Leveraging Eye-Tracking Data and AI-driven Analytics for Enhanced Debriefing in Interprofessional Crisis Management Training in the Operating Theatre: A Feasibility Study

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Background

Eye-tracking technology offers a novel approach for analysing cognitive processes and visual attention during crisis medical simulation training, correlating gaze behaviour to objective performance metrics. Initially probed in flight simulation to evaluate cockpit user-interface design on pilots' visual attention, workload and scanning strategies, expansion has also branched into the medical field[1,2,3]. Building upon prior investigations, this case study explores the integration of eye-tracking data in enhancing medical simulation debriefing, strengthening situational awareness, crisis resource management and interprofessional team interaction and training.
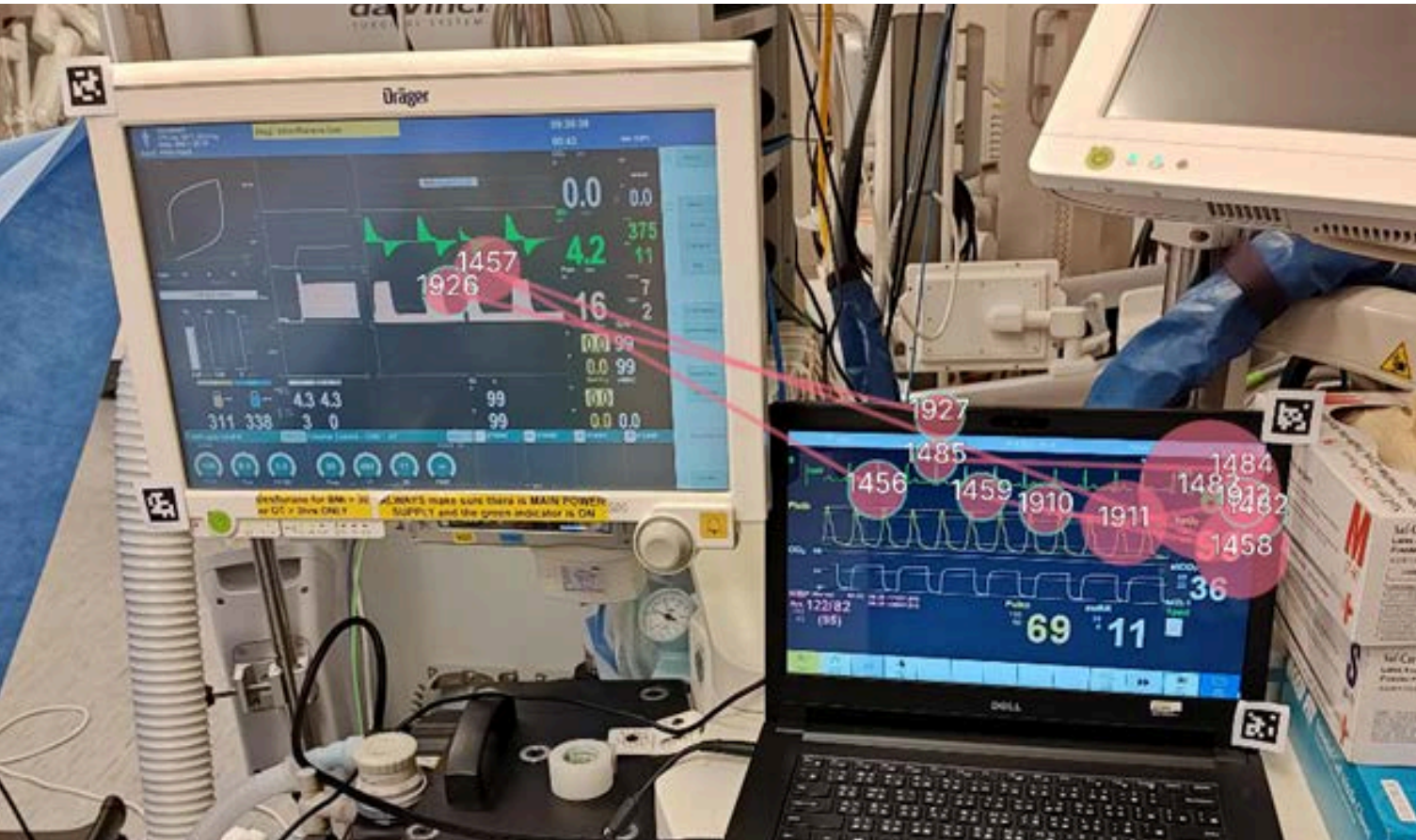
Method

Four interprofessional in-situ crisis medical simulations involving total of 40 staff were conducted - in the operating theatre and post-anaesthetic care unit respectively. Gaze and fixation data were captured from six team leaders using Pupil Labs NEON eye-tracking technology **(Pupil Labs GmbH, Germany)**, and post-processing analyses incorporated AI-driven analytics to generate visualisations: raw eye-tracking metrics, AI-generated heatmaps and scanpaths.

Pupil Labs Neon Eye Tracker

Discussion

AI-driven analytics yielded comprehensive visualizations utilising raw gaze, fixation and pupillometry data when reference objects were consistently identifiable. The debriefing process was enhanced using objective eye tracking output parameters around attention to vital signs, early recognition of deterioration, and team coordination.

Fixations can be tallied and traced back to the original eye tracking video down to the precise frame at which the fixation occurred.

Subsequent post-processing allow for in-depth analysis via heatmaps, scan paths and area of interest (AOI) analytics.

Fixation Count: 13, Total Fixation Duration: 2.186s, Average Fixation Duration: 168ms, Time to First Fixation: 09:56.995m

Future Applications

Integrating eye-tracking data with AI-driven analytics augment crisis medical simulation debriefing by providing objective parameters which strengthen situational awareness, team coordination, and critical decision-making reflection. Future research should focus on stabilizing and refining region-of-interest definitions within dynamic clinical environments to ensure that eye-tracking-assisted debriefing translates into sustained performance improvements. Additionally, investigation into enhanced training modalities may offer deeper insights into situational awareness during crisis management events.

Citations

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3. Mohamed, Abdallahi & Perreira Da Silva, Matthieu & Courboulay, Vincent. (2007). A history of eye gaze tracking.