



BRIEF COMMUNICATION



Simulated cataract surgery training of the non-dominant hand improves confidence and competence

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INTRODUCTION

The benefits of simulation training are increasingly being recognised in the ophthalmic surgical curriculum [1, 2]. Virtual reality simulation allows repetition of a surgical task in a non-risk environment to ensure familiarity with a procedure, and hopefully improved manual dexterity. There is no formal assessment for trainee surgeons (either in simulation or in vivo) documenting non-dominant hand development. We wished to establish objectively if training of the non-dominant hand would improve bimanual function and surgical performance, and investigate if improving trainees' bimanual surgical competence resulted in improvements in confidence.

METHODS

Ophthalmic trainees in Glasgow, UK, who had previously used the EYESI simulator (VRmagic Holding AG, Mannheim, Germany) and completed modules A and B for intra-ocular training, were invited to participate in the study in May 2020.

Participants performed forceps training with their dominant hand to re-familiarise themselves with the simulator. They then completed a bimanual training task three times to obtain a pre-training baseline measure. A 20-min bespoke training module which involved performing single-handed tasks with the non-dominant hand alone was undertaken. Participants then completed the same bimanual training task three times to obtain a post-training result (Fig. 1).

The median score from the three attempts at the bimanual training task pre- and post-training per participant was compared using the Wilcoxon signed-rank test.

A validated self-confidence survey was completed at the start and end of the study [3].

RESULTS

Sixteen trainees participated (8 male, 8 female; median age 29 years (26–35)). Seven were year ST1-3 (junior), 9 were ST4-7

(senior). Median completed cataract operations were 155 cases (1–730). Fifteen (93.8%) stated right-hand dominance, with median Edinburgh Handedness Index score of 87.5 [4]. Median self-confidence scores (Table 1) increased significantly following training (12.5/30 vs. 16/30; $t = 5.1194$, $p < 0.05$). Bimanual training module median total score improved significantly following training (76.5 vs. 77.8; $p = 0.02$), as did reduced task time (51.8 s vs. 44.1 s; $p = 0.002$) and reduced odometer speeds (103.68 mms^{-1} vs. 92.66 mms^{-1} ; $p = 0.03$). Unintended 'movement off sphere' instances reduced from pre-training range 3–30 to post-training range 3–18 ($p = 0.005$).

DISCUSSION

The surgical efficacy of the non-dominant hand in simulated cataract surgery has previously been demonstrated to be less safe than the dominant hand, particularly with less experienced surgeons [5]. We have demonstrated that the EYESI simulator can train the non-dominant hand in intra-ocular surgery, resulting in significant improvements in competence performing bimanual tasks. Our study demonstrated a statistically significant improvement in total scores, odometer movements, duration of task times, and reduced instances in slipping out of sphere, which demonstrates that bimanual control improved in our cohort. Such improved competence due to intentional training correlated with increased self-confidence regarding non-dominant hand use amongst participants. This is particularly relevant in the safe management of cataract-related complications and is one of the major advantages of simulating predictable surgical scenarios [6]. Surgical competence with appropriate dexterity and confidence should result in safer surgical outcomes.

Targeted non-dominant hand training should be included in surgical simulation to upskill the surgeon. Engagement with bimanual surgical simulation training could also help trainers if supervising alternate-handed trainees.

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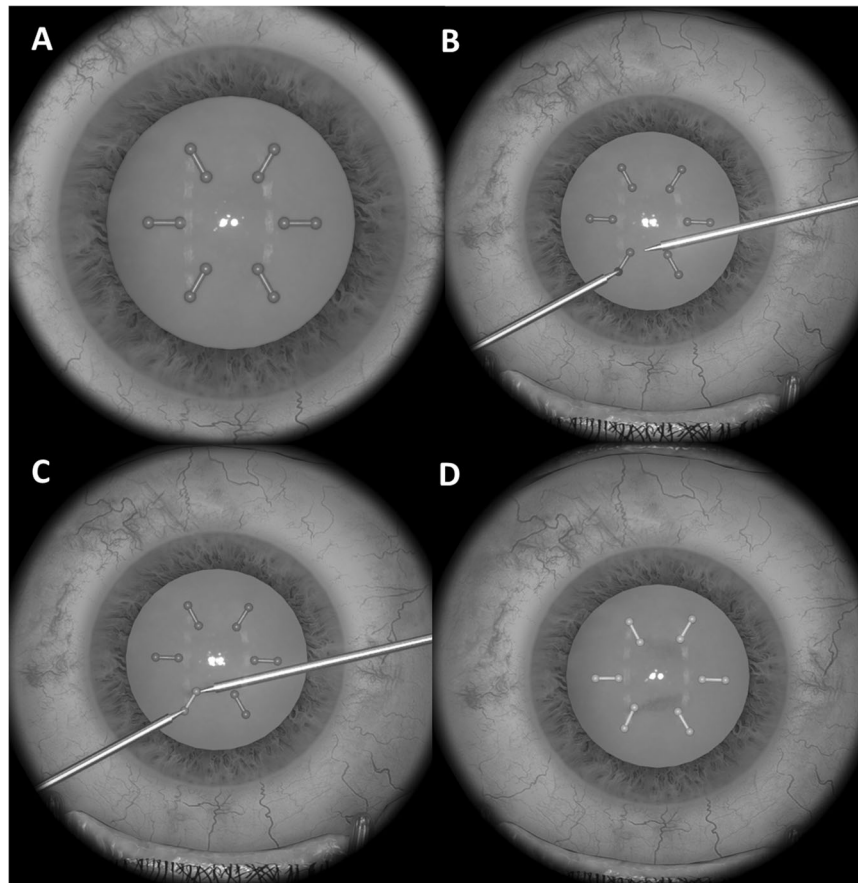


Fig. 1 Figure illustrating stages of bimanual training task used for assessment of bimanual dexterity. The aim is to touch the red dots (A) with an instrument in each hand at the same time to turn them blue (B, C), and then maintain bimanual contact and position to turn them green (D).

Table 1. Trainee performance results for bimanual tasks, with pre- and post-training of non-dominant hand.

Task: Bimanual training, level 4	Median pre-training test score	Median post-training test score	Wilcoxon signed-rank
Time (s)	51.8	44.1	$p = 0.002$
Odometer (mms^{-1})	103.68	92.6	$p = 0.03$
Unintended movement off sphere (Instances (range))	10.5 (3–30)	10.5 (3–18)	$p = 0.005$
Total score	76.5	77.8	$p = 0.02$

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AUTHOR CONTRIBUTIONS

DL and JH had the original idea. JH and CM coordinated the study and drafted the article. DL and AC reviewed and edited the article and provided senior support throughout. All authors reviewed the final version.

COMPETING INTERESTS

DL is the national Simulation Lead with the Royal College of Ophthalmologists at time of submission. The other authors declare no competing interests.

ADDITIONAL INFORMATION

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