

## FEASIBILITY OF STRESS MONITORING DURING STUDENT EXAMS

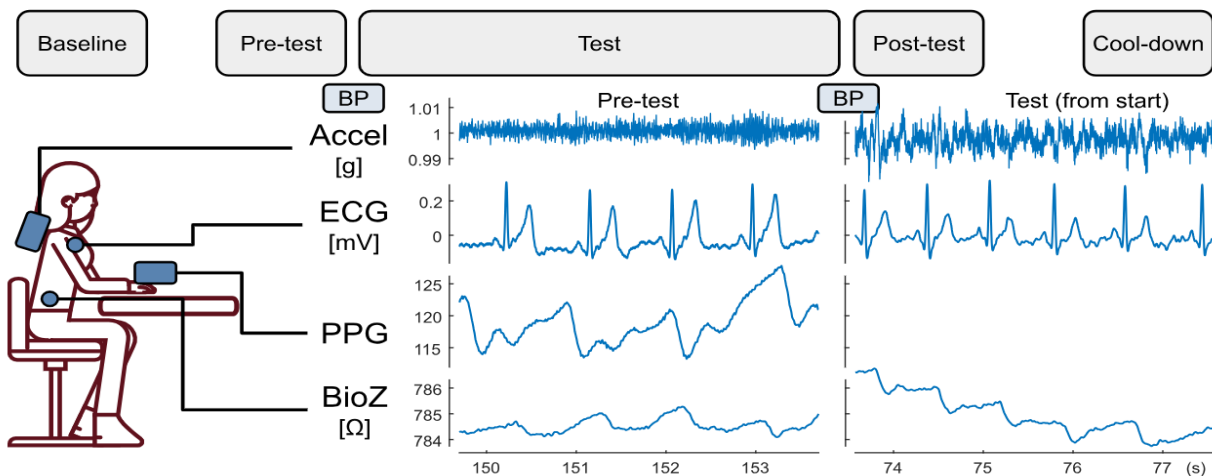
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**Introduction:** Laboratory studies have made major contributions to understanding stress by using standardized, well-validated tasks that elicit physiological and psychological responses under controlled conditions. However, these paradigms typically capture specific forms of induced stress in settings where the broader personal consequences are constrained by the experimental context. University examinations, by contrast, provide an opportunity to study stress in a naturally occurring, high-stakes context in which performance carries meaningful real-world consequences for students. In this study our goal is to evaluate whether physiological monitoring of students taking exams is feasible.



**Figure:** Test monitoring scenario and sensor locations (left), timeline of measurements (top) and sample signals during pre-test and test measurements (right). Note PPG measurements failed during this subject's test.

**Methods:** Recruited university students (N=7) taking mid-term examinations in biology and engineering courses. Subjects wore a compact, non-invasive sensor (Lithic-2 by TNHBiosystems, Ottawa, Canada). We recorded concurrent ECG, Pulse plethysmography (PPG), Blood Pressure (BP), Bioimpedance (BioZ), and Accelerometer (at the shoulders, for detection of movement and posture change). Signals were recorded during baseline sessions on days preceding the exam date, as well as 15 minutes before, throughout (80 minute exam) and then for 15 minutes following.

**Results:** Recorded signals were generally of high quality; however episodic movement artefacts (fidgeting and posture change) were common throughout the exam times. We saw clear differences between baseline, pre-test and post-test recordings relative to recordings during the test. The data show changes in heart rate and breathing patterns (BioZ) including periods of breath-holding. The accelerometer allowed discrimination of fidgeting behaviours.

**Discussion and Conclusions:** Results show that we can capture high-quality data during real examination scenarios, and that examinations produce objectively measurable physiological stress responses.