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Original Research Article

DESIGN OF A STRUCTURED VISUAL ART PROGRAMME IN ENHANCING INTUBATION TRAINING FOR NEW LEARNERS

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ABSTRACT

Background

In 2023, the Department of Emergency Medicine focused on Skill development of endotracheal intubation as Basic skill for New Learners including Interns, Postgraduates and Nursing Staff. In the background of desiring safe medical practice for which learning anatomy of the head and neck forms its foundation, difficulty in visualization appears to influence learning outcomes in endotracheal intubation. Factors that contribute, is the lack of visual literacy amongst learners and educators alike, and the association of spatial ability to anatomy of head and neck. This study aims to design an intervention to target visual literacy and spatial ability training to enhance learning in anatomy involved in endotracheal intubation. We used the standard mannequin test to conduct a prospective evaluation of the intubation skills of new Healthcare Learners immediately after a 4-hour course on endotracheal intubation along with a Structured Visual Art Programme. We hypothesized that the intubation success rates would be comparable with those of other types of providers newly trained in this skill.

METHODS

154 new learners were selected/recruited from three Groups namely Nursing Staff in Emergency Medicine Department, Interns and New Postgraduates. 37.01% percent of the new Learners were men, and the average age was 30 years. Training was provided in classes of about 40 persons and included 1 hour of didactic instruction, 1-hour of Visualization technique, 1-hour demonstration of intubation techniques, and 1 hour of supervised practice with the mannequins in groups of 10 persons. Testing followed Emergency Care and Life Support (ECLS) guidelines. The aim of the present study was to assess the effectiveness of Visualization techniques in enhancing learning outcomes in endotracheal intubation.

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Descriptive statistics analysis was carried out including frequency and percentage. The results of the study were then tabulated.

RESULTS

97.4% (150) of the New Learners passed the examination by intubating the mannequin within 35 seconds within 3 attempts. Of the successful New Learners, 71.43% succeeded on their first attempt, 19.48% (30) on second attempt, and 6.49% (10) on third attempt.

CONCLUSION

The present study revealed that 97.4 % of the new learners passed the examination by intubating the mannequin within 35 seconds within 3 attempts. 2.6 % of the new learners failed in the examination. The visualization technique helped in enhancing the Practical learning of endotracheal intubation in new learners.

KEY WORDS: Endotracheal Intubation, spatial ability, spatial visualization, medical education, anatomy.

INTRODUCTION

Over the past years, several studies have found a positive correlation between visual spatial ability (VSA) and learning in anatomy. A meta-analysis by Roach et al.,[1], reviewed studies over the past 50 years have established a positive correlation between VSA and anatomical scores, especially practical anatomy. Vorstenbosch et al.,[2] found that anatomy learning can improve VSA.

Nguyen et al.[3], using standardised tests for spatial visualization tasks, found in their study that students who scored higher in these tests had better performance in solving anatomical problems and also recommended spatial abilities training for those with low VSA.

Lufler et al [4] found a positive correlation between students who had good spatial abilities and performance in practical scores in gross anatomy. The authors here too recommend that early recognition of students of low VSA followed by remedial targeted intervention might potentially improve learning outcomes in anatomy.

Thus, the above studies appear to indicate a developing consensus on the association between VSA and anatomy, and on the benefit of targeted interventions for low VSA individuals.

The utility of drawing in learning has been recognized and applied in education. Although the exact mechanisms have not been established, theoretical underpinnings have been proposed borrowing primarily from recent developments in neuropsychology. Two, the issue of learning style preference in education. i.e., VARK (Visual, aural, read/write, kinaesthetic), can create confusion in learners and educators in recognising the utility of drawing, as drawing tends to be seen as being useful to visual learners, only.

MATERIALS AND METHODS

The present study was conducted from January 2023 to September 2023. The study was designed using Excel using a self-prepared questionnaire. Sample size was estimated to be 125 from a population size of 184 new learners including 11 Staff Nurses in Emergency Medicine, 43 Postgraduates and 130 Interns.

