

A COMPARISON OF BINOCULAR INDIRECT OPHTHALMOSCOPE MODELS
AND PERFORMANCE ON NATIONAL BOARDS PART 3

by

Kristen Johnson and Alyssa Drew

This paper is submitted in partial fulfillment of the requirements for the degree of

Doctorate of Optometry

Ferris State University
Michigan College of Optometry

May, 2018

A COMPARISON OF BINOCULAR INDIRECT OPHTHALMOSCOPE MODELS
AND PERFORMANCE ON NATIONAL BOARDS PART 3

by

Kristen Johnson and Alyssa Drew

Has been approved

February 5th, 2018

APPROVED:



Faculty Advisor:

ACCEPTED:



Faculty Course Supervisor

Ferris State University
Doctor of Optometry Senior Paper
Library Approval and Release

A Comparison of Binocular Indirect Ophthalmoscope and Performance on
National Boards Part 3

We, Kristen Johnson and Alyssa Drew, hereby release this Paper as described above to Ferris State University with the understanding that it will be accessible to the general public. This release is required under the provisions of the Federal Privacy Act.



Doctoral Candidates

4/27/18

Date

ABSTRACT

Background: The purpose of this study is to investigate if there is a difference in performance when optometry students perform a binocular indirect ophthalmoscope (BIO) examination using their personal BIO versus using a video BIO. We are also investigating whether or not these students feel as though the video BIO is a fair assessment of their performance for the National Board of Examiners in Optometry (NBEO) Clinical Skills Exam. *Methods:* Twenty-five participants were given 10 minutes to familiarize themselves with the video BIO. Participants then performed two fundus examinations; one with their personal BIO with teaching mirror and one with the Keeler Vantage Plus video BIO. Performance was graded by both of the co-investigators and compared. The participants were also asked to fill out surveys comparing their comfort and confidence levels with their personal BIO as well as the video BIO before and after using it. *Results:* The results of this study show that participants are significantly more comfortable using their own BIO as compared to the video BIO. While comfort with the video BIO was low initially, it did increase after practice using the video BIO. Participants in our study performed significantly better with their personal BIO as compared to the video BIO, however, this did not appear to be reflected in part 3 NBEO boards scores, as the majority of the participants of the survey were able to pass the exam. *Conclusions:* While students feel more comfortable with their personal BIO, the use of the Video BIO does not appear to negatively impact a candidate's ability to successfully pass the BIO station on the clinical skills exam of part 3 NBEO.

TABLE OF CONTENTS

	Page
LIST OF TABLES.....	6
CHAPTER	
1 INTRODUCTION.....	7
2 METHODS.....	9
3 RESULTS.....	12
4 DISCUSSION.....	20
5 REFERENCES.....	22
APPENDIX	
A. IRB APPROVAL LETTER.....	23
B. TEST SUBJECT RECRUITMENT SCRIPT.....	25
C. BIO INFORMED CONSENT.....	26
D. TEST SUBJECT PRE AND POST SURVEY.....	29
E. BIO EVALUATION SHEET.....	31
F. ONLINE SURVEY TO MCO FOURTH YEAR STUDENTS.....	32

LIST OF TABLES

Table		Page
1	Average comfort level comparison.....	13
2	Average confidence level comparison.....	14
3	Comparison of co-investigators grades for Personal BIO evaluation.	15
4	Comparison of co-investigators grades for Keeler BIO evaluation....	15
5	Average scores for fundus evaluations.....	16
6	Hours spent preparing for part 3.....	17
7	BIO Experience part 3 NBEO.....	18

