Clinical Science: Invited Commentary

The eye of the master

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“The eye of the master will do more work than his hands”
Benjamin Franklin

Surgical tasks are performed in a dynamic, ever-changing, anxiety-provoking environment that continuously tests the limits of human performance. The ability to maintain control and focus on attention is universally accepted as a key to success. In the operating room, there are many actions going on simultaneously, often distracting the novice learner. It begs the question – what exactly should surgical trainees focus on to acquire skills and produce anxiety-free performances? If we were in the business of training ball players, we would teach them to keep their eye on the ball. This is the advice passed on by my coaches at every level, but can we apply this same advice to students learning surgical skills? The answer is a resounding yes. In the preceding work by Causer et al., Dr Vickers has expanded her ground-breaking work from improving athletic performance into the operating room. This method of teaching has the potential of completely revolutionizing the way we teach surgical skills. While their manuscript is well written and important, it fails to provide the background information and supporting evidence that would excite surgical educators to completely rethink the way technical skills are traditionally taught.

Dr Vickers’ pioneered the concept of the “Quiet Eye” (QE), which is the final visual fixation or tracking gaze located on a specific area in the visuomotor workspace within 3° of visual angle for a minimum of 100 ms. During this period, the performer sets the final parameters which govern the movement to be executed. Both early onset of this behavior and longer QE periods have been found to differentiate elite from sub-elite and successful compared with unsuccessful physical performance across a wide variety of athletic activities including golf, ice hockey, rifle shooting, basketball, billiards, soccer, and darts. It appears that how the gaze is controlled is critical for acquiring skills that require precise cue selection and optimal timing. While this manuscript by Causer et al. demonstrated improvement in novice 1st-year surgical residents, QE training is not limited to the novice learner. QE has been found to further improve performance in those who already have elite level skills, suggesting that QE training would be effective at improving performance across the full spectrum of surgical experience.

Another important aspect not expanded upon in the preceding manuscript is the role of the QE in failure to execute acquired skills during periods of anxiety or stress. The operating room and skills laboratory can be a stressful environment for those learning basic surgical technique. Studying a group of elite biathlon shooters, Vickers and Williams found that athletes who were able to maintain their QE periods for longer did not “choke” under the pressure of competition, whereas when anxiety caused diversion of visual attention, there was a corresponding performance decrement. Researchers also found that practicing QE training under simulated stress lessened the adverse effects of anxiety on performance. Similar results have also been demonstrated during archery and basketball free throws. This finding suggests that incorporating stressful situations into our current simulation-based training may have positive educational benefits.

All the above studies provide strong support for the benefit of QE training of execution of physical skills, but how does QE training actually work? A critical review of this aspect of skills training is well beyond the scope of the

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manuscript by Causer et al.\textsuperscript{2} However, Vine et al.\textsuperscript{15} recently published a comprehensive review of the QE as it relates to skill acquisition, refinement, and resilience performance. Briefly summarizing this work, there are 3 phases to QE training. The 1st is “Attention Control.” Either when gained through experience or specific training, a long QE period has been proposed to facilitate technical performance by ensuring that the optimal attention is focused on the right target at the right time. The second phase is “Response Planning.” During this phase, longer QE duration is thought to extend the duration of critical preprogramming during which the parameters of movement such as force and direction as well as timing and coordination are fine tuned. The end result is cortical activation that causes patterns of muscle movements that are more effective, successful, and efficient. The 3rd and final phase of QE training is “External Focusing and Psychomotor Quiet­ing.” In this phase, attention is shifted away from the internal emotional motivation factors toward an external competent of the task, such as dribbling the ball routine before a free throw in basketball or concentrating on the dimples of a golf ball before a putt. This type of external focus on the task has been shown to enhance performance by decreasing heart rate and quieting the psychoneuromuscular system as evidenced by reduced electromyographic activity. This final phase of training may enhance preservation of acquired skills during times of stress.

There are many parallels between surgeons and athletes. Surgeons and elite athletes are engaged in activities which require both cognitive abilities and control of their patterns of muscular activity. Both groups perform these activities in stressful environments which may degrade the level of performance. QE training is emerging as fundamental training technique in sports but only has had limited application to surgical training. While the manuscript by Causer et al.\textsuperscript{2} may be difficult for general surgeons to fully comprehend, the potential implications may completely revolutionize how surgical educators approach skills training. While the current skills training is focused on specific types of simulators, types of tasks, and the number of operations recorded in a log book, the future will likely be QE training. After researching this topic, it is remarkable that so much of the work on QE has been devoted to improving athletic performance. Many of our patients and trainees would benefit from the application of a technique that results in better skill acquisition, refinement even in elite performers, and preservation of these skills in the setting of stress and anxiety. These attributes almost seem too good to be true and the authors are urged to continue their work in this important area.

References