Virtual Reality Simulators: Valuable Surgical Skills Trainers or Video Games?

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Comparison

Physical Model

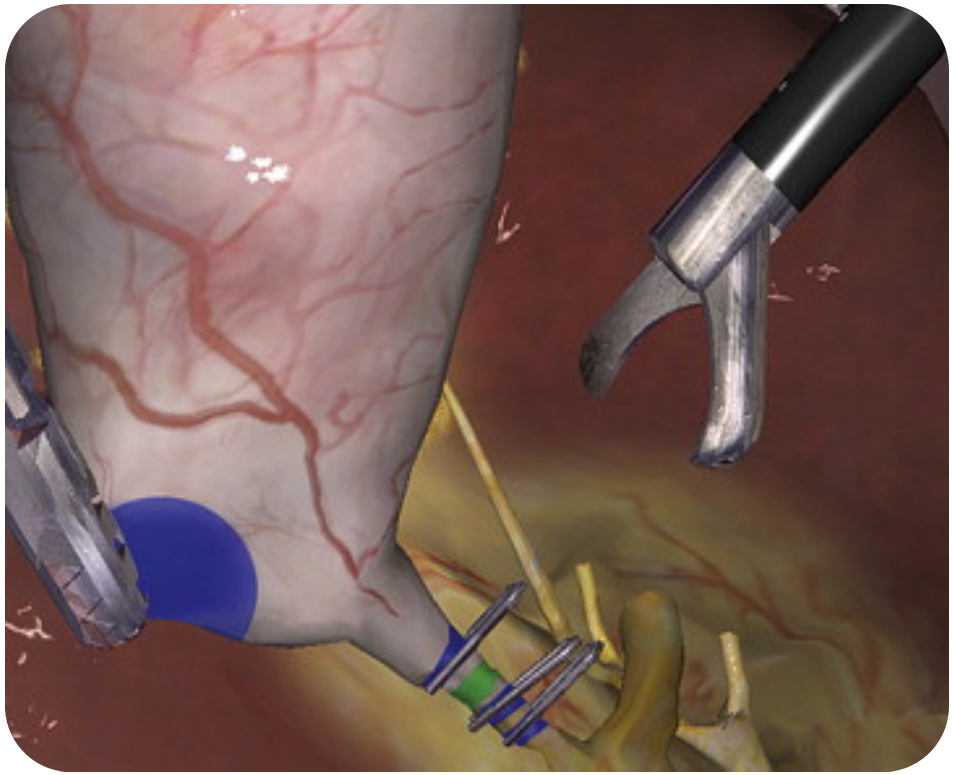
- Actual 3D objects
- Video projection
- Haptic feedback
- Rudimentary metrics
- $1500 - $10,000

Virtual Reality

- Computer-driven 3D objects
- Computer-driven haptic feedback
- Advanced metrics
- $40,000 - $150,000

Virtual Reality and Video Games

Virtual Reality Sim



Video Game

Research: Physical Model and Video Games

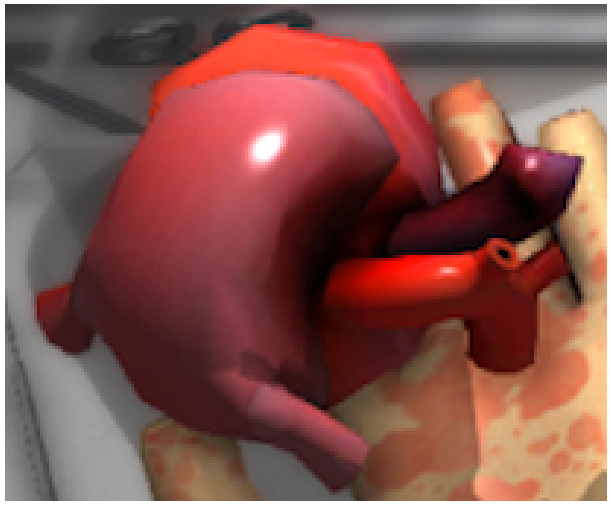
- Found significant correlations:
  - Badurdeen et al. – laparoscopic
  - Rosser et al. – laparoscopic
- Did not find significant correlations:
  - Rosenberg et al. – laparoscopic
  - Harper et al. – da Vinci robot
  - Willis et al. – laparoscopic
  - Madan et al. – laparoscopic

Research: Virtual Reality and Video Games

- Found significant correlations:
  - Schlickum et al. – laparoscopic
  - Hogle et al. – laparoscopic
  - Shane et al. – laparoscopic
  - Enochsson et al. – colonoscopy
  - Glaser et al. – endosinus
  - Hislop et al. – endovascular
- Did not find significant correlations:
  - None?

