

A COMPARISON BETWEEN VIDEO BIO AND STANDARD BIO

by

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A Comparison Between Video Bio And Standard Bio

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ABSTRACT

Background: As an optometrist, one needs to be comfortable and exceptional at binocular indirect ophthalmoscopy (BIO) to evaluate the internal health of the eye. The purpose of this study is to compare student's abilities to perform a dilated fundus examination (DFE) using their own standard BIO and a provided video BIO. *Methods:* Subjects will consist of 15 third year optometry students. Subjects will then be assigned to time slots where they will perform BIO and be graded on their skills. They will first use their own equipment with a teaching mirror on, then again with a video BIO. Both researchers will be grading each individual then scores will be compared. *Results:* Statistical analysis was done to compare participants personal BIO scores to their video BIO scores. The difference between the two graders scores were analyzed. Participants and graders subjective observations on the entire process were also reported. *Conclusions:* Participants scored much higher with the standard BIO versus the video BIO. Grades were also much more consistent between graders with the standard BIO. Participants were more confident in their skills and felt more comfortable using the standard BIO.

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CHAPTER 1

INTRODUCTION

In 1861, Marc-Antoine Giraud-Teulon of France created the first binocular indirect ophthalmoscope (BIO)¹. The first head-mounted BIO was developed in 1947, which became the standard method of ophthalmoscopy by ophthalmologists². Throughout the years, the BIO has been revamped and updated to become the sophisticated piece of equipment that it is today. As optometrists, it is an essential part of performing a complete eye examination. It allows you to evaluate the internal health of the eye, which is a large part of our responsibility as eye care providers. It provides a stereoscopic wide field of view that is not affected by the refractive state of the patient³. Both ocular and systemic conditions can be detected through dilated fundus examinations (DFE) with the use of a BIO. Optometrists need to be proficient at this skill to provide quality patient care. New methods of learning and teaching how to perform a DFE with the use of a BIO are constantly being developed to make this process more efficient and educational. One such method is the video BIO.

Video BIO's were introduced to bring another aspect to the optometric world. It was thought to have the potential to revolutionize the entire ophthalmoscopy procedure. It can be beneficial for educators and students, as well as patients. Educators can use it to demonstrate to students proper views that they can watch in real time. Students can be

recorded, so they have the ability to review their skills, seeing areas where they excel and areas where they need to improve. As far as incorporating the video BIO into practice in the real world, it can be an excellent tool for patient education. Patient's can be shown exactly what the doctor is viewing to provide a greater understanding of their ocular condition. This can improve optometrist's image from a patients prospective by physically showing them the extent of their skills and scope of practice. Our research was conducted to determine whether a video BIO can be used as a supplement when teaching or performing a DFE in optometry school, and possibly later in optometric practice.

CHAPTER 2

METHODS

In this research, we will be evaluating subject's BIO skills while using their own standard BIO with a teaching mirror and then using a Keeler video BIO (Figure 1). In clinic, these pieces of equipment are used to evaluate a patient's retina. In this research, we will use simulated plastic eyes to eliminate patient variables between the subjects, as well as eliminating having to dilate other subjects. BIO is originally taught on the simulated eyes, so students are familiar with them. The simulated eyes will be set up in the examination lanes in the Michigan College of Optometry procedures lab. Both investigators will be present during each session and will have their own grading forms.

