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View Abstract

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Abstract

TITLE: EYE-TRACKING TECHNOLOGY DIFFERENTIATES VISUAL GAZE PATTERNS BETWEEN TRAINEE ENDOSCOPISTS ACCORDING TO A VALIDATED OBJECTIVE SKILLS ASSESSMENT SCALE

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ABSTRACT BODY:

Abstract Body : Introduction

There is significant variability between skill level of individual endoscopists that contributes to differences in detection of adenomas during colonoscopy. Several validated objective assessment tools have been created to assess trainee endoscopists, however, use of these are both time and labour intensive. Eye tracking technology has shown correlations between specific visual gaze patterns and polyp detection rates in endoscopy. The aim of this study is to compare specific gaze patterns against a validated assessment score used in the United Kingdom's accredited endoscopy assessment for trainees.

Methods

Lightweight eye-tracking glasses were used to record twenty-six colonoscopies from twelve endoscopy trainees across three hospital sites. Trainees were assessed using a directly observed procedural score (DOPS) devised by the joint advisory group on GI endoscopy (JAG) and a visual analogue score of overall competence - these were combined to produce a 'total weighted procedure score' (TWPS) on a scale of 1-20. Primary outcomes of fixation duration (FixD) and fixation frequency (FixF) were analysed according to areas of interest based on (i) an anatomical approach, where a cross-section of bowel was represented by three concentric circles with the inner circle as the lumen, middle circle as the edge of the lumen, and outer circle as the rest of the colonic mucousa, and (ii) a screen-based approach, where the endoscopy screen was split into a 3x3 grid. A secondary outcome of maximum pupil diameter during withdrawal was also measured. Correlation was assessed using the Pearson's coefficient. Significance was set at $p<0.05$.

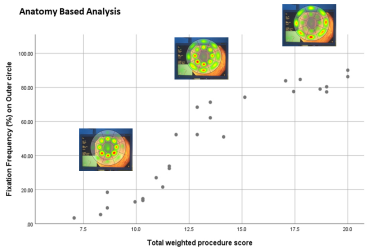
Results

Trainees displayed a significant positive correlation between TWPSs and FixD and FixF in the outer circle with both the anatomy-based (FixD:R=0.943, $p<0.0001$; FixF:R=0.936, $p<0.0001$ and screen-based (FixD:R=0.915, $p<0.0001$; FixF:R=0.930, $p<0.0001$) analyses. Conversely, they had significant negative correlations between TWPS and both the anatomical bowel lumen (FixD:R=-0.546, $p=0.004$; FixF:R=-0.568, $p=0.002$) and centre of the screen (FixD:R=-0.914, $p<0.0001$; FixF:R=-0.919, $p<0.0001$). There was a significant negative correlation between maximum pupil diameter in the right eye and TWPS (R=-0.518, $p=0.007$).

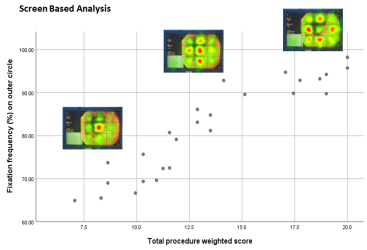
Conclusions

This novel study demonstrates that gaze patterns of endoscopists who focus on the periphery of the bowel lumen and/or screen are positively correlated with improved objective performance. This is consistent with prior analysis which demonstrated that peripheral gaze patterns of trainee endoscopists correspond with higher polyp detection rates. Further characterisation of visual gaze patterns in senior endoscopists according to adenoma detection rates is required to further the evaluation of eye-tracking as a training and assessment tool.

(No Table Selected)



Results of the anatomy based analysis showing total fixation frequency on the outer ring, which represented the walls of the colonic mucousa, according to Total Weighted Procedure Score. The heat maps show the cumulative distribution of fixation frequency for the lowest scoring 8 colonoscopies, the middle scoring 10 colonoscopies and highest scoring 8 colonoscopies (from bottom left to top right of the graph).



Results of the screen based analysis showing total fixation frequency on the outer ring of the screen according to Total Weighted Procedure Score. The heat maps show the cumulative distribution of fixation frequency for the lowest scoring 8 colonoscopies, the middle scoring 10 colonoscopies and highest scoring 8 colonoscopies (from bottom left to top right of the graph).

DISCLOSURE

The following authors have completed their 2020 DDW disclosure: Urvi Karamchandani: Disclosure completed | Simon Erridge: No Answer. | Keane Evans-Harvey: No Answer. | Ara Darzi: No Answer. | Jonathan Hoare: No Answer. | Mikael Sodergren: No Answer.