CHAPTER 1

INTRODUCTION TO BINOCULAR INDIRECT OPHTHALMOSCOPE MODELS AND PERFORMANCE ON NATIONAL BOARDS PART 3

In order for optometry students to become licensed as optometrists, they must successfully pass three examinations as set by the National Board of Examiners in Optometry (NBEO). The third portion of this examination is termed the clinical skills exam (CSE), where students perform a variety of skills learned throughout their optometry curriculum and are graded on their proficiency in these skills by examiners. One of these skills is evaluation of the fundus of a patient with an instrument called a binocular indirect ophthalmoscope (BIO). In the past, students would bring their personal BIO to the testing center and were evaluated with a teaching mirror which could be attached to the BIO and allow the examiner to view a reflection of what the student views when performing the exam. Within the last few years, the NBEO has switched to a video BIO, which transmits a feed of what the student is viewing to a monitor that an examiner views either in the room or remotely. Currently, NBEO is using the Keeler Vantage Plus video BIO.

In order for a student to obtain a clear image of a patient's fundus through their BIO, they must be able to converge and accommodate.¹ Often, +2.00D lenses are in the oculars of a BIO to lessen the accommodative demand, however, this increases the convergence demand.¹ Some students prefer to use plano lenses in their BIO. When a student is able to use their own BIO, they can select whichever lenses allow them to see a patient's fundus most clearly. There are also controls on a BIO for vertical light

adjustment and pupillary distance (PD) adjustment. While the video BIO allows students to make minimal vertical light adjustments and PD adjustments, it comes standard with +2.00D lenses which cannot be changed.

The purpose of this study is to investigate students' level of comfort, as well as their performance when evaluating a patient's fundus with a video BIO as compared to their level of comfort and their performance when using their personal BIO.

METHODS

Twenty-five students were recruited from the third year class at the Michigan College of Optometry to participate in this research study. The class was asked for voluntary participation using a pre-written recruitment script (Appendix B). Four stations were set up in the vision science lab at the Michigan College of Optometry building. The first station was for candidates to fill out their informed consent (Appendix C) and fill in part one of the survey relating to their level of comfort with their personal BIO and the Keeler video BIO (Appendix D). The second station had a Keeler Vantage Plus video BIO set up with the recording on a monitor along with a model eye (GWB International model) so that participants could practice with the Keeler video BIO for 10 minutes. Participants were then asked to fill out part two of the survey, which assessed their level of confidence in their views obtained after working with the Keeler video BIO. Station three included a model eye set up on a stand so that the vertical height and direction of the eye could be adjusted, and a fundus evaluation was performed with the student's personal BIO and assessed by the co-investigators. Station four included the same type of eye model which could be adjusted both vertically and horizontally for examination using the Keeler video BIO. The participant recorded their fundus evaluation at this station for the co-investigators to assess later.

Candidates were randomly assigned to begin with either station three or four after completing stations one and two. At station three, candidates were asked to obtain one posterior pole view and eight peripheral fundus views while using their personal BIO. Performance was evaluated by the co-investigators by viewing through each side of the

teaching mirror. A point was given for each view based on clarity of the view, fullness of the lens (>80%), and accuracy of location (see scoring sheet, Appendix E). Each peripheral view was given a point value of 1 and the posterior pole view a point value of 3, totaling 11 points possible. NBEO does not release how the points are distributed for each skill, the co-investigators therefore had to estimate how the points would be distributed. Of note, as a large number of candidates did not verbalize their findings when performing fundus examinations, we did not include that as a criteria for a point to be given as this study wanted to focus more on the quality of the view and how it would have affected the results. At the conclusion of station three, participants were asked to complete part 3 of their survey evaluation regarding their perception of their own performance. At station four, candidates were asked to perform the same posterior pole view and eight peripheral fundus views using the Keeler video BIO. The video BIO used had +2.00D lenses in the oculars, and allowed only for adjustment of the PD. Participants' views were recorded through Tegrity, and candidates could not see their views on the monitor at the time of the recording. These parameters were put in place to best model the NBEO rules and parameters for part 3. Participants were then asked to complete section four of the survey once finished with the fundus evaluation. The co-investigators watched each participant's recording and graded their views based on the same three criteria used for station three.