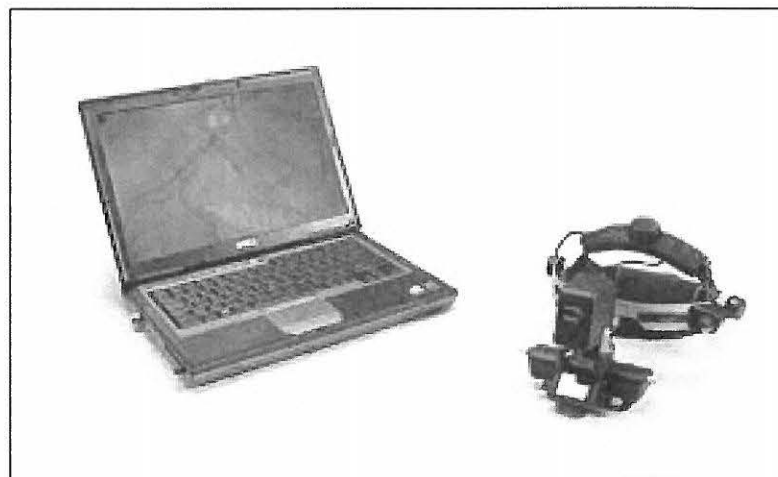


Figure 1. Keeler Video BIO

An email was sent to third year optometry students asking for volunteers to participate in the research. Once volunteers were recruited, a signed consent form was obtained from each individual and a time slot and number was assigned to the participant. Number assignments kept individuals anonymous throughout the study. Upon arrival to their appointed time slot, subjects completed a portion of a short questionnaire regarding their personal BIO information and skills. Participants brought their own BIO and 20 diopter (D) condensing lens, and the Keeler video BIO was provided.

The first round of evaluation was done with the teaching mirror connected to their personal BIO, allowing the examiners to obtain images of the subject's views. The subject performed a retinal examination, obtaining nine specified views on the plastic eye. Each view was observed and graded by both examiners. Once all nine views were obtained, the subject repeated the examination using the Keeler video BIO. After completing the second examination, subjects finished their questionnaire, assessing their degree of comfort with each BIO.

Both researchers graded the video recordings from the Keeler BIO privately. An analysis was made to see how subject's scores differed between using their own standard BIO versus the Keeler video BIO. The subject's scores were kept anonymous and did not have any effect on their academic standing at MCO.

CHAPTER 3

RESULTS

Subjects for this study consisted of 15 third year optometry students from the Michigan College of Optometry. Participants number one and two will be excluded from the sample due to technical difficulties regarding their video BIO recordings. This left a sample size of 13. The subjects were first asked to complete a short survey. They were first asked which brand of BIO they own. Eleven of the participants answered Heine (Figure 2), while the remaining two answered Welch Allyn (Figure 3). They were then asked how comfortable they were with their BIO skills in general on a scale of 1-5, 5 being extremely comfortable and 1 being very uncomfortable. Eleven of the participants answered 4, while the remaining two answered 3.

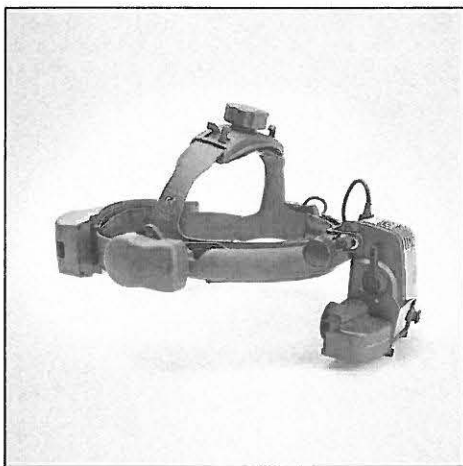
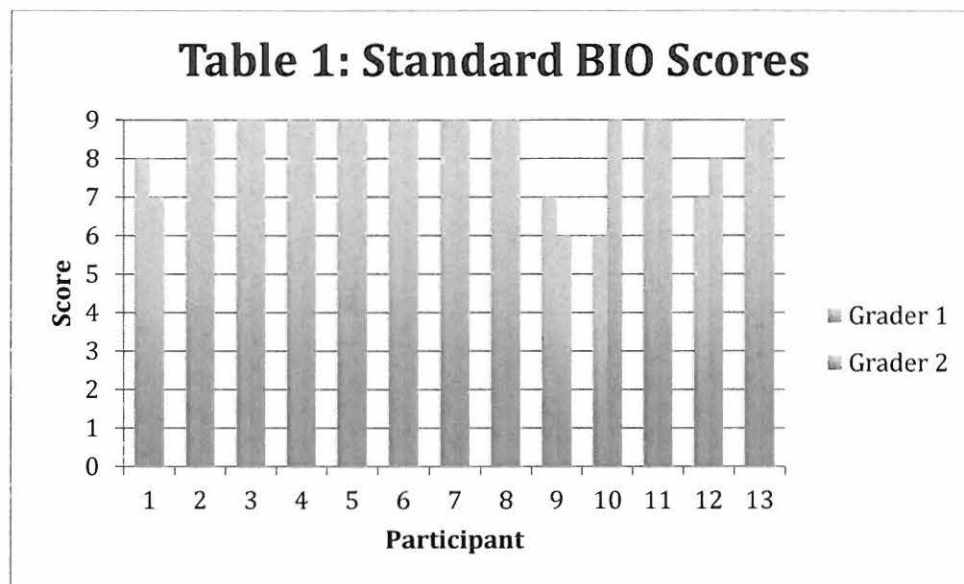


