Supplementary Material S5: Written Instructions to Raters and to Students

Instructions to Raters:

Hello, Dr. X!

Firstly, thank you so much for agreeing to assist in this project!

As we have previously discussed, we are enlisting your help as a faculty veterinary surgeon to assess and score videos showing the performance of 2nd year veterinary students participating in a study evaluating suturing techniques over the course of their surgical skills training course. We have teamed with a group of researchers from the XXX at the XXX to inform the creation of a machine-learning tool to systematically evaluate suturing skills through the use of algorithms derived from data. We collected data from an EMG armband, infrared camera, and various other cameras with advanced motion-detection capabilities. We recorded participants performing 4 basic suturing tasks- 1) passing a needle, 2) tying a surgeon's knot, 3) performing a simple continuous pattern, and 4) burying a knot- during 3 different suturing sessions over 4 weeks. During one session, only Tasks 1-3 were performed. During the other 2 sessions, all Tasks 1-4 were performed.

We are asking you to please assess each student's performance based on 3 standardized grading schemes using a Webtools electronic form. You can find the Webtools form at this link.

XXX

Once a score has been submitted, the Webtools program will thank you and give you an opportunity to start the next form for the next participant.

The standardized grading schemes are as follows:

A. OSCE checklist: The Objective Structured Clinical Examination (OSCE) model uses a series of standardized tasks assessed using structured score sheets as checklists. Please evaluate each task individually.

B. OSATS checklist: The Objective Structured Assessment of Technical Skill (OSATS)- The OSATS is a model of testing that involves direct observation of participants performing key, structured operative tasks. Please evaluate all tasks 1-3 or 1-4 as a whole for this category.

C. GRS: Global Ratings Scale (GRS) - The GRS is a score of operative performance generated based on the sum of 6 elements of surgical proficiency common to all procedures. Please evaluate all tasks 1-3 or 1-4 as a whole for this category.

Again, the OSCE checklist evaluates each of the 3 or 4 suturing tasks separately whereas the OSATS checklist and GRS assessments will ask you to consider all tasks for each participant together in the same evaluation. To maintain blinding of evaluators to participant identification and to week/session number, the videos are organized by student into 4 categories A, B, C, and D having 4 students each - 1, 2, 3, and 4 - and each participant's three experimental weeks/sessions are labeled as Week M, G or S. The videos can be found at this box site:
To start an evaluation:
1. First refer to the attachment which lists the randomized order in which we would like you to review these videos. The document will tell you which participant (ie A1) and which session week (ie Week M, G, or S) to evaluate. For example, if you were to review participant "A1"'s session "G", the files for A1 would be found under Week G Group A.
2. Open a new evaluation on the Webtools form emailed to you and then please choose from the dropdown menus for participant ID (ie A1) and session (ie G).
3. In the Box file, please find all of the videos for each participant (ie the file "Week G Group A" contains all of the videos for participants A1, A2, A3, and A4 from Week G. Select the"A1" file to view all the tasks for that week performed by participant A1.
4. Please watch the videos and evaluate them using the Webtools form. As mentioned above, the OSCE checklist will ask you to evaluate each task individually whereas the OSATS checklist and GRS will have you assign a grade to ALL of the videos in one session by giving a single score.

Again, thank you very much for your collaboration in and assistance with this project! We know your time and energy are precious commodities! Please know we greatly appreciate your input and look forward to collaborating together on the resultant manuscript.

Should you have any questions or concerns at all, or difficulty accessing either the videos or the grading forms, please do let us know!

Finally, if you do not mind letting us know after you have assessed one or two participants, we will run a report on the Webtools data and make sure everything is being saved appropriately!

Thank you so much again!
Written instructions to students provided also to raters before evaluation:

Task 1. Needle-passing (using half-bites):

Review the video and follow along with the instructions before beginning the task.

1. Pick up the needle with the correct instruments and correctly grasp the needle
2. Proceed the needle to the incision in the bench top tissue model
3. Pass the needle through the tissue from one side of the incision at the corresponding dot marked and out the middle of the incision
4. Correctly re-grasp the needle in preparation for a new bite
5. Proceed the needle to the middle of the incision in the bench top tissue model
6. Pass the needle through the tissue on the other side of the incision and out the corresponding dot marked
7. Place instruments on the table and then place your hands on the table until otherwise instructed

***Once instructed, please pull the suture out of the model and set everything down.

Task 2. Knot-tying:

Review the video and follow along with the instructions before beginning the task.

1. Pick up the needle with the correct instruments
2. Proceed the needle to the incision in the bench top tissue model
3. Pass the needle through the tissue from one side of the incision at the corresponding dot marked and out the middle of the incision
4. Correctly re-grasp the needle in preparation for a new bite
5. Proceed the needle to the middle of the incision in the bench top tissue model
6. Pass the needle through the tissue on the other side of the incision and out the corresponding dot marked
7. Tie a single surgeon’s throw
8. Follow the surgeon’s throw with 3 extra throws for a total of 5 throws
9. Appropriately cut the suture to the correct length using the correct instrument
10. Place instruments on the table and then place your hands on the table until otherwise instructed

***Once Task 2 is completed, please set everything down – DO NOT CUT OR REMOVE THE SUTURE.

Task 3. Continuous suturing:

Review the video and follow along with the instructions before beginning the task.

1. Pick up the needle with the correct instruments
2. Proceed the needle to the incision in the bench top model
3. Pass the needle through the tissue from one side of the incision at the corresponding dot marked and out the middle of the incision
4. Correctly re-grasp the needle in preparation for a new bite
5. Proceed the needle to the middle of the incision in the bench top tissue model
6. Pass the needle through the tissue on the other side of the incision and out the corresponding dot marked
7. Tie a single surgeon’s throw
8. Follow the surgeon’s throw with 4 extra throws for a total of 6 throws
9. Appropriately cut the free end of the suture to the correct length using the correct instrument
10. Pass the needle through the tissue from one side of the incision at the dot marked to the other side at the corresponding dot marked for a total of 3 times, then pass 6 more times without marked locations
11. To finish the continuous pattern, tie a surgeon’s throw applying appropriate tension on both the suture and suture loop
12. Follow the surgeon’s throw with 5 extra throws for a total of 7 throws
13. Appropriately cut the suture to the correct length using the correct instrument
14. Place instruments on the table and then place your hands on the table until otherwise instructed

***Once Task 3 is completed, please set everything down – DO NOT CUT OR REMOVE THE SUTURE.

Task 4. Buried suture:
Review the video and follow along with the instructions before beginning the task.

1. Pick up the needle with the correct instruments
2. Proceed the needle to the incision in the bench top model
3. Pass the needle through the tissue from deep to superficial and out the middle of the incision. Your needle and suture should not breach the tissue face or engage the subcutaneous tissue
4. Correctly re-grasp the needle in preparation for a new bite
5. Proceed the needle to the middle of the incision in the bench top tissue model
6. Pass the needle through the tissue on the other side of the incision from superficial to deep. Your needle and suture should not breach the tissue face or engage the subcutaneous tissue
7. Tie a single surgeon’s throw so that it buries in the tissue pulling parallel with the incision
8. Follow the surgeon’s throw with 3 extra throws for a total of 5 throws
9. Appropriately cut the suture to the correct length using the correct instrument
10. Place instruments on the table and then place your hands on the table until otherwise instructed

***Once Task 4 is completed, please set everything down – DO NOT CUT OR REMOVE THE SUTURE.