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Comparative Efficacy of Video and Text Instructional Modalities for an Oral Surgery Technique among Dental Students

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Abstract

Purpose: To gauge the efficacy of video media in pre-doctoral oral and maxillofacial surgery education and compare it to traditional text-based learning materials.

Methods: Twenty novice dental students were randomly divided into two groups to place an Erich arch bar to the maxillary dentition of a dentoform. Group A was given a 10 minute video instruction while Group B was given 10 minutes to review written text instruction. All participants were given 45 minutes to place the arch bar on a dentoform while being recorded. This session concluded with a survey of student perceptions using the SEEQ. The students then alternated instructional modalities and again evaluated using the SEEQ. Two double-blinded clinical OMS faculty evaluated the recordings in accordance with the standards detailed in the ABPAS.

Results: The difference in the post-instructional skill scores of Group A and Group B students was deemed not significant ($p = 0.46$). Overall, the students expressed significant preference for the video modality compared to the textual modality. The difference of the scores in each preference category between the video and text modalities were all found to be significant with p-values well below 0.05.

Conclusion: Educators must remain cognizant towards the benefits of new technology and continue to explore newer, potentially more efficacious modalities such as interactive teaching materials. These benefits may be utilized to help increase student engagement and increase long-term retention of the material. It is imperative to understand the limits of each method and balance them strategically to offer comprehensive healthcare training.

Keywords

academic environment, professional education, educational methodology, educational technology, video instructional modality, text instruction, dental student teaching

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INTRODUCTION

Oral and maxillofacial surgery (OMS) instructors have traditionally relied on textbooks and written tutorials to provide instruction to pre- and post-doctoral dental students. Unfortunately, this textual modality can only present information in a dry, one-dimensional manner despite indications that student retention depends largely on the degree of visualization.[1] While increasing numbers of programs are seeking to produce intuitive, animated materials, programs in OMS generally fall behind because of 1) the short and transitional nature of student oral surgery “rotations” and 2) the relatively small personnel sizes of OMS departments that make digital production difficult. This trend necessitates exploration of easily devisable visual-digital mediums that can also contribute to greater knowledge retention. Furthermore, improved teaching modalities may increase job satisfaction among dental educators.

While several studies have suggested the efficacy of animated media in teaching conceptual topics, their efficacy within applied fields such as dentistry and OMS is not well documented. A literature search of keywords including one or more of the terms "oral surgery video," "oral surgery education," "digital oral surgery education," has not yielded relevant results within the MEDLINE database as of late 2017. Furthermore, a general survey of the dental digital media suggests that the number of high quality video materials for pre-doctoral dental education is few and far in between.[2, 3]

To gauge the efficacy of video media in OMS education, the Erich arch bar placement technique was utilized as a simple and routine but vital material within the field of OMS. The Arch Bar Placement Assessment Scale (ABPAS) was also utilized to rate the students’ post-instructional proficiency. The ABPAS is a reliable and consistent rating scale of the

arch bar placement performance of facial plastic surgery residents.[4] An established, modified version of the Student Evaluation of Educational Quality (SEEQ) was utilized to determine student reception of video modules in comparison to a traditional textual module.[5] The SEEQ is a validated, reliable, and accurate method of collecting university students' evaluations that has been verified across cultures in Great Britain, Greece, China, and India.[6-11] Results from the SEEQ survey were documented under the relative certainty that student perception plays a role that is equally, if not more, significant compared to the material itself.

MATERIALS AND METHODS

This study involved the participation of dental students performing a commonly employed technique in OMS. This study received exemption from the Institutional Review Board at Western University of Health Sciences in Pomona, California. The authors report no conflicts of interest. A total of twenty students were enlisted via a campus-wide email recruitment process. Selected students were those currently enrolled - without academic probation – at the same pre-doctoral program in dentistry with at least 6 months of instruction in clinical dentistry. None of the students had taken part in surgical rotations, internships, externships, or employments. All were first-time pre-doctoral candidates who had not previously concluded a doctoral program in dentistry or related healthcare fields. In exchange for participation, participants were informed that they would acquire knowledge about a technique that otherwise would not be taught during a typical pre-doctoral course of study.

