COMPARISON OF DISSOCIATED PHORIA MEASURING METHODS.

REPEATABILITY AND RELIABILITY.

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BACKGROUND

Many methods of heterophoria measurement are clinically available. Several studies have been carried out to compare their results. Due to the difference of the methods in the ability to control accommodation, the induced proximal convergence, the technique used for dissociation, and the method of data analysis[1], the results can vary on the same patient.

The aim of this study is to determine the reliability and compare reproducibility of different dissociated phoria measure tests: Modified Thorington, Von Graefe, and “fast” and “slow” Cover Test. For that purpose, I designed a specific protocol, in order to control and equate test conditions.

SAMPLE

Inclusion criteria

- Patients aged 8 to 40 years old.
- Men and women.
- Myopic, hyperopic and emmetropic patients.

Exclusion criteria

Visual acuity
- Snellen chart VA < 20/25 (eccentric fixation patients excluded)
- VA difference between eyes higher than one line (amblyopia excluded)
- Presbyopia (near VA < 20/20)

Binocular vision
- Strabismus or previous strabismus surgery
- Central suppression presence
- Vertical deviation > 2dp (Maddox test)
- Stereopsis (Randot) > 40’’

Ocular health
- Aphakic or pseudoaphakic patients

METHOD

Initial examination

- Anamnesis
- Monocular VA
- Retinoscopy
- Titmus stereopsis test
- Unilateral Cover Test
- Maddox test with the rods in vertical

Considerations

In order to avoid examiner bias, every objective test was combined with subjective ones.

Refraction: retinoscopy vs. subjective refraction
CT: ask for “phi phenomenon” to neutralize movement.
Stereopsis: Ensure absence of strabismus or microstrabismus

Use **best corrected refraction** in spectacles or contact lenses.

Clinical approach

* Perform each test 3 times

* Allow binocular vision between measures.

* As an accommodative control stimulus, use a near acuity chart (VA 20/30) at 40cm

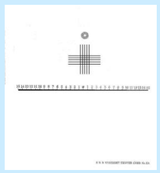
* Lighting conditions: dimmer while performing Modified Thorington. That way, we help visualize the red rod.

Less dissociating method

Modified Thorington

Horizontal Red rod on OD

Punctual light behind the test



Ask for the position of red rod (direction and number)

Von Graefe

Risley prisms quantity:

12BI (OD) & 4BS (OS)

Note: If in the previous test phoria was higher than 7XF’, 15BI prism is used

Fast Cover Test

5 occlusion of 1 second
Ask for “phi phenomenon”
Neutralize with prisms

Slow Cover Test

5 occlusion of 3 seconds
Ask for “phi phenomenon”
Neutralize with prisms

Most dissociating method

RESULTS

31 non-presbyopic patients were enrolled in this study. 11 of them were optometrists. Mean age was 23.2 + 3.9 (SD) years.

Table 1. Statistical Analysis (Δ)

Method	Avg (Δ)	SD (Δ)	FAC*	KC**	Max (Δ)	Min (Δ)
Modified Thorington	1.78	6.99	-0.21	-2.24	7	-8
Von Graefe	3.22	7.8	0.31	-1.86	16	-4
Fast CT	2.19	7.13	-0.40	-2.28	8	-6
Slow CT	2.5	8.56	-0.47	-2.24	8	-9

*FAC: Fisher asymetry coefficient **KC: Kurtosis coefficient

Table 2. Intraclass correlation coefficient among measures (repeatability)

Method	Measure 1	Measure 2	Measure 3
Modified Thorington	0,975	0,947	0,989
Von Graefe	0,834	0,684	0,926
Fast CT	0,981	0,959	0,992
Slow CT	0,989	0,976	0,995

Table 3. Intraclass correlation coefficient among methods (reliability)

	Fast CT			Slow CT		
	CCI	IL*	SL**	CCI	IL	SL
Modified Thorington	**0,85**	0,64	0,94	0,83	0,60	0,93
Von Graefe	0,64	0,27	0,84	0,59	0,19	0,82

* IL: Inferior limit ** SL: Superior limit

CONCLUSION

Cover Test and Modified Thorington are two reliable methods of measuring phoria[2,3] and they offer similar results in normal binocular vision subjects. The difference in prismatic dioptres between Fast Cover Test and Modified Thorington is not clinically significant. These two methods are equivalent.

Von Graefe shows more variability[2], and yields higher values of exophoria[4]. The use of phoropter can trigger this[5].

Slow CT unmasks higher amounts of phoria than Fast CT. Cover Test is the unique method that allows assessing the fusional stability, varying the occlusion period and estimating the time of recovery.

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