A Unique Endoscopy Simulator Using a Commercial Video Game

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INTRODUCTION

- Procedural simulation enhances early endoscopy training.
- Use of commercial endoscopic simulators are limited by cost and poor user compliance.
- First-person "shooter" (FPS) video games are a popular.
- Our **objective** was to show that a novel in-house designed colonoscope controller used to play an FPS video game shares similar constructs with real-life endoscopy.

METHODS

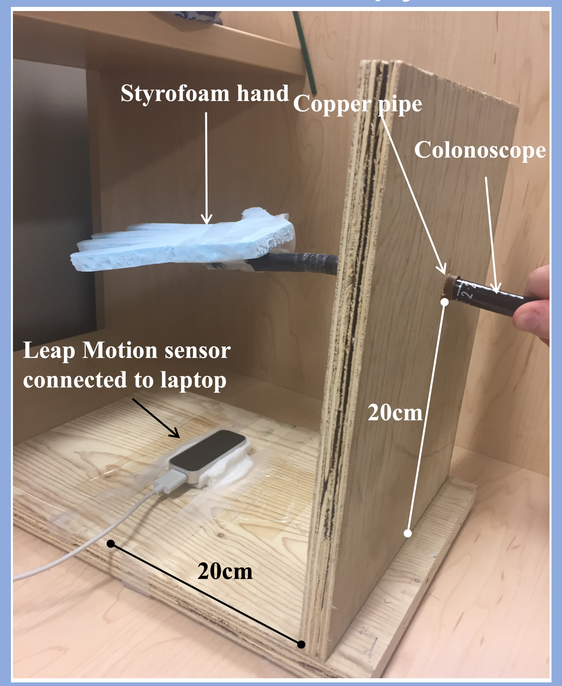
1. We took a used non-functional colonoscope (~150USD on eBay) and connected it to an inexpensive hand motion sensor (Leap Motion Inc., San Francisco, CA).
2. Using free commercially available computer software (GameWave for Mac, v1.5.5), scope position was used to control a popular commercial FPS video game - Portal (Valve Corporation, Bellevue, WA),
3. Participants completed the first three levels of the game, first using a conventional mouse and keyboard, and then using the colonoscope.
4. Twelve expert surgeon-endoscopists and twelve surgical residents with minimal endoscopy experience were evaluated based on completion time, number of button presses, and hand motion analyses.

DISCLOSURES: none

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Main Conclusion:

Experts outperform novices using the new colonoscope-controller. Our endoscope-controlled video game shares similar constructs with real-life endoscopy.



RESULTS

- **Experts outperformed novices** for time to study completion (expert 944 seconds; novice 1515 seconds; p = 0.006) and number of hand movements (expert 1263.1; novice 2052.6; p = 0.004) using the novel colonoscope controller.
- There was no difference in number of buttons pressed or total path length travelled. Performance did not differ between groups when using the conventional mouse and keyboard game controls

Table 1. Hand motion analysis outcomes while using colonoscope controller

Outcome Measure	Left Hand Mean (SD)			Right Hand Mean (SD)			Combined Score, Mean (SD)		
	Novice	Expert	p	Novice	Expert	p	Novice	Expert	p
Completion Time, s	-	-	-	-	-	-	1515 (542)	944 (300)	**0.006**[U]
No. movements	1173.0 (467.8)	644.8 (230.0)	**0.002**	879.6 (383.4)	618.3 (247.0)	0.089	2052.6 (815.5)	1263.1 (457.5)	**0.004**[U]
Path length traveled, m	666.3 (406.2)	393.1 (252.4)	0.089	561.7 (407.4)	364.2 (296.2)	0.160	1228.0 (702.2)	757.3 (456.2)	0.143[U]
No. button presses	-	-	-	-	-	-	66 (23.5)	60 (16.4)	0.580[U]

Bold text indicates statistically significant p<0.05.
[U] Mann–Whitney U-test, 2-tailed

CONCLUSIONS

1. Experts outperform novices using the endoscope-controller, but not the mouse and keyboard, with respect to economy of movement and completion time.
2. Our endoscope-controlled video game shares similar constructs with real-life endoscopy and serves as a first step toward creating a more enjoyable and cheaper alternative to commercially available endoscopy simulators.