



EQClinic: Using technology to teach complex communication skills including non-verbal behaviours

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Communication skills in healthcare student education

Communication is critical in patient interactions because of the impact on a number of quality metrics, including patient outcomes [1]



As a result, healthcare student education frequently includes communication skills learning (CST). This is recognised by the Human Computer Interaction (HCI) community [2].

In CST, students invariably develop verbal skills, yet much communication is nonverbal (NV); this requires emphasis with learners [3] as it improves consultations [1]



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1. Silverman, J., Kurtz, S. & Draper, J. (2013). Skills for Communicating with Patients (3rd ed.). Abingdon, UK: Radcliffe Medical Press.
2. Slovák, P., & Fitzpatrick, G. (2015). Teaching and developing social and emotional skills with technology. ACM Transactions on Computer-Human Interaction (TOCHI), 22(4), 19.
3. Kurtz, S., Silverman, J., & Draper, J. (2005). Teaching and Learning Communication Skills in Medicine (2nd ed.). Abingdon, Oxon, UK: Radcliffe Publishing

Communication Skills Training methods

Simulated Patient Programs (SPP) can provide accessible and authentic simulation for CST [4,5,6]

The SP is “a well person playing the role of a patient with the purpose of students learning clinical skills in controlled circumstances” [6]



Limitations

- **Place** – all participants have to attend a suitable venue
- **Time** – all participants have to attend at specific time(s)
- **Participant numbers** may be dictated by venue size
 - Student numbers may be large and create logistical challenges
 - SP availability may limit opportunities, or require multiple repeats of sessions
- **Cost** – these can be expensive programs to run!

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EQClinic and the Online Simulated Patient Interaction and Assessment (OSPIA) platform

The central activity is a video-telephony session between student and simulated patient. UNSW Medicine initiated this project in partnership with the Positive Computing Lab and Pam McLean Centre at the University of Sydney

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We wanted a real interaction (not a virtual reality experience) – but online:

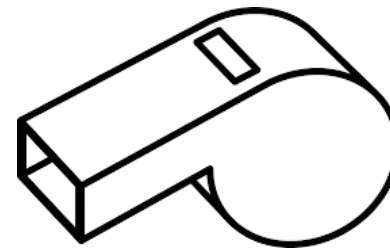
- Online venue – freely accessible by all parties
- Time – less constraining, as participants would mutually agree this

But other requirements *and opportunities* were apparent:

- A ‘virtual’ appointment
- Being able to focus on and maximise learning
- Provide multiple forms of feedback
- Assess interactions



