MEDICAL EDUCATION

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Does Replacing Live Demonstration With Instructional Videos Improve Student Satisfaction and Osteopathic Manipulative Treatment Examination Performance?

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Example instructional videos are available online.

Context: Instructional videos for osteopathic manipulative treatment (OMT) are a potentially valuable resource for novice learners.

Objective: To evaluate student experiences and the effectiveness of instructional videos in lieu of live faculty demonstration in a second-year osteopathic manipulative medicine course.

Methods: Faculty created and produced written instructions and videos for selected Still and facilitated positional release techniques. These materials incorporated curricular design principles and psychomotor skills development strategies. During a second-year OMT skills laboratory session, students used the videos as the primary source for technique demonstration and instruction. Table trainers monitored and assisted students per their request or if errors were observed. Students completed surveys regarding their previous experiences in the OMT skills laboratory sessions (presession survey) and the video-based instructional one (postsession survey). One month after the survey, students were also asked to complete a postexamination survey. Student scores on the skills competency examination were compared with scores from the previous year.

Results: Of the 230 students, 162 (70%), 135 (59%), and 86 (37%) responded to the presession, postsession, and postexamination surveys, respectively. The majority of students indicated that the OMT videos helped them feel more prepared (98%) and more confident for their examination (78%), were a valuable addition to learning (97%), and would help increase confidence in using osteopathic manipulative medicine on patients (84%). Two-thirds of students indicated that the videos were superior to faculty demonstration from the stage. Compared with students from the previous year, no statistically significant improvement was noted on the total clinical competency examination scores.

Conclusion: The faculty-created videos for teaching OMT techniques did not improve scores on the clinical competency examination but had subjective benefits as part of the OMT laboratory sessions. Instructional videos can serve as an alternative to live demonstration to allow more time in the laboratory for assessment and feedback.

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Osteopathic manipulative treatment (OMT) is a psychomotor skill that is taught at all colleges of osteopathic medicine (COMs) as a part of comprehensive patient care. In teaching psychomotor skills, several principles exist that help create an optimal learning environment, including observed practice with feedback and self-controlled practice with an external focus. External focus directs the learner's attention on the end-goal of a procedure, not on the steps required to perform the procedure.[1] A clinical skills teaching method that consists of overview, slow demonstration with explanation, and practice (including verbalization and visualization) has been described as an optimal learning strategy.[2] Modeled examples, whether live or videotaped, can decrease cognitive load and thus increase learner acquisition of a skill.[3]

With increasing enrollment in COMs, the establishment of new COMs, and a limited number of trained faculty, COMs are challenged to maintain optimal table trainer (faculty)–to-student ratios for teaching OMT skills.[4] The use of instructional videos can substitute for faculty demonstration and thereby allow the faculty more time to observe and provide feedback to students. At the time of this study, the University of North Texas Health Science Center Texas College of Osteopathic Medicine (UNTHSC/TCOM) used a traditional delivery of OMT curriculum. Students were expected to complete out-of-class reading assignments and view available online videos from the *Atlas of Osteopathic Techniques*,[5] a commercially available textbook. Students then attended required laboratory sessions where faculty demonstrated OMT techniques from the stage and students practiced under faculty guidance.

Numerous studies have demonstrated success using videos or computer-based instruction for teaching medical students surgical skills.[6-8] One study[9] compared video use with traditional delivery for OMT instruction. Self-efficacy scores were higher for students who practiced a technique independently with a handout and videotape outside of class and then practiced on an instructor and obtained feedback, compared with students who participated in a more traditional faculty demonstration and practice laboratory.[9] The videos created for the current study applied learning sciences principles to video instructional design to optimize skill acquisition. To our knowledge, no videos exist that are intentionally designed for novice learners using specific educational strategies pertinent to psychomotor skill acquisition.

In the present study, we evaluated student perception and performance outcomes with instructional video use in lieu of live demonstration during an OMT skills laboratory. Our hypothesis was that instructional videos would result in increased satisfaction from students and faculty and improved clinical competency examination (CCE) performance compared with performance in the previous year when the videos were not used.

