Nintendo Da Vinci: Implementing a Novel Control System to Improve Performance in Robotic Surgery

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Complications associated with robotic surgery are on the rise, in part, due to surgeons not receiving proper training prior to operation. To improve performance and accelerate learning in robotic surgery, a Nintendo Joycon control system was designed to replace the conventional Da Vinci control system. To test the Joycon control system, two users were recruited (doctor and gamer) and their performance was tested with both control systems (Nintendo and Da Vinci) in a simulated robotic surgery skills assessment (FRS) in 2D and 3D. The skills assessment consists of a modified version of the fundamentals of laparoscopy pegboard task. For each testing session, each user completed 7 FRS tasks, and task completion time and error were recorded. Then, FRS scores and learning rates were calculated. The users were each given 5 minutes to practice before each session, and each session was separated by a window of one week to mitigate any learning gained from previous sessions and minimize any fatigue factor. The results show that, when compared to the Da Vinci control system, implementing a Nintendo Joycon control system improves task time by 83% for doctor and 88% for gamer, reduces error by 73% for doctor and 82% for gamer, improves FRS score by 72% for doctor and 46% for gamer, and accelerates the learning rate by 84% for doctor and 86% for gamer. Statistically significant ($p<0.05$) improvements in task completion times, error, FRS scores, and learning rates were observed among both users favoring the Nintendo Joycon control system, both in 2D and 3D trials.

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