The Tobii eye-tracker was used to record surgeons' eye movements while they performed a micro suturing task. A total of 19 experts and 18 novice trials were recorded under the microscope. Surgical videos were annotated to label subtasks and critical actions. Total suturing time and subtask times were also compared between novice and expert surgeons. At 3 critical and discrete surgical actions (needle piercing into the tissue, exiting, and thread cutting) they examined eye fixation that was directly coupled to each of these actions.

Compared with novices, expert surgeons completed the suture with shorter total time (258.52 ± 102.14 seconds vs. 330.02 ± 96.52 seconds, P = 0.038), penetration time (17.15 ± 3.50 seconds vs. 26.26 ± 18.58 seconds, P = 0.043), and knot-tying time (194.63 ± 94.55 seconds vs. 262.52 ± 79.05 seconds, P = 0.025). On average, experts displayed longer fixation (1.62 seconds) and preaction fixation time (1.3 seconds) than novices (fixation time = 1.24 seconds, P = 0.048; preaction fixation = 0.82 seconds, P = 0.005)). Experts maintained their visual engagement constantly over the 3 levels of subtasks while novices required a longer fixation time for the challenging piercing action than for the exiting and cutting action.

The action-related fixation can be used to evaluate microsurgeons level of expertise and in surgical education for gaze training [1].

1)
Chainey J, Elomaa AP, O'Kelly CJ, Kim MJ, Bednarik R, Zheng B. Eye-Hand Coordination of Neurosurgeons: Evidence of Action-Related Fixation in Microsuturing. World Neurosurg. 2021 Nov;155:e196-e202. doi: 10.1016/j.wneu.2021.08.028. Epub 2021 Aug 13. PMID: 34400325.