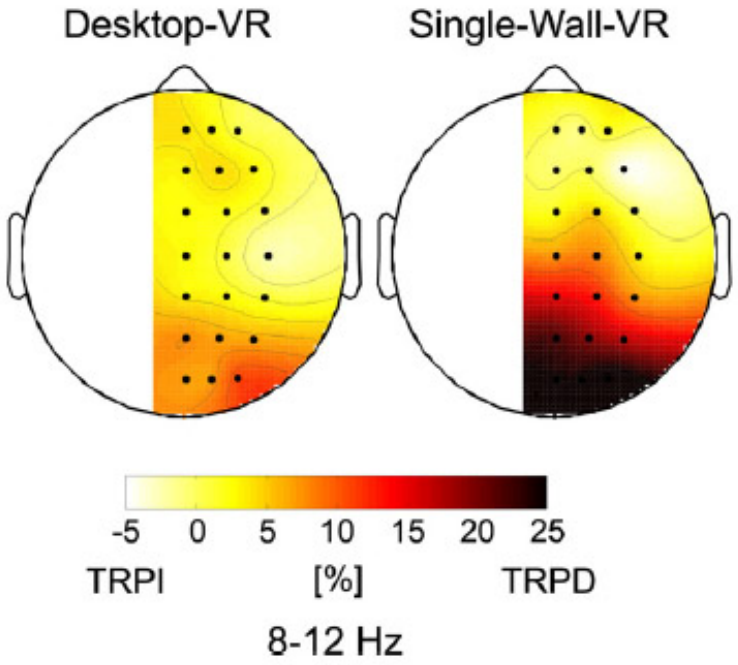
Visual Perceptual Differences?

- Visual perceptual system processes computer-generated images differently than camera-projected images



EEG Patterns

- Kober et al. – EEG patterns differed for 2D and 3D VR environments



- Even greater differences between virtual reality and physical models?

Purpose

- Determine whether relationships exist among virtual reality, physical model, and video games
- Experiment 1
  - Laparoscopic camera navigation
- Experiment 2
  - Colonoscopy

Hypotheses

- Video games would correlate with virtual reality, but not with physical model
- Virtual reality performance would not correlate with physical model performance

Experiment 1:
Laparoscopic Camera Navigation

Methods

- n = 20 MS1 & MS2 lap camera nav novices
- 3 trials of fine motor skills video game
- 3 trials of each virtual reality lap camera nav (0° and 30°)
- 3 trials of each physical model lap camera nav (0° and 30°)
- Counterbalanced
- 1st 2 trials considered warm-up

