Orthoptic Landmarks into the 21st century

This edition of the Australian Orthoptic Journal celebrates two tremendous landmarks in the development of orthoptics in this country. Following closely on the heels of the 50th anniversary of the OAA are two works of distinction that involve both clinical and research developments. The first is the invention by Australian orthoptist, Zoran Georgievski, of the Torsionometer, the second is the first establishment of normative data for long wavelength perimetry by Australian orthoptists, Josephine Piraino and Helen Goodacre.

The Torsionometer is currently being marketed world-wide by the producers, Clement Clarke International Ltd. This invention has received accolades from our European and North American counterparts and from ophthalmologists renowned in the field of strabismus. Congratulations are extended to Zoran who began with the clinical observations that symptomatic torsion needed to be accurately measured before and after intervention. It was observed that existing tests were limited either by capacity, fixidity of gaze or artifical space. Discussions with colleagues determined that colour dissociation on a white background would prove to have the elements of high contrast and allow best levels of understanding for patients. The ease of use of the Torsionometer for both the patient and clinican is one of the key features of this new instrument. Perhaps the most outstanding feature, is the ability to measure the amount of torsion in various positions of gaze - most commonly, primary position and the depressed positions. These measures are gathered in free-space with minimal binocular dissociation and therefore approximate the level of torsion experienced by the patient in daily life. Having worked from his clinical observations to the development of a prototype, Zoran then conducted reliability and validity testing and research. One such study is published in this edition. This work has been inspiring and will continue to contribute to our understanding of torsion. Feedback from users is invited through letters to the editor or directly to the author.

A second torsion paper in this edition tackles the objective/subjective method of blind spot mapping. The very interesting results of Cornell and co-workers show partial compensation mechanisms of cyclotorsion in response to set rotations of the head. These positions were static by nature of the apparatus. The most significant finding was that intorsion mechanisms were 30% more effective than extorsion mechanisms and were larger in amplitude. This would suggest a confirmation of the superior oblique muscle as the active torter by way of anatomy and physiology. Is there a corresponding sensory asymmetry to this motor asymmetry and how would this affect the binocular state? Your comments are invited on this paper also.

Perimetric testing featured in the previous edition and the second landmark contribution this year concerns perimetry with long wavelength stimuli, the red field. The significance of the study by Piraino and Goodacre is that it goes a long way towards solving the quandary of utilizing the red field as a diagnostic tool. White field interpretation is aided by comparisons to norms incorporated in the Statpac programme of the Humphrey automated perimeters. Deviations from these norms can be interpreted as pathology in conjunction with other diagnostic tools such as symmetry. Comparison of a red field against norms can now be performed as normative red field data has been collected and analysed by these authors. Ideally this will be incorporated into the Statpac database and red field perimetry will gain the diagnostic credence it deserves as a sensitive long wavelength low illumination target. The ideal early detector of pathology. These authors have recognised the need to eliminate possible error sources in clinical interpretation and establishing the norm is a critical step in the scientific process. More research into colour perimetry is eagerly awaited.

Monocular visual assessment is addressed twice in this edition, as a letter to the editor and in a study by Duyshart on test design, test features, age and repeated measures. Many more questions are raised than are answered with respect to screening for the detection of amblyopia versus clinical assessment of the visual system. It is about time that these issues were resolved. Send your comments.

Orthoptist have argued long and well that the services that are provided in the arena of ophthalmic assistance are ones of intelligent

data gathering and interpretation as opposed to proforma technical activities. Many diagnostic dilemnas have been solved by orthoptists employing deductive testing procedures. The need for complete and sensitive investigations has been well highlighted in the case study by Ryan and Kelly. Internuclear ophthalmoplegia is a subtle yet clear and distinctive clinical sign localised to the brainstem. Its sequelae is well known as is its association with vascular disease, and bilaterally, with multiple sclerosis. The case presented highlights the significance of the detection of unilateral INO in association with optic neuritis and decreased monocular function and symptomatic interruption of binocular functions.

The extensive head injury review by Apostolou is a reminder of the full visual and ocular motility workup required to establish the usually multiple lesion sites of ocular problems in these instances. The pathophysiology is updated with the exception of the comments on divergence paralysis. Clinicans and researchers alike continue to describe the occurrence of divergence paralysis. The site of defect has even been suggested to be at the level of the VI CN nucleus in the region of the pontine paramedian reticular formation. This makes no sense at all. A reduction or absence of divergence ability is invariably accompanied by a reduction or absence of convergence ability. The patient has decompensation of an exophoria for near and an esophoria for distance fixation. The point of binocular single vision is at 120 cm which is the average resting vergence or tonic vergence position, for an IPD of 6 cm.

This defect of both convergence and divergence ability can be easily localised to the dorsal midbrain, 1-2 mm from the III CN nucleus, as this is the region of groups of phasic and tonic cells that fire in response to approaching and receding targets. Nowhere near the pons. Again, a full binocular vision workup leads to localisation and answers to pathophysiology. It was reassuring in this head trauma paper to see the term 'skew' deviation applied to brainstem anomalies in which a disturbing disruption to vertical alignment and management of the horizontal meridan occurs. (Vertical vergence or vestibulo-ocular brainstem pathways may possibly have been disrupted.) This is mainly seen in comatosed patients. It has recently become fashionable to adopt the term 'skew' for the yet to be explained minor incomitant hyperphorias/tropias of L/R in left gaze and R/L in right gaze. Suspicions lie with sloping insertions of the lateral recti, only evident in extreme dextro and laevodepression. The inferior recti anatomy could also be considered if there is an accompanying A exotropia. Certainly no brainstem anomalies. Diagnostic terms are designed to relate to underlying pathophysiological mechanisms and should be used as such.

