

Report on the International Symposium on Low Vision

Introduction to Abstracts

The International Symposium on Low Vision held at the School of Optometry, University of Waterloo, June 25th to 27th was a major event in Canadian Optometry. It was the first of its type ever held but, no doubt, it will not be the last. The rapidly rising demand for low vision services will ensure that.

As the longevity of our population steadily increases so too does the number of potential consumers of low vision services. Advances in technology and understanding of the nature of low vision problems have dramatically increased the range and effectiveness of the services available to the people. Low vision is a frontier area of vision care. Optometry, appropriately, is a key pioneer and leader in this field.

Aside from the obvious benefits of the Symposium that will filter down to the low vision service consumer, there are

other, more subtle, but very significant pluses that I observed during those June days in Waterloo. One of the most striking of these was the international and interdisciplinary interaction. It was exciting to see professional jealousies, prejudices and politics set aside as all focused on how to best help those in need of our combined knowledge. In my more optimistic moments, I can see this trend spreading to other aspects of the vision care and health care fields. Perhaps symposia such as this are keys to opening the communication channels that too often hinder progress and patient welfare in the name of protecting some perceived professional turf.

Topics and discussions ranged from highly technical to socio-economic, from clinical to pure research. There was something for everyone who attended. All the comments that I have since received were positive and enthusiastic.

I attended as a representative of Canadian Optometry and as a private practi-

tioner with an interest in low vision. I learned a great deal and met many dedicated people. I came home feeling proud — proud that Optometry was the host and leader in this significant event; proud of our outstanding facility at the University of Waterloo, the School of Optometry, which was seen and appreciated by so many leaders in this special field of vision care; proud of the tremendous job that Dr. George Woo and his Committee did to make the occasion the success it was.

The Symposium was a major step forward in bringing help to people with low vision, in the sharing of knowledge in the field by great minds from around the world (fourteen countries were represented by those presenting papers at the Symposium), and in developing closer interprofessional relations. I can hardly wait for the next step.

**Scott D. Brisbin, O.D., F.A.A.O.
President, CAO**

Colour Vision in Optic Neuritis

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Patients with a past history of optic neuritis were selected with differing degrees of stable residual deficits and with marked interocular differences in sensitivity. Firstly, a comparison was made of contrast sensitivities to chromatic and to luminance stimuli in ten subjects. Contrast sensitivities were measured to sinusoidal luminance gratings, and to both red/green and blue/yellow chromatic gratings (1 cycle/degree, 0.5 Hz). Detection of the chromatic gratings was solely on the basis of their colour differences. Results suggest that colour contrast sensitivity can be more severely impaired than luminance contrast sensitivity. Secondly the suprathreshold nature of the deficit was investigated.

ed. Suprathreshold hue, saturation and brightness matches were made between the more and the less severely affected eye in five subjects, using Munsell colour patches. The results indicate that the most predominant deficit is a loss of saturation (chroma) perception. In addition, marked changes in perceived hue were found to occur.

Contrast Sensitivity Function Evaluation of Low Vision Patients Using the Vision Contrast Test System

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Low vision patients can often exhibit losses in functional vision that are not evident from standard acui-

ty measurements. The discrepancy between the "quantity" of vision and patient performance as measured by acuity has long been noted by low vision practitioners. Contrast sensitivity is emerging as a more complete performance-related measure of the "quality" of vision. A new vision contrast test system (VCTS) is a quick, simple, standardized chart system for measuring contrast sensitivity. Here we report the results of testing 55 low vision patients using the VCTS. The contrast sensitivity values of a low vision population are compared to those of a normal population. The differences in contrast sensitivity between the left and right eyes of the low vision patients revealed that the preferred eye had higher contrast sensitivity rather than best acuity. Contrast sensitivity data identified 95% of patients who were able to perform well with visual aids. Although the VCTS can provide a contrast sensitivity function from five spatial frequencies in about one minute, the question arises as to whether measurements of fewer spatial frequencies are equally diagnostic. For example, suppose only the peak and highest spatial frequency (acuity) values are used. It is shown that such reduced data great-

ly reduces the diagnostic power of contrast sensitivity analyses. Contrast sensitivity data from the VCTS is a better indicator of potential reading ability than visual acuity.

