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ORIGINAL RESEARCH

A Picture Paints a Thousand Words: Perspectives of the Use of Images and Videos of Physical Findings in Virtual OSCE Teaching Sessions

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Background: The COVID-19 pandemic has resulted in medical students' education being disrupted and a new direction of learning towards the online classroom, with students frequently learning to identify clinical signs via online conferencing platforms. Given this shift in student study techniques in the pandemic and post-pandemic era, we set out to analyse the confidence levels of students recognizing clinical signs in patients and the opinions and patterns of resources students would use to build up the knowledge and confidence for their future clinical practice.

Methods: OSCEazy, a student-led medical education organisation, delivered an online teaching session and disseminated a questionnaire containing ten-point Likert scales, multiple-choice questions and free text options.

Results: The majority (over 75%) of respondents reported using digital resources to learn physical examinations. Most respondents were somewhat confident with recognising clinical signs during physical examinations (Median 7, IQR 6–8). Kruskal–Wallis *H*-test on students' impression of the quality of current OSCE materials showed a statistically significant difference between cohorts ($X^2(2) = 14.209$, $p = 0.014$). A large proportion of students (98.41%) agreed that an online resources bank would be beneficial for their learning. Wilcoxon rank test showed a statistically significant preference for learning physical examinations using clinical images rather than videos ($p = 0.014$). A 29% of respondents mentioned the use of physical textbooks as a resource, while online platforms such as OSCE revision websites, YouTube and Google Images had become the mainstream platforms.

Conclusion: The findings reported here suggest that there needs to be a greater emphasis on providing online image-based resources to support medical students in learning clinical signs. A resource containing these clinical signs would prove to be of benefit for students to access high-quality self-directed learning to identify and verify clinical signs.

Keywords: medical education, visual, multi-media, clinical, online, teaching

Introduction

The maxim, "A picture paints a thousand words" is a truism in education. The concept of visual cues in learning is well established, has been employed by various organisations and individuals, and has been demonstrated to be helpful in learning and teaching.[1–5] Clinical images and videos are resources that potentially enable current and future clinicians to gain an understanding of specific clinical signs of medical conditions. No two patients are the same, but clinicians must still have a conceptual understanding to underpin the nuances of diagnosis that can be detected both visually and clinically via a thorough history. There are multiple platforms and services available online that allow access to these resources, with many of these platforms having unique ways of visually presenting clinical signs.[1] The popularity and importance of visual learning[2] highlight the potency of clinical footage as a resource for learning.

Clinicians must be able to spot clinical signs, should they arise, to aid their imaging modalities, differential diagnoses and treatment options. The adjustments in teaching to address the widespread lockdowns and social distancing experienced during the COVID-19 pandemic have had a major effect on the education of many future clinicians. There has been an accelerated shift into

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online teaching since the start of the pandemic,[2,3] where medical students' learning opportunities on clinical placement opportunities became very limited. The limited or restricted access to the clinical environment reduced exposure to clinical signs on placement.[4] Clinical experiences affect the application of what medical students potentially learn and incorporate into discussions with patients and clinicians. This limitation may eventually influence the outcome of a student's learning.[5]

This shift has also impacted both the initial learning of clinical signs, where students are exposed to new information, and revision, where students review and reinforce knowledge in preparation for exams. While both processes are crucial, they serve different purposes in a student's educational journey. Initial learning involves understanding and identifying clinical signs for the first time, often accompanied by clinical experience. In contrast, revision is more focused on consolidating this knowledge to ensure readiness for assessments such as OSCEs.[6,7]

Images and videos are valuable tools in medical education but serve different purposes. Images can provide clear, static depictions of clinical signs, which are useful for initial identification and memorisation. Conversely, videos can demonstrate dynamic processes such as physical examinations or patient interactions, offering a more comprehensive understanding of clinical scenarios. The accessibility and utility of these resources can vary depending on the context in which they are used. Multiple studies have identified the benefits of a digitalised approach to teaching, which includes using videos to aid teaching sessions ranging from clinical skills to identifying anatomy.[8–11] Images, on the other hand, were used for teaching radiology and concepts which can be depicted statically.[12] These studies show that there are subtle differences in the two multimedia options; however, the aim of this study evaluates both as "multimedia tools".

Online e-learning service providers have capitalised on the expansion of online learning to develop further technological advancements[2,13–16] and enhance how we learn clinical signs visually. There have been many advantages to virtual learning such as reducing travel time, recording lessons, and ease of convenience.[16] A study conducted by Rajab et al[15] found many challenges to learning during COVID-19, with issues surfacing such as communication breakdown, pandemic-related anxiety or stress and student assessment issues. Despite this, the Rejab et al study explains that these challenges can be turned into opportunities and methods of content delivery are thoroughly reviewed before converting the teaching to online. Other studies, including one conducted by Gaur et al,[13] have found that COVID-19 has disrupted medical training for many and has forced the curriculum to rapidly adapt to the changes.

Medical decisions are often made based on clinical observations. This includes identifying key pieces of information, pattern recognition and devising what is important.[17] All these skills require experience and clinical exposures for medical students to become confident in making clinical judgements. Ebbinghaus's classic forgetting curve has been an influential model portraying how memory fades over time if they are not retrieved regularly. Whether memory is retrieved in a clinical environment or elsewhere, reviewing clinical signs regularly helps prevent memory from deteriorating.[18] The dual coding theory of memory[11] suggests that memory of verbal information is emphasised and retained better if images related to the verbal content are incorporated into the learning process. Working memory is produced via visuospatial and phonological pathways. Memory traces are reinforced when both pathways are activated simultaneously.[19]

The literature currently shows that students employ textbooks, writing notes, question banks and watching online tutorials as the most popular modalities of revision.[20] It is recognised that question banks allow students to actively retrieve knowledge and apply it to scenarios which has shown improvements in summative assessments.[21] However, there is a gap in the literature that assesses students' awareness of what clinical signs look like in practice and if students are aware of where to access these resources.