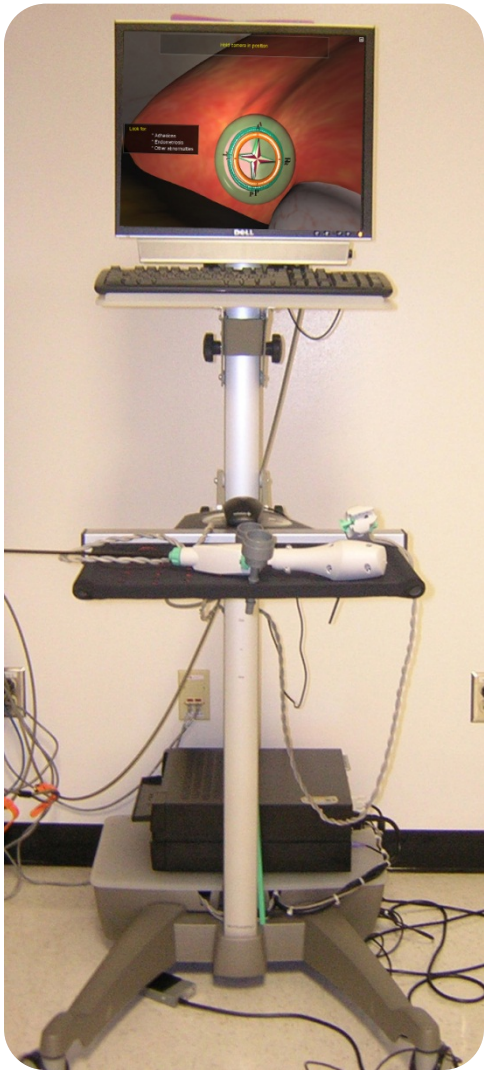
Marble Mania Level 2

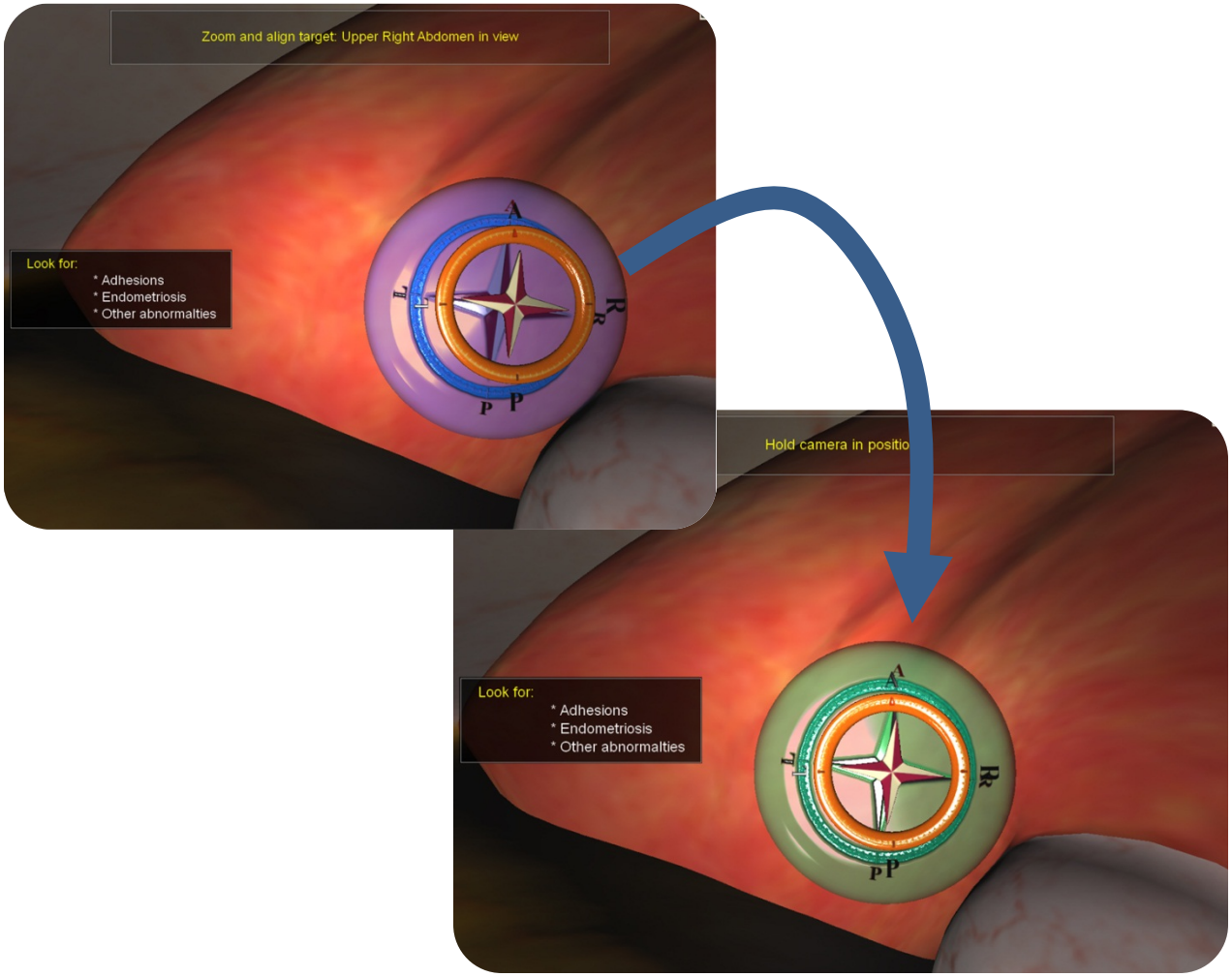
Marble Mania Level 11

Marble Mania Level 12

Virtual Reality Lap Camera Nav

METI SurgicalSim