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The minimum sample size was kept at 125 but a total of 154 healthcare professionals consisting of Staff nurses, interns and who work in The Oxford Medical College Hospital & Research Centre participated in this study.

Inclusion Criteria

- New Learners Staff Nurses, Interns and Postgraduates-working in The Oxford Medical College Hospital & Research Centre.

Exclusion Criteria

- Senior Postgraduates and Senior Nursing Staff

Procedure

The data was stored in Microsoft Excel format and Data analysis was done using Microsoft Excel.

Statistical Analysis

Data was collected, coded and fed in Statistical Package for Social Sciences (SPSS) for statistical analysis. Descriptive statistics analysis was carried out including frequency and percentage. The results of the study were tabulated.

RESULTS

Among the 154 participants of the survey, among the Staff Nurses group 36.36% (4) were male, and 63.63% (7) were female. Among the Interns group, 43.64% (48) were male and 56.36%(62) were female. Among the Postgraduate doctors group 39.39% (13) were male and 60.60% (20) were female. (Table 1).

Variable		Frequency	Percentage
Staff Nurses	Male	4	36.36
	Female	7	63.63
Interns	Male	48	43.64
	Female	62	56.36
Postgraduate Doctors	Male	13	39.39
	Female	20	60.60

Table 1. Demographic Details of the New Learners

DISCUSSION

Over the past years, several studies have found a positive correlation between visual spatial ability (VSA) and learning in anatomy. A meta-analysis by Roach et al.,[1], reviewed studies over the past 50 years have established a positive correlation between VSA and anatomical scores, especially practical anatomy. The authors submit that Interest in spatial ability has sparked following correlational evidence associating spatial aptitude with educational performance in the fields of science, technology, engineering, and mathematics (STEM).

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James C et al [5] conducted a life drawing session for medical students modelled around traditional art training sessions. They reported subjective improvements in the skill of drawing and its utility in learning anatomy. The students also reported that the sessions helped improve their clinical examination skills.

Nayak et al [6] tried an approach called progressive drawing where students in small groups took turns to draw an anatomical structure on a black board during gross anatomy lecture sessions. Unstructured questions were used to collect student feedback which revealed a positive nod for its utility in training. The author proposed theoretical underpinnings for its effects on active learning and various learning methods related to VARK.

In their 12 tips for implementation of artistic learning approaches in anatomy learning, Keenan I et al [7] outlines suggestions that can be used for designing art based learning interventions and I have modelled this current study with these suggestions in mind. The 12 Tips which have helped in designing the Visualization programme include the following: Take a scholarly approach, Choose your artistic method wisely, Choose your materials wisely, Ensure a clear purpose, Emphasise learning gain over aesthetic creation, Know your audience, Provide clear guidance, Cultivate student partnerships, Cultivate artist partnerships, Use artistic methods to supplement and provide variety, Optimise timing and Incorporate technology.

Alvarado AC et al[8] described various Endotracheal Tube Intubation Techniques. The principles of the Standard mannequin test was based on this study. Endotracheal intubation (ETI) using Direct Laryngoscopy is the current standard of care for prehospital Advanced Life Support (ALS) airway management. The authors compared 4 different intubation methods performed by novice intubators on mannnequins: conventional direct laryngoscopy, video laryngoscopy, Airtraq laryngoscopy, and fiberoptic laryngoscopy.

Kim DK et al [9] described a new blind intubation device (BID) for endotracheal intubation. The authors reported that The mannequin simulation was conducted using a Laerdal trainer airway mannnequin. The Study Participants performed intubation using all three devices, Direct Laryngoscopy (DL), Video Laryngoscopy (VL), and Blind Intubation Device(BID). The authors further reported that the primary outcome was *intubation success rate* in the first pass, the secondary outcome was intubation time to first ventilation, and the tertiary outcome was dental injury. This study was used as one part of designing this original article.

