Modified MEM retinoscopy improved card design for accuracy and ease of use

Travis M. Johnson

Pacific University
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Abstract
MEM retinoscopy is an excellent reliable method of determining accommodative posture. However, there are two basic problems that make traditional MEM retinoscopy a rarely practiced procedure in primary care optometry. First, the traditional MEM procedure requires a clinician to hold three pieces of equipment simultaneously. This is a clumsy and cumbersome which translates to extra time. (A clinicians’ nightmare) The second problem is the characters used on the various MEM hole cards. They are not specific for age demand or task demand. This factor can result in unreliable accommodative posture measurements. The modified MEM cards are designed to alleviate these two problems. First, a simple apparatus has been constructed to secure the MEM hole card to the retinoscope. This results in the clinician only having to hold the retinoscope and the neutralizing lens. Second, the modified MEM cards have been designed with regard to age demand and task demand. These cards will render a more accurate, task specific measurement of accommodative posture. The modified MEM cards make MEM an accurate and easy to use procedure clinicians can incorporate into their exam sequence.

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Thesis

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MODIFIED MEM RETINOSCOPY

IMPROVED CARD DESIGN FOR ACCURACY AND EASE OF USE

By

TRAVIS M. JOHNSON

A thesis submitted to the faculty of the
College of Optometry
Pacific University
Forest Grove, Oregon
For degree of
Doctor of Optometry
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Adviser:

Dr. Scott Cooper
Grade Page

MODIFIED MEM RETINOSCOPY
IMPROVED CARD DESIGN FOR ACCURACY AND EASE OF USE

Travis Johnson

Dr. Scott Cooper
Biography

Travis Johnson is from a small rural town in northeast Montana. The town is named Plentywood, but one would be hard pressed to find such there. He attended Plentywood high school and graduated in 1992. He first attended Trinity Bible College in Ellendale, North Dakota. He was there for the fall semester of 1992. He then transferred to Evangel College in Springfield, Missouri and attended there for the spring semester of 1993. In the fall of 1993 he transferred to Minot State University and attended there until the spring of 1995. In the fall of 1995 he transferred to Pacific University where graduated with a bachelors degree in visual science in 1996. He is currently attending Pacific University College of Optometry and plans to graduate in May of 1999. He has two beautiful children named Austyn (girl) and Dallas (boy). He also is an active student member of Fellowship of Christian Optometrists and Amigos eye care. He plans to investigate potential opportunities for future employment and is optimistic about a bright and exciting future in optometry.
Abstract

MEM retinoscopy is an excellent reliable method of determining accommodative posture. However, there are two basic problems that make traditional MEM retinoscopy a rarely practiced procedure in primary care optometry. First, the traditional MEM procedure requires a clinician to hold three pieces of equipment simultaneously. This is a clumsy and cumbersome which translates to extra time. (A clinicians’ nightmare) The second problem is the characters used on the various MEM hole cards. They are not specific for age demand or task demand. This factor can result in unreliable accommodative posture measurements. The modified MEM cards are designed to alleviate these two problems. First, a simple apparatus has been constructed to secure the MEM hole card to the retinoscope. This results in the clinician only having to hold the retinoscope and the neutralizing lens. Second, the modified MEM cards have been designed with regard to age demand and task demand. These cards will render a more accurate, task specific measurement of accommodative posture. The modified MEM cards make MEM an accurate and easy to use procedure clinicians can incorporate into their exam sequence.
Acknowledgements

I would like to thank Dr. Scott Cooper, Dr. Hannu Laukenan, Dr. Neil Hodur, Dr. Linda Casser, and Dr. Diane Madson for their help, guidance, and input with this thesis project. I would not have been able to develop this procedural idea without their valued expertise.
Modified MEM RETINOSCOPY
Improved card design for accuracy and ease of use

Monocular Estimation Method (MEM) retinoscopy is a procedure grouped under the category of dynamic retinoscopy. Monocular Estimation Method (MEM) retinoscopy is an excellent method of determining accommodative posture. Rouse, London, and Allen evaluated the validity of MEM retinoscopy and found it to be very accurate in comparison with the phoroaccommodometer.\textsuperscript{a} Cross is credited with the introduction of theory and practice of dynamic retinoscopy.\textsuperscript{b} Others such as Sheard, Pierce, and Haynes are credited with perfecting dynamic retinoscopy and developing the Monocular Estimation Method (MEM).