The objectives of this study were to (i) explore and understand the perceptions of students on their use of images and videos in their learning, (ii) understand the material and resources they use in enhancing their learning and understanding, (iii) appreciate the barriers students face in accessing these resources and (iv) provide a direction to how these material can be integrated into didactic synchronous or asynchronous teaching sessions to further augment student's learning experiences.

Methods

Study Design

The data were collected via an online survey, after a student-led teaching session delivered by via Zoom™. The online teaching session was offered as part of a suite of student-led sessions aimed as supporting students for their

"Objective Structured Clinical Examination" (OSCE) and "Integrated Structured Clinical Examination" (ISCE) assessments. The session was advertised on various OSCEazy social media platforms including FaceBook™, Instagram™ and LinkedIn™. Teaching involved using images and videos of clinical signs in examinations. The sessions were aimed at students in their first and second year of studies, primarily, although students from other year groups also attended. The focus of the survey was to identify the effectiveness of images and videos of clinical signs in their teachings.

The teaching sessions were carried out by current and recent medical students, via an international online student-led medical education platform, OSCEazy. The teaching sessions were advertised through a range of social media platforms. Participants joined from these links to the online conferencing software, Zoom™, where the teaching sessions were conducted. Participants had complete freedom to join these sessions, and they did so voluntarily. The questionnaire was disseminated in a "Gastroenterology Session" specifically designed to include clinical signs illustrated by videos and images. Involvement in the teaching session was not conditional on participation in the survey with the filling of the survey being completely voluntary. A Participant Information Sheet (PIS) as supplied in Figure S1 was included at the top of the Google Form™.

Questionnaire Design and Dissemination

Google Forms™ was used for the survey. Participants were given the Participant Information Sheet (PIS) (Figure S1) and by completing the quiz they were given their informed consent. The survey asked what year of study the participants were in but did not collect any further demographic or identifiable data. The questionnaire asked participants to rank their answers on a 10-point Likert scale, with 1 being strongly disagree and 10 strongly agree. The questions involved how important they felt images and videos were towards clinical examinations, how aware they were of the resources for accessing these and the resources they currently used to access the images and videos. Students were asked if they would be willing to pay a small fee to access such resources. The specific questions may be found in Figure S2.

Ethical Considerations

The study is an evaluation of students' perception of the importance of images and videos in clinical examinations. The NHS ethics online tool (https://hra-decisiontools.org.uk/ethics/) concluded that ethics approval was not required given that the study was a service evaluation of an intervention. The questionnaire stated that, upon completion, consent was given to use the data in an academic publication. The data collected is non-identifiable and handled according to General Data Protection Regulation (GDPR) principles and local university guidelines. A Participation Information Sheet (PIS), attached in Figure S1, at the beginning of the form clearly outlined to participants the abovementioned specifics.

Statistical Analysis

Summary statistics used were reported and displayed as appropriate for baseline characteristics. To test for the normality of the data distribution, the Kolmogorov–Smirnov test was utilised, using a threshold of $p > 0.05$ to indicate a normal distribution (see Table S1). Parametric or non-parametric tests were used accordingly based on the normality test result. The data were compared using medians and interquartile ranges (IQR) to demonstrate the changes in feedback across cohorts. If the data did not follow a normal distribution, medians were used as a measure of central tendency. Kruskal–Wallis *H*-Test was utilised to evaluate statistical significance across the 6 cohorts (Years 1, 2, 3, 4, 5, 6; see Table S1). Wilcoxon Rank Test was used to compare the efficacy of learning physical examination between clinical images and videos (see Figure S3). Data were processed with Microsoft Excel 2023 and SPSS Version 27.

Results

Survey Participants

Out of a total of 428 participants in the teaching session, 337 (78.7%) responded to the survey. Participants who were not medical students were excluded from the data set (Figure 1 and Table S2), making it a total of 315 responses. A 29.8% of

