Evidence-Based Practice: Implications of a Guided Activity for the Skull Base

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INTRODUCTION

- Cranial nerves are high yield on NBOME level 1 and USMLE Step 1 exams.
- Spatial relationships and detailed knowledge of structure/function are required to apply knowledge to clinical scenarios.
- Traditional teaching methods include 2D diagrams, didactics, or a model skull with a single wire and encourage rote memorization.
- Active learning can improve student engagement and interest1. No known studies apply active learning methods to supportive structures at the skull base.
- The current study designed an active learning activity to aid visualization of spatial relationships and engagement with the learning content.
- The activity was then compared with two traditional methods during a learning session.

Objectives & Hypotheses

Objectives:
- Determine which of 3 learning tools results in the highest student test scores
- Assess student perceptions and cognitive load of each resource

Hypotheses:
- H1a: The guided activity group will score higher on the post-test compared with the single wire skull lab and lecture groups.
- H2a: Students will have more positive perceptions for the guided activity compared with the single wire skull lab and lecture.
- H3a: Students will perceive the guided activity as having lower cognitive load compared with the two traditional learning tools.

METHODS

Guided Activity Design

TASKS:
- Left side: label foramina
- Right side: pass a colored wire through the opening where each cranial nerve exits the skull
- Match the nerve with pre-made structure/function tags
- Simulate lesions in different locations using air-dry clay. Use the tags to predict patient signs/symptoms.

Study Design

Recruitment:
Master of Medical Science • MS1 (n=95)  
MS2 (n=215) surveys only

Semi-randomized into treatment groups controlling for prior experience & learning style

Demographic survey, VARK

Lecture (n=29)  
Self-directed lab (n=34)  
Guided activity (n=32)

Pre-test, Learning session, Post-test, Perceptions survey

2 week retention test

RESULTS

Pre, Post, and Retention Tests

Novice: Single wire skull lab scored higher on post-test than guided activity

Advanced beginner: No difference between groups

All treatment groups increased knowledge from pre-test to post-test

DISCUSSION

- Novice students scored highest on the post-test using the self-directed skull lab
- All groups had more positive perceptions of the guided activity compared with traditional learning tools
- Novice and advanced beginner students found the guided activity engaging and interesting. Competent learners additionally reported that the guided activity was well designed, easy to use, and useful for studying for board exams.
- Novice and advanced beginner students perceived the guided activity as having less complex content.

CONCLUSION

- The single wire skull lab is recommended to improve test scores in novice students
- The guided activity is recommended to increase engagement in students with prior exposure to the learning content
- Cognitive load data suggest a benefit to using the guided activity. This is a promising area for future research.

SIGNIFICANCE

- The most effective and preferred learning resource differed based on prior exposure to the learning content.
- This study highlights the importance of testing educational tools with different levels of preclinical learners to tailor resources to student needs.
- The current study is the first known to develop an active learning exercise for neurovascular structures of the skull base

REFERENCES


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