MEM retinoscopy is performed by holding a hole card at the plane of the retinoscope. The patients' attention is directed to the characters on the hole card. The hole card is designed such that the characters are located no further than 1.25 cm from the center of the hole card.\textsuperscript{c} This is done to ensure that the estimate of accommodative posture is relatively on axis with the eye being tested. The retinoscope is held at the patient's working distance. With the retinoscope in plano mode, a vertical streak is moved in a horizontal direction across the patient's pupil. If a with motion is noted in the reflex, a plus lens is quickly placed in front of the eye to neutralize the reflex. If an against motion is noted in the reflex, a minus lens is quickly placed in front of the eye to neutralize the reflex. The lens power used to neutralize the reflex is then designated as the lag (or lead) of accommodation.\textsuperscript{d}

There are two basic problems with traditional MEM retinoscopy. The first problem pertains to the cumbersome setup used while performing MEM. A clinician must hold a retinoscope, a hole card, and a test lens at the same time. This fact
alone is the main reason most clinicians do not incorporate MEM retinoscopy into their exam sequence. The second problem is in regards to the characters used on the hole cards. Studies done to validate MEM retinoscopy in the past have varied significantly with respect to the characters being used on the hole card. Casser, Locke, and Somers did a comparison study of dynamic retinoscopy techniques and for MEM retinoscopy and they used characters with a 20/40 Snellen acuity demand. Rouse, London, and Allen did a study in 1982 evaluating MEM retinoscopy using the Pierce* card. Haynes published his clinical observations with dynamic retinoscopy in 1960 and in that study he used several different targets varying characters size and cognitive load. His observations showed that accommodative posture of a patient changes when that patient views characters of different size and different cognitive load. In addition to the information revealed in Haynes clinical observations with dynamic retinoscopy, Kruger did a study in 1977 that evaluated changes in fundus reflex luminance with increased cognitive processing. With this in mind, it is important for clinicians to use material that is age specific for character size and cognitive load.

Modified MEM retinoscopy alleviates the two basic problems with traditional MEM retinoscopy. A small magnet is attached to the retinoscope directly above the illumination source. Some retinoscopes, like the Welch Allen retinoscope, already have this feature. The opposing magnet is attached to the back side of the Modified MEM card. The card is positioned so that the optics of the retinoscope are unaffected. The only two pieces of equipment that need to be held are the retinoscope and the neutralizing lens.
The characters represented on the modified MEM cards range from picture characters for infants and toddlers to age appropriate words for elementary school students, junior high school students, high school students, college students, and adults. The pictures used for infants and toddlers are characters from Allen cards, Lighthouse cards, LH cards, and Childrens pictures recognition cards. The words used for elementary school students’ first grade to fourth grade are from Fry’s Instant Words.\(^1\) The words used for fifth graders, sixth graders, junior high students, high school students, college students, and adults are from the Dyslexia Determination Test.\(^1\) The point size of the letters are specific for the text size students would use in elementary school, and are specific for the text and task demands of junior high school students, high school students, college students, and adults.\(^\text{k}\) The font used for the words is Times New Roman. Research indicated that for the normal observer, only slight differences were noticed when comparing Times font with Courier font.\(^1\)

The modified MEM card design makes MEM retinoscopy an accurate and easy to use procedure that clinicians can incorporate into their exam sequence. An excellent place to perform MEM retinoscopy in the exam sequence is during the trial framing process. With the modified MEM cards the procedure can be performed in just seconds. It is my hope that the modified MEM card design will provide clinicians with an easy to use and accurate system in determining accommodative posture.
Sheard, Charles Dynamic Skiametry Chicago: Cleveland Press 1920
Dyslexia Determination Test VTS 33.435 pg. ¼ Pacific University College of Optometry Vison Therapy Department.
money green look
here wish
came hill
yes call funny ball
saw big may ran
home where
soon think
name under
back sure run book
walk start close carry
third same eyes once
thank close
fine early
letter brown sleep ate
jump yellow bed longer
summer bank grade egg
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risible apnea ritual albino graduation heinous endeavor aroma abode islet inept bonus regime exonerate prevalent snuggle detested pollute minus digit