After all of the data was collected, t tests were conducted to compare the participants comfort and confidence levels with their personal BIO versus the video BIO, prior to practicing with it and after practicing. We also performed an analysis to ensure that there was no discrepancy in the grades given between each co-investigator. Scores

for personal BIO evaluations versus video BIO evaluations were then compared to evaluate if the model of BIO used affects performance. Finally, an anonymous survey was sent out to fourth year students to evaluate their performance on part 3 NBEO, specifically the BIO station and analyzed.

RESULTS

Description of Subjects

The study consisted of 25 third year students from the Michigan College of Optometry Class of 2018. None of the participants had previous exposure to the Keeler video BIO or completed the part 3 portion of NBEO. The pre-survey provided the following information regarding the students and their experience with BIOs. Twenty-one participants used Heine Omega 500 as their personal BIO on a daily basis, four participants used Keeler brand BIO- two were the All Pupil model and two were Vantage Plus model. Twenty- three of the participants used the +2.00D ocular lenses in their personal BIOs. The +2.00D lenses are mandatory for part 3 NBEO. Three out of 25 participants used the full 10 minutes of practice time with the Keeler video BIO and no participant practiced for 10 minutes with their personal BIO. 88% of participants felt the 10 minutes of practice time was acceptable or too much time. Because the opinions about practice time and the use of +2.00D lenses were a majority for our subject base, these areas of the study were no longer considered confounding factors and therefore not analyzed statistically.

Data Analysis

The survey asked the participants to score their comfort level and confidence with their personal BIO and the Keeler video BIO before, during, and after they completed the study's requirements. As seen in Table 1, the average comfort score increased throughout the study for the Keeler video BIO and the personal BIO. Before the study, participants

were more comfortable with their personal BIO and remained so after the study when compared to the Keeler video BIO. Comparing the post-study comfort levels there was a significant difference ($p < 0.001$) between the comfort level for the Keeler video BIO and the participant's personal BIO, such that the students were more comfortable with their personal BIO.

	Pre-Practice	Post-Practice	Post- Study Evaluation
Average Comfort Level with Keeler Video BIO	1.44	3.32	3.48
Average Comfort Level with Personal BIO	4.56	Not Surveyed	4.6

Table 1: Average comfort level comparison. Highest comfort score possible was 5 on a 1-5 Likert scale described on the survey (see Appendix D). There is a significant difference ($p < 0.001$) between the post-study comfort level of Keeler Video BIO and Personal BIO; students were more comfortable with their personal BIO.

The survey asked participants to score their confidence level pertaining to the fundus views they obtained and overall use of the BIO models after they completed the fundus evaluations. Overall, the participants, no matter the model of their personal BIO, showed a statistically significant difference ($p = 0.002$) between the confidence level score for their personal BIO (average 4.32) compared to the Keeler video BIO (average 3.46) as seen in Table 2. Unfortunately, this study included only four participants with Keeler models as their personal BIO therefore not enough participants were recorded to further

compare the intricate differences that may exist based on the personal BIO model. However, looking at the breakdown by model and the average confidence level score, some loose conclusions could be made. Students whose personal BIO was a Heine model had the average confidence score of 3.57 for the Keeler video BIO compared to those students with a Keeler personal BIO average confidence score of 4. One might suggest those with the Keeler personal BIO feel more confident with the Keeler video BIO earlier or more easily due to their daily personal experience.

	Average Confidence Level for all Subjects	Average Confidence Level (Personal BIO- HEINE; 21 subjects)	Average Confidence Level (Personal BIO- Keeler; 4 subjects)
Keeler Video BIO	3.46	3.57	4
Personal BIO	4.32	4.28	4.5

Table 2: Average confidence level comparison. Highest confidence score possible was 5 on a 1-5 Likert scale described on the survey (see Appendix D). There was a statistically significant difference ($p=0.002$) between the confidence level with the student's personal BIO compared to the Keeler Video BIO, such that the students were more comfortable with their personal BIO.