New and Improved Contrast Sensitivity Approaches to Low Vision

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The contrast sensitivity approach which has enjoyed much success in the field of normal vision research has been applied to clinical vision investigations over the last decade. Its clinical success has been less than expected and it is now clear that there are some important deficiencies in the initial approach. These deficiencies will be outlined with reference to amblyopia, optic neuritis, medical opacities and retinal degeneration. In each case they suggest important modifications that need to be made to this approach before it can fully realize its clinical potential. From these studies emerge a number of specially modified contrast sensitivity approaches adapted to solve specific clinical problems.

The Role of X and Simple Cells in the Contrast Transducer Function of Low Vision and Normal Observers

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The defining property of retinal X cells and cortical simple cells is that they exhibit a *null phase* at which grating stimuli produce little or no response. It follows that for such "linear summation" cells a masking stimulus at the null phase should have no effect on detection of a stimulus at the optimum phase (90° from the null phase). When the stimuli are in phase, however, we expect the masking stimulus to reduce sensitivity according to the power law of the contrast discrimination function. Thus, if the psychophysical discrimination function was determined by either retinal X or cortical simple cells, the degree of masking should be markedly affected by background phase relative to the test. I examined this hypothesis in low vision and normal observers by presenting brief contrast increments, for a 2 octave range of test frequencies, at 0° and 90° phase to a steady background grating, consisting of single or multiple spatial frequencies at a background contrast of 10%. A 2AFC procedure was used to measure the contrast threshold. For both low vision and normal observers no difference was found between the contrast discrimination functions for 0° and 90° increments at any combination of spatial frequencies. This shows that the psychophysical contrast discrimination function is *not* determined by the responses of either retinal X or cortical simple cells. I will evaluate the alternative hypotheses that i) the contrast threshold is mediated by cells with non-linear spatial summation properties, or ii) the masking effect of the background occurs after a phase-insensitive combination of simple cell responses in the cortex.

Paradoxical Cases of Visual Improvement Offered by Above-Average Lighting Levels in Cases of Albinism and Retinitis Pigmentosa

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It is generally accepted that patients suffering from albinism and retinitis pigmentosa are photophobic (see, for example, Falls, M. (1966), 'Retinitis Pigmentosa-like Syndromes' in *Retinal Diseases*, Ed. S.J. Kimura, W.M. Caugill (Kimpton, London); and Taylor, W.O.G. (1985), 'Aiding Vision in Albinism', *Trans. Ophthalm. Soc. (UK)*, 104, 309-314). The argument put forward as an explanation for this phenomenon is a lack of pigment in the albino and above average intraocular light scatter in the pigmentosa sufferer. Cases are presented where visual performance is vastly improved when above average lighting levels are carefully employed in conjunction with refractive error and low vision correction. The need for careful application and patient education during the examination period is highlighted.

Quantifying the Magnitude of Visual Impairment with Multi-flash Campimetry

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Multi-flash campimetry is a static perimetric technique used to assess temporal resolving power in 120 points per eye in about half an hour. Using these data, two and three dimensional visual field maps can be created to visually discriminate among the fields of low vision patients and those of normals. An experiment involving the sensitivity of normals to flicker revealed that the amplitude of the fundamental Fourier component is directly related to flicker detection thresholds, and can be used to empirically quantify the degree of impairment depicted within the multi-flash fields. The output of an algorithm based on the ratio of the amplitudes needed by a patient to detect flicker with the multi-flash technique and a normal with the sensitivity paradigm will be presented.