Methods

To test this hypothesis, 2 faculty members (R.S. and S.M.G.) of the Department of Osteopathic Manipulative Medicine (OMM) at UNTHSC/TCOM created a set of instructional videos with written instructions for selected Still and facilitated positional release (FPR) techniques. These modalities were chosen because the students had no previous formal training in them; however, they had received instruction in other OMT techniques and somatic dysfunction diagnoses during the first-year curriculum. This project used an experimental design with a convenience sample of second-year osteopathic medical students and department faculty. The faculty consisted of physicians only, including 2 neuromusculoskeletal medicine/OMM residents. All student and faculty participants were aware of this project, as it occurred as part of the usual UNTHSC/TCOM second-year OMM MEDE 7421 course in fall 2014. The UNTHSC institutional review board deemed this study exempt.

Videos

For each OMT technique, 3 specific applications were selected, as follows:

- **Still technique:** occipitoatlantal joint (OA), cervical vertebrae (C2-7), and thoracic vertebrae (T3-12)
- **FPR:** suboccipital musculature, cervical vertebrae (C2-7), and thoracic vertebrae (T3-12)

Videos for each technique were recorded and edited using Camtasia Studio software version 2.10.2. Pertinent 3-dimensional anatomical images were recorded using Cyber Science 3D virtual anatomy simulator version 4.0b.2982. Videos were created for each of the 6 OMT technique applications with slow demonstration and step-by-step narration (*eVideo 1*). Full-speed videos were also created without narration and used 2 simultaneous views (*eVideo 2*). A total of 12 videos (6 videos with slow demonstration and narration and 6 full-speed videos) were created.

Osteopathic manipulative treatment skills are traditionally assessed during a CCE, whereby students perform techniques on each other in front of a faculty member. The video instructional steps were aligned to the assessment rubric used at UNTHSC/TCOM to maintain consistency. This strategy of congruency between objectives, instructional methods, and assessment is a well-established approach to curriculum design.[10]

Didactic Session

A background and introduction were written for each technique application, which included the elements of diagnosis, setup, contact of tissues, application of principles, and retest. These factors were reviewed and discussed in a single, 1-hour large group didactic learning session by the course director to ensure that the students understood the principles of each technique. Detailed instructions for each Still and FPR technique application were also written using the same format and included, when appropriate, statements to enforce external focus and visualization (*Table 1*). The course director in 2014 was the instructor delivering the instructions on the video (R.S.). The 2013 course director was a different instructor (S.M.G.).

Outcome Measures

Students were asked to complete an 8-item survey before the OMT laboratory session (presession survey) to assess their current attitudes and satisfaction regarding OMT laboratory sessions. Students had no knowledge of the video-based laboratory instruction at the time of the presession survey.

A laboratory worksheet that outlined the workflow for students and faculty during the 2-hour laboratory session was distributed. Students were instructed to watch the videos using headphones on their own computer and then to practice the techniques in pairs. Specifically, they were asked to watch the videos for one technique application, then practice that technique, and then go on to the next application videos. The narrated videos were 1 ½ to 2 minutes long, and the real-time videos were about 20 seconds long. Total video time, then, was about 15 minutes, but students had the ability to watch videos more than once if needed. The laboratory session was 2 hours, so the majority of time was spent practicing and asking faculty for help and feedback.

Faculty did not demonstrate from the stage, but faculty table trainers instructed and provided feedback as necessary to answer student questions and assist with student learning. The faculty-to-student ratio was approximately 1:12 to 1:14, which is usual and customary at UNTHSC/TCOM. After completion of the OMT skills laboratory, both faculty and students were asked to complete surveys (postsession surveys) about their experience. The faculty postsession survey contained 12 items and the student survey contained 11.

