

# THE EFFECTS OF MENSTRUAL CYCLE PHASE ON MUSCULAR PERFORMANCE IN HEALTHY, ACTIVE FEMALES

School of Psychology, Sports Science, and Wellbeing

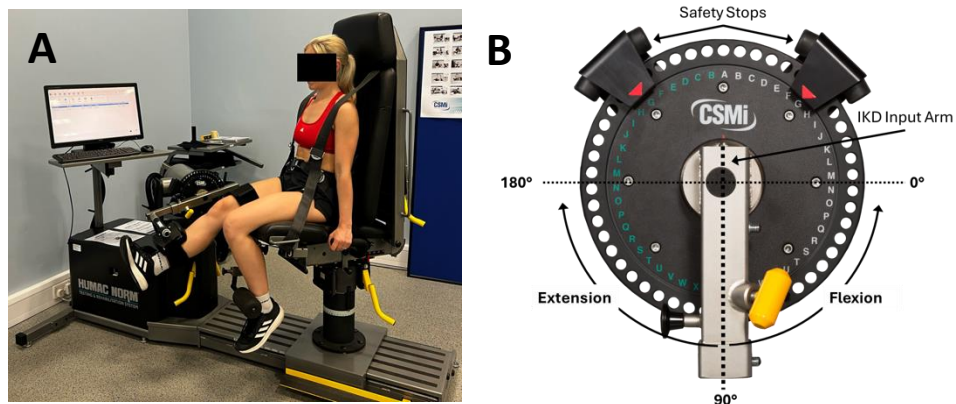
## INTRODUCTION

- Long-term benefits of elevated oestrogen include increased strength (Sipilä et al., 2001), yet acute effects of fluctuating concentrations across phases of the menstrual cycle are unclear (Chidi-Ogbolu & Baar, 2019).

- The aim was to investigate muscular performance during early and late follicular phases of the menstrual cycle.

## METHODS

- Healthy, recreationally active, eumenorrheic females, not taking hormonal contraception participated (N = 9; mean ± SD age, 27.51 ± 5.79 years; height, 1.64 ± 0.03 m; body mass, 62.18 ± 4.19 kg; cycle duration, 28.44 ± 1.51 days).
- Maximum concentric quadriceps strength was assessed at 60, 120, and 180°/s on an isokinetic dynamometer (IKD; Figure 1A).
- Angles were defined as 0° when the IKD arm was horizontally backwards (knee flexion) and 180° when horizontally forwards (extension; Figure 1B).
- Two-way repeated measures ANOVA ( $p < .05$ ).



**Figure 1:** A) IKD setup and knee extension testing; B) IKD input arm

## RESULTS

- There were no significant phase x angular velocity interactions for peak torque or the angle at which peak torque occurred, and no significant paired differences at each angular velocity were found. For peak power and angle of peak power, there were significant interactions, yet only peak power angle at 60°/s differed across phases (Table 1).

**Table 1:** Muscle performance during maximal effort, isokinetic, concentric knee extension

	Early Follicular		
	60°/s	120°/s	180°/s
Peak torque (Nm)	95.50 ± 14.90	76.40 ± 15.50	67.10 ± 11.10
Peak torque angle (°)	65 ± 8	56 ± 9	56 ± 8
Peak power (W)	136 ± 21	216 ± 44	285 ± 47
Peak power angle (°)	66 ± 8	57 ± 9	57 ± 8
	Late Follicular		
	60°/s	120°/s	180°/s
Peak torque (Nm)	96.10 ± 11.70	83.00 ± 8.83	64.90 ± 12.70
Peak torque angle (°)	61 ± 6	56 ± 3	57 ± 6
Peak power (W)	136 ± 17	235 ± 25	276 ± 54 <sup>†</sup>
Peak power angle (°)	62 ± 6*	57 ± 4	57 ± 6 <sup>†</sup>

Note: Data are means ± standard deviation; † = significant phase x angular velocity interaction; \* = significant paired EF-LF difference. All statistical tests,  $p < .05$ .

## DISCUSSION & CONCLUSION

- Peak knee extension torque and power remained consistent across phases.
- Hormonal fluctuations during the follicular phase do not impact muscular performance.
- Periodised training may not be needed to accommodate within-cycle hormonal changes.
- Injury risk may not change across the follicular phase of the menstrual cycle.

## REFERENCES

- Chidi-Ogbolu, N., and Baar, K. (2019). Effect of estrogen on musculoskeletal performance and injury risk. *Front Physiol*, 9, 1-11.
- Sipilä, S., et al. (2001). Effects of hormone replacement therapy and high-impact physical exercise on skeletal muscle in post-menopausal women: a randomized placebo-controlled study. *Clin Sci*, 101(2), 147-157.

Student Researcher: Lucy J. Brewer

Supervisor: Dr Anthony J. Gorman

