An Investigation of Gender Differences in Computer Science Using Physiological, Psychological and Behavioural Metrics

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Gender imbalance in tertiary Computer Science (CS) and Information Technology (IT) courses is a cause for concern globally. Current estimates of this imbalance are ~70:30 male to female. Within the CS education field numerous studies have investigated the cause of this imbalance (e.g. misconceptions of CS, stereotypes, etc.) and have attempted to identify factors that influence uptake, retention, and performance. Whilst these studies have had varying degrees of success, none appear to have investigated in-the-moment physiological differences between genders during module examinations. Such research could provide new insight on how male and female students process and respond in such a setting and provide new opportunities to better tailor module delivery and assessment.

This paper describes a novel study that investigates gender differences in skin conductance and heart rate variability during a controlled exam-like setting. Participant background information such as gender, age, previous experience, etc. was collected at the outset. The examination was designed and validated in-house using a peer-review process and carefully constructed to ensure that only one new concept was introduced per question. General behavioural metrics, such as doodling, response time, and researcher observations were gathered. An out-of-the-box psychological test was used to measure self-reported anxiety and physiological arousal was measured using wearable sensors before and during the experiment. Study design, methodology, and analysis are described in detail. Findings suggest differences exist between genders in physiological and behavioural responses when completing programming comprehension questions. The findings provide valuable evidence to justify future research in this area.

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