Finally, this study examined the scores for the fundus evaluations completed with the personal BIO model and the Keeler video BIO model. For completeness of this study

it is important to confirm that having the co-investigators grade each subject was not a confounding factor in the overall performance. Tables 3 and 4 show grading metrics comparing the raw scores given by the co-investigators. There was no significant difference between the scores of co-investigator #1 and co-investigator #2 for either evaluation, therefore this was not a limitation of the study.

	Co-investigator #1	Co-investigator #2
Mean	9.88	9.28
Median	10	10
Mode	10	10

Table 3: Comparison of grades from co-investigators for fundus evaluations using the subject's personal BIO. The highest score possible was 11. There was no significant difference between co-investigators ($p=0.123$).

	Co-investigator #1	Co-investigator #2
Mean	2.28	2.92
Median	0	2
Mode	0	1

Table 4: Comparison of grades from co-investigators for fundus evaluations using the Keeler video BIO. The highest score possible was 11. There was no significant difference between co-investigators ($p=0.548$).

The most important comparison for this study was the scores achieved for each participant when performing a fundus evaluation with their personal BIO and the Keeler video BIO. The scores of co-investigator #1 and co-investigator #2 were averaged. The averaged scores were then compared indicating there is a significant difference ($p < 0.001$) in scores for fundus evaluations using the personal BIO (averaged score of 9.58) compared to the Keeler video BIO (averaged score of 2.60), such that performance scores were higher for personal BIO evaluations. These results can be found in Table 5.

	Average of Averaged Scores
Keeler video BIO	2.60
Personal BIO	9.58

Table 5: Comparison of average scores of fundus evaluations using the personal BIO and Keeler video BIO. The Highest score possible was 11. The co-investigator's scores were averaged before making this comparison. There is a significant difference ($p < 0.001$) between the scores of Keeler video BIO evaluations and personal BIO evaluations; personal BIO evaluation scores were higher.

At the conclusion of the study, participants were asked a series of questions regarding their opinion of what BIO model should be used to test optometry students during NBEO part 3. The following conclusions were made. 76% of participants felt the Keeler video BIO was not acceptable for part 3. Only one of the participants whose personal BIO was a Keeler model felt that the Keeler video BIO was acceptable. 100% of participants felt their personal BIO was acceptable for part 3. When asked which model they would feel most comfortable using for Part 3, 92% said their personal BIO.

Eight months later, a survey was distributed to the Michigan College of Optometry Class of 2018. Twenty-three now fourth year students responded to the survey. Four of the students did not participate in the study eight months prior. Fourteen students passed part 3, two students failed part 3, four students had taken part 3 but had not received their scores yet and three students had not taken part 3. Of the 23 students who responded to the survey, 18 had Heine personal BIOs and four students had Keeler personal BIOs.

The survey asked how long the student practiced with the Keeler Video BIO available to them at the Michigan College of Optometry during their preparation for Part 3 of boards. The responses are indicated in Table 6.

Hours spent practicing	Number of survey responders
None	7
0-1	7
1-2	5
2-3	2
3-4	1 *failed Part 3
4-6	1 *failed Part 3

Table 6: The distribution of survey responders according to the number of hours the student prepared for Part 3 using the Keeler Video BIO.

The survey asked the students how their experience was during the BIO portion of Part 3. The results are shown in Table 7.

Experience	Number of survey responders
Excellent	3
Expected	12
Terrible	5
Haven't taken Part 3	3

Table 7: The distribution of survey responders according to their Part 3 BIO experience.

The survey asked the students their opinion about the BIO model that NBEO should use to test future optometry students. Ten students said their personal BIO, nine students said the Keeler video BIO and one student said NEBO should go back to the Heine Video BIO.