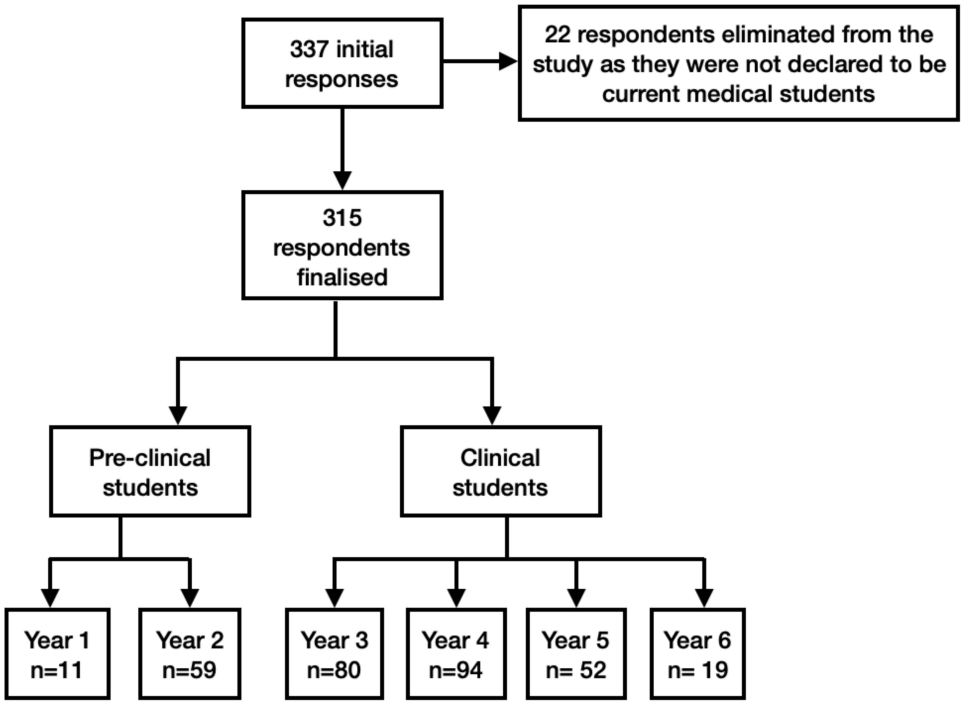

Figure 1 A summary of participants in the study. 337 attendees filled in the questionnaire after the OSCE teaching session. The study purpose was explained and by proceeding with the questionnaire, participants consented to their responses to be included in the study. 22 respondents were disqualified as they were not medical students. 315 responses were evaluated for this study and participants were divided into two broad groups, preclinical and clinical students.

responses were derived from students in their fourth year of medical school, which was the largest cohort compared to Years 1, 2, 3, 5 and 6.

Questionnaire Analysis

Considering the sample size of this study (n=315), the Kolmogorov–Smirnov test was suitable for evaluating whether the data came from a normal distribution. The Kolmogorov–Smirnov test was done, and the significance was recorded (S1). It was evident that the data did not follow a normal distribution ($p < 0.05$), hence non-parametric evaluation methods were used to analyse statistical significance.

Most respondents were somewhat confident with recognising clinical signs during physical examinations (Median 7, IQR 6–8; Figure 2). Medical students in Years 5 and 6 had a higher upper quartile (Q3 = 9) than students from Years 1,2,3 and 4 (Q3 = 8) (Figure 2).

When asked about the quality of current online resources, the median score across Year 2, 3, 4, 5 and 6 cohorts ranged between 6 and 7 out of 10 (Figure 3). This meant most respondents across all year groups believed that whilst there were resources, there was still an insufficient number of high-quality clinical images for their learning. The year 1 cohort, except for one outlier, was the only group where all respondents agreed with the statement to a certain extent (Figure 3). Again, the data were not normally distributed, and so were tested under the Kolmogorov–Smirnov test. A Kruskal Wallis *H*-test gave a $\chi^2(2)$ value of 14.209 ($p = 0.014$). The result was statistically significant with a mean rank Likert score of 203.68 for Year 1, 133.76 for Year 2, 148.41 for Year 3, 156.31 for Year 4, 187.63 for Year 5, and 174.45 for Year 6 (Table S1). The results aligned with the observations made in Figure 3. Among the Year 3 and 4 groups, the rating ranged from 1 to 10, suggesting students' learning experiences could still vary greatly despite being in the same cohort. Images of clinical signs included content found online and in textbooks or teaching materials.

Whilst images could be found in a wide range of resources, videos were more constrained to online resources. The data suggested a significant polarity in opinions where respondents either strongly agreed or strongly disagreed that there were enough high-quality videos of real clinical signs available online (Figure 4).

