

## A COMPARATIVE ASSESSMENT OF THE LANG, T.N.O. AND TITMUS STEREO TESTS

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### Abstract

*The Lang stereo test was assessed. This test is based on the combination of the random dot stereogram and the panagraphic technique of Hess. It allows for rapid examination of stereopsis without the use of glasses and with only a minimum amount of co-operation and comprehension from the patient. The new Lang stereo test is compared with the T.N.O. and Titmus tests in children between the ages of 3 months and 12 years of age. Four groups of children were assessed:*

1. a control group of children with no apparent ocular defects
2. a group of infants with no apparent ocular defects
3. a group of children with moderate anisometropic amblyopia
4. a group of children with microtropia.

*The results show that the Lang test is a superior screening test for infants; it is a comparable screening test for anisometropic amblyopia and a superior screening test for microtropia.*

**Key words:** Lang test, T.N.O. test, Titmus test, stereopsis, microtropia, anisometropic amblyopia, screening test.

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### INTRODUCTION

"Stereopsis is the binocular perception of depth made possible by the fact that the two eyes view the external world from different vantage points, and ... (it) requires the correlation of information from the two eyes."<sup>1</sup>

In recent times, there have been a number of major advancements in the understanding of binocular single vision. One development has been the physiological demonstration of binocularly driven cells at the cortical level<sup>2,3</sup> and another, the invention of various tests designed to demonstrate the presence of stereopsis under "near normal" viewing conditions.<sup>4</sup>

At Sydney Eye Hospital Orthoptic Clinic, the tests most commonly used have been the Titmus and T.N.O. tests. The Titmus is designed to

quantitatively elicit stereopsis. It is based on the principle of the polarised 3-D vectograph and polaroid glasses must be worn so that each eye receives only one of the two images at a time. The T.N.O. is also a quantitative test. It employs the principle of random dot stereograms and spectacles are required to isolate the images received by either eye in order that the disparity is appreciated and the test plates viewed stereoscopically. The advantage of the T.N.O. is its absence of monocular clues. While both tests are designed for children, it is our experience that they are difficult tests for those under three years, since the child has to be persuaded to wear glasses, and because a positive response requires a subjective response from the child. This is especially true of the T.N.O.

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Professor J. Lang has designed a new stereo test where spectacles are not required. In this test, a positive response can be obtained objectively by the examiner observing the child's eye movements. The Lang test combines the random dot principle of Julesz, with the panagraphic technique invented by Hess in 1912. In the test, a cat, a star and a car are seen stereoscopically on a flat screen measuring 9.5 cms × 14.5 cms. At a distance of 40 cms, the cat represents a disparity of 1,200 secs of arc, the star 600 secs of arc, and the car 550 secs of arc.<sup>5</sup>

Because of technical reasons, the Lang is not as suited for assessing the stereothreshold as the Titmus and T.N.O. To date, no statistics have been published, but Lang has found by experience that subjects with constant strabismus and microtropia generally fail to give a stereoscopic response, whereas subjects with moderate anisometropic amblyopia may pass the test.<sup>6</sup> He also found that the design permitted a reliable testing of infants under three years of age.

#### AIMS

The aims of this study were to:

1. ascertain the validity of Lang's statements concerning his new stereo test whereby:
  - (a) subjects with a moderate degree of anisometropic amblyopia generally do give a stereoscopic response,
  - (b) subjects with microtropia usually fail to give a stereoscopic response,
  - (c) infants can be tested accurately
2. assess the screening effectiveness of the Lang as compared to the Titmus and T.N.O. tests.

#### METHOD

Eighty-four children were examined. Following orthoptic examination, the children were placed in the following categories:

Group 1 a control group of 22 children with no apparent ocular defects. They ranged in age from three to 11 years.

Group 2 12 infants with no apparent ocular defects. They ranged in age from three to 30 months.

Group 3 28 children with anisometropic amblyopia of a moderate degree. They ranged in age from five to 11 years.

Group 4 22 children, all of whom had a convergent microtropia which measured 10 or less on a simultaneous prism cover test. They ranged in age from three to 11 years.

All children, with the exception of the control group had a full ophthalmological examination. All had a routine orthoptic test. The Titmus, T.N.O. and Lang tests were performed on all children. A stereoscopic response was said to be positive if:

- (a) any objective response was noted (i.e. if the examiner observed the movements of a child's eye from one test object to another, or
- (b) any subjective response was noted (i.e. a verbal or kinetic response, e.g. "pinching" the fly's wings) which indicated that the child could appreciate the test object stereoscopically.

#### RESULTS

The results of testing the children in the four groups are shown in the table and graph below.