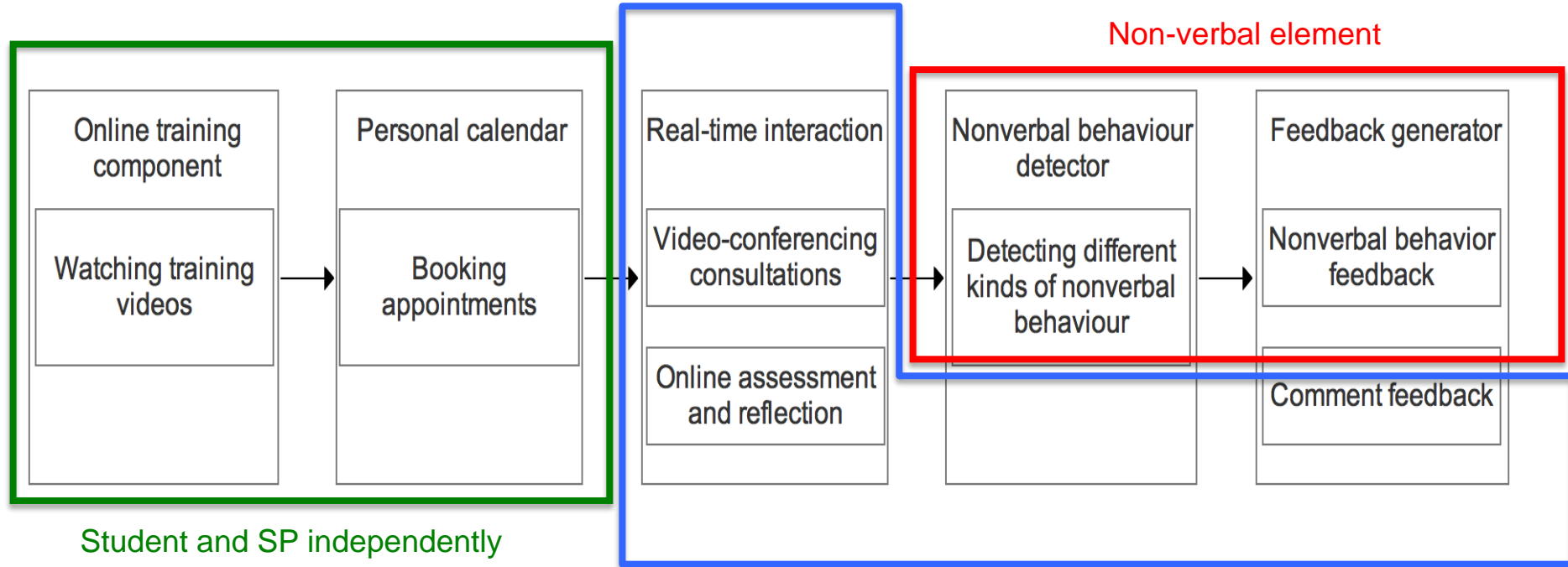
EQClinic/OSPIA functionality



1. **Calendar** function to book interactions
2. Participant interaction using **live video-conferencing**, recorded for later **review** and **reflection**
3. **Feedback** to students includes:
 - Directly from the SP, at the time of the interaction, primarily on verbal communication skills
 - smile face/frown face tool (mouse click)
 - written comments (free text)
 - both time-stamped to the recording of the interaction
 - Computer generated
 - sophisticated ‘computer vision’ algorithms provide detailed non-verbal communication (NV) analysis
 - also available on the timeline of the recording of the interaction
4. Innovative patient-led **assessment**
5. Guided **reflection**



EQClinic/OSPIA architecture [7]



Student and SP independently complete preparatory tasks and create appointment.

SP and student interact – SP generates feedback on verbal skills

Multimodal student feedback [8]

Feedback is generated during interaction by

- Simulated Patient
 - Focuses on verbal communication skills
- Computer
 - Detects and analyses non-verbal communication (NV)
 - Analysis takes one hour to perform. Students are subsequently prompted to login to review detailed analysis across eleven NV cues including
 - head movements (nodding, head shaking and head tilting)
 - facial expressions (smiling and frowning)
 - body movements (body leaning and overall body movements)
 - voice properties (volume and pitch)
 - speech patterns (turn taking and speaking ratio changes)

NVB Type	Description	Examples
Kinesics	Head and Body movements	Facial expressions and hand gestures
Vocalics	Non linguistic Vocal Cues	Sound volume and pitch
Haptics	Body Contact	Handshakes, touching
Proxemics	Spatial Cues	Doctor patient distance and orientation

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Research relating to NV and EQClinic/OSPIA

Question

- Do students show improvement in communication skills after EQClinic/OSPIA and the associated non-verbal communication feedback (NVF)?

Methods [7,9]

- 268 Year 2 medical students received CST teaching as part of their program and 257 participated in one OSPIA interaction.
- Students were randomly divided into two groups (A and B). Both groups received the usual course content and each group completed online interactions in addition, each in only one of two consecutive courses.
- Subsequently, both groups participated in live face-to-face SP sessions in both courses, such that crossover was performed and each student received the same learning activities.
- SPs enrolled in the EQClinic/OSPIA and played one specific patient-case scenario. Each interaction included one medical student and one SP and lasted about 30 mins.