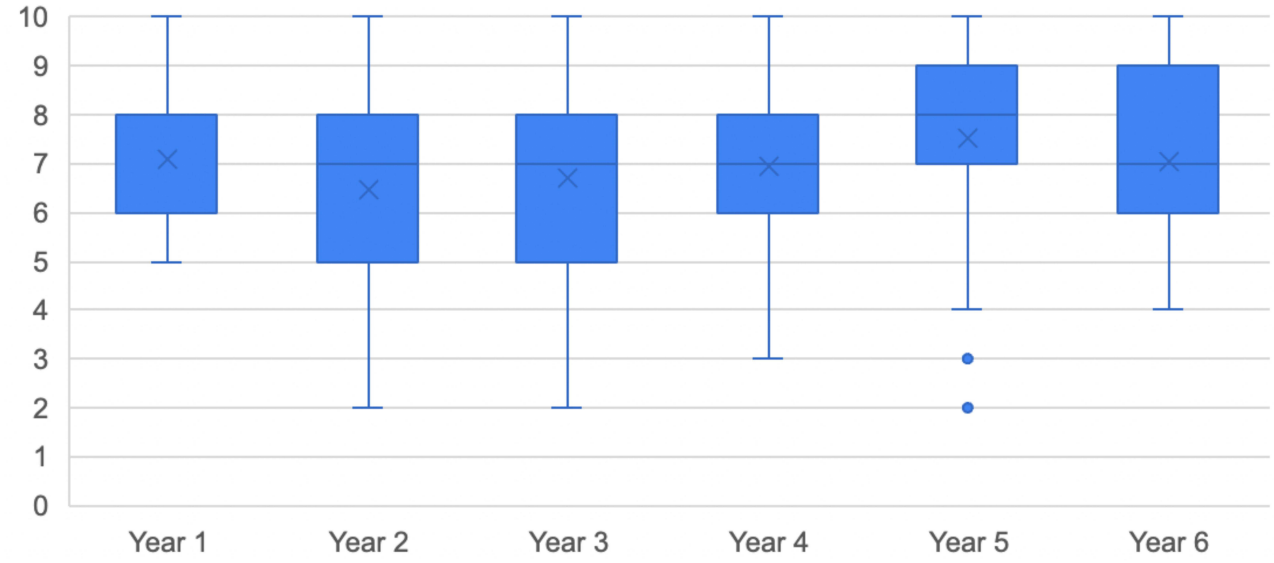

Figure 2 Participants were asked "To what extent do you agree with the statement: 'I feel confident in my ability to recognize the appearance of clinical signs during physical examinations'". Their confidence with recognising clinical signs were rated on a 10-point Likert Scale and result was organised with a box and whisker plot. Scores were sorted in descending order and divided into four equal sized groups (quartiles). The box represented the range of scores rated by the middle 50% of each population, with the top end representing the upper quartile (75%) and the bottom end being the lower quartile (25%). The whiskers represented the range of scores rated outside of the middle 50% population. The top and bottom end of the whiskers indicated the highest and lowest score each group gave.

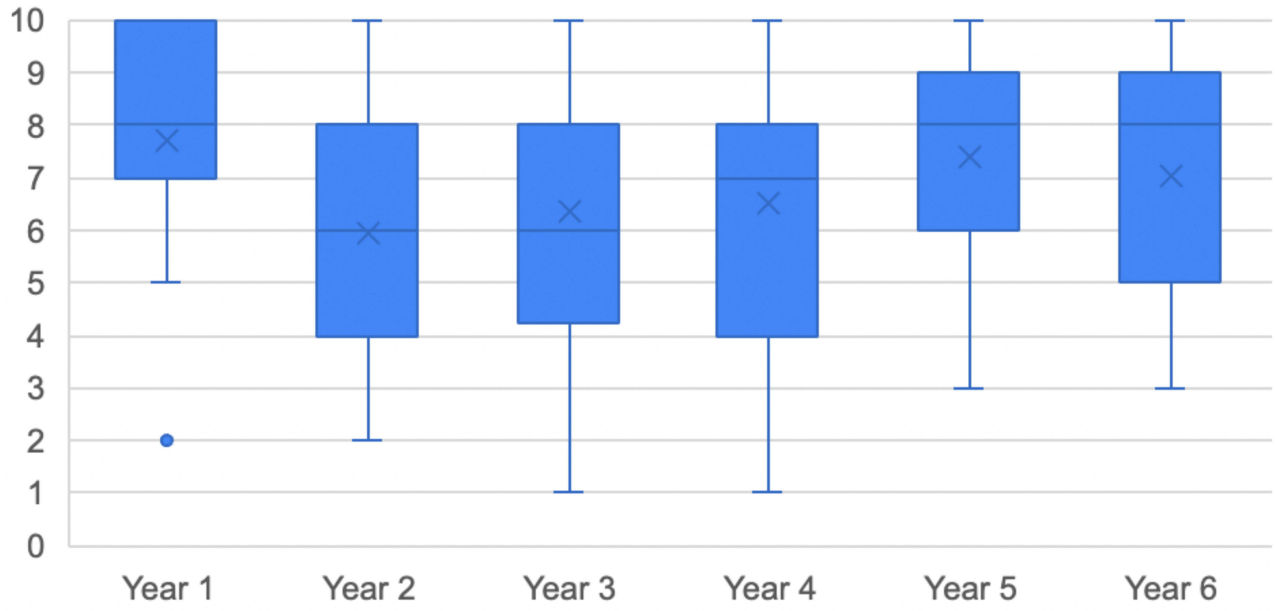

Figure 3 Box and whisker plot displaying participants' rating of the quality of current learning resources available on a 10-point Likert scale. Participants were asked "To what extent do you agree with the statement: 'Current available OSCE preparation resources include a sufficient number of high-quality images of real clinical signs to learn physical examinations".

A significant number of respondents (98.41%) agreed that an online resources bank or website with a collection of high-quality images and videos of clinical signs would be beneficial for their learning. The general demand for images and videos of clinical signs increased as students' progressed throughout their training (Figures 5 and 6). A Wilcoxon Rank Test was run to study whether respondents preferred clinical images more than videos, or vice versa (Table 1). Clinical images (Mean = 7.07) were preferred over videos (Mean = 6.81). The ranks table in Table 1 also showed that 97 participants preferred learning physical examinations with images over videos. Sixty-seven participants favoured videos

