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**TITLE: INTEGRATED SACCADE LATENCY AS A MEASURE OF FATIGUE**

**ABSTRACT BODY:**

**Abstract Body: INTRODUCTION:** High workload, long working hours and inadequate sleep patterns can have deleterious effects on an individual's performance. Fatigue is often linked with compromised cognitive and motor function. Our information processing system becomes overloaded and unable to monitor and suppress irrelevant information. Subsequent changes in oculomotor parameters and cortical processing times may therefore provide useful biomarkers to assess one's state of fatigue. We propose a new non-invasive method to quantify fatigue by measuring Eye Movement And Intrinsic Latencies (EMAIL) without the use of any eye-tracking equipment.

**METHODS:** The test is easy to perform and employs a Landolt C flanked by ring distractors. The test is presented at an eccentricity of 8°, randomly on either side of fixation point within ±5° elevation. The measurement variable is the time of presentation,  $\delta T$ . The subject's task is to saccade to the peripheral target, register the orientation of the gap and respond by pressing one of four buttons. The EMAIL test measures the presentation time,  $\delta T$ , the subject needs to detect the peripheral target, generate an appropriate eye-movement and register the orientation of the gap.

**RESULTS:** The EMAIL test was used to measure the stimulus presentation times needed to achieve 73% correct responses (using a one up, two down staircase). These times were subject specific and ranged from 165 to 200ms in the absence of fatigue. We investigated how,  $\delta T$ , is affected by exposure to other visually demanding tasks and levels of controlled fatigue. Measured integrated oculomotor responses such as latencies and visual processing times were found to increase significantly following demanding visual tasks by as much as 20ms, but only when fatigued. Preliminary findings using the EMAIL test also show that this technique can be used to investigate the effect of stimulants such as caffeine and depressants, such as alcohol.

**CONCLUSIONS:** The EMAIL test provides a simple method to measure oculomotor parameters and to investigate how these are affected by fatigue. This method can be incorporated in the overall safety management system that is often needed in a number of work areas that involve visually-demanding and safety-critical tasks. The measured parameters provide information about an individual's level of alertness and may also be of relevance in other industries in order to evaluate drugs developed to control fatigue.

**Learning Objective 1:** Understand how integrated latencies may be used to characterise a subject's level of alertness and effects of stimulants and depressants on their performance.