One month later, the students took a CCE composed of all techniques taught in the curricular unit, including the Still and FPR techniques. The rubric used at UNTHSC/TCOM grades categories of diagnosis,

Table 1.
Use of Instructional Video in Learning Osteopathic Manipulative Treatment: Instructions for Applying the Still Technique

Step	Description
Diagnosis	Diagnose articular somatic dysfunction.
Setup	The physician and patient should be positioned so that the dysfunctional segment can be monitored and moved through all planes of physiologic range of motion of the segment and body region that will be used as a long lever.
Contact of tissues[a]	**Monitoring hand:** Contacts the dysfunctional segment and surrounding soft tissues and palpates tissue texture changes and position of the dysfunctional segment during the entire procedure. It moves with but does not move the dysfunctional segment. **Operating hand:** Contacts the distal end of the body region being used as the long lever and serves 2 purposes: (1) It creates the activating force of compression or distraction. (2) It moves the distal end of the long lever through physiologic range of motion, which eliminates the somatic dysfunction.
Application of principles	**Monitoring hand:** Maintain contact throughout procedure and palpate surrounding tissue texture changes and position of dysfunctional segment. **Operating hand:** 1. Position the dysfunctional segment using the long lever so that the segment is in the position of somatic dysfunction in all its planes of motion. 2. Add an activating force, either compression or traction,[b] until it is felt with your monitoring hand at the dysfunctional segment. Maintain this force, which is minimal but firm. 3. Move the long lever fluidly and slowly in all planes of motion, through neutral and toward the initial restriction. During the procedure, correction of dysfunction can often be palpated. In synovial joints, a pop or click may be heard. 4. Release the activating force. 5. Return the body to neutral position.
Retest	Retest for somatic dysfunction. Determine if there is complete resolution, improvement, or no change in the original somatic dysfunction. If <50% improvement occurs, this technique may be repeated 2-3 times, but it is not performed in a repetitive fashion.

[a] If the hand or hands are not sufficient, the arm or arms may be substituted.
[b] Compression will loosen the surrounding tissues, whereas traction will create space in the joint to move it. Compression and traction are equally effective; the choice to use one or the other is based on physician preference and patient tolerance.

treatment, communication, and professionalism. Each subset is scored 0 (not performed/very poorly performed), 1 (needs improvement), 2 (competent), or 3 (outstanding). The students were provided this rubric when preparing for the CCE. Consistent with usual examination design, students were randomly assigned to perform a single OMT technique from the curricular unit. This randomization was done as the students entered the grading room by giving them a number that corresponded to a faculty grader.

Scores on the CCE of the class using the videos (2014) were compared with scores of the previous class (2013). The CCE scores compared were for identical techniques with the same grading rubric. Students in each year were assumed to be equivalent in abilities related to the tasks that were assessed. A faculty grader evaluated students performing each technique on 5 aspects: contact of tissue, use of force, positioning, application of principles, and reassessment. Students received scores on each aspect as well as a total score on the technique.

After taking the examination, all students were asked to complete a 7-item postexamination survey. All surveys were voluntary, anonymous, and distributed using Qualtrics online survey tool (Qualtrics LLC). All surveys also allowed for free-text comments to give feedback on details not specifically asked.

Statistical Analyses

Descriptive statistics including frequency were used to report survey results. We used *t* tests for independent samples to compare students trained in 2014 with those trained in 2013 on each of the 5 aspects and total score for 3 OMT techniques: Still OA, Still thoracic spine, and FPR thoracic spine. Equal variance was assumed for *t* test analysis for the data reported. In addition, χ^2 tests were conducted to compare the 2013 and 2014 groups on the proportion of satisfactory (score 2 or higher) and unsatisfactory (score <2) performances on each aspect of each technique. All statistical analyses were run in SPSS version 21 (χ^2) and Microsoft Excel 2013 (*t* test).

Results

A total of 230 second-year osteopathic medical students were invited to participate in these anonymous surveys. Student response rate for the presession survey was 70% (n=162); postsession survey, 59% (n=135); and postexamination survey, 37% (n=86).

Student Presession Survey

With regard to their usual study habits, 72 of 162 students (44%) reported that the online videos from the *Atlas of Osteopathic Techniques*[5] were useful for preparing for the OMT laboratory always or most of the time. Fewer students (57 of 162 [35%]) reported that the online videos from the *Atlas of Osteopathic Techniques*[5] were useful for preparing for the CCE always or most of the time.