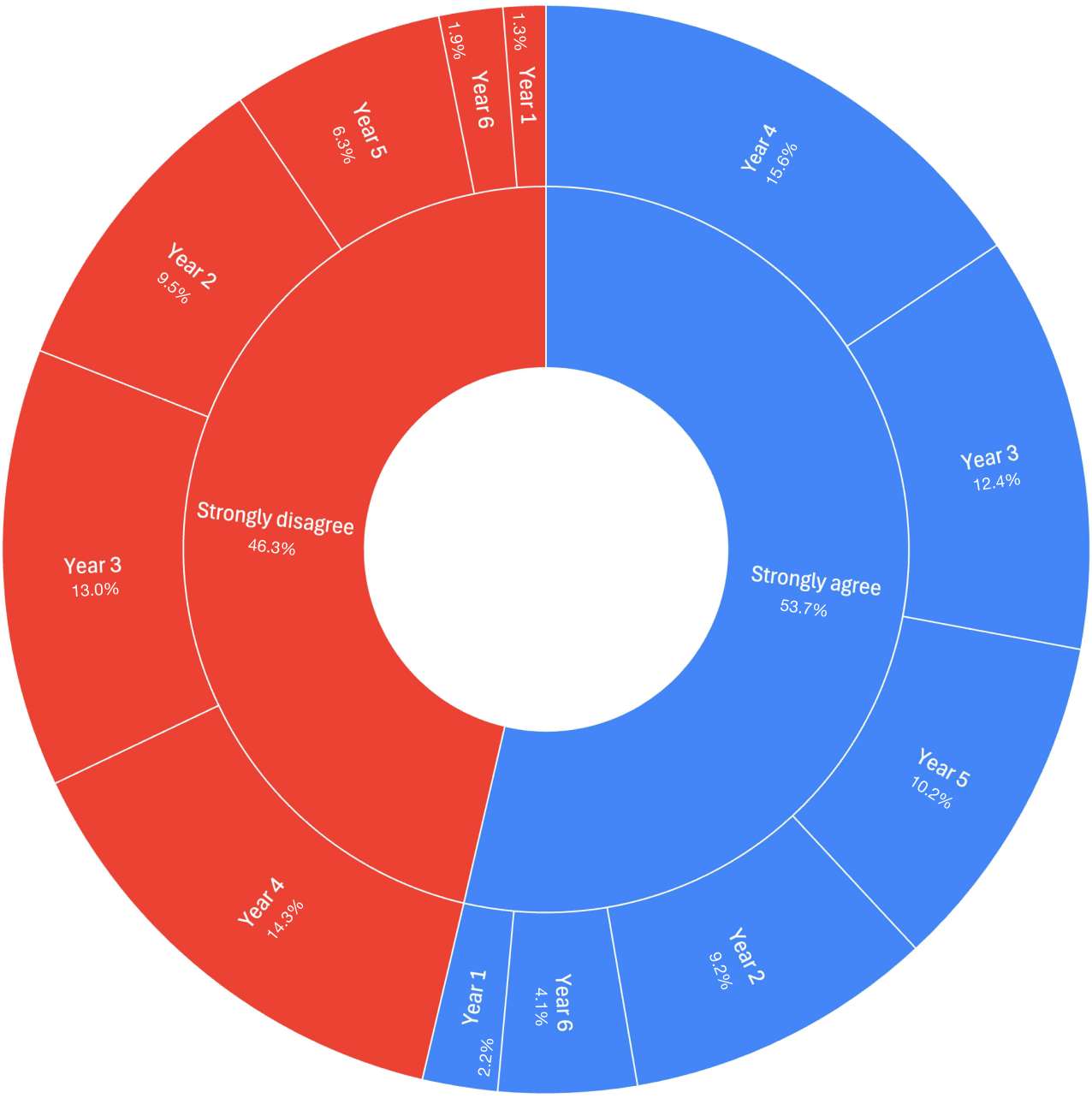

Figure 4 Pie chart showing the distribution of the 6 cohorts' opinions on whether current resources are sufficient for learning physical examinations. Participants were asked "To what extent do you agree with the statement: 'Current available OSCE preparation resources include a sufficient number of high-quality videos of real clinical signs to learn physical examinations".

over images and 151 participants saw no difference between the two. A Wilcoxon signed-rank test showed that there was a statistically significant difference in participants' preference for studying physical examinations with clinical images and videos ($Z = -2.446$, $p = 0.014$). In summary, participants believed that they were more likely to learn physical examinations using clinical images than videos.

With the relevance of using images and videos as study resources established from the results above, it was vital to evaluate the accessibility and quality of the resources. In general, regardless of the amount or quality of the resources, 96% of correspondents felt that they knew where to gain access to some sort of clinical images or videos. When asked about their awareness of where the resources could be found, only 15% of correspondents claimed that they were extremely confident with getting high-quality and reliable clinical images and 13% for the videos (Figure 7).

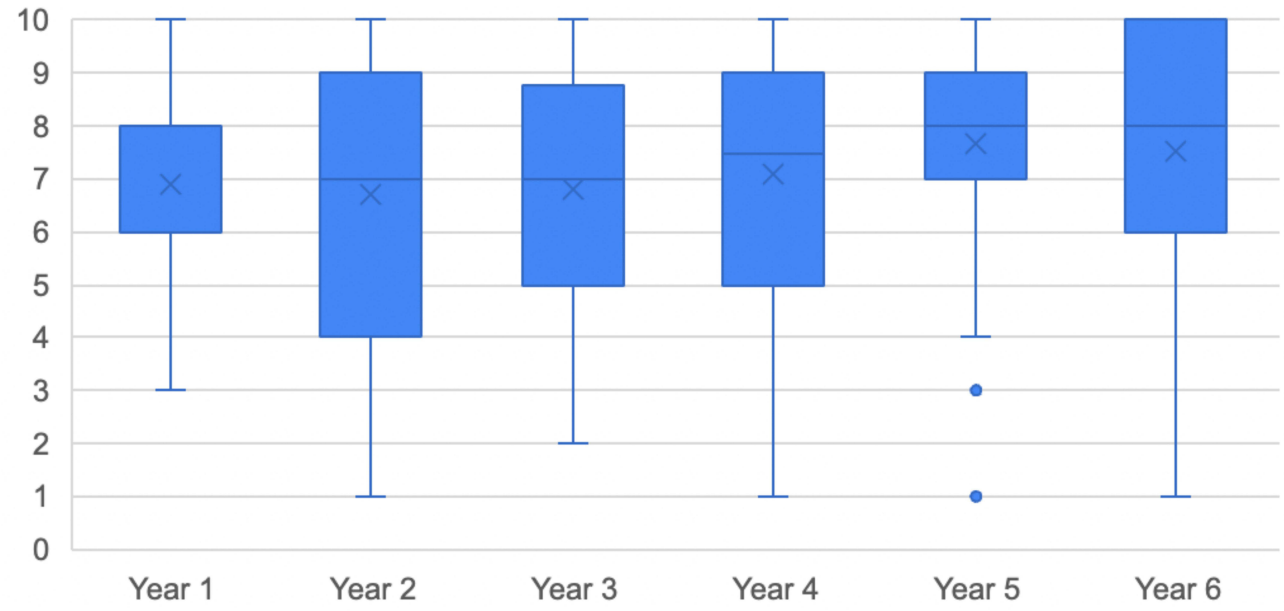

Figure 5 Box and whisker plot presenting the frequency of medical students using clinical images to study physical examinations. Participants were asked "To what extent do you agree with the statement: 'I regularly look at real images of clinical signs to learn physical examinations".

