

## ORIGINAL RESEARCH

## Use of smartphones to aid the teaching of equine ocular fundus examination

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**Introduction**

Teaching procedural skills is one of the greatest challenges in veterinary medical education. For example, when learning how to perform an ophthalmic examination, students often have to rely on description to correctly interpret what they see with direct ophthalmoscopy. However, this can result in misunderstanding, which ultimately undermines students' self-confidence. Hand-held tools, such as smartphones, that allow visualisation of the ocular fundus on a screen visible to more than one operator could, therefore, aid the teaching of ophthalmic examinations to veterinary students.

The aims of this study were to establish whether students would find using a smartphone alongside traditional teaching methods for ophthalmic examination useful, and whether the use of the smartphone would have a positive impact on students' confidence.

**Approach**

A total of 30 fourth-year undergraduate veterinary students from the University of Nottingham that participated in an optional revision practical on equine ophthalmology were recruited to the study. The traditional teaching portion of the practical included a brief review of ophthalmic anatomy as well as a practical demonstration of how to use a hand-help direct ophthalmoscope. The students then practised visualising the tapetal fundus, non-tapetal fundus, optic disc and associated blood vessels.

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**Still frame of the equine optic disc and related blood vessels obtained from a smartphone recording**

**KEY FINDINGS**

- Smartphones were found to be a useful aid to traditional teaching of the examination of the equine ocular fundus and have a positive impact on students' confidence in performing the procedure.

After the traditional teaching session was completed, the teacher used a smartphone to demonstrate how changing the position and direction of the ophthalmoscope would influence the structures visualised. A video was then recorded, and the findings were discussed with the students. The students then attempted the examination with the ophthalmoscope again.

After the practical, the students completed a questionnaire to determine the effect of the practical on their confidence in carrying out the procedure and whether they found the use of the smartphone helpful as an aid to traditional teaching.

**Results**

Students' confidence in performing direct ophthalmoscopy significantly increased after the practical ( $P < 0.001$ ). The perceived usefulness of traditional teaching was 62.3 ( $\pm 23.8$ ) per cent, and the perceived usefulness of teaching with the smartphone was 91.1 ( $\pm 8.6$ ) per cent. While students found both methods useful, they perceived the teaching using the smartphone to be significantly more useful ( $P < 0.001$ ).

**Interpretation**

The results of this study indicate that the addition of smartphones to the traditional teaching of the equine ophthalmic examination has a positive effect on student confidence and learning. However, the study lacked a control group of students that repeated the examination with the ophthalmoscope without the aid of a smartphone. Therefore, the positive outcome may be due to increased learning opportunity rather than a true effect of the use of the smartphone.

Furthermore, asking students to complete the questionnaire at the end of the practical might have influenced how they perceived traditional teaching compared with teaching using the smartphone. However, asking them to complete the questionnaire during the practical would have been disruptive to the learning process.

**Significance of findings**

The use of a smartphone alongside traditional teaching methods helps students to better understand how to orient the ophthalmoscope to visualise different areas of the equine fundus.

The use of smartphones may also have value in telemedicine, where a vet could seek a second opinion from a specialist by simply sharing a video collected with a smartphone rather than providing a wordy description of the ophthalmoscopic findings.