7. Liu C, Calvo RA and Lim R (2016). Improving medical students' awareness of their nonverbal communication through automated nonverbal behavior feedback. *Front. ICT* 3:11. doi: [10.3389/fict.2016.00011](https://doi.org/10.3389/fict.2016.00011)

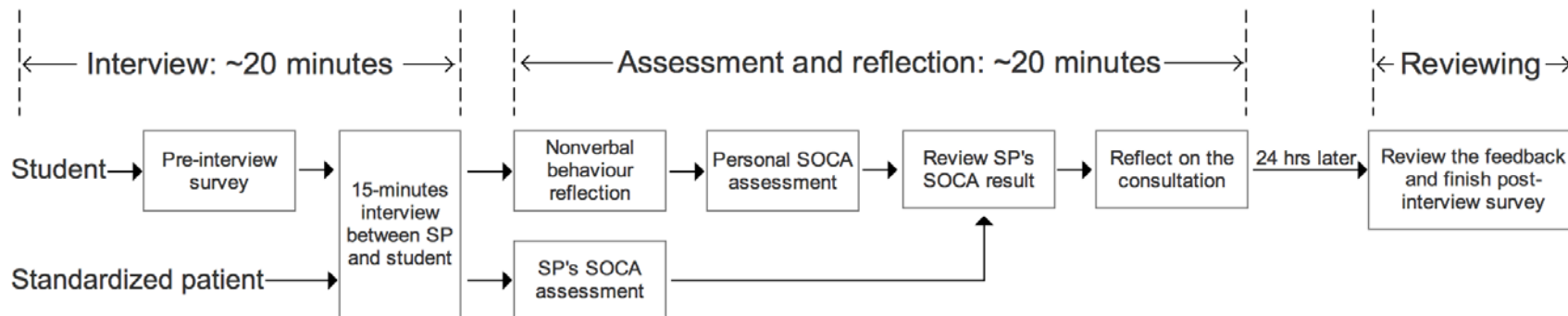
9. Liu C, Lim RL, McCabe KL, Taylor S, Calvo RA (2016). A Web-Based Telehealth Training Platform Incorporating Automated Nonverbal Behavior Feedback for Teaching Communication Skills to Medical Students: A Randomized Crossover Study. *J Med Internet Res*;18(9):e246. DOI: [10.2196/jmir.6299](https://doi.org/10.2196/jmir.6299)