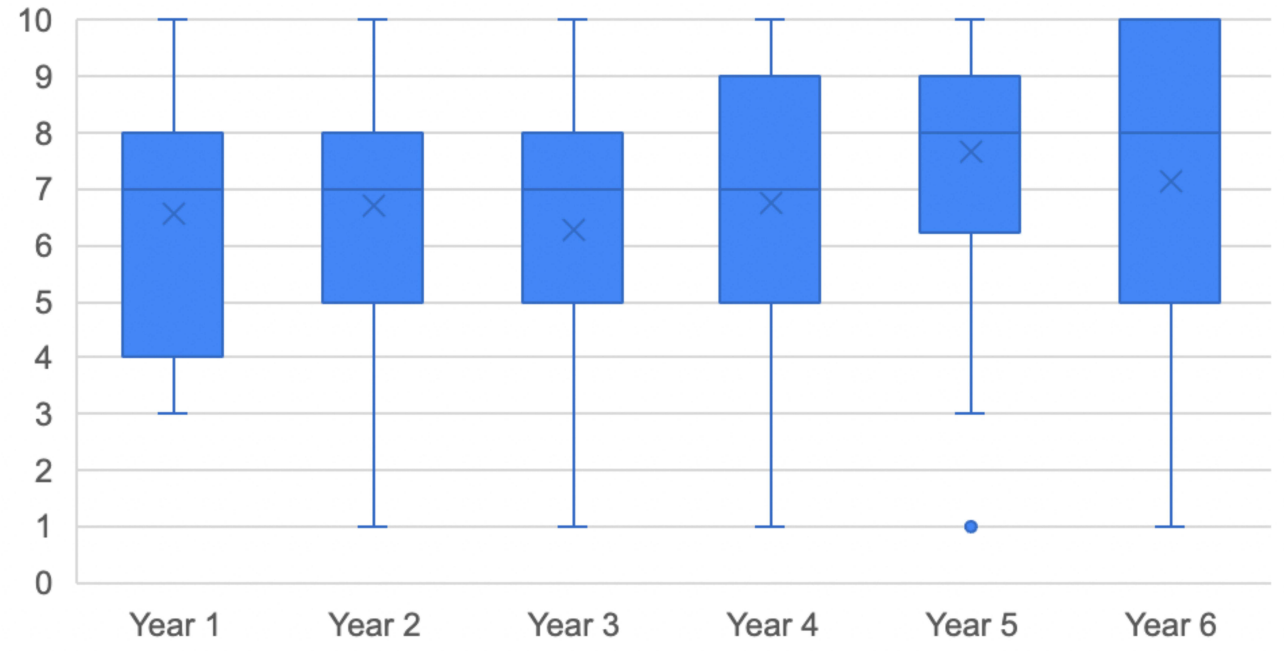

Figure 6 Box and whisker plot presenting the frequency of medical students using clinical videos to study physical examinations. Participants were asked "To what extent do you agree with the statement: 'I regularly look at real videos of clinical signs to learn physical examinations".

The survey also asked participants which specific platform or resources they used regularly. Referring to the word cloud generated from their response, most correspondents got their clinical images from platforms such as OSCE revision websites (72%), YouTube (69%) and Google images (50%). Of the 315 responses, 29% of respondents mentioned using physical textbooks as resources. With the abundant number of clinical images available across the internet, physical textbooks seem to be a less popular resource of choice. Similarly, YouTube (56%) and OSCE revision websites, such as "Geeky Medics" (42%), were the most popular platforms for accessing video clinical content (Figures 8 and 9).

Table 1 Result of Wilcoxon Rank Test on Whether Clinical Images Were Significantly More Important Than Clinical Videos, or Vice Versa. Table describing whether clinical images were significantly more important than clinical videos

Descriptive Statistics		Mean	Std. deviation	Percentile		
				25th	50th (Median)	75th
Q2) Rating the importance of images in studying clinical signs (Scale of 1–10)		7.07	2.331	6.00	7.00	9.00
Q3) Rating the importance of videos in studying clinical signs (Scale of 1–10)		6.81	2.459	5.00	7.00	9.00
Ranks Table				N	Mean Rank	Sum of Ranks
Q3 – Q2	Negative Ranks[a]			97	84.87	8232.00
	Positive Ranks[b]			67	79.07	5298.00
	Ties[c]			151		
	Totals			315		
Test Statistics Table						
Z (Q3 – Q2)				−2.446		
Asymp. Sig (2-tailed)				0.014		

Notes: [a]For scores where Q3 (Video) < Q2 (Image). This meant that participants preferred images over videos. [b]Positive Ranks: For scores where Q3 (Video) > Q2 (Image). This meant that participants preferred videos over images. [c]Ties: For scores where Q3 (Video) = Q2 (Image). This meant that participants saw no difference in the efficacy of using clinical videos or images.

