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# Procedures and methodology in the diagnostic evaluation of the manipulatory skills test

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# Procedures and methodology in the diagnostic evaluation of the manipulatory skills test

**Abstract**

Procedures and methodology in the diagnostic evaluation of the manipulatory skills test

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Thesis:  
p. 5  
12

PROCEDURES AND METHODOLOGY IN THE  
DIAGNOSTIC EVALUATION OF THE  
MANIPULATORY SKILLS TESTS

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A Fourth Year Optometry Project  
presented to  
The Faculty of the College of Optometry  
Pacific University

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In Partial Fulfillment  
of the Requirements for the Degree  
Doctor of Optometry

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by

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Duane T. Brooks  
Edwin H. Glur  
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May 1971



APPROVED

Graduate Thesis Committee

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G.C.S.

## TABLE OF CONTENTS

Chapter	Page
I. INTRODUCTION AND OBJECTIVES . . . . .	1
II. EQUIPMENT . . . . .	2
III. SUGGESTIONS FOR VIEWING THE VIDEO TAPE . . . . .	3
IV. LIST OF EQUIPMENT USED . . . . .	6
V. SUMMARY . . . . .	8
APPENDIX	
STUDY GUIDE . . . . .	10
I. Monocular Light Fixation . . . . .	10
II. Binocular and Monocular Versions and Rotations . . . . .	12
III. Near Point of Convergence . . . . .	13
IV. Unilateral and Alternating Cover Test . . . . .	15
V. Saccadic Fixations . . . . .	17

## CHAPTER I

### INTRODUCTION AND OBJECTIVES

This video tape has been prepared to aid the optometric student in developing a technique and routine for the administration of the manipulatory skills tests. With this objective in mind, a subject was selected who demonstrated responses that are within established clinical norms.

The video tape offers an excellent method to be followed and points out a few of the many important observations that can be seen during these tests.

In conjunction with clinical instruction and lecture material this program, with the accompanying study guide, may be a supplement in optometric procedures.

## CHAPTER II

### EQUIPMENT

The clinical equipment necessary to perform the manipulatory skills as shown in the video tape, is a fixation light, preferably with a very fine filament for a precise target, two colored beads of contrasting color, a set of loose prisms, and a paddle occluder.

## CHAPTER III

### SUGGESTIONS FOR VIEWING THE VIDEO TAPE

Throughout this tape strict clinical procedure was followed. However, instructions to the patient were modified in an attempt to facilitate observation of the visual responses. These modifications were required due to the limitations of the video equipment.

The study guide is a transcript of the audio portion of the video tape with additional explanatory remarks regarding further techniques and refinements. It was designed to be studied prior to and following the viewing of the tape.

After the clinician has performed the techniques shown on several patients, a review of the program is suggested.

The following outline of the manipulatory skills tests was used in preparing the script for this production.

1. Monocular light fixation O.D. and O.S.

Clinical functions:

- a. Normal monocular fixations

- b. Estimate of Angle lambda or kappa
- c. Eccentric fixations
- d. Initial probability of presence of amblyopia and/or strabismus

2. Binocular Versions

3. Binocular Rotation

4. Monocular rotation and versions

(Monocular rotation and version are recommended only when the binocular performance shows abnormal responses in children under 5 years of age.)

Clinical Functions:

- a. Concomitancy vs. non concomitancy (gross)
- b. Extent of monocular motor field
- c. Extent of binocular motor field  
(combined with unilateral cover test)
- d. Pursuit or tracking skill
- e. Head and other bodily involvements
- f. Responses to verbal instructions

5. Near Point of Convergence (N.P.C. or N.P.B.)

Clinical Functions:

- a. Quantitative measurement of break point
- b. Quantitative measurement of recovery point
- c. Qualitative evaluation of tracking skill
- d. Asymmetric presentation of the fixation target and its relationship to the binocular motor field
- e. Evidence of eye dominance
- f. Pupil reactions
- g. Suppression responses
- h. Near binocular fixation range (NBFR) in strabismic cases (predominantly esotropic)
- i. Asthenopic and evasion symptoms

## 6. Unilateral and alternating Cover Test

### Clinical Functions:

- a. Binocular versus strabismic fixation at various test distances
- b. Magnitude of phoric and tropic responses at varying distances (estimate as loose prism measurements)
- c. Classification of strabismic behavior by deviation
- d. Comitancy or non comitancy
- e. Observation of phoria-recovery response
- f. Gross estimation of the change in phoric behavior as a function of time of disassociation
- g. Quantitative measurement of the NBFR (near binocular fixation range)
- h. Possible to calculate or graph the linearity or alinearity of phoric or tropic responses. Calculation of slope of response or lag of convergence.