Research relating to NV feedback and EQClinic/OSPIA

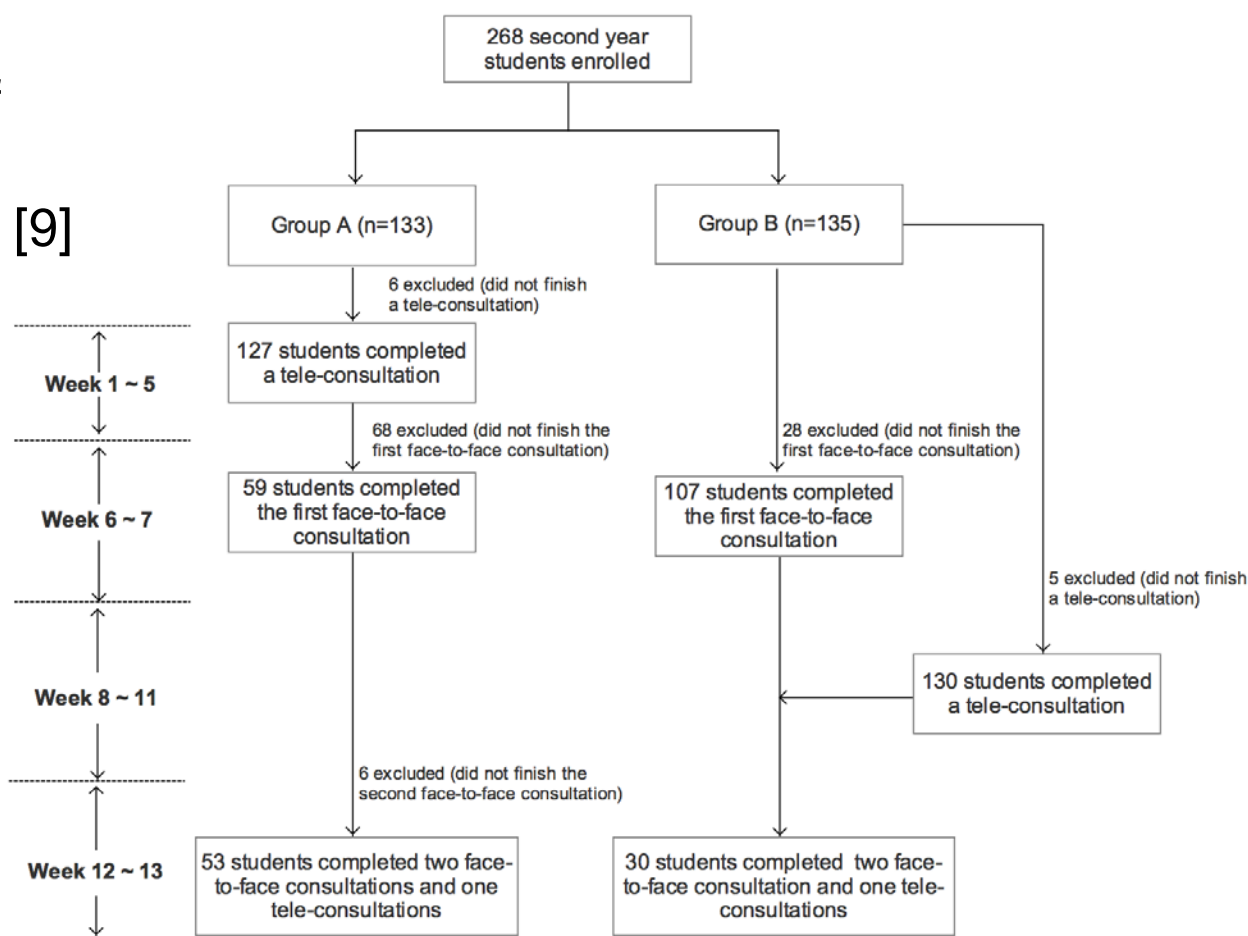
Methods (continued) [7,9]

- Students and SPs securely logged into the platform to conduct interactions.
- Both the live face-to-face and the online interactions were assessed on a Calgary-Cambridge Guide-based (Medicine specific validated tool) form by the SP.
- Online interactions were analysed, providing students with visual feedback on NV skills.
- Student accessed videos of their online session, to reflect on this, receive NV feedback, and complete questionnaires.



7. Liu C, Calvo RA and Lim R (2016). Improving medical students' awareness of their nonverbal communication through automated nonverbal behavior feedback. *Front. ICT* 3:11. doi: 10.3389/fict.2016.00011
9. Liu C, Lim RL, McCabe KL, Taylor S, Calvo RA (2016). A Web-Based Telehealth Training Platform Incorporating Automated Nonverbal Behavior Feedback for Teaching Communication Skills to Medical Students: A Randomized Crossover Study. *J Med Internet Res*;18(9):e246. DOI: [10.2196/jmir.6299](https://doi.org/10.2196/jmir.6299)

Flowchart of student participation [9]



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Results [9]

Mean SOCA scores (SOCA total score was on range 4-16)

Period	Week 1-5	Week 6-7			Week 8-11
Type	OSPIA	F2F	F2F	F2F	OSPIA
Group	A	A	A+NVBF	B	B
n	127	59	33	107	130
Total score	11.59 (SD=2.67)	13.02 (SD=1.49)	<u>13.21</u> (SD=1.45)	12.58 (SD=1.61)	13.13 (SD=2.31)
<i>p</i>			0.037		