Panchal AR et al [10] emphasizes 3 essential components for good resuscitation outcomes: guidelines based on sound resuscitation science, effective education of the lay public and resuscitation providers, and implementation of a well-functioning Chain of Survival.

Crewdson K et al [11] summarized that in 2011, prehospital advanced airway management was identified as a 'top five' in physician-provided pre-hospital critical care and provided evidence to support the same.

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Toda J et al [12] recommended about 13 to 30 intubations as part of training since Pre-hospital laryngoscopic endotracheal intubation (ETI) was potentially a life-saving procedure but was a technique difficult to acquire. The authors used a standard mannequin test to perform a prospective evaluation of the intubation skills of basic Emergency Medical Technicians (EMTs) immediately after a 4-hour course on endotracheal intubation. The original article bases the principles of intubation based on this study. The authors compared 4 different intubation methods performed by novice intubators on manikins: conventional direct laryngoscopy (DL), video laryngoscopy (VL), Airtraq laryngoscopy, and fiberoptic laryngoscopy.

Kunkes T et al [13] described a study which aims to use the cognitive task analysis (CTA) framework to identify the cognitive demands and skills needed to proficiently perform a task, elucidate differences between novice and expert performance, and provide an understanding of the workload associated with a task.

Demirel D et al[14] present a simulation of Virtual Airway Skill Trainer (VAST) tasks. The simulated tasks are a part of two main airway management techniques; Endotracheal Intubation (ETI) and Cricothyroidotomy (CCT).

Park L et al [15] aimed to improve access to ETI training by creating a comparable yet cost-effective simulation model

producible by 3-dimensional (3D) printers.

Larmon B et al [16] described a study of paramedical personelle with no prior intubation experience being given structured training using mannequins.

Various other studies have described various trainings using manikins for endotracheal intubation skill development for new learners. [17-23]

The present study revealed that 97.4 % of the new learners passed the examination by intubating the mannequin within 35 seconds within 3 attempts. 2.6 % of the new learners failed in the examination. The visualization technique helped in enhancing the Practical learning of endotracheal intubation in new learners.

CONCLUSION

The present study revealed that 97.4 % of the new learners passed the examination by intubating the mannequin within 35 seconds within 3 attempts. 2.6 % of the new learners failed in the examination. The visualization technique helped in enhancing the Practical learning of endotracheal intubation in new learners. The novel structured Visualization techniques along with endotracheal intubation by direct laryngoscopy should be a gold standard in the training of New Learners.

Declarations

Ethics approval The authors declare that this review was completed in compliance with ethical standards.

Conflict of Interest The authors have no relevant financial or nonfinancial interests to disclose.

Consent to participate Not applicable

Consent for publication Not applicable

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REFERENCES

[1] Roach VA, Mi M, Mussell J et al. Correlating Spatial Ability With Anatomy Assessment Performance: A Meta- Analysis. Anat Sci Educ. 2021 May;14(3):317–29

[2] Vorstenbosch MATM, Klaassen TPFM, Donders ARTR, et al. Learning anatomy enhances spatial ability. Anatomical Sciences Education. 2013 Aug;6(4):257–62.

[3] Nguyen N, Mulla A, Nelson AJ, et al. Visuospatial anatomy comprehension: The role of spatial visualization ability and problem-solving strategies: Spatial Anatomy Task Performance. American Association of Anatomists. 2014 Jul 8;7(4):280–8.