Discussion

The results presented here show that students feel some confidence in identifying clinical signs and believe in the quality and quantity of the available images and videos. Images and videos are also accessible outside of the clinical environment, allowing students to strengthen their confidence in spot diagnosing. We see the use of images and videos in advertising and the ability for visual attention alongside the stimulation of emotions to impact long-term memory in

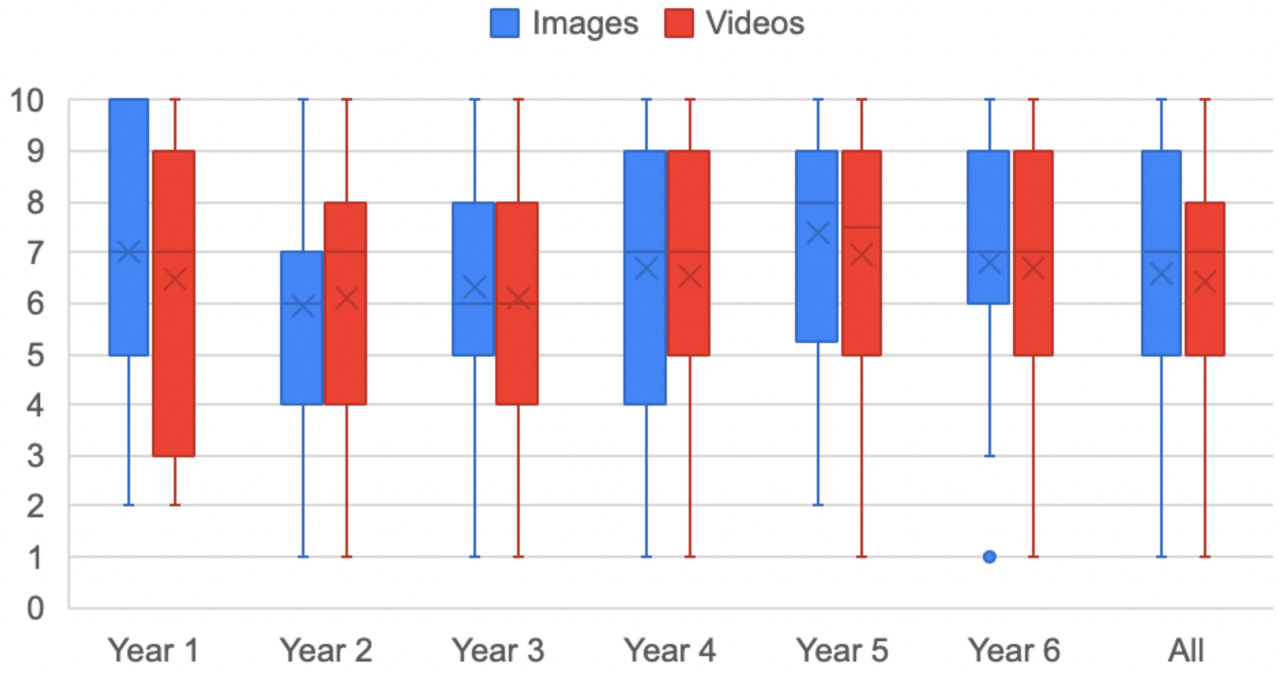

Figure 7 Box and whisker plot displaying participants' knowledge on whether to access images or videos as learning resources. Participants were asked "To what extent do you agree with the statement: 'I am aware of where to access images or videos of real clinical signs to learn physical examinations".

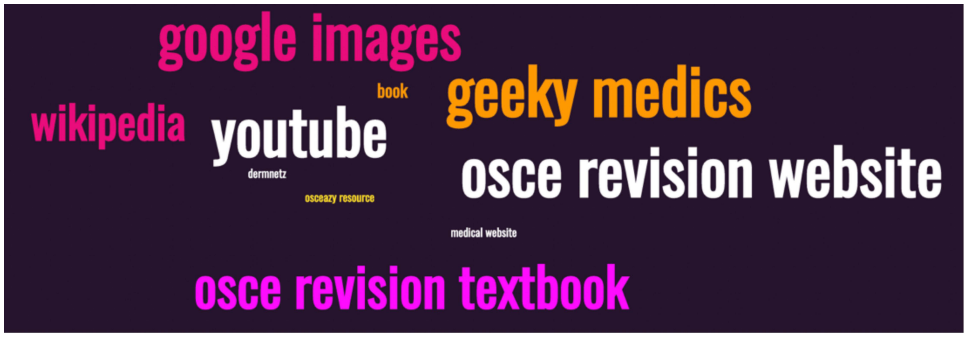

Figure 8 Word cloud showing which resources individuals used to access images of real clinical signs.

Figure 9 Word cloud showing which resources individuals used to access videos of real clinical signs.

most aspects of present-day life.[22] Clinical images and videos could employ a more engaging approach to capture students' attention and utilise mnemonics and pattern recognition comparisons to help ingrain the learning point to long-term memory. A study on the efficacy of audio-visual mnemonics in memory retention of medical sciences found a statistically significant difference between the control group and the mnemonic group.[23] Another study on harnessing the internet and cartoon drawings for medical education has shown promise in using images to teach students. It is also important to consider that there are some major barriers to accessing these resources such as the cost implications and the access to WiFi which may hinder some students.[24] Wynter et al have identified the resources that most students access, which include question banks and online tutorials.[20] The study however does not represent the number of clinical images and videos that the students are exposed to and what is the significance of this.