Students from Group A who completed an online interaction *and reviewed the NV feedback* subsequently achieved significantly higher assessment scores in the live face-to-face consultation

9. Liu C, Lim RL, McCabe KL, Taylor S, Calvo RA (2016). A Web-Based Telehealth Training Platform Incorporating Automated Nonverbal Behavior Feedback for Teaching Communication Skills to Medical Students: A Randomized Crossover Study. J Med Internet Res;18(9):e246. DOI: [10.2196/jmir.6299](https://doi.org/10.2196/jmir.6299)

Results (2)

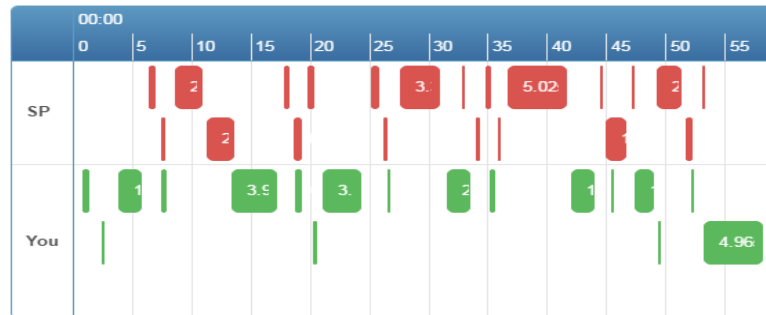
User experience (UX) data from the research period (first half 2016) showed EQClinic/OSPIA

- Suffered 30.7% had interruptions/difficulties
- Scored 5.4/7 in usability/value scales.
- SP's provided real-time feedback 3.4 times per interaction
 - >75% positive feedback, shows both
 - user acceptance,
 - feedback preference

Computer generated NV feedback [8]

Turn-taking

Turn Taking	Speak Ratio	Sound Volume	Sound Pitch	Smile
Frown	Body Leaning	Head Tilting	Nodding & Shaking	Hand Gesture
Overall Movement				
You	SP			
Total speaking percentage: 61.35%	Total speaking percentage: 38.65%			
Number of turns: 108	Number of turns: 107			
Average length of each turn: 2.24 seconds	Average length of each turn: 1.42 seconds			
Longest turn: 19.65 seconds	Longest turn: 6.94 seconds			
Overlapping time: 16.26 seconds (6.72%)	Overlapping time: 16.26 seconds (10.66%)			