Spatial vs Temporal Information about Suspected and Confirmed Chronic Open Angle Glaucoma Patients

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Temporal resolving power and spatial contrast sensitivity were assessed in early glaucoma patients and

glaucoma suspects, using techniques developed at the Concordia University vision labs. These methods are called multi-flash campimetry and the "Anticipated Threshold Technique" respectively. Multi-flash campimetry is a computer implemented algorithm which allows the sampling of temporal resolution in 120 points per eye of a 40 degree field in a half hour. Two- and three-dimensional density maps are produced from the data providing an easy interpretation of the results for clinical use. The "Anticipated Threshold Technique" is also a computer implemented algorithm which allows a 6 point contrast sensitivity function to be generated in less than 10 minutes. Both temporal resolving power and spatial contrast sensitivity are decreased for the suspects and the early confirmed open angle glaucoma as opposed to normal controls. More patients, however, demonstrated deficits in multi-flash campimetry than deficits in spatial contrast sensitivity. These results may be due to the fact that multi-flash campimetry samples information throughout a 40 degree visual field while the "Anticipated Threshold Technique" creates sine wave gratings within a 8 X 8 degree window.

Differential Retinal Structural Damage Exhibited by Image Enhancement of Fundus Photographs

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Non-invasive evaluation of retinal structural damage caused by various ocular diseases such as macular degeneration is an extremely difficult task. No quantitative method of such evaluation is available at present. We have demonstrated that a rather simple interactive damage of the retina in specific cases. Interactive image enhancement techniques such as histogram modification and pseudocoloring using point to point mapping have been found to be extremely useful in demonstrating differential structural damage in the retina by using digitized fundus photographs. Such differential structural damage has been correlated with the loss of visual function measured by spatial contrast threshold perimetry (Mitra, 1983-1985) and may provide a quantitative and non-invasive technique for differential diagnosis of specific types of macular degeneration.

Localization of Defect in Cortical Visual Impairment using Topographic Mapping

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Cortical Visual Impairment (CVI) has recently been described in the literature (*Dev. Med. Child Neurol.* Dec 1985). These children often have multi-

ple neurological handicaps, and encompass a rather wide clinical spectrum of disorders. They have in common retro-chiasmatic visual loss due to defect in the optic radiation (OR), striate cortex (primary) or secondary visual association cortical areas (secondary). Clinical examination of these patients is often difficult, and attempts to localize the neurological defect have not always been successful.

We report our experience with topographic visual evoked potential mapping (VEPM) in 50 children with CVI. Their age ranged from 3 months to 18 years. They all had extensive neurologic and ophthalmologic exams, CT and EEG. Traditional visual evoked responses were not useful. Using strobe stimuli, 200 epochs of 512 ms. were averaged, from 20 simultaneous scalp channels. Multi-colour potential maps were created 2 ms. apart and analysed. Our preliminary data supports the hypothesis that there are 2 distinct VEPM patterns, corresponding to dysfunction of the primary or secondary visual areas.

Visual Field Detection Using Topographic Evoked Potential Mapping

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The clinical examination of visual field defects in young children is a difficult procedure. Due to lack of cooperation, formal testing using Goldmann Perimetry and hemi-field pattern visual evoked potential (VEP) is not often possible or accurate. Traditional 2 to 5 channel flash VEP and routine EEG have also not been particularly useful. We wish to report our experience with the use of VEP mapping on 12 children with clinically obvious hemi-field defects.

Using 20 simultaneous scalp electrodes, 200 epochs of 512 ms. of EEG following strobe stimuli were averaged, with on-line artifact rejection. Digital conversion was at 500 Hz. with 8 bit accuracy. Data was displayed both in voltage-time tracings and in potential field maps. Our preliminary observations identified patterns of differences between the affected and unaffected hemispheres. Thus, VEPM may complement clinical visual field testing.

Low Vision Management in Selected Eye Diseases

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Management of low vision problems is influenced by the type of eye disorder and the degree of involvement of the various structures of the eye that are responsible for image formation. This presentation will consider the characteristic functional impairments in prevalent eye conditions and will relate the level of function to performance with visual aids and devices.

