenham, UK; ³ORRECO Ltd, Institute of Technology, Sligo, Ireland; ⁴English Institute of Sport, Loughborough, UK; ⁵Brown University, Providence, Rhode Island, USA; ⁶Massachusetts General Hospital, Boston, Massachusetts, USA; ⁷The Poundbury Clinic, Dorchester, Dorset, UK

Correspondence to G Bruinvels, Division of Surgery and Interventional Science, University College London, 21 University Street, London WC1E 6AU, UK; georgie.bruinvels@ucl.ac.uk, @gbruinvels



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