Figure 2. Heine BIO



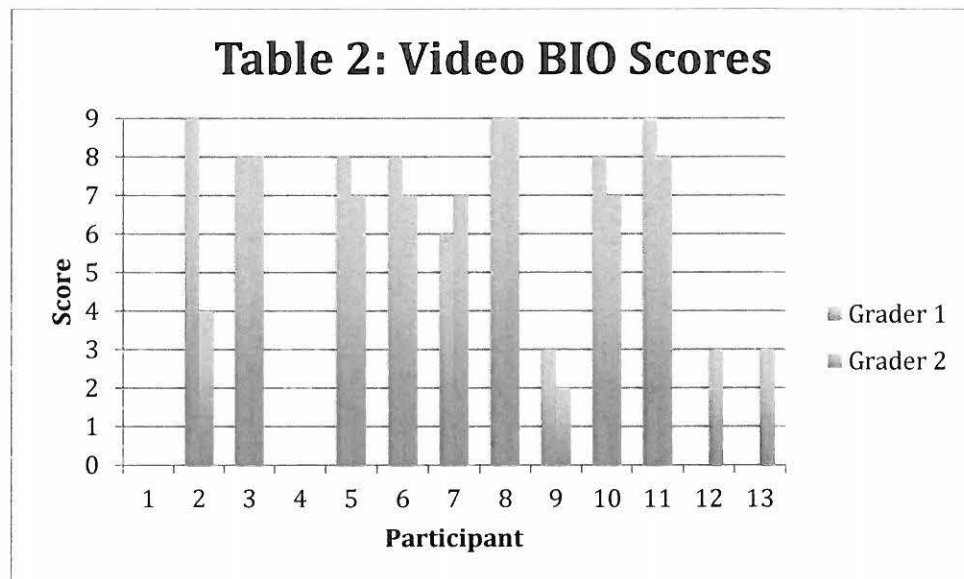
Figure 3. Welch Allyn BIO

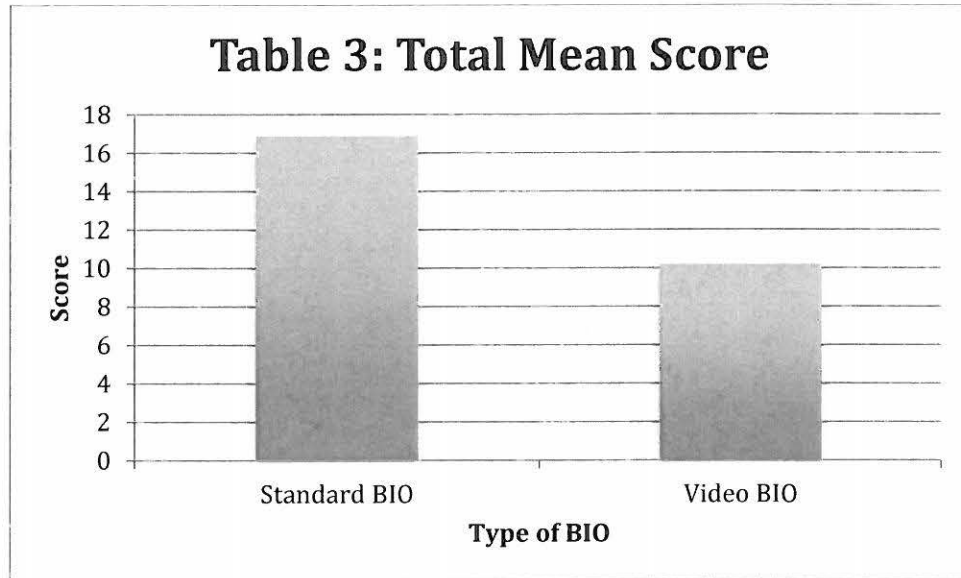
After completing this portion of the survey, each participant was graded by both examiners on their simulated DFE on a plastic eye (Table 1). This was done in real time while the examiners viewed the teaching mirror attached to the participant's BIO. Eight different views of the peripheral retina were to be attempted, as well as one view of the posterior pole, reaching a total of 9 views. A raw score out of 9 was given to each subject. In order for a view to be given credit, it had to fill at least 75% of the lens and be a clear image. The mean score for grader number 1 was 8.4 \pm 1.0. The mean score for grader number 2 was 8.5 \pm 1.0. This shows a 1.8% difference between the two graders. The two scores were then added together, giving a total score out of 18. The mean score was 16.9 \pm 1.8.