Student Postsession Survey

When asked how learning using the videos compared with faculty demonstration from the stage, of 135 students, 89 (66%) indicated that the videos were better and 29 (21%) indicated that they were worse (*Figure 1*). When asked to compare the UNTHSC/TCOM videos with those from the *Atlas of Osteopathic Techniques*,[5] of 134 students, 113 (84%) indicated that the UNTHSC/TCOM videos were much better, better, or somewhat better; 4 (3%) indicated that they were worse, and 7 (13%) indicated that they were about the same. The video features identified as most useful, very useful, or somewhat useful were use of force vectors (121 of 133 [91%]), having 2 views (118 of 133 [89%]), 3-dimensional anatomy graphics (116 of 133 [87%]), and having full-speed videos (90 of 132 [68%]).

Faculty Postsession Survey

All 9 eligible faculty participated in the faculty postsession survey. Six faculty indicated that compared with the *Atlas of Osteopathic Techniques*[5] videos, the UNTHSC/TCOM videos were much better or better, 2 believed they were about the same, and 1 did not answer this question. When asked to rate their agreement with the statement, "compared to live demonstrations, using the videos allowed me to spend more time with students," 4 agreed, 4 neither agreed nor disagreed, and 1 disagreed. For the statement "the new videos helped me be more clear on how to teach the technique," 4 agreed and 5 neither agreed nor disagreed. Eight faculty recommended creating more videos.

Clinical Competency Examination Scores

About 20% of the students in each class were tested on one of the techniques that could be directly compared between the 2 classes. There was no significant difference between the control group (year 2013) and the experimental group (year 2014) on contact of tissue, positioning, and reassessment tasks on the Still OA technique. However, mean (SD) scores for the control group were significantly better overall (14.31 [1.32] vs 12.79 [1.89]; P=.024) and on application of principles (2.92 [0.28] vs 2.21 [0.58]; P<.001) than for the experimental group (*Table 2*).

No significant difference was found between the 2013 and 2014 students on any of the 5 tasks or on overall performance for the Still T3-6 assessments. There was no significant difference between the 2013 and 2014 students overall on contact of tissue, use of force, positioning, and application of principles for the FPR T4-6 performance. However, the experimental group performed significantly better on reassessment than the control group (2.87 [0.35] vs 2.14 [0.53]; P<.001).

The number of satisfactory scores (competent and outstanding) compared with unsatisfactory scores (needs improvement and requires remediation) were also compared by class using χ^2 analysis, but this analysis revealed no difference between the control group and the experimental group in any category.

Student Postexamination Survey

A majority of students indicated that the new OMT videos helped them feel more prepared for the CCE (78 of 80 [98%]) and more confident when taking their CCE (62 of 80 [78%]). In addition, students largely believed that the videos would enhance their future learning and use of OMT (*Figure 2*).

Students' comments were overwhelmingly positive. For example, one student wrote, "Stick with this format please! It makes lab so much more efficient when we can *progress at our own pace* (italics added)." Another student wrote, "It's great to have the videos because I am able to replay them as necessary. It was harder for me to *remember and apply what I learned* from class demonstrations (italics added)."

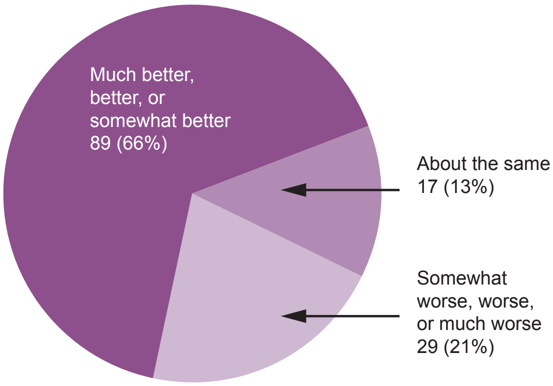

Figure 1.
Responses to the postsession survey item, "For my learning, compared to the faculty demonstration from the stage, the new [University of North Texas Health Science Center Texas College of Osteopathic Medicine] videos were…" (n=135).