Educational Material Production

The video and textual materials were produced by the same team using the same source information. A textual material was first written describing, in detail, the sequence and technique of arch bar selection, placement, and confirmation. Once the textual material was devised, its contents were used as the voice-over script in a 10-minute video material demonstrating the same. Static screenshots were then taken from the video and added to the text to accompany its paragraphs (Fig. 1).

Initial Trial

The participating novice dental students were randomly divided into two groups - Group A and Group B. Individuals from both groups were placed in isolated simulation laboratory stations and allowed to view a dentoform whose Erich arch bar had already been placed by an experienced oral and maxillofacial surgeon (Fig. 2). The students were then given 45 minutes to replicate the technique on a new dentoform (without further directions or instructions) to help establish each student's baseline ability. The students' gloved hands and forearms were recorded on video with appropriate participant permissions.

Instructional Trial

Upon conclusion of the 45 minutes, Group A members were given a private screening of the video instruction while Group B was given 10 minutes to review the written text instruction. All participants were given an additional 45 minutes post-instruction to reattempt the technique on a new dentoform while being recorded using a digital camcorder. This session concluded with a survey of student perceptions using the SEEQ. Upon conclusion of the SEEQ surveys, two double-blinded clinical OMS faculty were

recruited to jointly evaluate the student recordings in accordance with the standards detailed in the ABPAS.

Final Evaluations

Once the students had concluded the instructional trial, Group A participants were given 10 minutes to review the textual modality while Group B was allowed to view the video modality. The groups were then asked to evaluate the newly given modality on the SEEQ in the same manner as before.

Selection of the Erich Arch Bar Training

The Erich arch bar training was chosen because of its simplicity despite clinical importance in immobilizing the jaws following fracture. Placement of the arch bar is an excellent topic of exploration because its training process takes only a single session, but the procedure itself is one of the most commonly used techniques in oral and maxillofacial surgery. Furthermore, the arch bar is a critical component of facial surgery because it requires specific knowledge on the part of the clinician to ensure safe and efficient placement. It is a well-suited and widely used protocol that remains a critical part of any OMS surgeon's repertoire.

SEEQ

As established previously, SEEQ is a validated instrument for collecting students' evaluations of a college/university level instruction. More specifically, researchers have shown that ratings obtained via SEEQ are valid when compared against the retrospective feedback of former students, student mastery of the subject gauged via examinations, as well as teaching staff self-evaluations of their own efficacy.[12] The SEEQ utilizes a survey to measure the participant's perception of how stimulating the respective modality was, if

the modality was successful in increasing the participant's interest in the subject matter, if the modality allowed the participant to learn the specified technique, clarity of presentation, instructional efficacy, as well as the student likelihood of recommending the modality to peers.[6]

Both the APBAS and SEEQ survey scores were compared using student's paired t-test with $p < 0.05$ indicating significance.

RESULTS

The ABPAS scale rates the student proficiency on a scale of 0 to 19, with higher scores indicating greater proficiency. On average, Group A students who were instructed using the video modality began with an average baseline score of 8.9 that had increased significantly to an average post-instructional score of 11.7 and $p < 0.001$ (Table 1). Group B students who were instructed using the text modality began with an average baseline score of 7.8 which had also increased significantly to an average post-instructional score of 10.6 and $p < 0.04$ (Table 2). The difference between the two baseline skill scores of Group A and Group B participants was not deemed significant ($p = 0.21$). The difference in the post-instructional scores of Group A and Group B students was also deemed not significant ($p = 0.46$).

Overall, the students expressed significant preference for the *video* modality compared to the textual modality. The video tutorial received an average rating of 4 out of 5 in terms of the "stimulating" category, a 4.25 in terms of the "increasing interest" category, a 4.5 within the "learning" category, a 4.5 in terms of the "clarity" category, a 4.2 in terms of the "efficacy" category, and a 4.5 in how likely the participant will recommend the video modality to others. In contrast, the *text* modality received an average rating of a

3.05 out of 5 in terms of the "stimulating" category, a 3.3 in terms of the "increasing interest" category, a 3.9 within the "learning" category, a 3.8 in terms of "clarity" category, a 3.25 in terms of "efficacy" category, and a 3.2 in how likely the participant will recommend the text modality to others (Table 3). The difference in the average ratings of the two modalities was deemed significant ($p = 0.0003$).