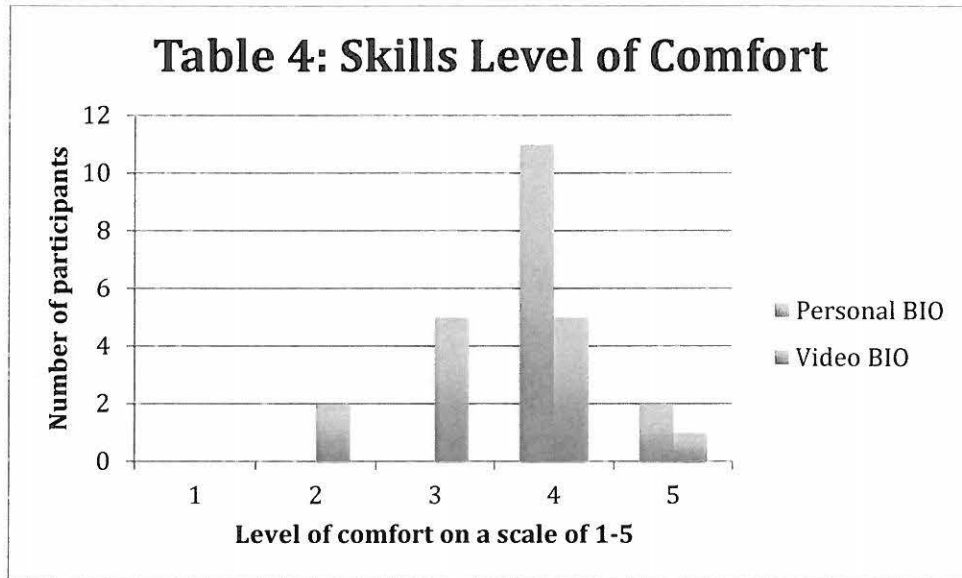
The video BIO recordings were graded by each examiner individually at a later date (Table 2). The same views had to be obtained, and the same criteria were used to

give credit for each view. The mean score for grader number 1 was 5.2+/-4.0. The mean score for grader number 2 was 5.0+/-3.1. This shows a 4.5% difference between the two graders. The two scores were then added together, giving a total score out of 18. The mean score was 10.2+/-3.9. It is also worth noting that there were two participants who received a score of zero with at least one grader, and two participants who received a score of zero from both graders. The mean video BIO score was 49.3% lower than the mean standard BIO score (Table 3). The mean scores between the standard BIO and video BIO were compared with a two-sample t-test, assuming unequal variances with a 95% confidence interval. This gave a p-value of 0.003, showing a statistically significant difference between the two scores.





Following their simulated DFE's, the participants were asked to complete the questionnaire. Again on a scale of 1-5, 5 being extremely comfortable and 1 being very uncomfortable, they were asked to rank how comfortable they felt using their own BIO and the video BIO. When it came to their personal BIO, two participants answered 5 and 11 answered 4. When it came to the video BIO, one participant answered 5, five participants answered 4, five participants answered 3, and two participants answered 2 (Table 4).



Finally, they were asked if they rated any of the above 3 or less, what do they think can be done to help improve their confidence in each. Answers for their comfort level with their BIO skills in general included: more practice on inferior views and more practice on those with smaller pupils and who struggle to keep their eyes open. Answers for their comfort level with the video BIO included: practice with the video BIO on patients in clinic, being able to view an example recording of a video BIO, simply more practice with the video BIO, being able to view your own recording with the video BIO to see how well it correlates, and being able to better adjust the video BIO. There was also mention of the video BIO being cumbersome, uncomfortable, having a lot of wires, and being unfamiliar due to the fact it was a different brand than their personal BIO.