## 7. Saccadic Fixations

- a. Near to near fixations
- b. Near to far (N → F & F → N)
- c. Lateral saccadics

### Clinical Functions:

- a. Landings and release of fixations
- b. Corrective movements
- c. Response to verbal instructions
- d. Involvement of head and other body parts

## CHAPTER IV

### LIST OF EQUIPMENT USED

#### Video Tape Recorder Sets

Ampex Video Recorder (for video taping)  
Model VR-7500  
Serial No. 2814

Ampex Video Recorder (for editing)  
Model VR-7800  
Serial No.

#### Camera Complete Units

Video Camera  
GPL 990  
Model No. 473

Video Camera  
GPL 990  
Model No. 33

#### Camera Lens

Canon TV Zoom Lens  
V 5x20  
20-100 mm  
3 to 1

Videcon Zoom Lens  
15-150 mm  
10 to 1

#### Camera Mounts

- (2) Samson Tripods  
Model 7301
- (2) Samson TV Heads  
Model 7201

- (2) Samson Dollies  
Model 7601

Microphones

Shure Lavalier Microphone  
Model 560 Dynamic

Miscellaneous

- (1) Tapes
- (3) Photo-flood lamps  
(3) hundred watt bulbs

## CHAPTER V

### SUMMARY

This video tape has been prepared to make the beginning optometric clinician aware of the many observations which can be made by employing a few simple techniques. Once the clinician has mastered these techniques and understands their functions, he will quickly recognize any deviations from the norms and find the manipulatory skills as an invaluable aid in making an accurate optometric diagnosis.

**APPENDIX**  
**STUDY GUIDE**

## STUDY GUIDE

### For the Procedures and Methodology in the Diagnostic Evaluation of the Manipulatory Skills Tests

#### INTRODUCTION

This video tape has been prepared to aid the student in developing his own checklist of diagnostically significant information that can be extracted from the manipulatory skills tests. The testing techniques have to be modified depending on the type of case and the diagnostic information the examiner is seeking. The clinician should carefully study how he needs to modify his testing in order to be able to observe the many responses and clinical functions. Special consideration should be given to the limitation of these tests since they are largely qualitative rather than quantitative. Where quantification is possible the clinician should become adept in accurate measurement. The following patients demonstrate clinically normal responses.

#### I. MONOCULAR LIGHT FIXATION

##### A. Clinical Technique

When doing a monocular light fixation, the patient-clinician distance is 16-24 inches.<sup>1</sup> The fixation

light is placed between the patient and the doctor on their respective visual axes, with the patient's eyes in the primary position of gaze. It is preferable to occlude the unobserved eye.<sup>2</sup> The instructions are, "Look at the tip of my light."

<sup>1</sup>When examining children, it is advisable to place fixation light 6-9 inches from the patient. Giving the child a task such as touching the tip of the light or placing a transparent soda straw over it enhances fixation.

<sup>2</sup>The clinician should be aware of the possibility of cover nystagmus under unilateral cover conditions.

#### B. Clinical Functions

Observations are made to determine the characteristics of the monocular light fixation: is the fixation steady or unsteady?<sup>1</sup> By observing the light reflex in relation to the center of the pupil, a determination is made of angle lambda. Angle lambda may be positive, negative, or zero. A comparison of this angle is made between the right and left eyes. It is expected that steady fixation and equality of angle lambda will be observed. Deviation of the expected suggests the possibility of amblyopia and/or eccentric fixation.

<sup>1</sup>It is important to have ample illumination upon the eyes so fixation characteristics can be observed with ease.

## II. BINOCULAR AND MONOCULAR VERSIONS AND ROTATIONS

### A. Clinical Technique

Binocular versions and rotations are performed at approximately 16 inches with the center of movement on the midline and slightly below the patient's eye level.<sup>1</sup> The instructions are, "Watch the tip of my light." If head movement is noted further instructions are, "Now keep your head still and watch the tip of the light." Monocular rotations and versions are recommended only when binocular performance shows abnormal responses.

<sup>1</sup>Some clinicians prefer to do versions before rotations. The question is academic, however, the importance of doing both cannot be over-emphasized.

### B. Clinical Functions

The primary and most important observation to be made during rotations and versions is the determination of gross motor capability. Constant binocular fixation throughout all phases of these tests indicates gross concomitancy. The absolute extent of binocular eye movements is observed by moving the fixation light laterally until the corneal light reflex moves or disappears from the cornea.<sup>1</sup> The limit of the binocular motor field is determined by employing the unilateral cover

test while moving the fixation light toward the midline. Measurement of the binocular motor field and the monocular motor field can be determined in any meridian using the same technique. Norms for the binocular motor field and the monocular motor field have been established.

<sup>1</sup>A differentiation should be made between the limits of the binocular motor field and monocular motor field. The absolute extent of the monocular motor field is reached when the light reflex moves on the eye ipsilateral with the fixation target.

The extent of binocular movements under binocular motor field conditions is apparent when the light reflex moves on the cornea on the same side of the light, or anatomical features of the face interfere with the opposite eye. Either can occur first.

