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Commentary: New ground: Applying the science of learning to cardiothoracic trainees

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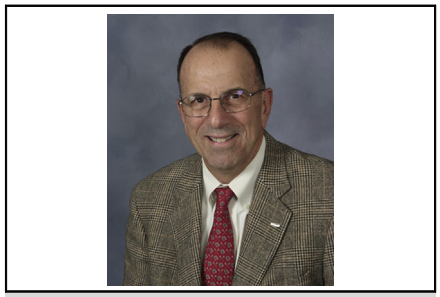

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CENTRAL MESSAGE

Focus on technical aspects of training is important, but not the only part of cardiothoracic training.

Sergeant and De Raet[1] present an article that stands out as both unique and unfamiliar. In my search through the abstracts of this *Journal* I was unable to find a single article that addresses the science of learning in the ways described in this article. The world of educational theory is foreign to most cardiothoracic surgeons, yet training and teaching is an important and necessary part of sustaining a viable specialty. There are newer—some would say exciting—concepts and practical advances that will surely influence our specialty, primarily because of the need for specialty-related technical and cognitive skills. The article by Sergeant and De Raet[1] addresses how learning theory may influence surgical skill development in cardiothoracic surgery trainees. To many cardiothoracic surgeons (me included), reading this article must seem like reading ancient Greek or deciphering hieroglyphics. The words may be recognizable, but putting them together into meaningful dialogue is difficult and mostly obscure.

There is evidence that brain plasticity is required to learn new skills, and this occurs in normal individuals just as it does in patients with major sensory–motor deficits.[2] That is, through massive cortical reorganization that does not occur rapidly, but requires prolonged conscious effort and specific task re-orientation. The skill acquisition that is associated with cortical reorganization has obvious overlaps with learning a specialized skill like performing cardiothoracic surgery. In reading the article by Sergeant and De Raet,[1] one gets the impression that our specialty has been slow to adopt newer, advanced models of skill acquisition and has not advanced beyond using the left internal thoracic artery for coronary revascularization and using cardiopulmonary bypass to perform operations. This is a gross oversimplification that may be unfair to the authors—I am sure they meant for their article to be provocative and to be a vehicle for change in our specialty. The authors point out some obvious (to them!) shortcomings in the surgeon-training process:

- Lack of specific training objectives,
- Reliance on a single person (ie, program director) for final assurance of competence,
- Incomplete adoption of newer medical devices and tools,
- No specific curriculum design but reliance on random exposures,
- No reliance on distant learning tools,
- Surgical educators lack skills and knowledge base to provide adequate education,
- Minimal reward for excellent trainers,
- No learner-focused training areas,
- Time pressure of clinical activity negatively influences training regimens,
- Failed leadership at a national level and failing local or regional leaderships, and
- Possible loss of attractiveness of cardiothoracic surgery as a viable career because of potential for litigation.

With this list of deficits, it is amazing that a competent cardiothoracic surgeon can ever be trained and surface to public acceptance! The authors propose a strategy to

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combat these shortcomings that is based on principles of the science of learning, and it is hard to argue with their logic.

Where the authors' assessment and strategy for improvement seems more difficult to understand and may lack some solid evidence-based information for change is in their so-called strategy map. They reasonably define skill as "psycho-motor competencies, gained through sustained practice with expert feedback within a simulated learner-centered environment." Yet, it is hard for me to visualize their description of the 32-step process of deconstructing the creation of a coronary anastomosis, followed by the Objective Structured Assessment of Technical Skill tool. I accept that there are learning aids for skill development of complex procedures. I am not sure that the authors' example of a coronary artery bypass graft anastomosis and an in-depth understanding of needle holders needs to be included in their article. I fear that these details will detract from the authors' message. Further, assuming that most surgeons use the "parachute" method for creating a coronary anastomosis is neither correct nor important in relaying their message. There is a prolonged and overly complete description of their training techniques that may be inaccurate or incomplete. For example, to assume that no surgeons should use on-pump venous anastomoses or proximal aortic anastomoses avoids providing broad-based cardiothoracic training that is likely still relevant in most of the cardiothoracic surgery world.

The authors focus extensively on the practice of performing coronary anastomoses, perhaps rightfully so because learning technical skills constitutes a major part of cardiac surgery training. They focus on the kinesthetic aspects of training to perform coronary surgery to the exclusion of multiple other aspects of the education process. Professional educators might point out that there are many facets to the learning process. The focus on the practice and kinesthetic fraction of the process to the exclusion of many other important parts of learning may be an overreaction to their perceived deficits in the typical training of cardiothoracic surgeons. It is likely that there are other deficits that reflect shortcomings in several of the components of the "Learning Pyramid." The authors' focus on technical training may be appropriate for our highly technical specialty, but should probably not ignore the global education process.

These shortcomings are not meant to detract from the authors' message. It is clear that modern learning methods and proper learning environments need to be embraced by students and trainers, especially for those learning to perform complex coronary operations. It is likely correct that our specialty has been negligent in embracing some modern teaching and learning paradigms. I hope that this message comes through in the article. I look forward to gauging the responses of cardiothoracic surgeons who read this article. It is sure to generate robust dialogue.

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