Project Details	
Project Code	MRCNMH24Ex Higginson
Title	Can online games be indicators of mental health issues?
Research Theme	Neuroscience & Mental Health
Summary	Diagnosing mental health issues is challenging as it relies on self-reporting and is difficult to assess. This project will develop an approach to diagnosing issues using online games. Experiments will involve quantifying participants' behaviour in games and using questionnaires to assess how behaviour is associated with symptoms. We will also develop theory to predict these associations and which games and measures most likely to indicate poor mental health.
Description	Mental illnesses are the primary cause of disability worldwide. Despite this, the causes of the onset and persistence of illnesses such as depression and anxiety disorder are not well understood. Medical approaches have tended to be based on the idea that mental illnesses are caused by pathological malfunction, but drugs are often ineffective. Other explanations involve theories about how disorders are appropriate responses to challenging environments, so they do not explain why illness persists when the environment improves. By using methods established in the behavioural sciences, Higginson has shown that whilst depression may not be an appropriate response to an individual's current environment, it could be a product of a cognitive system that learns about the environment but has incomplete information. This system could be a perfectly rational one in that it usually generates appropriate responses, even if it leads to bad outcomes for a minority of individuals. This work suggests that the root of mental illness may lie in information that an individual's subconscious has about their world and its temporal and spatial dynamics. In this project, we will build on this theoretical work by developing applications in the form of online games. The key research questions are: (1) Are information processing and pattern identification correlated with mood disorders, (2) Can mood disorders be measured using simple online games? Higginson has developed a basic version of a game for identifying depression and preliminary results show promise, in that scores on the Beck's Depression Inventory correlate with some aspects of participants' behaviour. In the experiment, participants repeatedly bet on a binary outcome, and are informed that the outcomes are not completely random but may correlate over time (e.g. the football teams have winning streaks). In different contexts the winning option is either always 50/50, positively autocorrelated (winning options tend to keep winning), or negatively autocorrelated (winners tend to alternate). Detecting this pattern would enable participants to increase their performance in terms of the number of winning bets. Participants with high BDI scores were more likely than others to repeatedly bet on the same option when the outcomes were truly positively autocorrelated, which is appropriate. However, when outcomes were truly negatively autocorrelated they were even more likely to do so, which is inappropriate. Overall, there was no association between BDI scores and performance in the game in terms of overall credits earned. Thus, behavioural measures rather than performance measures were needed to indicate mood states. The theory will be developed according to

	the student's interests and skills. We have two suggestions to start them off. First, the existing depression model will be developed to assess how individual differences in the susceptibility to depression may lie in errors in estimation of the probability of very bad events. Another possible research direction would involve the characterisation of anxiety disorder as a consequence of a threat-detection system, that in some individuals cause deleterious beliefs and behaviour. We will then develop further online games as guided by the theory. With access to Wright's participants, we could test whether behaviour in the game could be diagnostic of mental health issues in a clinical population, as well as the larger studies using the Prolific population. This will increase the validity and ensure the potential usefulness of the outputs. This project will address two research themes of MRC: mental health and wellbeing (theme 1) and lifestyles affecting health and environment and health (theme 2). Overall, the insights from this work could help to develop new diagnostic methods and guide new interventions that help people living with mental illness.
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