

Researchers show that keyhole surgeons have more than just good hands—they have highly adaptable hands

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A study conducted by cognitive scientists at Macquarie University, published in *Human Movement Science*, found that highly experienced surgeons who perform minimally invasive surgery (MIS), also known as keyhole or laparoscopic surgery, have an enhanced ability to adapt when challenges occur with MIS equipment, compared to student practitioners.

Study authors Ph.D. student Christopher Hewitson, Dr. Matthew Crossley, and Associate Professor David Kaplan, from Macquarie's Department of Cognitive Science, compared visuomotor adaptation performance in two groups of participants. The first group contained experienced [laparoscopic surgeons](#), from Macquarie University Hospital and Nepean Hospital. The second group contained undergraduate university students. The results of their study showed that expert [surgeons](#) learned to adapt more rapidly and generalize more broadly than the students in response to a change in visuomotor mapping.

One of the researchers, Dr. Matthew Crossley, compared the challenges of MIS to using a computer mouse to control a cursor's position on a screen if mouse controls were reversed. "Suddenly down means up, and left means right. Situations remarkably similar to this occur frequently in [keyhole surgery](#), with two important exceptions. First, keyhole surgeons often don't have the option of flipping the mouse back to the normal orientation; rather, they must adapt. Second, quickly and accurately

adapting to altered visuomotor mappings like this can be a matter of life and death."

Almost nothing was known about the development of expertise in visuomotor adaptation, including the most basic question of whether or not expert keyhole surgeons are really better than others, prior to the study.

"These findings suggest that by designing novel training methods and assessments that are optimized to improve both motor execution and motor adaptation aspects of technical surgical skill, the MIS community may be able to more fully achieve its goal of producing expert surgeons who are better prepared for the various challenges they will encounter in the [operating room](#)," Associate Professor Kaplan commented.

"It is now widely recognized that MIS is inherently challenging to learn and can even be prohibitively difficult for some surgical residents such that they never reach proficiency," said Associate Professor Kaplan.

"It requires surgeons to perform precise and dexterous actions in a highly variable environment. This paper is the first to demonstrate that, in addition to the classic notion that expert surgeons have 'good hands' (i.e., they excel at motor execution), minimally invasive surgeons also have unique motor adaptation abilities," he concluded.

More information: Christopher L. Hewitson et al. Enhanced visuomotor learning and generalization in expert surgeons, *Human Movement Science* (2020). [DOI: 10.1016/j.humov.2020.102621](https://doi.org/10.1016/j.humov.2020.102621)

Provided by Macquarie University

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