The following conclusions were drawn from the surveys of those who received a score from Part 3, pass or fail:

- There were 16 survey responders with a test result, 14 had passed and two had failed. Two of the responders had Keeler BIOs as their personal BIO and both passed, one described their experience as “excellent”, the other with “expected”.
- Four responders said their experience was “terrible”, two of which passed Part 3 and the other two failed.
- Three responders did not practice with the Keeler video BIO and all three responders passed part 3.

- Seven responders said Keeler video BIO, six responders said the personal BIO with teaching mirror and one responder said Heine video BIO should be used in future part 3 examinations. Two responders offered other suggests that allowed the test taker to decide the BIO model during part 3.
- Five students practiced for 0-1 hour, five students practiced 1-2 hours with the Keeler video BIO. All three students who practiced more than 2 hours said their experience was “terrible” and two of the students failed Part 3.

DISCUSSION

The purpose of this study was to investigate if the model of BIO used during the clinical skills exam of the NBEO was a limiting factor resulting in students not passing the BIO station. Our results show that with limited exposure to the Keeler video BIO, students performed significantly worse as compared to using their personal BIO. These results, however, are not mimicked when applied to the outcomes of the students' performance on the clinical skills exam, as the majority of the students were still able to successfully pass the exam.

Video BIOs have been used in the realm of ophthalmology to help residents practice and feel more proficient in their evaluation of the fundus as they are able to watch and evaluate themselves after performing an exam.² This is true for MCO students as well, as the majority of students who took part 3 NBEO practiced with the video BIO for at least one hour prior to their examination, resulting in more positive outcomes than were seen in our study.

The survey distributed to students after taking the clinical skills exam illustrates that it does not seem as though students who fail part 3 are failing as a result of the BIO model used, but rather because of their lack of proficiency in performing the skill. Whether students were familiar with Heine or Keeler BIOs, both parties were successful in passing the BIO station on the clinical skills exam.

There are certainly advantages to having a recorded viewing using the video BIO as opposed to a live viewing. More than one proctor is able to view the recording, so that the proctor's criteria for giving credit is not a limiting factor.

Although not all data for the class of 2018 part 3 NBEO performance is available, when comparing the currently known performance to the performance of the class of 2017, it appears that the Keeler video BIO allows students to be more successful than the previously used Heine video BIO. The Keeler video BIO has been evaluated as a tool to perform live teleretinal screening and has been shown to be effective.³

As seen in the results of our study, we are able to conclude that the Keeler video BIO is not a limiting factor to students' performance on the clinical skills exam of the NBEO. Despite poor performance using the video BIO in our research study, the majority of students who have already taken the clinical skills exam have successfully passed this part of the exam. It appears that students who do not pass the BIO station of the clinical skills exam may simply be weak in this skill and require more instruction from peers and instructors in order to be successful in performing this skill.

REFERENCES

1. Winters JE, Frantz KA, Kern RM. Accommodative and vergence difficulties interfering with image clarity through a binocular indirect ophthalmoscope. *Optm Vis Sci.* 2004; 81; 259-266.
2. Sridhar J et al. Usefulness of structured video indirect ophthalmoscope- guided education in improving resident ophthalmologist confidence and ability. *Amer Acad Ophthalmol.* 2017; 1-6.
3. Ho TC, Lee TC, Uni J, Nallasamy S. Evaluation of real-time video feed from the digital indirect ophthalmoscope (Keeler) for telehealth consultations. *J AAPOS.* 2015; 19; 12.

APPENDIX A – IRB APPROVAL

Date: Apr 27, 2017

To: Brian McDowell

From: Gregory Wellman, R.Ph, Ph.D, IRB Chair

Re: IRB Application *IRB-FY16-17-11 A Comparison of Binocular Indirect Ophthalmoscope Grading Techniques*

The Ferris State University Institutional Review Board (IRB) has reviewed your application for using human subjects in the study, *A Comparison of Binocular Indirect Ophthalmoscope Grading Techniques (IRB-FY16-17-11)* and approved this project under Federal Regulations Exempt Categories:

Category 2. Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

Category 4. Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects.