[4] Lufler RS, Zumwalt AC, Romney CA, et al. Effect of visual-spatial ability on medical students' performance in a gross anatomy course. Anat Sci Educ. 2012 Feb;5(1):3–9

[5] James C, O'Connor S, Nagraj S. Life Drawing for Medical Students: Artistic, Anatomical and Wellbeing Benefits. MedEdPublish [Internet]. 2017 Jun 16 [cited 2020 Sep 27];6. Available from: https://www.mededpublish.org/manuscripts/1041

[6] Nayak SB, Kodimajalu S. Progressive drawing: A novel "lid-opener" and "monotony-breaker." Anat Sci Educ. 2010 Dec;3(6):326–9

[7] Keenan ID, Hutchinson J, Bell K. Twelve tips for implementing artistic learning approaches in anatomy education. MedEdPublish [Internet]. 2017 Available from: https://www.mededpublish.org/manuscripts/1012/v1

[8] Endotracheal Tube Intubation Techniques. Alvarado AC, Panakos P. StatPearls [Internet]

[9] Kim DK, Kim YJ, Jeong J. Usability testing of a blind intubation device for intubation novices: a randomized crossover simulation study. Clin Exp Emerg Med 2023; 10(2): 181-190 DOI: https://doi.org/10.15441/ceem.22.370

[10] Panchal AR, Bartos JA, Cabanas JG, et al. Part 3: adult basic and advanced life support: 2020 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation 2020; 142(16_suppl_2):S366-468

[11] Crewdson K, Rehn M, Lockey D. Airway management in prehospital critical care: a review of the evidence for a 'top five' research priority. Scand J Trauma Resusc Emerg Med 2018; 26:89.

[12] Toda J, Toda AA, Arakawa J. Learning curve for paramedic endotracheal intubation and complications. Int J Emerg Med 2013; 6:38

[13] Taylor Kunkes. Basiel Makled, Jack Norfleet. Understanding the Cognitive Demands, Skills, and Assessment Approaches for Endotracheal Intubation: Cognitive Task Analysis. JMIR Perioperative Medicine Vol 5, No 1 (2022): Jan-Dec

[14] Demirel D, Yu A, Halic T, Sankaranarayanan G, Ryason A, Spindler D, et al. Virtual Airway Skills Trainer (VAST) simulator. Stud Health Technol Inform 2016;220:91-97

[15] Park L, Price-Williams S, Jalali A, Pirzada K. Increasing access to medical training with three-dimensional printing: creation of an endotracheal intubation model. JMIR Med Educ 2019 Apr 09;5(1):e12626

[16] Larmon B, Schriger DL, Snelling R, et al. Results of a 4-Hour Endotracheal Intubation Class for EMT Basics. Annals of Emergency Medicine VOLUME 31, ISSUE 2, P224-227, FEBRUARY 1998 DOI: https://doi.org/10.1016/S0196-0644(98)70311-7

[17] Stratton SJ, Kane G, Gunter CS et al. Prospective study of manikin-only versus manikin and human subject endotracheal intubation training of paramedics. Ann Emerg Med. 1991; 20: 1314-1318

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[18] Stewart RD, Paris PM, Pelton GH et al. Effect of varied training techniques on field endotracheal intubation success rates. Ann Emerg Med. 1984; 13: 1032-1036

[19] Stralen DVW, Rogers M, Perkin RM, et al. Retrograde intubation training using a mannequin The American Journal of Emergency Medicine Volume 13, Issue 1, January 1995, Pages 50-52

[20] Langlois J, Bellemare C, Toulouse J, Wells GA. Spatial Abilities Training in Anatomy Education: A Systematic Review. Anat Sci Educ. 2020 Jan;13(1):71–9.

[21] Kozhevnikov M, Kosslyn S, Shephard J. Spatial versus object visualizers: a new characterization of visual cognitive style. Mem Cognit. 2005 Jun;33(4):710–26.

[22] Shapiro J, Rucker L, Beck J. Training the clinical eye and mind: using the arts to develop medical students' observational and pattern recognition skills. Med Educ. 2006 Mar;40(3):263–8.

[23] Langlois J, Bellemare C, Toulouse J, Wells GA. Spatial abilities training in the field of technical skills in health care: A systematic review. Heliyon. 2020 Mar;6(3):e03280.