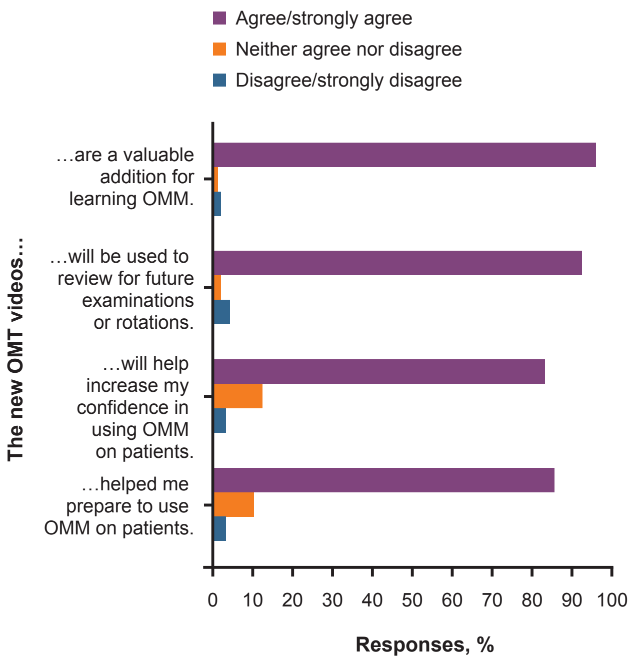

Figure 2.
Student postexamination survey responses regarding the new instructional videos to teach second-year osteopathic medical students the Still technique and facilitated positional release (n=86). *Abbreviations:* OMM, osteopathic manipulative medicine; OMT, osteopathic manipulative treatment.

Table 2.
Use of Instructional Video in Learning Osteopathic Manipulative Treatment: Mean (SD) Clinical Competency Examination Scores[a]

Osteopathic Manipulative Treatment Technique	Grading Aspect					
	Contact of Tissue	Use of Force	Positioning	Application of Principles	Reassessment	Total
Still, Occipitoatlantal Joint						
2013 (n=13)	2.77 (0.60)	2.77 (0.44)	2.92 (0.28)	2.92 (0.28)	2.92 (0.28)	14.31 (1.32)
2014 (n=14)	2.86 (0.36)	2.57 (0.65)	2.57 (0.65)	2.21 (0.58)	2.57 (0.65)	12.79 (1.89)
t value	−0.47	0.92	1.81	4.00[b]	1.86	2.06[c]
Still, T3-6						
2013 (n=14)	2.79 (0.58)	2.79 (0.43)	2.5 (0.76)	2.29 (0.73)	2.43 (0.51)	12.79 (2.04)
2014 (n=14)	3 (0)	2.79 (0.43)	2 (0.96)	2 (0.96)	2.29 (0.61)	12.07 (1.49)
t value	−1.39	0	1.53	0.89	0.67	1.06
FPR, T4-6						
2013 (n=14)	2.36 (1.84)	2.86 (0.36)	2.57 (0.51)	2.79 (0.43)	2.14 (0.53)	12.71 (1.64)
2014 (n=15)	2.8 (0.41)	2.87 (0.35)	2.67 (0.62)	2.53 (0.83)	2.87 (0.35)	13.73 (1.87)
t value	−1.82	−0.07	−0.45	1.01	−4.34[b]	−1.56

[a] Not all students in the class could be included because of slight variations in examinations between years. Thus, n reflects the number of students who performed the same technique to the same region between class years. Scores ≥2 were considered satisfactory; scores <2 were considered unsatisfactory.
[b] Statistically significant ($P<.001$).
[c] Statistically significant ($P=.024$).

Abbreviation: FPR, facilitated positional release.

Discussion

Based on survey responses to the present study, the OMT videos and active learning sessions with student-directed faculty support were valuable learning tools for the students. The increased satisfaction with the videos compared with live demonstration suggests a preference for the delivery modality, especially considering that the instructor (R.S.) on stage and in the videos in 2014 was the same. These results support the existing educational literature that stress the value of external focus, overview, demonstration, visualization, and practice when learning psychomotor skills.[1,2] The videos provide the opportunity for students to learn the techniques at their own pace and repeat or rewind if necessary. It is often challenging for all students to see well in groups during the demonstration. Multiple simultaneous views in videos allow the students to see all angles with relative ease. Anatomical images and force vectors are more easily demonstrated via video than in live demonstration. These video features, along with the ability to rewind as needed, were designed to decrease cognitive load, which is known to increase learner acquisition of a skill.[3] Adult learning theory supports the idea of learning being self-directed, which the new videos allow.[10] The novel features of our approach are use of psychomotor skills principles in the written instruction and the video demonstration to provide greater congruence in the curriculum.