Approval has an expiration date of three years from the date of this letter. **As such, you may collect data according to the procedures outlined in your application until Apr 26, 2020.** Should additional time be needed to conduct your approved study, a request for extension must be submitted to the IRB a month prior to its expiration.

Your protocol has been assigned project number IRB-FY16-17-11. Approval mandates that you follow all University policy and procedures, in addition to applicable governmental regulations. Approval applies only to the activities described in the protocol submission; should revisions need to be made, all materials must be reviewed and approved by the IRB prior to initiation. In addition, the IRB must be made aware of any serious and unexpected and/or unanticipated adverse events as well as complaints and non-compliance issues.

Understand that informed consent is a process beginning with a description of the study and participant rights, with the assurance of participant understanding followed

by a signed consent form. Informed consent must continue throughout the study via a dialogue between the researcher and research participant. Federal regulations require each participant receive a copy of the signed consent document and investigators maintain consent records for a minimum of three years.

As mandated by Title 45 Code of Federal Regulations, Part 46 (45 CFR 46) the IRB requires submission of annual reviews during the life of the research project and a Final Report Form upon study completion. Thank you for your compliance with these guidelines and best wishes for a successful research endeavor.

Regards,

A handwritten signature in black ink, appearing to read "Gregory Wellman". The signature is written in a cursive style with a large initial "G" and a long, sweeping underline.

Gregory Wellman, R.Ph, Ph.D, IRB Chair
Ferris State University Institutional Review Board
Office of Research and Sponsored Programs

APPENDIX B – RECRUITMENT SCRIPT

You are invited to take part in a research study where we will compare the Keeler Video BIO and your personal BIO with your teaching mirror. We will be having you perform a fundus exam on a model eye using both types of BIOs and then grading your performance on each exam. You will then be asked to take part in a survey regarding your subjective experience performing each exam. This study will take approximately 30 minutes of your time. Your surveys will be identified using numbers that are in no way linked to any identifying information. This study will take place in the vision science lab at the Michigan College of Optometry. Your participation in this study is completely voluntary; any participation (or lack thereof) will not impact your standing in the College.

**FERRIS STATE
UNIVERSITY**

BIOMEDICAL RESEARCH STUDY INFORMED CONSENT

RESEARCHER INFORMATION

Project Title: Comparison of Binocular Indirect Ophthalmoscope Grading Techniques for Optometry National Boards Clinical Skills Examination

Principal Investigator: Dr. Brian McDowell Email: brianmcdowell@ferris.edu Phone: (231) 591-2171

STUDY PURPOSE

You are invited to participate in a research study assessing for grading discrepancies at Station 4: Skill 18 Binocular Indirect Ophthalmoscope due to video recording technology versus teaching mirror. Researchers are interested in assessing for discrepancies between the two methods. There is no funding for this study.

PARTICIPATION

Taking part in this study is completely voluntary. You do not have to participate in this study if you don't want to and you may leave at any time without consequence.

You are eligible to participate in this study because you are an Optometry student who will be taking part in the NBEO (National Board of Examiners in Optometry) Clinical Skills Examination. If you agree to be part of this study, you will be asked to perform a fundus examination using a binocular indirect ophthalmoscope (BIO) on a model eye, including eight peripheral views and a posterior pole view. You will perform the examination two times, once with the Keeler Video BIO and once with your personal BIO with teaching mirror. You will have ten minutes to familiarize yourself with both BIOs prior to the examination. You will be randomly assigned an order of which type of BIO to begin with. The personal BIO with teaching mirror will be graded by both of the co-investigators at the time you perform the procedure. The Keeler Video BIO recording will be graded by both co-investigators following completion of the procedure. Once both fundus examinations are performed, you will be given a survey regarding your experience. The study will take approximately 30 minutes to complete and your participation in this study will be over when you have finished both fundus evaluations and the survey.