### III. NEAR POINT OF CONVERGENCE

#### A. Clinical Technique

The near point of convergence is determined by moving the fixation light toward the patient along his midline at eye level. When doing an asymmetric near point of convergence the light is presented in front of the right eye and moved directly toward it. The procedure is repeated for the left eye. Again the instructions are, "Watch the light."

## B. Clinical Functions

Various observations are made during this procedure. Quantitative measurements are made of the break and recovery, evaluations of tracking skills, eye dominance, pupillary reactions, asthenopic and evasion symptoms, and suppression responses are noted.<sup>1</sup> First the break and recovery are measured. The break is observed when the light reflex moves on the cornea or the eye is seen to turn outward. The patient is asked, "How many lights do you see?" A response of "One light" indicates the possibility of suppression. After moving the fixation light well inside the break point it is moved out slowly until binocularity is re-established. This point is reached when the light reflex on the cornea is again centered or at points corresponding to that seen under conditions of the monocular light fixation testing. Binocularity is always confirmed with the unilateral cover test. A re-fixation movement in the non-occluded eye indicates lack of recovery. Quantitative measurements of the near point of convergence should be the result of at least five repetitions. Consistency and sustained performance is expected. Tracking skills,

pupillary reactions, asthenopic and evasion symptoms should be evaluated. The eye that maintains fixation longest is most often the dominant eye. The preceding observations should also be applied in the asymmetric near point of convergence. Quantitative comparisons of break and recovery are made between the two eyes.

<sup>1</sup>Five repetitions of the near point of convergence should be adequate to acquire the necessary information from this procedure. Smooth and accurate tracking of the target is expected. Avoidance reactions such as head movements and tenseness should be recorded. Wrinkling of the brow, tearing, squinting, and expressions of discomfort are asthenopic symptoms.

#### IV. UNILATERAL AND ALTERNATING COVER TEST

##### A. Clinical Technique

The unilateral and alternating cover test is normally done at two distances, at 16 inches using a fixation light as a target, and at 20 feet with the target being a small acuity letter.<sup>1</sup> It consists of three parts: unilateral, alternating, and again the unilateral.

<sup>1</sup>There is no prescribed order specifying at which distance the cover test should first be performed. However, since it is easier to direct children's attention to near objects, the near cover can be done first.

There are several techniques that can be used with children to obtain far cover test results. We suggest placing a muscle light on the test chart and having the child "cover" this light using a hand-held pointer flashlight.

#### B. Clinical Functions

The initial unilateral cover test is used to classify the patient as phoric or tropic at that specific distance. The key observation is obtained by watching the unoccluded eye at the moment of occlusion. A binocular recovery under these conditions indicates a phoric response. Lack of binocular recovery indicates a tropic response. The near testing distance will have to be modified if the near point of convergence is not within normal limits.<sup>1</sup> The alternate cover is used to determine the magnitude of phoric or tropic responses, and secondly, to determine the change in either response as a function of the time of dissociation.<sup>2</sup> The unilateral phase is repeated to differentiate between constant and periodic strabismus. Usually a periodic strabismic will show a phoric response during the first unilateral cover test and a tropic response during the second. The magnitude of the phoric or tropic

response can be established with loose prisms using the alternate cover, first with the eyes in the primary position. The alternate cover is then performed in the other eight directions of gaze. Any change in response in these positions indicates non-concomitancy. To facilitate observation in the lower fields of gaze the head can be tipped backward.

<sup>1</sup>A receded near point of convergence necessitates a modification of the near cover testing distance. The near cover should be performed well outside the recovery of the NPC. If done at or near the NPC's recovery, a tropic response may be elicited which is an artefact of the testing distance.

<sup>2</sup>Under alternate cover conditions if a change in phoria or tropia is noted, it should be continued until the magnitude is stabilized.

## V. SACCADIC FIXATIONS

### A. Clinical Technique

Saccadic fixations are performed at about 16 inches with the beads approximately 8 inches apart and equidistant from the midline. The instructions to the patient are, "Look at the red bead when I say red, and the green when I say green." Testing is done in the vertical, oblique, and horizontal meridians. The beads are then held at approximately 10 and 20 inches repeating the instructions

to the patient. This procedure is the near to near saccadic test. The near to far saccadic test is performed with a white spot of light at 20 feet and a colored bead held at 16 inches. The patient is told to "Look at far, then at near."

B. Clinical Functions

The quality of saccadic movements is observed and recorded.

CONCLUSION

This video tape presents a systematic technique necessary to administer the manipulatory skills tests. To acquire valid and clinically significant information the sequence demonstrated should be followed. It is suggested that several viewings of this tape will be needed if the clinician wishes to master the techniques and fully understand their functions. The study guide should be used in conjunction with the viewing of the video tape to obtain maximum benefit.