Project Details	
Project Code	MRCPHS25Ex Sharp
Title	“You must be on your period”: using smartphones and wearables to study changes in mental wellbeing throughout the menstrual cycle
Research Theme	Population Health Sciences
Summary	The menstrual cycle can influence mental wellbeing for a variety of biological and psychosocial reasons, but high-quality data are lacking. This is an exciting opportunity to work with people that menstruate to co-produce and trial a cutting-edge smart technology method to collect real-time data on menstrual experiences. You will advance our understanding of the important intersection of the menstrual cycle and mental health and develop skills highly valued in the FemTech industry.
Description	Background: The menstrual cycle and menstrual experiences can substantially impact an individual’s mental health and wellbeing. Perhaps the most well-known example is premenstrual syndrome (PMS), a set of symptoms that occur in the luteal phase, including anxiety, low mood, and irritability, with a severe form being Premenstrual Dysphoric Disorder (PMDD). However, menstruation can influence mental wellbeing in other ways and at different cycle stages, e.g. through physical discomfort, changes to behaviours, and social effects arising from stigma. There are many unaddressed or unanswered questions about the association between the menstrual cycle and mental health, for example: What biopsychosocial mechanisms increase risk of low mood and mental distress during certain stages of the menstrual cycle? And why do some individuals show large variability in their mental wellbeing within or between cycles? Previous studies have been hampered by a lack of high quality real-time data on mental health and menstrual symptoms throughout the menstrual cycle. However, smartphone apps and wearable devices like fitness trackers make it possible to collect quality, prospective, real-time data on physical and emotional states. Ecological Momentary Assessment (EMA) is a cutting-edge method that involves collecting frequent data on experiences close in time to the experience itself, either actively (e.g. self-report of mood via a smartphone app) or passively (e.g. wearable sensors measuring physiological features including heart rate, temperature, activity and sleep). Innovative statistical models are needed to integrate and analyse these complex data to help researchers better understand menstrual cycle-related fluctuations in mental wellbeing. Research questions: 1) How can EMA be used to collect high quality real-time data on mental wellbeing throughout the menstrual cycle? 2) How can EMA data be effectively integrated, analysed and visualised to provide insights into menstrual cycle-related variation in mental wellbeing? 3) How do mental wellbeing-related EMA measures vary in association with the menstrual cycle and menstrual characteristics? Aims and objectives: 1) Co-produce a research protocol to collect EMA data on mental wellbeing throughout the menstrual cycle using existing smartphone app

	and wearable devices. Co-production will help keep participant burden low and improve engagement to minimize missing data; 2) Develop and evaluate an approach to integrate, analyse and visualise EMA data collected using the EMA protocol. Such an approach will involve mixed-effects models: a flexible and appropriate method of modelling longitudinal data, with repeated observations over time nested within individuals. 3) Recruit a main study sample and use the developed methods to collect EMA data over at least three menstrual cycles, and analyse within- and between- individual and cycle variability in mental wellbeing. The successful student will choose which concepts of mental wellbeing to study and which populations to focus on (e.g. people with particular menstrual issues, people with existing mental health issues like anxiety or depression, people in perimenopause, etc). Depending on their interest and existing skills, the student may choose to develop any one of the three aims in more detail, for example, conducting qualitative research with the co-production group, building an R/python web-app to visualize data, or drilling down into specific biological, psychological and/or social mechanisms driving cyclical variation in mental wellbeing. Students may choose to tailor their PhD around their future career aspirations. The research provides an excellent opportunity to develop skills that are highly valued in the FemTech industry and to become one of only a few global experts in EMA based methods.
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