POTENTIAL RISKS/DISCOMFORTS

There are no known risks associated with this study because the data collection is completely anonymous and the topic is not sensitive.

ANTICIPATED BENEFITS

Although you may not receive any direct benefits by participating in this study, you may benefit from your participation because it will allow you time to work with the technology used for the

Optometry National Boards Clinical Skills examination. You will learn any necessary adjustments in your technique with the Keeler Video BIO.

PARTICIPANT RIGHTS

You are free to leave the study at any time. If you leave before the study is finished, you will not lose any benefits to which you may otherwise be entitled. If you are an employee/student at FSU, your employment status/academic standing at FSU will NOT be affected whether or not you decide to participate in this study. If you choose to tell the researchers why you are leaving the study, your reasons may be kept as part of the study record. If you decide to leave the study before it is finished, please tell one of the persons listed in the “*Contact Information*” section below.

If you decide to leave the study before it is finished, there will be no harm to you.

Researchers could take you out of the study, even if you want to continue to participate.

There are many reasons why the researchers may need to end your participation in the study. Examples include:

- The researcher believes that it is not in your best interest to stay in the study
- You become ineligible to participate
- Your condition changes and you need treatment that is not allowed while you are taking part in the study
- The study is suspended or cancelled

Researchers will tell you if they learn of important new information that may change your willingness to stay in this study. If new information is provided to you after you have joined the study, it is possible that you may be asked to sign a new consent form that includes new information.

CONFIDENTIALITY

Your participation in this research study will remain completely anonymous. As required by federal regulations and university policy, study records will be maintained for 3 years and kept confidential and securely stored in a locked cabinet in Dr. Brian McDowell’s office. Should the results of this study be published on any report, publication or at any scientific meeting, your identity will not be revealed.

Signing this form is required in order for you to take part in the study and gives the researchers your permission to obtain, use and share information about you for this study. The results of this study could be published in an article, but would not include any information that would identify you. There are some reasons why people other than the researchers may need to see the information you provided as part of the study. This includes organizations responsible for making sure the research is done safely and properly, including Ferris State University, or government officials. The researchers certify that the use of medical records in this study complies with the Health Insurance Portability and Accountability Act (HIPAA).

CONTACT INFORMATION

The main researcher conducting this study is Dr. Brian McDowell, a professor at Ferris State University. **Please ask any questions you have now.** If you have questions later, you may contact Dr. Brian McDowell, at 1124 S. State Street MCO 226, Big Rapids, MI, (231) 591-2171, brianmcdowell@ferris.edu

If you have questions or concerns about your rights as a subject in this study, please contact:

Ferris State University Institutional Review Board (IRB) for Human Participants
220 Ferris Drive, PHR 308, Big Rapids, MI 49307; (231) 591-2553 or IRB@ferris.edu

Research Subject: I understand the information printed on this form. I have discussed this study, its risks, potential benefits and other alternatives. My questions so far have been answered. I understand that if I have more questions or concerns about the study or my participation as a research subject, I may contact one of the people listed in the "Contact Information" section. I understand that I will receive a copy of this form at the time I sign it. I understand that if my ability to consent for myself changes, either my legal representative or I may be asked to re-consent prior to my continued participation.

Signature of Subject: _____

Printed Name: _____

Date of Signature: _____

If Applicable:

Signature of Person Legally Authorized to Give Consent: _____

Printed Name of Person Legally Authorized to Give Consent: _____

Relationship to Subject (check): Parent Spouse Child Sibling Legal Guardian
Other: _____

Date of Signature: _____

Principal Investigator (or Designee): I have given this research subject (or his/her legally authorized representative, if applicable) information about this study that I believe is accurate and complete. The subject has indicated that he or she understands the nature of the study and the risks and benefits of participating.