The Clinical Profile of a Young Visually Handicapped Population

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In 1977 in Quebec, a governmental program was begun for the rehabilitation of visually handicapped persons. This program permits the distribution of free visual aids to eligible persons. Initially an age limit of 18 years, later raised to 36 years, was applied to those eligible for the program. The *Institut Nazareth et Louis-Braille* is one of the centers accredited for this program. A sample of 500 records of patients examined at this institution was randomly selected from among the 2000 available, and computerized for analysis. The results permit a determination of the clinical profile of this population, in which 73% of the patients are less than 40 years old. The distribution, the nature and etiology of the functional deficiencies could be established, the type of visual aids used and the visual improvement will also be discussed.

Visual Impairment and Disability: Enhancement and Substitution

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By means of a descriptive study made on approximately 300 visually impaired persons seen for rehabilitation services at the Institut Nazareth et Louis-Braille, the authors present and compare the characteristics of the low vision and blind population according to the WHO's classification of impairment and the dimensions of visual performance suggested by Colenbrander in 1977. The frequency of use of vision enhancement aids and techniques and/or vision substitution aids and techniques are discussed for each of the 6 categories of impairment, along with the specific modes of written communication utilized by the patients. The authors further explore the relationship between the categories of impairment and disability and stress the need for new tools and means to evaluate and describe the different levels of disability.

Vision Examinations of Handicapped Children at Oregon State School for the Blind

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During May and June 1984 fifty residents of the Oregon State School of the Blind were given a vision examination at their facility in Salem, Oregon. This on-site process was chosen to eliminate trans-

portation costs and fears related to "going to the doctor". The objectives were to evaluate the visual needs and detect the unmet visual needs of the residents at OSSB, to prescribe low vision aids and other refractive materials as required, to establish the need for a low vision clinic and optometry services at OSSB and to introduce the institution to Optometry and Pacific University College of Optometry, so the services of the profession might be available to Oregonians.

Each child was given an individual vision assessment, including a visual evoked potential, a visual acuity assessment, retinoscopy, direct ophthalmoscopy, cover tests (distance and near), and ocular motilities. Results revealed that 2 children (4%) required new low vision aids, 19 (38%) required an updated lens prescription, and 25 students (50%) would benefit from a vision therapy program. A repeat of this study is planned for the Spring of 1986 to increase the patient base.

Accommodation in Visually Impaired Children

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In the visually impaired child there is often dysfunction of accommodative function, resulting in greater disability of vision at near. There seems to be a disturbance of the normal physiological development during early months of life of the sensorio-motor reflexes regulating the accommodation of the lens. A simple clinical test of accommodation in visually impaired children is presented. The importance of treatment/compensation of the accommodative defect in the young child is discussed.

Assessment of the Vision of the Deaf-Blind

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Although patients with a double sensory impairment are relatively few in number, there are several sub-populations within this group with differing communication needs during the clinical examination.

- 1) visual difficulties (small visual field, poor central vision) resulting in poor compliance
- 2) restricted vision-related vocabulary in spoken or sign language
- 3) vision examination preventing visual communication

These problems can be solved if the ophthalmologist, optometrist and rehabilitation personnel learn some basic skills in communicating with the deaf. The visual examination can be structured so that tactile information is used to replace visual signs and lip reading when the patient cannot perform testing and simultaneously see the interpreter, and care should be taken to assess the luminance level and distance that are optimal for the patient. Visual function should be assessed in different daily situations as an adjunct to the clinical examination.

A unique Model for a Resource Rehabilitation Centre for Consumers with Low Vision

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A consumer based low vision service delivery model is proposed which is scheduled for implementation this year. The essential features of this model are i) it is consumer controlled and consumer focused, ii) it uses existing community resources and services in a creative fashion that replaces the current fragmentation with a more integrated process of providing assistance and iii) the centre would exist outside the confines of "blindness" agencies and organizations recognizing instead that the needs of people with low but useable vision are distinctly different from the needs of the functionally blind.