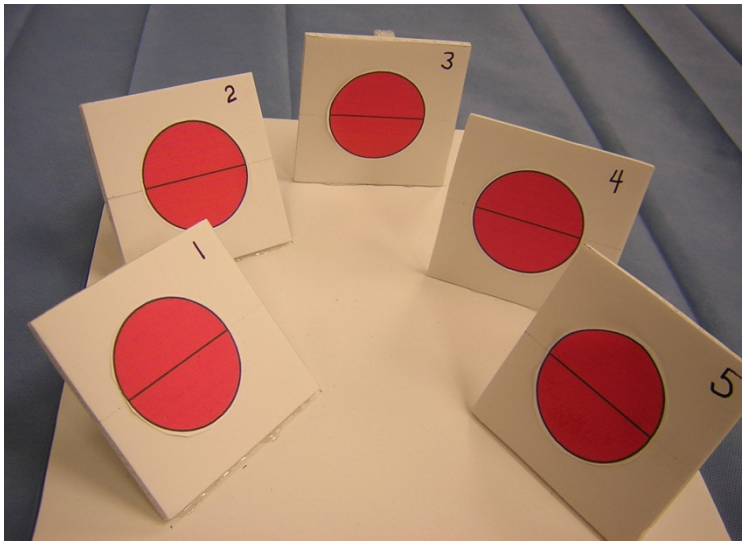




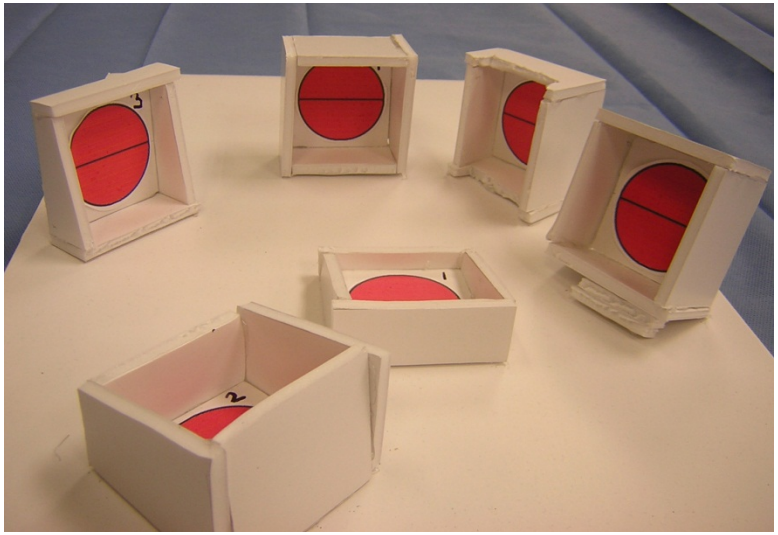
Physical Model Lap Camera Nav

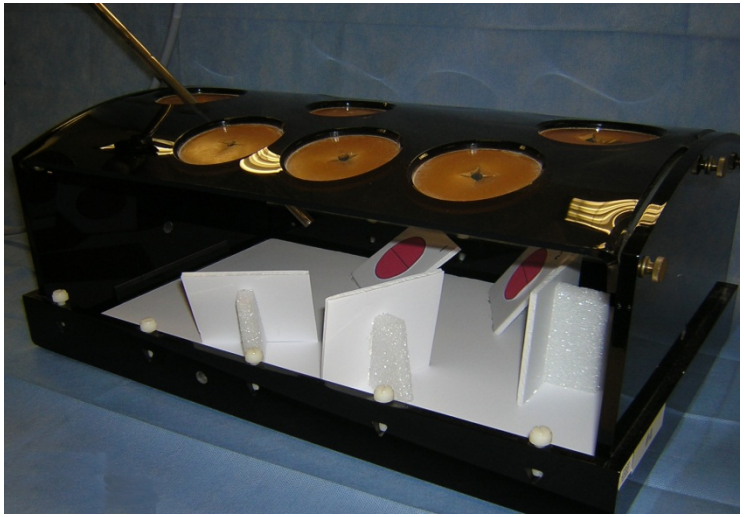
Tulane Trainer (Korndorffer et al.)