Research on Visual Acuity Tests: A Need for a Functional Perspective.

In response to the article "Comparison of crowded single optotypes with linear acuities in amblyopes" by Williams et al., published in AOJ 1995, Vol.31: 21—27, I would like to comment on which test should be used to identify amblyopia. The debate is a double edged sword as it can be discussed in reference to either screening or diagnostic protocols. These protocols should consider different aims and mean age of acuity assessment, which are reflective of the population groups examined. The confusion generally results when attempting to debate such a topic because the above factors are not addressed simultaneously.

The aim of screening is to detect and reduce the incidence of visual anomalies. Amblyopia is thought to be the most common visual anomaly in children, hence, many vision screening programmes are aimed at its detection. Screening involves a non repeated measure that often occurs during the preschool years. Consequently, screening visual acuity tests should have a high sensitivity and specificity for three and a half year olds in order to detect amblyopia. It may be argued that acuity tests used for screening are not chosen to be used in isolation and therefore do not need a high sensitivity and specificity. However, a greater emphasis is placed on acuity test results for referral purposes by those who are not familiar with the overall characteristics of amblyopia and its influence on the visual system.

The implementation of Single optotype tests as a screening tool is commonly debated in the literature. Their use is advocated on the basis of short test duration times and high reliability [1]. However, it must be remembered that Single optotype tests were originally chosen as a screening tool because it was the only reliable alternative in paediatric assessment of visual acuity in the early seventies [2]. Its use as a screening tool has since been debated because it overestimates acuity in amblyopes and its absence of adjacent contours is thought to induce the crowding phenomenon [3,4,5]. Since the 1970's there have been several new paediatric test designs that incorporate form and spatial perception as well as contour interaction. However, validations of test types have generally been conducted with a small sample size, varying types of amblyopia and often have a diverse subject age range. Consequently, results are difficult to extrapolate to specific population groups, in particular which test type to choose in a screening program or clinical setting. For example, although the study conducted by Williams et al. [6] concluded that the LM test provides a stimulus that detects amblyopia and its acuity measurements equate to those measured by a Snellen Chart, the findings are limited to any further interpretation. Williams' et al [6] results could have had greater clinical significance if their subjects were between three and five years of age, included test-retest reliability with inter-test correlations, and analysed anisometropic and strabismic amblyopia results separately.

Can the use of single optotypes in a screening program be substantiated with the development of other test designs? The question can only be partly answered and debated if large studies are conducted to determine the characteristics and incidence of amblyopia in preschool children, as it is these characteristics which will influence the design specifications of future screening tests.

Screening is aimed at eliminating a disease and the method employed is dependent on the prevalence and characteristics of the disease. Therefore, by definition, if a screening program has been successful, the test used to detect a disease should continually change in accordance with the changing prevalence and characteristics of the disease. It is logical then to argue that the screening tests used 25 years ago are not appropriate as screening tools for today.

Single optotype VA tests, however, are still a clinically valid VA test. Why? In a clinical environment acuity measurements can be conducted repetitively over time and the choice of test is largely up to the discretion of the clinician, who can determine which test type to implement, dependent upon the aim of the investigation, child's age and cognitive function. When diagnosing and monitoring amblyopia, there is sufficient time to make comparisons between eyes, with repeated measures, and between single and multiple optotype tests, as well as in conjunction with other ocular motility and binocular function tests. This enables the use of clinical judge-

ment to overcome the inherent problems associated with the use of Single optotypes.

In conclusion, it is important for clinicians to recognise the different aims and mean age groups in studies when reviewing the literature, to determine whether Single optotypes are a valid test to use in the detection of amblyopia. Specifically, clinicians need to be aware to not extrapolate information from studies which are not stringent in design and subject criteria in conjunction with its aim. Furthermore this letter addresses the importance for researchers to design studies that have clinical significance.

Rebekah Duyshart

Ed: Some excellent points have been made in this letter concerning the testing of visual acuity. Replies are welcome on any or all of the above issues.

References

1. Fern KD. Contour interaction in the preschool child. Am Jnl Optom Physiol Opt 1986; 63 No,5:313-318.

2. Sheridan M and Gardiner P. Sheridan-Gardiner test for visual acuity. BMJ 1970; 2: 108–109.

3. Griffin J and Grimsham J. Binocular Anomalies–Diagnosis and Vision Therapy. 3rd ed. Boston: Butterworth–Heinemann. 1995; 146–155.

4. Hammer R and Mayer D. The development of spatial vision, In: Principles and Practice of Ophthalmology–Basic Sciences, Albert D, Editor. Philadelphia: WB Saunders. 1994; 578–608.

5. Mein J and Trimble R. Diagnosis and Management of Ocular Motility Disorders. 2nd ed. London: Blackwell. 1991; 56–58.

6. Williams M. et al; Comparison of crowded single optotypes with linear acuities in amblyopes. Aus Orth Jnl 1995; 31: 21–27.