When considering the intra-participant rating difference for the video modality compared to the text modality, a "video-minus-text" (VMT) value was obtained for each category by subtracting the participant's text modality rating from his/her video modality rating. Therefore, a positive VMT value was assumed to signify the participant's degree of preference for the video modality in that specific category. Every average VMT value was found to be positive. The average VMT value for the "stimulating" category was 0.95, for the "increasing interest" category was 0.95, for the "learning" category was 0.6, for the "clarity category" was 0.7, and for the "efficacy" category was 0.95. In addition, the participants were, on average, 1.3 points more likely to recommend the video modality over the text modality (Table 4). The difference of the scores in each category between the video and text modalities were all found to be significant as well with p-values well below the 0.05 threshold.

Almost every participant showed improvement in arch bar placement times between their first and second attempts. For the video modality participants, the average first attempt placement time was approximately 37.04 minutes (37 minutes and 2.1 seconds) and the average second attempt time was approximately 29.86 (29 minutes and 51.8 seconds). For the text modality participants, the average first attempt placement time was approximately 39.98 minutes (39 minutes and 58.7 seconds) while the average second

attempt time was approximately 29.80 minutes (29 minutes and 48 seconds). Both improvements in placement time were deemed significant with p-values of 0.0251 and 0.0013, respectively. However, Group A participants did not seem to place arch bars more quickly than their Group B counterparts or vice-versa (P = 0.3171).

DISCUSSION

Despite the ongoing trend of growing reliance on digitalized teaching modalities, our results suggest that animated materials do not necessarily result in greater acquisition of knowledge in the Erich arch bar oral surgery training of pre-doctoral students. This remains true not only in terms of the proficiency of the skill acquired but the speed with which the students can perform this skill. Still, there exists plentiful evidence that enjoyable, engaging – and therefore preferred – presentation modalities lead to greater duration of knowledge retention, allowing similar degree of proficiency even years following the initial instruction.[13-15] Our own surveys indicate that students show notable preference for training that allows direct visualization of each step of the surgical procedure. It is the authors' opinion that the success of the visual medium arises not only in its ability to convey information in a unique way, but also the overall satisfaction it incurs in students who, in a sense, are paying consumers of dental education.

Interestingly, several students have also provided anecdotal feedback in which they believed that availability of both the textual and digitalized modalities would have been even more conducive to the learning process. Some students reported that the digitalized material could help establish a mental image of the procedure at hand, while a textual material can exist as a ready reference that can present information without the need for playback.

Future studies may be required to ascertain the efficacy of dual- or multiple-modality instruction in OMS and dentistry. Our own study remains somewhat limited by a lack of this consideration. Other studies may also benefit from exploring educational options that feature interactive, digitalized materials instead of those that display fixed animations.

CONCLUSION

Educators must remain cognizant towards the benefits of new technology and continue to explore newer, potentially more efficacious modalities such as interactive teaching materials. These benefits may be utilized mainly to help increase student engagement and increase long-term retention of the learning materials. However, OMS instructors should also address the limitations of digitalized mediums using older but proven teaching methods. It is imperative that we understand the limits of each educational method and balance them strategically to offer comprehensive healthcare training.

DISCLOSURE

The authors do not hold any financial, economic, or professional interests that may have influenced the design, execution, or presentation of this scholarly work.

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FIGURE LEGEND

Figure 1. Static screenshot demonstrating the application of an Erich arch bar to the maxillary dentition of a dentoform taken from the instructional video. The screenshot was one of several that were added to the text instructions to accompany its paragraphs

Figure 2. Erich arch bar applied by an oral and maxillofacial surgeon that was on display in the isolated simulation station for viewing by the students in both groups

Table 1. ABPAS Scores of Group A Video Modality Participants

Table 2. ABPAS Scores of Group B Text Modality Participants

Table 3. Average SEEQ Score by Category

Table 4. Video-Minus-Text (VMT) Values for Each SEEQ Category