0°

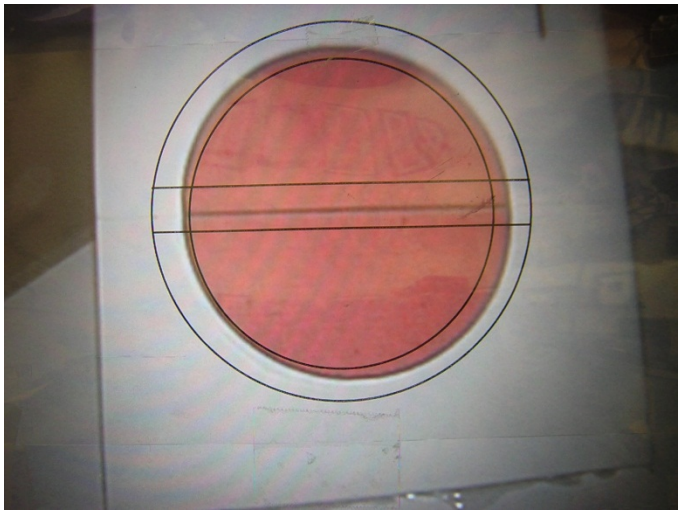


30°





Target Aligned



Results

	Fine Motor Skills Video Game Level 2	Fine Motor Skills Video Game Level 11	Fine Motor Skills Video Game Level 12
Virtual Reality 0°			
Virtual Reality 30°	Time: p=.008		Time: p<.001 Tip Traj: p=.005
Physical Model 0°			
Physical Model 30°			

No significant correlation between virtual reality and physical model performance

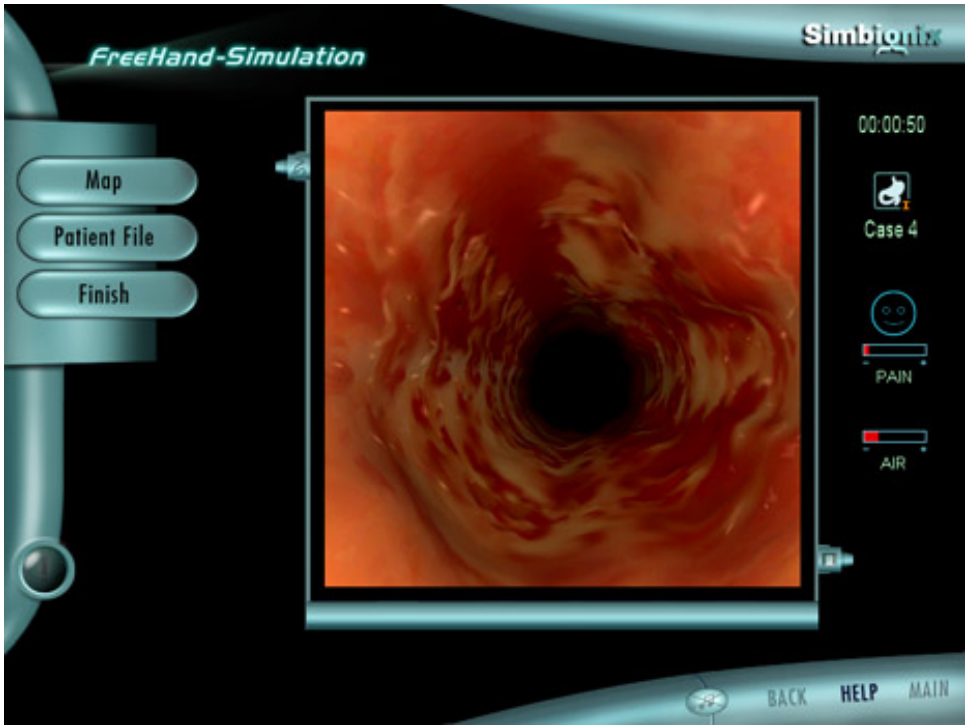
Experiment 2: Colonoscopy

Methods

- n = 20
- New MS1 & MS2, colonoscopy novices
- Fine motor skills video game levels 2, 11, 12
- Counterbalanced for order of virtual reality & physical model
- 2 trials, 1st trial considered warm-up

Virtual Reality Colonoscopy

Simbionix GI Mentor II (Case 5)