Printed Name: _____

Title: _____

Signature: _____

Date of Signature: _____

APPENDIX D – PARTICIPANT SURVEY

Survey

1. How confident were you in getting acceptable views? (Acceptable- 90% lens filling and in-focus)

1= not at all confident 5= extremely confident

1 2 3 4 5

2. What is your comfort level after the fundus exam with the Keeler Video BIO?

1 2 3 4 5

In your opinion is the Keeler Video BIO an acceptable method for grading Station 4 on the Clinical Skills exam? (Circle)

Yes No

If no- Why?

In your opinion is your personal BIO an acceptable method for grading Station 4 on the Clinical Skills exam? (Circle)

Yes No

If no- Why?

Which method would you feel most comfortable using for Station 4?

Personal BIO with teaching mirror

Keeler Video BIO

Please use the space below to write any comments that you have:

APPENDIX E – BIO EVALUATION FORM

Scoring Sheet

Subject Number: _____

Method: Keeler Video BIO Heine BIO with teaching mirror

Total Examination Time _____

Did the candidate:

4. explain the purpose of the procedure to the patient?
5. position the condensing lens properly (more convex side toward candidate)?

Did the candidate properly examine and obtain a clear image, filling the condensing lens as much as possible, of the following quadrants:

6. **superior peripheral** retina?
7. accurately identify the quadrant and provide an assessment of the superior retina?
8. **superior-nasal peripheral** retina?
9. accurately identify the quadrant and provide an assessment of the superior-nasal retina?
10. **nasal peripheral** retina?
11. accurately identify the quadrant and provide an assessment of the nasal retina?
12. **inferior-nasal** peripheral retina?
13. accurately identify the quadrant and provide an assessment of the inferior-nasal retina?
14. **inferior peripheral** retina?
15. accurately identify the quadrant and provide an assessment of the inferior retina?
16. **inferior-temporal peripheral** retina?
17. accurately identify the quadrant and provide an assessment of the inferior-temporal retina?
18. **temporal peripheral** retina?
19. accurately identify the quadrant and provide an assessment of the temporal retina?
20. **superior-temporal peripheral** retina?
21. accurately identify the quadrant and provide an assessment of the superior-temporal retina?

Did the candidate properly examine and obtain a clear image, filling the condensing lens as much as possible, of the:

22. **posterior pole** (including optic nerve and macula)?
23. provide an assessment of the posterior pole?

Did the candidate:

24. properly instruct the patient throughout the procedure?
25. perform the procedure in a smooth and logical sequence?

APPENDIX F- ONLINE SURVEY TO FOURTH YEAR MCO STUDENTS

This survey was conducted through Survey Monkey. The link to the survey was provided to every member of the 2018 class on the class Facebook page. The surveys were submitted anomalously.

1. I have...
 - a. Taken part 3 and passed all 4 stations (don't worry about injections)
 - b. Taken part 3 and did NOT pass the test OR the BIO station
 - c. Taken part 3 and did NOT pass the test BUT PASSED the BIO station
 - d. Taken part 3 and I have not received my scores yet
 - e. Have not taken part 3
2. In optometry school my BIO was _____ brand
 - a. Heine
 - b. Welsh Allen
 - c. Keeler
3. I practiced with the Keeler video BIO at school (time during Alyssa and Kristen's research project does not count).
 - a. Yes, 0-1 hour
 - b. Yes, 1-2 hours
 - c. Yes, 2-3 hours
 - d. Yes, 3-4 hours
 - e. Yes, 4-6 hours
 - f. No, I did not practice with the Keeler video BIO
4. My experience with Keeler video BIO during boards part 3 was....
 - a. Excellent
 - b. Expected
 - c. Terrible
 - d. I haven't taken part 3 yet
5. After taking part 3, I think NBEO should...
 - a. Let us use our own BIO with teaching mirror
 - b. Continue using Keeler Video BIO
 - c. Go back to Heine Video BIO
6. I participated in Kristen and Alyssa's research project
 - a. Yes
 - b. No
7. Please leave any other comments regarding you part 3 preparation or testing experience that pertains to BIO skills. Thank you.