CHAPTER 4

DISCUSSION

After completion of the study and data analysis, interesting conclusions were made when comparing the video BIO to the standard BIO. Comparisons including how the BIO grading scores differed both between the graders and between each other were examined. Comparisons between individual participants were analyzed as well. Findings related to the overall experience between the two differing types of BIO's were also reviewed.

There are some factors that must be taken into consideration when comparing the scoring. First, the scoring by each grader is subjective. Even though the graders were given the same rubric, it is each grader's personal opinion whether or not 75% of the lens was filled and if the image was clear. With this being said, variability in scoring between grader 1 and 2 with the subjects personal, standard BIO was minimal. The scores were extremely similar for each participant. The scores with the video BIO do not show the same consistency. There was a vast difference between the average score between the two graders. This shows there is more variability when viewing images with the video BIO in comparison with a standard BIO. The exact reason for this is unknown, but one might hypothesize that the video recordings are not quite as definitive and clear as they appear when viewing through a teaching mirror. This, in turn, leads to greater instability

and subjectivity when deciphering whether or not a participant gets credit for a particular view.

To further demonstrate how the video BIO and the standard BIO differed in this study, comparisons were made between average scores. The total average score, done by adding together the scores from both graders, for the standard BIO was significantly greater than that for the video BIO. The average scores for the video BIO were nearly 50% lower than that for the standard BIO, exhibiting statistical significance. This proves that larger and clearer views were seen by the graders when looking through the teaching mirror as opposed to examining the video recordings.

It is interesting to note that there were no subjects to receive a score of zero, or anything below a 6 for that matter, with the standard BIO. There were, however, four subjects who earned a score of zero by at least one grader for the video BIO. Of the subjects that were given a zero, all of them received scores of 7 or higher from the individual graders when using the standard BIO. This demonstrates that the subjects do have the capability to perform a DFE and obtain clear views, filling the condensing lens, but for some reason had difficulty specifically with the video BIO. Once again, the exact reason for this is unknown, but we can make predictions as to why this might be the case. The participants might be having difficulty using the video BIO because it is unfamiliar, or maybe slightly uncomfortable. Another prediction is that the participant is obtaining a clear image from his or her point of view, but it somehow is not translating through to the video recording. One thought is this could be some type of technical issue. Another thought is that the participant is accommodating to some degree, giving them a clear

view, but this accommodation does not transpire through the recording, causing the grader to see a blurry image.

Finally, subjective responses regarding how comfortable participants felt with the overall experience were reviewed. Participants had a more favorable response when it came to their standard BIO's. They were much more confident in their skills and felt it was a more comfortable piece of equipment to use. This is likely because their standard BIO is what they learned on and use on a regular basis. However, one might argue that because the video BIO is slightly more cumbersome and not quite as user friendly, this could also contribute to the lack of comfort experienced by the participants with this piece of equipment. The provided video BIO was also a different brand than any one of the participants own BIO, further making it less familiar.

With all that was stated above, it does not go to say that video BIO's are a device that should not be utilized. This tool has great potential as a useful item in education for students and patients. To be used properly and to its highest potential, there must be extra practice with the equipment and correct connection from the headset to the recording/video screen. This is especially true if the device is to be used for any type of student proficiency. It should be calibrated correctly to ensure the teacher/doctor viewing the video is able to see exactly what the student is observing. In time, the introduction of this device into offices and optometry schools is likely, as we are currently seeing it being used as a tool in national board testing for fourth year optometry students.

In conclusion, when comparing an evaluation and scoring done with a standard BIO with teaching mirror versus a video BIO, users performed better with the standard BIO. For a person who has not been thoroughly trained to use a video BIO, it is notably

harder to obtain adequate views that could be used for education or scoring. With numerical support proving a standard BIO with teaching mirror provides more consistent scoring between proctors and better quality images for viewers, a traditional BIO seems like the proper choice for testing-type situations at this point in time. With this being said, the video BIO has a tremendous amount of potential with recording capabilities and the ability to display images on large screens. Both types of BIO's allow for the user to obtain views of the retina, which is the ultimate goal for optometrists to provide proper patient care. Having the option to view a video to review these images is a great feature, and when trained or used properly, can be very educational for both patients and students.

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APPENDIX A
IRB APPROVAL LETTER