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Surgeons Perform Better With Eye Movement Training

ScienceDaily (Nov. 30, 2011) — Surgeons can learn their skills more quickly if they are taught how to control their eye movements. Research led by the University of Exeter shows that trainee surgeons learn technical surgical skills much more quickly and deal better with the stress of the operating theatre if they are taught to mimic the eye movements of experts.

This research, published in the journal Surgical Endoscopy, could transform the way in which surgeons are trained to be ready for the operating theatre.

Working in collaboration with the University of Hong Kong, the Royal Devon and Exeter NHS Foundation Trust and the Horizon training centre Today, the University of Exeter team identified differences in the eye movements of expert and novice surgeons. They devised a gaze training programme, which taught the novices the expert visual control patterns. This enabled them to learn technical skills more quickly than their fellow students and perform these skills in distracting conditions similar to the operating room.

Thirty medical students were divided into three groups, each undertaking a different type of training. The gaze trained group of students was shown a video, captured by an eye tracker, displaying the visual control of an experienced surgeon. The footage highlighted exactly where and when the surgeon's eyes were fixed during a simulated surgical task. The students then conducted the task themselves, wearing the same eye-tracking device. During the task they were encouraged to adopt the same eye movements as those of the expert surgeon.

Students learned that successful surgeons 'lock' their eyes to a critical location while performing complex movements using surgical instruments. This prevents them from tracking the tip of the surgical tool, helping them to be accurate and avoid being distracted.

After repeating the task a number of times, the students' eye movements soon mimicked those of a far more experienced surgeon. Members of the other groups, who were either taught how to move the surgical instruments or were left to their own devices, did not learn as quickly. Those students' performance broke down when they were put into conditions that simulated the environment of the operating theatre and they needed to multi-task.

Dr Samuel Vine of the University of Exeter explained: "It appears that teaching novices the eye movements of expert surgeons allows them to attain high levels of motor control much quicker than novices taught in a traditional way. This highlights the important link between the eye and hand in the performance of motor skills. These individuals were also able to successfully multi-task without their technical skills breaking down, something that we know experienced surgeons are capable of doing in the operating theatre."

"Teaching eye movements rather than the motor skills may have reduced the working memory required to complete the task. This may be why they were able to multi-task whilst the other groups were not."

Dr Samuel Vine and Dr Mark Wilson from Sport and Health Sciences at the University of Exeter have previously worked with athletes to help them improve their performance through gaze training, but this is the first study to examine the benefits of gaze training in surgical skills training.

Dr Vine added: "The findings from our research highlight the potential for surgical educators to 'speed up' the initial phase of technical skill learning, getting trainees ready for the operating room earlier and therefore enabling them to gain more hands on experience. This is important against a backdrop of reduced government budgets and new EU working time directives, meaning that in the UK we have less money and less time to deliver specialist surgical training."

The research team is now analysing the eye movements of surgeons performing 'real life' operations and are working to develop a software training package that will automatically guide trainees to adopt surgeons eye movements.

Mr John McGrath, Consultant Surgeon at the Royal Devon and Exeter Hospital, said: "The use of simulators has become increasingly common during surgical training to ensure that trainee surgeons have reached a safe level of competency before performing procedures in the real-life operating theatre. Up to now, there has been fairly limited research to understand how these simulators can be used to their maximum potential."

"This exciting collaboration with the Universities of Exeter and Hong Kong has allowed us to trial a very novel approach to surgical education, applying the team's international expertise in the field of high performance athletes. Focusing on surgeons' eye movements has resulted in a reduction in the time taken to learn specific procedures and, more importantly, demonstrated that their skills are less likely to break down under pressure. Our current work has now moved into the operating theatre to ensure that patients will benefit from the advances in surgical training and surgical safety."

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A trainee surgeon conducts a simulated operation while wearing the eye-tracking device. (Credit: Image courtesy of University of Exeter)

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