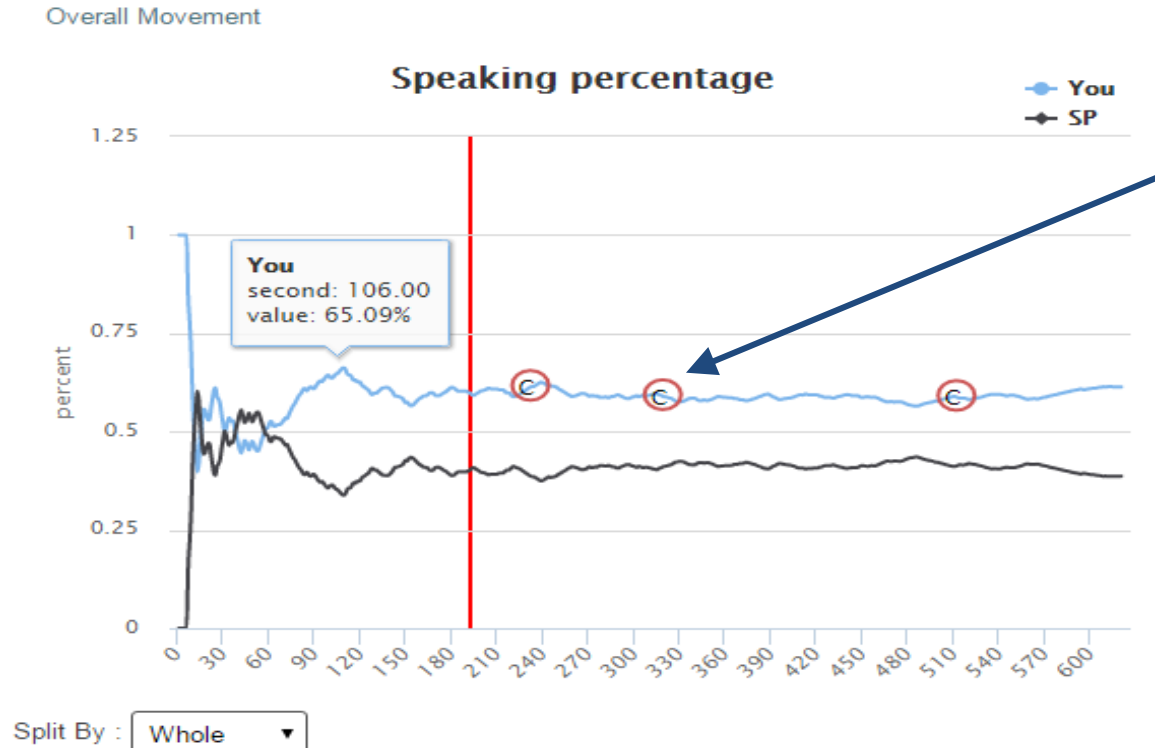
Tips:

- 1) This graph depicts all the speaking periods of you and the SP.
- 2) Green labels represent your speaking periods.
- 3) Red labels represent the SP's speaking periods.
- 4) Scroll your mouse to zoom in or zoom out the graph, and drag the graph to move forward or backward.

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NV feedback – example [8]

Speaking percentage

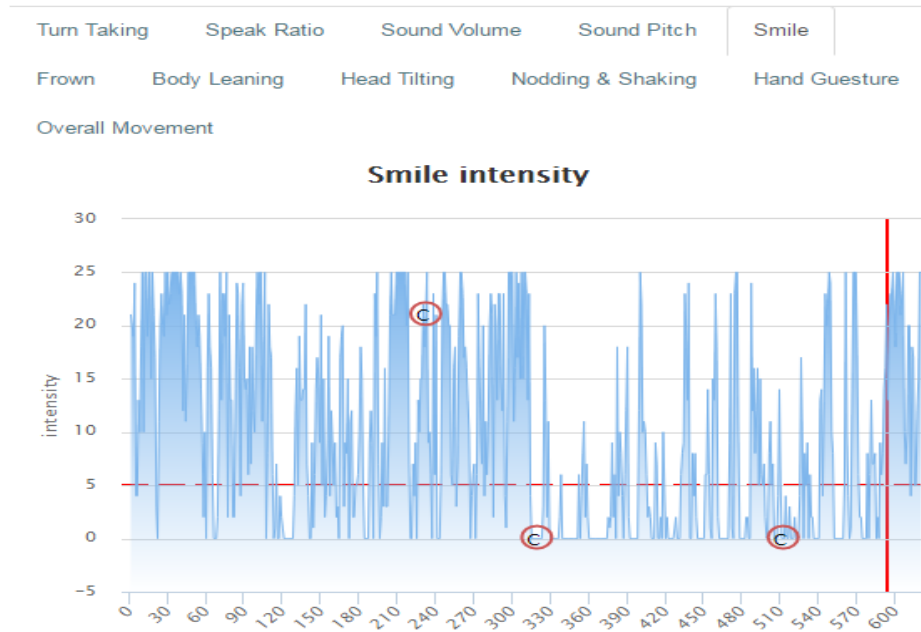


C = A comment was entered at this point by the SP. Students can compare the nature of the comment (usually identifying verbal behaviours) with NVB as identified on the computer generated graphs