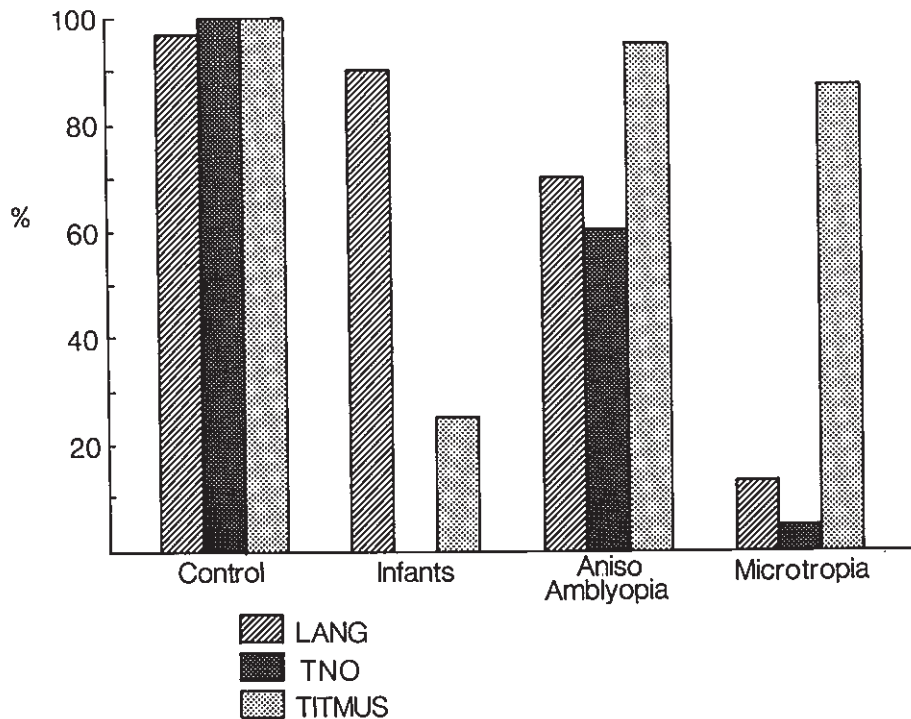
#### DISCUSSION

All children in group 1 performed well on the three tests, as expected because they had no ocular defects and were sufficiently mature to perform the tests. It should be noted that the results of the Lang test are similar to the other two tests.

TABLE 1  
Percentage (%) of children who gave a positive stereoscopic response on the Lang, T.N.O. and Titmus tests.

	Lang	T.N.O.	Titmus
Group 1 (control) n=22	97	100	100
Group 2 (infants under 3 years). n=12	90	0	25
Group 3 (anisometropic amblyopia). n=28	70	60	95
Group 4 (microtropia) n=22	13	5	85

GRAPH 1. % of positive stereoscopic responses



#### *Infants*

Group 2 consisted of normal subjects under the age of 30 months.

Twenty-five percent (25%) of the infants gave a positive response to the Titmus, none responded positively to the T.N.O. while 90% responded positively to the Lang test (table, graph). Lang reported that the youngest child to perform the test was 8 months old. In this study, the youngest child was three months. It should be noted, however, that the child was the daughter of an orthoptist! The superior performance with the Lang test could be due to the design of the test which more easily elicits a stereoscopic response in this age group. The poorer performance of the infants as compared to the control group, especially with the Titmus and T.N.O. tests, can possibly be explained by the difference in ages between the two groups.

#### *Anisometric Amblyopia*

In group 3 there was an overall pass rate of 75% with the three tests which indicates that none of them appear to be adequate as screening devices to detect the presence of anisometric amblyopia. Within the group, however, a greater failure rate was evident with the T.N.O. and Lang tests than with the Titmus (table, graph), but there was no significant statistical difference between the results of the three tests. The results support Lang's assertion that subjects with moderate degrees of anisometric amblyopia generally pass his test.

#### *Microtropia*

In this group, the greater failure rate with the Lang and T.N.O. tests as compared to the Titmus proved to be statistically significant. It is interesting to note that the higher failure rate

was evident with the two tests (Lang and T.N.O.) which are based on the random dot principle. The results support Lang's claim that subjects with microtropia generally fail his test, and also indicate that the Lang and T.N.O. tests are more reliable than the Titmus test for the screening of microtropia.

#### CONCLUSIONS

In summary, the results of this study support Lang's claims that subjects with microtropia usually fail to give a stereoscopic response to his test, while subjects with a moderate degree of anisometropic amblyopia generally pass.

Lang has said that his test is suitable for infants. It is an easy test to administer, no spectacles are needed and it is possible to objectively assess the child's reaction. The results of the study tend to support this view.

The Lang test was designed as a screening test, not as a measure of quantitative stereopsis. This study has found that it is a more reliable screening test for microtropia than the Titmus test. It is a comparable screening test of moderate degrees of anisometropic amblyopia, though with an overall pass rate of 75%, none of these stereoscopic tests appear to be reliable screening tests for this condition.

#### References

1. Bishop PO. Binocular vision. In: Robert A. Moses (ed.). Adler, Physiology of the eye, clinical application, 6th ed. St Louis: Mosby, 1975, 21.
2. Hubel DH, Wiesel TN. *J Physiol (Lond)* 1968; 195-215.
3. Blakemore C, Van Sluyters RC. *Brit J Ophthalmol* 1974; 58: 176.
4. Frisby JP. Random-dot stereograms. *Brit Orthopt J* 1974; 31: 1-8.
5. Lang J. A new stereotest. *J Paediatr Ophthalmol and Strabismus* 1983; 20: 72-74.
6. Lang J. Instructions for use of the Lang stereotest. (Instructional booklet supplied with the Lang Test.)