MEDICAL STUDENTS' PERCEPTIONS OF THE VIDEO-MODIFIED PEYTON'S 4-STEP TECHNIQUE

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Abstract

Background: Peyton's 4-step technique is one of the most widely researched framework for teaching physical examination. This study aims to explore student perceptions of a video-modified version of this technique, and how it can be improved. Methods: This cross-sectional study was carried out amongst 606 2nd year medical students'. An online questionnaire was distributed following an examination teaching session which explored students' perceptions using a 5-point Likert scale. A total of 354 students' responded. Results: This study demonstrated that student confidence improved following the examination session (P-value <0.05). This technique is well-accepted amongst medical students'. This study identifies areas for improvement in future examination sessions. Conclusions: In conclusion, we recommend that this technique is utilised in all examination teaching sessions incorporating our recommendations. We also recommend that student outcomes of this model are measured and compared to other teaching models.

Introduction

At Cardiff University Medical School; the instruction of spinal, upper, and lower neurological examinations is taught to students' during the second-year of their five year course. This is essential in preparing them for their clinical placements, which begin in the third year of their studies. Proficiency in physical examination skills is of utmost importance for healthcare professionals as it enables them to achieve accurate diagnoses and provide high-quality care to their patients'. Despite this, there has been a decline in the ability to perform physical examination skills amongst medical students over the past two decades (1).

Our research aims to explore the students' perceptions regarding the current instructional model employed for teaching neurological and spinal examinations at Cardiff Medical school. The most widely endorsed framework for teaching physical examination skills in the existing literature is Peyton's 4-step technique, which a recent meta-analysis has determined is an effective technique for the acquisition of procedural skills (2). This technique comprises four steps that ensure consistent and efficient examination instruction. These steps involve:

1. Demonstration (where the educator showcases the examination procedure to the students')
2. Deconstruction (where the educator presents the examination steps in a step-by-step manner)
3. Comprehension (where the students themselves articulate the examination steps in the appropriate order)
4. Performance (where the students independently conduct the examination and receive feedback for improvement)

Research has shown that video-based models utilising Peyton's 4-step technique are more effective compared to Halsted's "see one, do one" approach (3). However, there is currently not much evidence surrounding student perceptions of this model and its possible improvements. In this study, we employed the video-based Peyton's 4-stage technique approach and collected both qualitative and quantitative data to assess student perceptions of this model.

Methods

Study Design:

This cross-sectional study was conducted at Cardiff University medical school. Students' participate in a two-week

learning course focusing on a patient with lower back pain. A case based approach is utilised to encourage learning about the biological, psychological and social aspects of the case. Supplementary lectures, tutorials and practical sessions are integrated into this course to facilitate these case discussions.

Study Participants:

A total of 606 undergraduate medical students in the second year of a 5-year program participated in this teaching session, which was conducted in 2022 and 2023. All students had no prior experience in performing neurological and spinal examinations. Attendance to the session was mandatory, but students' participation and feedback was recorded voluntarily. Since no specific demographic information was collected and the student feedback was anonymised, this study did not require any specific ethical considerations.

Study Intervention:

The study utilised a modified video-based approach of Peyton's 4-step technique as the foundational framework for teaching. Prior to attending the session, students were instructed to watch a series of videos. These videos included demonstrations of the examinations without audio and deconstruction of the individual steps involved in examining the specific systems and explanations of the reasoning be hide each step. The upper and lower neurological examination videos had an approximate duration of 8 minutes, and a separate 4-minute video focused on how to examine sensation. Additionally, a 12-minute video was produced for the spinal examination.

During the session students were divided into groups of 6-8 with each group supervised by a single tutor. The sessions were carried out over four designated days. Students engaged in collective discussions, guided by a staff member, to comprehend the steps involved in examining the upper and lower neurological system and the spine. Subsequently, students chose a partner and performed the examinations on each other under the supervision of a tutor. The tutor then provided verbal feedback on their performance. This study used a deliberate non-random pairing approach to facilitate a comfortable learning environment. Staff members responsible for supervision were selected from the orthopaedic or neurological department, and received a guide prior to the session to ensure the effective execution of the session.

Evaluation of Students' Perceptions:

To assess the effectiveness of this intervention, a questionnaire was administered to students' through an online survey platform. The questionnaire utilised a 5-point Likert scale (5: Strongly agree/ 4: Agree/ 3: Unsure/ 2: Disagree/ 1: Strongly disagree) to evaluate various aspects of the session. The session domains assessed were learning outcomes achieved, explanation and clarity, usefulness, student enjoyability, and overall perceptions. The questionnaire also assessed student confidence in neurological and spinal physical examination, comfort with peer

examination, and overall perception of the modified teaching structure. Additionally, students were asked open-ended questions to gather insights regarding the enjoyable aspects of the session and any suggestions for improvement.

