INTRODUCTION

Laparoscopic surgery requires surgeons to learn novel complex movement patterns.

Virtual reality laparoscopic training systems (e.g. Simbionix LAP Mentor™) are becoming increasingly available to surgical trainees.

Research is needed to determine optimal laparoscopic training regimes.

Here we examine whether constraining the plane of movement during training aids or hinders later performance at test.

METHODS

LAP-KAT is an experimental tool that measures motor learning. It links a commercially available robotic arm with specialised software that presents visual stimuli and objectively measures movement outcomes (kinematics; Figure 1).

Training: Participants generated aiming movements along a horizontal plane to move a visual cursor to a series of targets on a vertical screen (Figure 1).

- The Constrained group received training that forced movements onto the correct plane.
- The Unconstrained group could explore the entire ‘action space’ during training.

Test: Both groups performed the task without constraints.

RESULTS

LAP-KAT generated the requisite force fields and recorded the movements precisely.

Unconstrained group showed better Test performance indexed by duration (p<0.05).

DISCUSSION

Our novel system allowed exploration of laparoscopic relevant motor skill learning.

Improved performance after exploring the entire action space, shows that learning the full dynamics of laparoscopic instruments is critical.

Understanding how the CNS best learns the visual-motor skills required for surgery will allow optimised training and increased efficiency of virtual reality laparoscopic training systems.