Using the Mind as a Simulator: A Randomized Controlled Trial of Mental Training

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OBJECTIVES: Laparoscopic simulators have been introduced as safe and effective methods of developing basic skills. Mental training is a novel training method likened to using the mind as a simulator to mentally rehearse the movements of a task or operation. It is widely used by professional athletes and musicians and has been suggested as a technique that could be used by surgical trainees. The purpose of this study was to assess the use of mental training in developing basic laparoscopic skills in novices.

METHODS: Sixty-four medical students without laparoscopic experience were randomized into 4 groups. The first 3 groups were trained to cut a circle on a box trainer. Group 1 received no additional training (BT), Group 2 received additional virtual reality training (BT + VRS), and Group 3 received additional mental training (BT + MT). The fourth group was trained on a virtual reality simulator with additional mental training (box-free). The following 4 assessment criterias: time, accuracy, precision and overall performance were measured on both the box-trainer and virtual simulator.

RESULTS: The mental training group (BT + MT) demonstrated improved laparoscopic skills over both assessments. The improvement in skills in the VRS group (BT + VRS) was limited to VRS assessment and not observed in the box assessment. The fourth group (box-free) had the worst performance on both methods of assessment.

CONCLUSION: The addition of mental training led to improved laparoscopic skills development. It is a flexible technique and has the potential to challenge VRS as a more cost-effective training method associated with lower capital investment. Given the benefits of mental training with further research, it could be considered for inclusion in training curricula. (J Surg 70:544-551. © 2013 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

KEY WORDS: mental training, mental practice, education, laparoscopy

COMPETENCIES: Patient Care, Medical Knowledge, Practice-Based Learning and Improvement

INTRODUCTION

Surgical training is adapting to a continually changing environment where shorter working hours, patient safety concerns, and increased specialization have reduced training opportunities in the operating room.[1,2] Laparoscopic surgery presents further challenges to trainees who have to develop unique psychomotor skills in an impaired spatial and tactile environment.[3,4] Laparoscopic simulators have emerged as an effective and convenient option for skill development allowing repeated self practice.[5] The most common laparoscopic simulators are the video-box trainer (also referred to as 'pelvi-trainers') and virtual reality simulators.[6]

Another training method of fresh interest is 'mental training,' which is widely used by professional athletes and musicians to enhance their performance and reduce stress.[7,8] Mental training is the process of rigorously mentally rehearsing the movements of a task and can be likened to using the mind as a simulator.[9] It involves first identifying and memorizing a detailed list of sequential steps to the operation including as many sensory cues as possible. The trainee first mentally watches himself perform the operation from an 'outside' perspective, before mentally performing

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TABLE 1. Participants' Demographics

	Group 1	Group 2	Group 3	Group 4
Sex Ratio (M:F)	9:7	7:9	9:7	1:1
Age (y)*	21.5 (20-38)	20 (19-25)	21 (19-34)	21 (18-26)
Years at medical school*	2 (1-3)	2 (1-3)	2 (1-3)	2 (1-3)
Handedness (R:L)	15:1	11:5	4:1	15:1
Number per group (N)	16	16	16	16

*Values are median (range).

the operation from an 'inside' perspective using the memorized list of sensory cues.[10] Relaxation exercises are carried out before starting the process in order to reduce stress and increase mental readiness.

In a preliminary randomized controlled trial that compared the video-box trainer, virtual reality simulator, and mental training as independent training modalities, we found that the box trainer was the most effective initial training method.[11] The next step was to establish which adjunct method to box training is the best at enhancing skill development.

This study aimed to investigate the effect of additional mental training in developing basic laparoscopic skills in novice trainees. We hypothesize that mental training may facilitate skills development after physical practice on the box trainer. A secondary aim was to assess if 'box-free training' is a viable option. To our knowledge, this is the first randomized controlled trial to examine and compare mental training as an additional training modality on novices.

METHODS

Subjects

A population of 64 medical students from Kings College London volunteered to participate in the study conducted as a randomized controlled trial. Institutional approval was granted and informed consent was obtained. The participants attended an introductory session where they completed a demographic questionnaire and eligibility criteria. Only true novices without prior laparoscopic training or experience were eligible. Participants were each assigned a number from 1 to 63 and randomized into 4 groups according to a computer randomization program. Each group contained 16 participants. All participants were blinded to the training received by other groups and none withdrew after randomization. The demographics showed no significant difference between the groups (Table 1).

Study Design

To ensure all teaching was standardized all training sessions followed the Peyton's four-step approach for teaching practical skills as recommended by the Royal College of Surgeons of England.[12] The groups received individual sessions each lasting 30 minutes, 48 hours apart. A flow chart summarizing the study design is shown in Figure 1.

Group 1 was the control group and received the basic level of training: a session of box training followed by a session of additional self-practice on the box trainer.

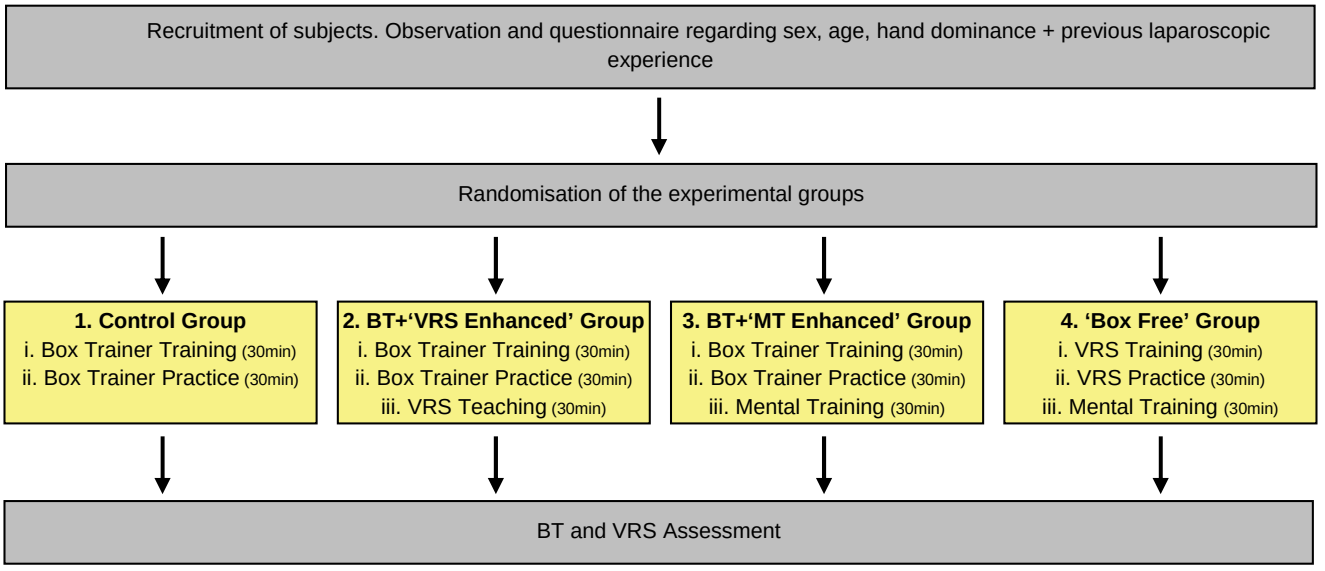

FIGURE 1. Study design showing training schedule for each group.