Results

In total, 58% (354/606) of students responded to the online questionnaire. The data was compiled in Microsoft Excel and any missing data was excluded from the data set. This was then analysed and presented graphically. The mean Likert scores for the session domains are presented below:

		Mean Likert score		
Question number	**Questions**	***2022***	***2023***	***P value***
1.	Please rate the quality of today's teaching below: Learning Outcomes Achieved	4.88	4.79	0.85
2.	Please rate the quality of today's teaching below: Explanation and Clarity	4.81	4.85	0.94
3.	Please rate the quality of today's teaching below: Usefulness	4.90	4.91	0.99
4.	Please rate the quality of today's teaching below: Enjoyable	4.80	4.74	0.89
5.	Please rate the quality of today's teaching below: Overall	4.82	4.82	0.99

Figure 1: Responses of closed questions concerning students' perceptions of the session domains across 2022 and 2023

The graphical representation in Figure 1 illustrates the students' perceptions of the examination session domains across 2022 and 2023. Based on the findings presented in Figure 1, it can be concluded that the teaching sessions received positive ratings across all assessed domains. To determine if there were any significant differences between the two years, an unpaired t-test was conducted and a P-value at the significance level of 0.05 was chosen. The P-values obtained for all domains assessed were above this value suggesting that the positive ratings for the teaching sessions were consistent across 2022 and 2023.

The remaining closed questions were combined across 2022 and 2023. Beforehand, a unpaired t test was carried out to determine any statically significant difference between the two years. No statical difference was found indicating consistent results (P-value > 0.05).

Figure 2 illustrates the responses of the students' to if they had watched the pre-examination videos prior to the session. 92% (314/340) of students' responded 'Yes'. This suggests that the majority of students' were able to access and utilises these videos. Additionally, we found that 91% (294/323) of students' strongly agreed/ agreed with the statement that they found the pre-examinations videos a useful resource for preparing for the session

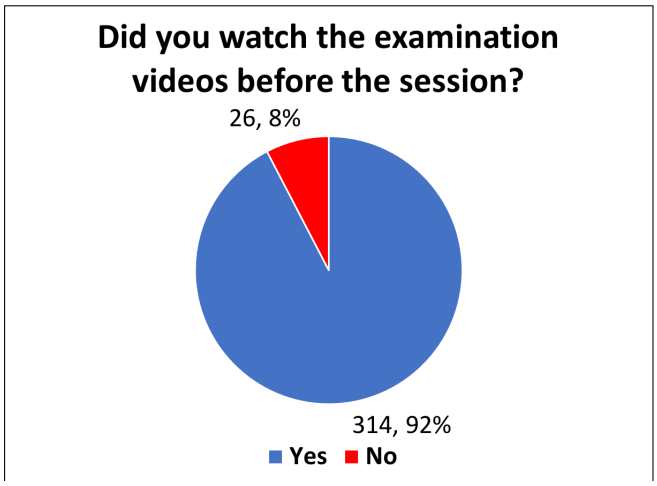

Figure 2: Yes/No responses of students' in watching pre-session examination videos

96% (312/326) of students' responded 'Yes' to feeling comfortable with peer examination.

Figure 3 illustrates the confidence of the students' in preforming the examinations before and after attending the session. The mean Likert score before the session was found to be 2.70, suggesting that students' did not feel confident in their examination technique. This indicates that the video-based approach alone was not enough to provide students' with the confidence to perform the examinations. The mean Likert score after the session was calculated at 4.37. To assess if a significance difference was observed between the data, a paired t test was carried out with the two data sets. It was found that the two-tailed P value was less than 0.05 (0.0001) indicating a statically significant improvement in student confidence following the examination session.