Although clinical images and videos can help students increase their awareness of the clinical presentations, the data presented in our study suggest that there is a great discrepancy between how reliable each resource is perceived by the users (Figures 8 and 9). Of all the online resources that were reported as most-used by the respondents, the online notes platform, "Geeky Medics", textbooks and lecture notes are those resources that are reviewed/developed by specialty experts. This recognition and use of reliable source material correlates with the findings of Wynter et al[20]. Other resources, such as Wikipedia, have an abundance of clinical images and videos, but not all the contents are trusted and published by reliable organisations.[25–27] Azer et al[19] have employed DISCERN scores and identified that although Wikipedia has covered the aetiology and clinical picture of diseases, there were notable deficiencies in the signs and symptoms of pathologies. This is concordant with our hypothesis, where there is not enough reliable information about the presentation of clinical signs.

Students should not solely rely on online imagery of clinical signs, as they do not give a holistic assessment of the patient.[28] This factor reflects the increasing need to incorporate videos and images into clinical practice. The data presented here suggest that students are somewhat aware of where to access these resources, but there may need to be a greater emphasis on them. This further reinforces the need to integrate images into clinical teaching so that students can orientate themselves around the presenting pathology. Clinicians understand that not every patient is the same, however students with less experience in the clinical environment only have model patients, didactic teaching, and reference material to build their understanding of clinical signs and may not have the same appreciation for this variation. A study conducted by Sulaiman et al[29] shows that assessing clinical competency using clinical images and videos can prove to be beneficial in pattern recognition for clinical diagnoses. The test involves clinical reasoning and decision-making in the format of clinical images and videos. The study recognises that the test is a good indicator of clinical reasoning and decision-making and thus clinical signs are crucial for clinicians in their decision-making process.

In the data presented in this study, videos and images of clinical signs were perceived by participants as an "aid" in learning, where students would learn the clinical signs and then see them in the clinical environment. The data suggest that students find images very important in helping with identifying clinical signs in examinations (Table 1). An analysis by Makdissi et al[28] identified that images and videos can be useful adjuncts in the assessment of pathologies, but they should not replace a multimodal clinical assessment. Images of a presenting complaint can be used to portray a clinical scenario, but it does not replace the value of speaking to the patient and gaining real-world experience alongside images and videos.

The use of exemplar images as a learning and reference resource is supported by several theoretical frameworks for learning. Cognitive learning theory can be integrated into teaching, by facilitating greater retention of information through spaced repetition, revisiting key points, interleaving, generation, self-practice and reflection and elaboration.[30] A study conducted by McSparron et al[22] mentions that

> by invoking a metaphor or visual image when teaching, or by putting a concept into our own words, the skill of elaboration is employed. This form of elaboration expands mental cues for later recall and transfer of information.

Using visual cues has the potential to reinforce the understanding of relevant knowledge, and this has a two-way effect: memory reinforcement for the teacher and the introduction of the topic for the learner. From this, the learner can continue the cycle of the cognitive learning theory, and thus using images and videos of clinical signs can prove efficient in memory retention.

Experience-based learning revolves around the principle of applying lessons from the classroom to clinical practice under guidance from expert clinicians to reinforce understanding.[5] Using images in parallel can prove to be of benefit as both models have been shown to work. We have shown that students somewhat regularly look at clinical footage and know where to access them to a certain degree (Figures 5–7). By regularly looking at clinical signs, students can introduce themselves to the pathology and what to potentially look for. Clinicians should implement this into their teachings to help students get as much exposure as possible to the variation of presentations, to reinforce the idea that no two patients will present identically.

Finally, dual-coding theory[11] can be applied to medical students learning clinical signs with images and videos. Visuospatial and phonological pathways are first stimulated when students watch a video with visual materials related to the content. Memory traces of the clinical signs are then reinforced in clinical environments when they see the signs on patients.

Limitations

We have yet to consider the difficulty of obtaining medical photography. The ethical and legal principles of medical photography are barriers to the publication of clinical signs. There have been cases of clinicians who have been disciplined for inappropriate illustrations of clinical photographs. However, studies show that patients are generally compliant with their clinical presentations being published, if there is informed consent, anonymity, and appropriate equipment.[31] Specialist-reviewed visual resources would be useful for learning, but the production of these materials depends on funding and dedication to commit.

Furthermore, this study relies on self-reported benefits on learning for the participants. The methodology did not assess students' actual interpretation of clinical signs on images and compared it to an intervention which measured actual learning gain. An objective assessment of impact on learning would facilitate gaining an accurate understanding of whether medical students benefit from exposure to real clinical images and videos in identifying clinical signs. Ideally, one would collate data on how the intervention has improved participants' ability to identify clinical signs via a spot diagnosis.

Conclusion

The data presented here provide a rationale to create a resource bank for students to access high quality and wide-spanning database of clinical photography. The COVID-19 pandemic caused an unprecedented shift in medical education and the continuation of high-quality medical education is crucial to help future physicians strive for competent clinical practice. Scientific evidence and participant data support the effective use of clinical images and videos to reinforce clinical knowledge.

The use of virtual platforms to learn clinical signs has made a shift from being a supplementary resource to becoming one of the mainstream choices of learning medium with participants feeling that seeing clinical images and videos is an important aspect of learning clinical signs.

There must however be a quality control to the clinical images and videos employed to teach medical students of clinical signs. A national repository of these would allow for an array of high-quality illustrations of clinical signs. Medical students should also be informed of these resources, and there must be a greater emphasis on differentiating high-quality to low-quality images and videos.

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Disclosure

The authors report no conflicts of interest.

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