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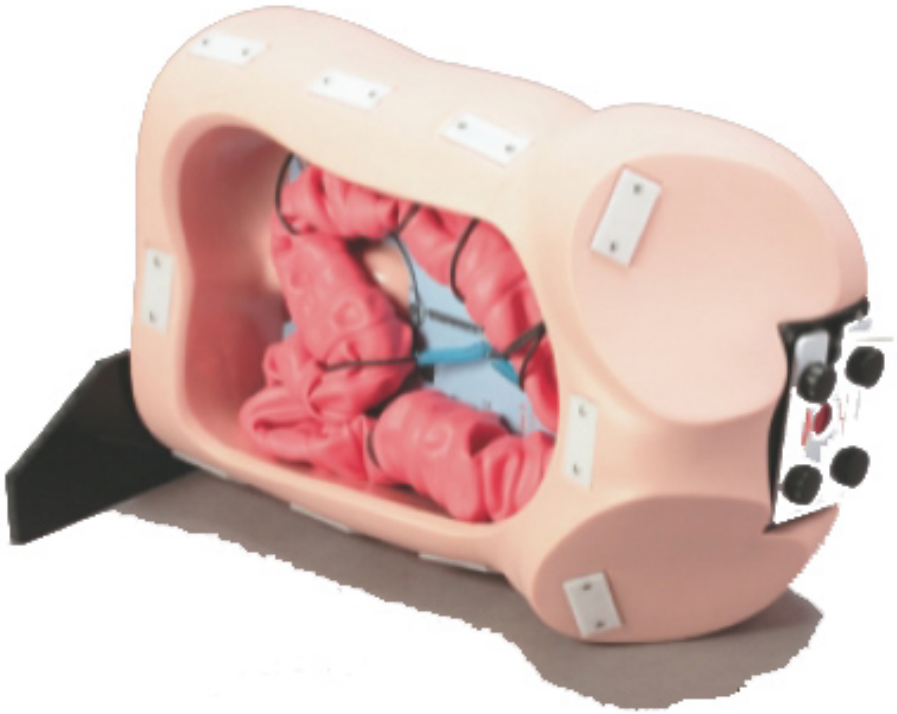
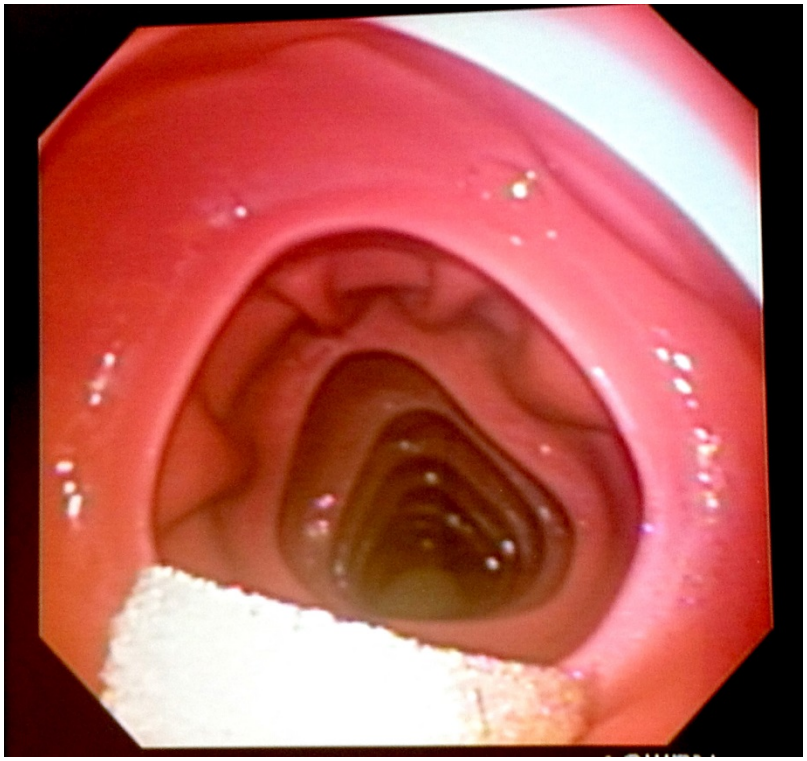
Physical Model Colonoscopy

Kyoto Model (Case 1)





Results

	Fine Motor Skills Video Game Level 2	Fine Motor Skills Video Game Level 11	Fine Motor Skills Video Game Level 12
Virtual Reality		p=.008	

No significant correlation between virtual reality and physical model performance

Conclusions

Conclusions

- Fine motor video game skills correlate with virtual reality sim performance
- Virtual reality sim performance does not correlate with physical model sim performance
- Virtual reality sims = video games?
- Fried et al. – “Residents sometimes learn bad habits that give them good scores [on VR sims]. It is a little like a video game.” Annals of Surg (2004)

Questions?


Don’t worry, sir. You’re in good hands. I got mad skillz in Crysis 3.