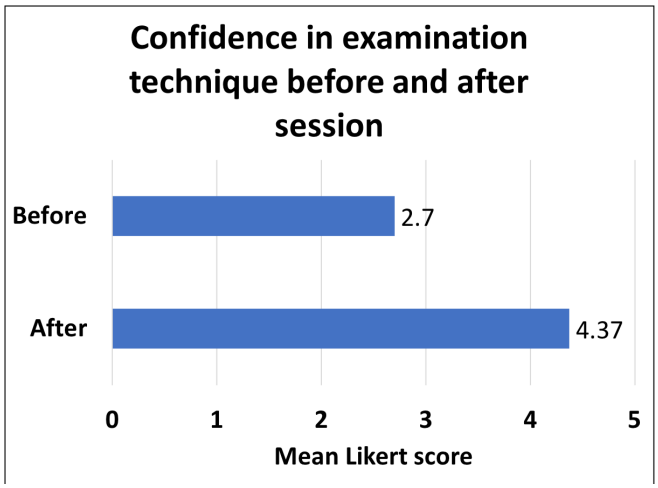

Figure 3: Students' confidence in neurological and spinal examination before and after attending session

90% (297/331) of students' responded 'No' or 'Unsure' when asked if they had been aware of Peyton's 4-step technique prior to the teaching session (figure 4).

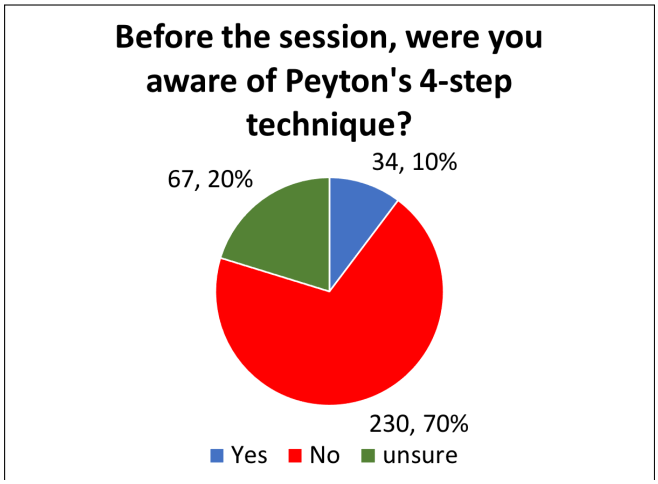

Figure 4: Yes/No/Unsure responses of students' to their awareness of Peyton's 4-step technique

Figure 5 illustrates the students' responses to whether they believed this modified technique was helpful in their learning. The mean Likert score was 4.58, suggesting that this technique was well-accepted by students.

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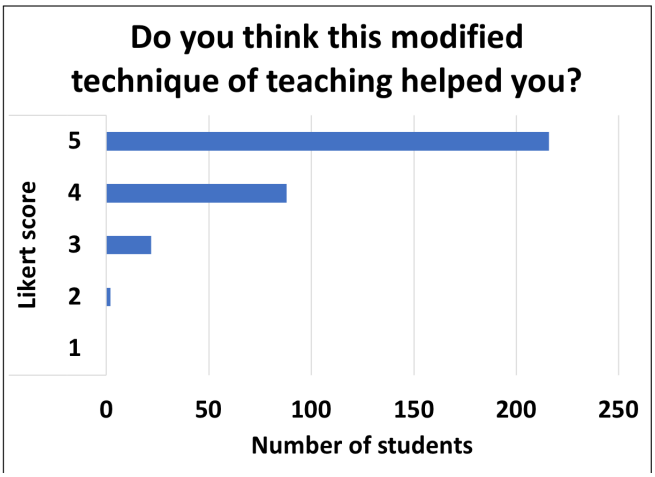

Figure 5: Students' perceptions of the video-modified Peyton's 4-step technique

The qualitative data was analysed and recurring the themes were identified. The majority of the feedback was similar between the two years. The positive feedback from the sessions is shown below:

1. Practical hands-on learning through the use of peer observation

'It was really good how we could all practise on each other and split into pairs'

Students' felt that the practical, hands-on nature of the session was an effective way of practising their examination technique for the clinical environment.

'Relaxed nature of the session allowing us to feel comfortable in examining each other in front of our peers'

Students' felt comfortable in examining each other during the session

2. Small group learning

'Being supervised in small groups and a safe space to make errors without being judged'

Students' felt that a small group was beneficial as its lessened the pressure on individual students', provided opportunities to practise and ask questions which highlighted any errors being made.

3. Effective teaching strategies

'I enjoyed the half an hour per exam layout and the initial recap of the videos. It was reassuring that I did know the structure and made me more confident in examining my peers during the session'

Many students' mentioned the use of the pre-examination videos as an effective way to learn the structure of the examination prior to the session, this was particularly prevalent amongst the 2023 year group. They also mentioned the benefit of clear demonstrations and use of helpful mnemonics. Many students' described that this was one of the best examination teaching sessions they had attended during their time at medical school.

