Teaching and Assessing Microscopy Skills in Med Students

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INTRODUCTION

Clinical microscopes are used to perform microscopic procedures by many medical and surgical specialties. These microscopes work differently from table-top microscopes. Because they are used in a three-dimensional space, they also require significant hand-eye coordination and the ability to see in three dimensions while in use. However, in many medical schools, students are only exposed to table-top microscopes, for instance to examine micro-organisms in microbiology on a static two-dimensional stage. Formal training in clinical microscopy is rarely included in medical school curricula. Hence, many medical students have inadequate exposure to clinical microscopes, and the skills to use them. This lack of exposure to clinical microscopes during a medical student's education may influence their ability to make an informed decision about the specialty they would like to go into. It may also hide deficits in a student's ability to use microscopes in clinical care. While formal training in clinical microscopy could be extremely valuable, we do not know the most effective method to teach medical students how to use clinical microscopes, or how to perform simulated clinical tasks using microscopy. There are several formats to compare: video, personal demonstration, and a combination of video and personal demonstration. We also do not know students' perceptions on the usefulness of this type of training, or how training would affect their career goals. Thus, this research means to assess methods addressing this gap in medical education.

OBJECTIVES

- Evaluate and compare the effectiveness of using video and/or personal instruction to teach clinical microscopy.
- Assess students’ ability to perform simulated clinical tasks using clinical microscopes.
- Measure students' feedback on the perceived usefulness of this training, and whether their perceptions of fields which use clinical microscopes were affected.

MATERIALS AND METHODS

a) Clinical Microscopes

The microscopes used in this study were Zeiss OPMI pico models. 10x objectives were used, with focal length 220mm.

b) Study participants:

Fifteen Boston University School of Medicine (BUSM) medical students were recruited for this study. Exclusion criteria included:

- Subjects planning to pursue a career in Otolaryngology at the time of study
- Subjects have been trained in binocular microscopy to perform manual dexterity tasks before

c) Random assignment

Students were randomly distributed through sequential assignment to one of three instruction groups as they arrived for their individual appointments. There were 5 students assigned to each instructional method.

d) Answer questionnaires

We asked each participant to fill out a pre-training and post-training questionnaire to evaluate students’ perception of this training. Post-training questionnaires were administered after completing both clinical tasks.

RESULTS

Table 1: 3-minute training

<table>
<thead>
<tr>
<th>Group</th>
<th>Average time (sec)</th>
<th>Standard Deviation</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>2.34</td>
<td>0.22</td>
<td>0.42</td>
</tr>
<tr>
<td>Group 2</td>
<td>2.02</td>
<td>0.18</td>
<td>0.02</td>
</tr>
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Upon further analyses, those in Group 3 were significantly faster, on average, than those in Group 2 and the time it took to find and focus on the object before performing the manual task.

Table 2: Average manual task time (sec)

<table>
<thead>
<tr>
<th>Group</th>
<th>Average time (sec)</th>
<th>Standard Deviation</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>15.07</td>
<td>2.07</td>
<td>3.0</td>
</tr>
<tr>
<td>Group 2</td>
<td>14.80</td>
<td>2.87</td>
<td>0.09</td>
</tr>
<tr>
<td>Group 3</td>
<td>14.23</td>
<td>2.07</td>
<td>0.23</td>
</tr>
</tbody>
</table>

The efficacy of video over personal instruction suggests that incorporating clinical microscopy training into medical school curricula may be more feasible, logistically speaking, than perhaps originally thought. It is difficult to make definitive claims based on the questionnaire data due to the small sample size. However, certain generalizations can be noted. There was general agreement among students that clinical microscopy training should be incorporated into medical education. Also, students believed that this training will be useful to them in the future. There was slightly greater interest in both surgical specialties, and specifically ophthalmology post training. This is particularly noteworthy considering participants were specifically screened against considering otolaryngology as a potential career. Further research is necessary to investigate how large of an impact this type of training can have on specialty choice.

Since the data from Task 2 were inconclusive, other suggestions for future research would be to do a more definitive elucidation of the effect of teaching with larger sample size, more advanced manual tasks, and minimization of possible confounding factors such as practice effect and magnification.

CONCLUSIONS

Based on our findings from Task 2, we’ve demonstrated that video instruction, either alone or in combination with personal instruction, is superior to personal instruction for teaching medical students how to focus on a target using a clinical microscope. Furthermore, having the combination of personal and video instruction is best for gaining proficient performing manual tasks.

The efficacy of video over personal instruction suggests that incorporating clinical microscopy training into medical school curricula may be more feasible, logistically speaking, than perhaps originally thought. It is difficult to make definitive claims based on the questionnaire data due to the small sample size. However, certain generalizations can be noted. There was general agreement among students that clinical microscopy training should be incorporated into medical education. Also, students believed that this training will be useful to them in the future. There was slightly greater interest in both surgical specialties, and specifically ophthalmology post training. This is particularly noteworthy considering participants were specifically screened against considering otolaryngology as a potential career. Further research is necessary to investigate how large of an impact this type of training can have on specialty choice.

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1. Video instruction, alone or in combination with personal instruction, is superior to personal instruction alone in teaching medical students how to focus with a clinical microscope.
2. The combination of video and personal instruction is ideal for teaching how to perform manual tasks under the clinical microscope.
3. There is general consensus among students that training in clinical microscopy should be incorporated into medical education.