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NV feedback – example [8]

Smiling



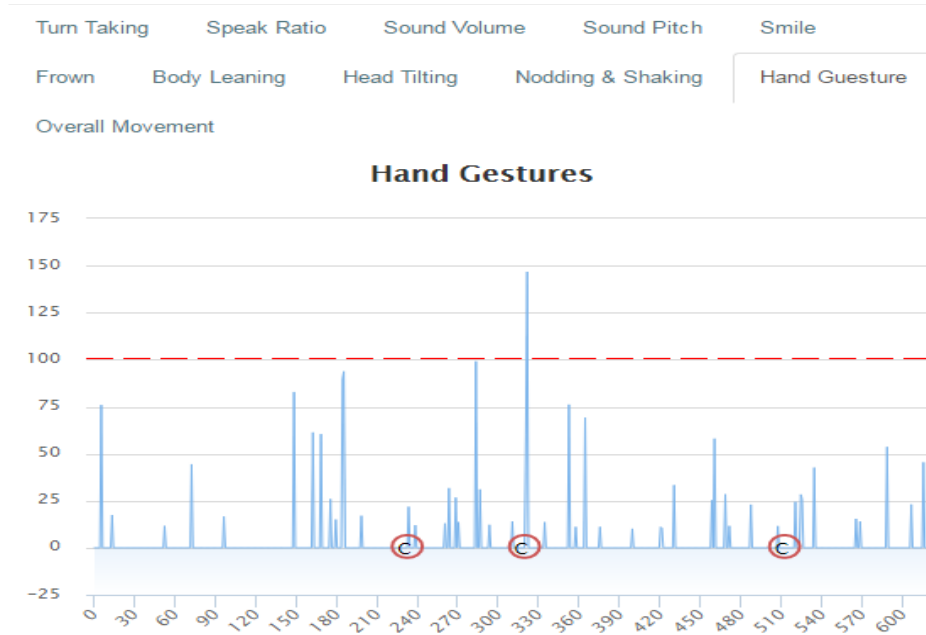
Tips:

- 1) This graph depicts the time and intensity you smiled.
- 2) The higher the value, the more obvious the smile is.
- 3) The values above the red dash line would be considered visible smiles.
- 4) The "C" labels in the graph represent the comments from the SP.
- 5) Highlight a section of the graph to zoom in to that time period.

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NV feedback – example [8]

Hand gestures



Tips:

- 1) This graph depicts the frequency and magnitude of your hand gesture.
- 2) The values that above the red dash line would be considered visible hand gesture.
- 3) The "C" labels in the graph represent the comments from the SP.
- 4) Highlight a section of the graph to zoom in to that time period.

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Summary

EQClinic/OSPIA is a novel addition to medical education which successfully takes CST into the online environment, and creates feedback on students' NV skills.

Our initial findings are interesting because they suggest improvement in student communication skills after reviewing nonverbal feedback relating to student/SP interactions conducted online, using the EQClinic/OSPIA platform.

While the need for CST is widely accepted, there is less consensus on the need for specific teaching on the nonverbal aspects of communication. This is related to the lack of adequate resources, knowledge, and expertise in this aspect of communication [8].

To our knowledge, this is the first study to systematically incorporate nonverbal communication feedback into medical student CST, and in addition we have shown that this positively affects communication skills in students in subsequent interactions.

References

1. Silverman, J., Kurtz, S. & Draper, J. (2013). *Skills for Communicating with Patients* (3rd ed.). Abingdon, UK: Radcliffe Medical Press.
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6. Barrows, H.S. (1993). An overview of the uses of standardized patients for teaching and evaluating clinical skills. *Acad Med*, 68 (6), 443-451.
7. Liu C, Calvo RA and Lim R (2016). Improving medical students' awareness of their nonverbal communication through automated nonverbal behavior feedback. *Front. ICT* 3:11. doi: 10.3389/fict.2016.00011
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