Low Vision Patients and Other Disabilities: A Comparative Study

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Life satisfaction measures of low vision patients were compared with those of 2 other diagnostic categories, dialysis and cardiac, and with a control group. The assumption was that life satisfaction would vary according to the functional limitations associated with each condition. Thus, life satisfaction scores of low vision patients were expected to fall between those of the dialysis and cardiac groups, as well as be lower than the control scores. Five different tests were utilized, Life Satisfaction Indexes A and B, the Activity Questionnaire, the Holmes Social Readjustment Scale, and the Assessment of Current Community, Emotional and Social Satisfaction questionnaire that was introduced to be validated. The statistical analysis showed no significant differences between diagnostic categories. However, such differences between diagnostic categories. However, such differences were found between low vision and control subjects' perceived life satisfaction. This suggests that control subjects, as representative of a relatively healthy elderly population, are more active and satisfied with their lives. Regardless of the fact that low vision individuals' functional level is more inhibited by their disability, dialysis patients are more affected in terms of morale and satisfaction found in their present lives.

The Visual Requirements of Mobility

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To determine the visual requirements of mobility we artificially restrict the vision of normally sighted subjects, and measure how well they perform a mobility task, e.g. walking through a laboratory maze or a shopping mall. For each environment we measure time, bumps, and anxiety. Time is how

long it takes them to do the task; bumps is the number of contacts with obstacles plus any full stops; anxiety is measured by scoring the answers to a multiple-choice questionnaire. The visual requirements for walking in a shopping mall are 4° field, 2% contrast, or an acuity of 20/2000.

An Evaluation of Follow-up Systems in Low-Vision Clinics in the United Kingdom

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The low vision (LVA) clinic at Moorfields Eye Hospital London was restructured in 1970, and improved methods of assessment and follow-up were introduced. A new LVA clinic based on Moorfields methods was created at The Royal Victoria Hospital, Belfast in 1983. At about that time the Moorfields clinic, by then heavily oversubscribed and with long waiting lists, switched from booking follow-up for every patient at the first visit to a system that combined booked follow-up for unstable situations with an on-request and by correspondence system for the majority. Belfast sustained the original system. A sample of 100 new patients originally seen early in 1984 in each clinic for whom follow-up data is available is reviewed and the systems compared.

Rights of Low Vision Children and Their Parents

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This paper will address the rights of low vision children and their parents. Topics will include the right to genetic/medical counselling; the right to accurate assessment, diagnosis, referral and follow-up; the right to appropriate educational/vocational services; the right to necessary aids and equipment; and the right to employment, housing and transportation. The need for optometry, ophthalmology, education and rehabilitation to coordinate services will be stressed, along with the need for each service provider group to function as advocates for this particular population of visually impaired persons.

Strengthening Low Vision Rehabilitation Through the Accreditation Process

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This paper will explore those elements of low vision rehabilitation in a clinical setting that relate

directly to the accreditation process as espoused by the Commission on Accreditation, The National Accreditation Council. In building strong, responsive low vision programs on a multidisciplinary basis, accreditation of such programs seeks to: 1) assess strengths and weaknesses, 2) determine ways to correct or ameliorate weaknesses while building on strengths, and 3) formulate and implement short and long range plans to help the program achieve its mission. Each of these elements will be discussed and related directly to quality care in comprehensive low vision rehabilitation.

Sight Enhancement Services: A Safety Net or a Spider's Web?

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This presentation will outline the development of sight enhancement services from the human service perspective.

The Canadian experience, portrayed against North American and world trends, will reveal new challenges for the future.

A brief historical overview is needed to understand the human service structure targeted to blind and visually impaired persons as the 21st century is fast approaching. Emphasis on the unique needs of this minority group, within the disabled community, will stimulate discussion on the allocation of human and financial resources and will expose a population at risk.

In the momentum of planning coordinated services we must be careful to avoid "having the sight of an eagle — and the vision of a clam". This presentation will analyze that perception with reference to sight enhancement services — a safety net — or a spider's web.

National Long Term Care Facility Survey

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Assessment of the current practices of the long term care facilities related to their elderly visually impaired residents will be reported in this study. A detailed questionnaire covering such areas as: the number of visually impaired residents, specific problem areas attributed to loss of visual functioning as it relates to activities of daily living, specific administrative policies, steps taken in the last two years to alleviate the problems, type and extent of any relevant inservice education, activities as well as needs and problems related to the area were sent to 2000 randomly selected long term care facilities that are representative of the national distribution of institutions by type, size and location. An analysis and summation of the survey research will be presented which will indicate the current practices and needs of long term care facilities with regard to the visually impaired elderly.