4. Instructor quality

'Our tutor was really encouraging even when we got the steps wrong'

Students particularly appreciated the tutors support, approachability, and enthusiasm. Students' found that the immediate feedback from tutors helped them improve and gain confidence in their examination technique.

Students' generally believed that the session was very effective. However, minor improvements and suggestions were made by students'. These are shown below:

1. **Additional time**

'Possibly have more time so that everyone has a proper go - sometimes the odd person didn't have a chance to do the full examination before moving into the next part'

Students' from both cohorts felt that the session was slightly rushed and could have been prolonged. Some students' described not having an opportunity to practise one of the examinations, meaning that they felt less confident in their examination technique by the end of the session. Many felt that an increase in the session by thirty minutes would've accommodated for this.

2. **Learning materials**

'Please can we get printed out instructions for ISCE revision, there's no harm in lots and lots of detail!'

Many students' would've liked to have handouts during the session containing the structure of the examination as well as ASIA charts. Some students' desired more acronyms and memory aids for easier recall.

3. **Real patients**

'The ability to practise on patients' would be great!'

Some students' suggested the use of real patients' for future sessions.

Discussion

The aim of this study was to investigate student perceptions of the video-modified Peyton's 4-step technique. Previous studies have demonstrated that this video-based model improves student performance when carrying out complex practical skills more than the traditional 'see one, do one' approach (3). However, the results of this study show that this technique is well-accepted amongst medical students' and improves their confidence in their examination technique. One limitation of this video-based model is that its relies on students' to watch the pre-examination videos prior to the session; however, this study demonstrates that the majority of students' (92%) utilise these videos.

Peyton's 4-step technique was initially designed for a student: teacher ratio of 1:1 (4). However, due to limitations in the available staff this is often not possible. For this study, we used a teacher: student ratio of 6-8:1, which we found was very effective. This is in keeping with the current literature that this technique can still be effective with less than nine students' per teacher (2). It should be mentioned that some students' in this study didn't have the opportunity to perform certain examinations. This may have been avoided if the session was prolonged or student: teacher ratio was reduced.

Interestingly, 90% of students were not aware of Peyton's 4-step technique prior to the teaching session. As a healthcare professional; education is a major part of their career. Therefore, it may be beneficial to incorporate techniques such as Peyton's 4-step technique in medical curriculum. This would ensure that effective teaching

techniques are carried over to the next generation.

In this study, we utilised peer observation during the performance section of Peyton's 4-step technique. 96% of students' in this study are comfortable with examination of their peers. Observing a peer perform an examination has been found to be an effective way of improving examination performance and retention (5). Students' appreciated the relaxed nature of this, indicating that allowing students to choose their peer as opposed to pairing students' beforehand is a way to facilitate a comfortable learning environment. This study also suggests that small group learning environments are the preferred method of teaching physical examination as students' feel less pressured and have more opportunity to practise the examination technique.

Areas for improvement:

Although the technique we have employed at Cardiff University for teaching spinal and neurological examinations is well-accepted by students', it is important to mention areas for future improvement:

- **Encourage mental repetition of the examination**

An study in the literature has found that encouraging mental repetition of the examination steps and reasoning be hide them improves retention and student confidence (6). Students' should be encouraged to run through the steps at every point during the session, for example, while being examined by a peer.

- **Teach anatomy relevant to the examinations prior to the session**

Encouraging anatomy teaching alongside physical examination teaching has been found to improve physical examination understanding (7).

- **Incorporate clinical cases**

While there is not much research in the literature regarding the incorporation of clinical cases into physical examination, this has been demonstrated to be well-accepted amongst a small sample of pre-clinical medical students' (8). This would likely improve the transition to clinical placements, which may students find as feeling unprepared and stressful (9).

- **Additional time, learning materials and real patients**

These recommendations have been suggested by the students in this study and would likely enhance the session if incorporated.

- **Measure student outcomes**

Although we have measured student perceptions of this technique, we recommend that further studies focusing on the incorporation of these suggestions are carried out and student outcomes are measured.

Conclusion

In conclusion, we have demonstrated that the video-modified version of Peyton's 4-step technique improves student confidence in their examination technique. This study has highlighted multiple areas for improvement of the current physical

examination teaching session that we employ at Cardiff University, such as additional time, learning materials and the use of real patients'. We have also identified other techniques demonstrated in the literature to further enhance the current teaching, such as encouraging mental repetition, teaching anatomy prior to session and the incorporation of clinical cases.

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