TESTING STEREOPSIS - WHICH TEST SHOULD BE USED?

Stereopsis has been defined as the binocular appreciation of depth made possible by the fact that the two eyes view objects in the external world from slightly different vantage points[1]. More specifically it is the perception of three dimensions brought about by fusion of images received by slightly disparate points on the retinae. Stereopsis is the quality of binocular vision which enables us to perceive depth independently of monocular clues and contours. The demonstration of stereopsis is believed to be of great importance[2], for it can reveal the presence of visual dysfunctions such as refractive errors, strabismus, or amblyopia.

But what exactly are we doing when we assess stereopsis? Hinchliffe[3] has suggested that before conducting clinical assessment of stereopsis, it is necessary to consider why a stereotest is being used. She has identified the three following factors: to determine the presence of binocular single vision; to determine the stereoscopic threshold; and to monitor the consolidation of binocular single vision during treatment. Large numbers of studies have been conducted to compare how effectively existing stereotests assess stereoscopic ability and screen for visual dysfunction[3-13]. In many of these studies, however, contour stereograms such as the Titmus and Randot stereotests were compared and used interchangeably with random-dot stereograms such as the Lang, TNO and Frisby stereo tests, when clearly random-dot and non-random-dot stereotests assess different aspects of stereoscopic function.

It is the authors' opinion that too frequently random-dot and non-random-dot stereotests are used interchangeably without consideration of the essential differences which exist between the two types of tests. We believe that a stereotest should be chosen discriminately depending upon the nature of assessment and ocular status of the patient. A thorough orthoptic examination should include both types of stereotests, each being used to assess different aspects of binocular function. For example, in a screening situation the most appropriate test to use is a random-dot stereotest such as the TNO, Lang 1 or Lang 2 stereotest. It should be remembered that the TNO and Lang stereotests were specifically designed as screening tests because, in most cases, stereopsis cannot be demonstrated on these tests in the presence of manifest deviations and unequal visual acuity. The effectiveness of these tests has been investigated in a number of studies,[4,6,14-19] which confirm, in particular, that the Lang stereotests are easily administered and successfully detect the presence of manifest strabismus, microtropia in 70% of cases[19] and a significant number of individuals with anisometropic amblyopia.

In comparison, in patients with confirmed microtropia or small angle deviations with anomalous retinal correspondence, a contour stereotest is more appropriate[20], as it allows for the measurement of stereoacuity in the presence of a manifest deviation with abnormal retinal correspondence. The Titmus and Randot

stereotests appear to be better indicators of the presence of peripheral stereopsis in patients with small angle esotropia,[10] thus providing results which may confirm the presence of binocularity in patients who lack bifoveal fixation and are unable to demonstrate stereopsis when presented with random-dot stereograms. It is conceded, however, that the results of a study by Clarke and Noel[21] suggest that the Randot test may be superior to the Titmus test as monocular cues in the Titmus test may influence the results. This aspect of stereotesting requires further investigation.

This letter serves to remind orthoptists to choose the appropriate stereotest for each clinical setting. Is the stereotest being conducted in order to screen for visual defects, or is it attempting to establish whether any form of binocularity exists in patients with known binocular anomalies? In each situation, a test for stereopsis is important, but one must remember to choose the type of test appropriate for the desired investigation.

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References:

1. Bishop PO. Binocular Vision. In R. A. Moses & W. M. Hart (Eds.), Adlers Physiology of the Eye: Clinical Applications. St. Louis: The C.V. Mosby Company, 1987; 619-689.
2. Neill R.A. A survey of the clinical evaluation of stereopsis in Australian Orthoptics. Aust Orthop J 1979-80; 17: 81-85.
3. Hinchliffe H.A. Clinical evaluation of stereopsis. Br Orthop J 1978; 35: 46-57.
4. Broadbent H, Westall C. An evaluation of techniques for measuring stereopsis in infants and young children. Ophthalmol & Physiol Optics 1990; 10: 3-7.
5. Cooper J, Feldman J, Medlin D. Comparing stereoscopic performance of children using the Titmus, TNO, and Randot stereo tests. J Am Optom Assoc 1979; 50 (7): 821-825.
6. Johnstone R, Brown S. A comparative assessment of the Lang, TNO and Titmus stereo tests. Aust Orthop J 1985; 22: 27-30.
7. Jolly N. A comparison of the Titmus and TNO stereoacuity tests. Aust Orthop J 1978; 16: 13-16.
8. Marsh WR, Rawlings SC, Mumma JV. Evaluation of clinical stereoacuity tests. Ophthalmol 1980; 87: 1265-1272.
9. Mazow ML, Prager TC, Cathey G. Assessment of three stereoacuity tests. Am Orthop J 1983; 33: 111-115.
10. Okuda FC, Apt L, Wanter BS. Evaluation of the TNO Random-Dot stereogram test. Am Orthop J 1977; 27: 124-130.
11. Schweers MA, Baker JD. Comparison of Titmus and Two Randot tests in monofixation. Am Orthop J 1992; 42: 135-141.
12. Simons K. A comparison of the Frisby, Random Dot E, TNO and Randot Circles stereotests in screening and office use. Arch Ophthalmol 1981b; 99: 446-452.
13. Tillson G. Two new clinical tests for stereopsis. Am Orthop J 1985; 35: 126-134.
14. Lang J. A new stereotest. J Ped Ophthalmol & Strabismus 1983; 20 (2): 72-74.
15. Lang J. The two pencil test and the new Lang stereotest. Br Orthop J (1984); 41: 15-21.
16. Lang JI, Lang TJ. Eye screening with the Lang stereotest. Am Orthop J 1988; 38: 48-50.
17. Manny RE, Martinez AT, Fern KD. Testing stereopsis in the pre-school child: is it clinically useful? J Ped Ophthalmol & Strabismus 1991; 28 (4): 223-231.
18. Lang J. Nine years experience with the Lang stereotest. In G. Tillson (Ed.), Transactions of the VIIth International Orthoptic Conference, Nurnberg: Fahner Verlag, 1991; 163-167.
19. Nussgens Z., Czerwonka B, Roggenkamper P. Examinations on the new Lang test. Strabismus 1993; 1 (2): 69-73.
20. Hansell R. (1991). Stereopsis and ARC. Am Orthop J 1991, 41: 122-127.
21. Clarke WN, Noel LP. Stereoacuity testing in the monofixation syndrome. Ped Ophthalmol & Strabismus 1990; 27 (3): 161-163.