However, scores on the CCE did not improve compared with the previous year. Although some differences were noted in grading factors, these data were not thought to be consistent enough to prove superior performance of one year over another. One confounding factor is that the students in 2013 had a different instructor for the large group didactic instruction than the students in 2014. Other factors include the relatively low numbers in each CCE subset group (resulting from randomization during examination and matching of students between years performing identical techniques), different faculty members grading different examinations in each year, and possible differences in cognitive abilities, which were not assessed (such as grade point average and medical college admission test scores) between the 2 classes. Additionally, because the grading rubric is designed to assess competency more than to give a percentage grade, stratification among "competent" and unsatisfactory scores becomes difficult. The examinations are pass/fail, and the relatively low number of failures (3 each year) makes distinction difficult. Investigation into interexaminer reliability for the current assessment methods is warranted.

It is difficult to identify and address important variables in educational research. The main objective of the present study was to evaluate strengths and weaknesses of receiving primary demonstration from the stage compared with from the videos. Given this aim, the results are encouraging and may more closely represent application of this approach in a typical classroom. This study does not account for differences in the individual table trainers, the abilities of the students, or how many times students viewed the videos. Additionally, no similar laboratory was performed with the *Atlas of Osteopathic Techniques*[5] videos, so it is unfair to make broad comparisons or conclusions between the 2 video sets. The information gathered from the survey that compared the videos will be used for curricular decisions at UNTHSC/TCOM and cannot necessarily be applied in other contexts.

The lack of clear evidence for improved performance should not necessarily distract from the value of the videos and student-led active learning sessions. The high student satisfaction rate in the present study parallels the improved self-efficacy found in a previous study related to video learning.[9] Increased self-efficacy is an important indicator for better performance,[11] and the students believed that the OMT videos would give them greater confidence when using OMT on patients. Students have reported lack of confidence as a reason for not performing OMT during rotations.[12] It is plausible, therefore, that increased confidence and self-efficacy with OMT techniques could lead to increased use by students during rotations and in future practice.

Allowing students to use the videos for instruction outside of class can allow for increased time with faculty for correction, formative assessment, and feedback by empowering the students to learn the basic steps independently. Formative assessment is a valuable component of curricular design because it gives learners specific ways to improve as they are learning and practicing new skills.[10] Finding time for expert feedback is increasingly important given the challenge of faculty-to-student ratios in many COMs.[4] Many students and faculty commented that video instruction should not entirely replace live demonstration, and the survey data agree. Given that 21% of students did not prefer the videos to live demonstration, it could be detrimental to completely remove live demonstration from the curriculum. However, the videos do allow for increased flexibility and a pathway toward a self-paced curriculum.

It is important to provide multiple avenues to deliver quality osteopathic education to future physicians. One must be cautious to interpret these results in context and resist any temptation to state that video demonstration alone can replace time with a faculty expert. All students in this study still had access to faculty for clarification, correction, and feedback. The data do not support the idea of using the videos to replace or decrease hands-on time with faculty. Also, conclusions about learning somatic dysfunction diagnosis from a video cannot be determined from this study, because the videos only addressed the treatment aspect of the techniques.

Conclusion

Students and faculty were satisfied with instructional videos for OMT techniques. Although examination scores did not improve, these videos may still serve a role in the demonstration of techniques as a part of osteopathic curriculum. Use of video demonstration could allow pathways for self-paced learning and free up time with faculty table trainers for assessment and feedback. Follow-up evaluation with the current groups would be valuable to assess retention of skills for the different delivery methods. Additionally, experiments that control for multiple variables could help establish cause and effect between different instructional designs and examination performance. Further investigation of the interexaminer reliability of the current clinical competency assessment is also warranted.

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Author Contributions

All authors provided substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; Drs Seals and Gustowski drafted the article or revised it critically for important intellectual content; Drs Seals gave final approval of the version of the article to be published; and Drs Seals and Gustowski agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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