The Effect of Blur Upon Psychophysical Receptive Field Properties

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The effect of optically induced blur upon static versus dynamic psychophysical center-surround receptive field relationships was examined. Previously believed to destroy these relationships, it was found, by using procedures similar to Enoch's Westheimer/Werblin functions, that the relationships were shifted by induced blur. Increased blur tended to have less effect on dynamic than on static thresholds under center-surround conditions.

Visual Acuity Deficits and Chromatic Aberration in Pseudophakia

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The pseudophakic eye exhibits an increased amount of chromatic aberration due to unfiltered ultraviolet (UV) light. As a consequence, the individual may have reduced visual acuity due to the defocusing of short wavelength light. Moreover, there is no empirical evidence quantifying the amount of longitudinal chromatic aberration in the UV. Therefore, this study includes two types of UV measurement in pseudophakic observers: 1) visual acuity loss, and 2) chromatic aberration. The visual acuity loss was measured by both optotypes and by a computer-driven vernier acuity apparatus. UV-filtered and unfiltered light sources were projected on either the eye chart or the vernier apparatus during the measurement of visual acuity. Chromatic aberration was measured with a computerized Badal-principle optometer. The acuity loss measured approximately one line on an eye chart and a comparable amount in vernier acuity. The relationship between the two measures is discussed in terms of the theoretical chromatic aberration computed by Cornu's formulae.

Eye Movement Considerations in the Assessment of Retinal Function in Patients with Maculopathies

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Our investigations have yielded several characteristics of eye movement control in individuals with maculopathies which differ substantially from those found in normally sighted individuals. While ap-

proximately 70% of our subjects adopted one preferred viewing locus for fixation, 30% developed two or more eccentric loci. In addition, the variability of the eccentric fixation in these individuals increased with increasing scotoma size. For subjects with central scotomata ranging from 2 - 30 degrees in diameter, 1 - 3 degrees of uncertainty of retinal position would be common with standard visual field testing. In subjects with larger scotomata, shifts in fixation angle of greater than 20 degrees have been recorded. While mean drift velocity in these individuals (31 minarc/sec; range: 13 - 186 minarc/sec) was slightly larger than that recorded in normally sighted subjects with artificial scotomata (mean: 25 minarc/sec; range: 13 - 55 minarc/sec), more important was the relatively high drift velocities in particular individuals and/or drift direction which may position that scotoma in the path of the desired image. Our results reveal that accurate psychophysical testing, such as higher resolution visual fields or spatial contrast sensitivity testing of specific retinal loci, of individuals with maculopathies, necessitates image stabilization techniques.

Contrast Sensitivity

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Many workers are understandably interested in the upper limits of visual performance, and the cut-off frequency of the contrast sensitivity curve provides a useful index for this purpose. But minimal performance can be shown to be not only of practical but also of theoretical interest. It shows that birth, focus, luminance level, colour, amblyopia and senescence share a common meeting point.

Prescribing Magnification: Strategies for Improving Accuracy and Consistency

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All low vision clinicians develop their own methods for prescribing magnification devices. Virtually all methods for determining magnification requirements can be fitted with one broad model, but the accuracy, consistency and efficiency of prescribing depends on the methodology applied within each of the broad stages. Commonly used models will be critically reviewed and consideration given to the effects of test chart designs, sequences of power steps, and reliance on lens power or viewing distance. Recommendations for enhancing clinical consistency will be developed.

Once the magnitude of the required magnification effect has been determined, it must be decided whether the magnifier will be provided in the form of reading glasses, hand held magnifiers, stand magnifiers, near vision telescopes, or video magnifiers. Methods to ensure that the examiner maintains maximum control over the resolution capabilities and the efficient visual functioning will be presented.

Evaluation of Cylindrical Minifying Biopic

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Assessment in the use of a cylindrical minifying biopic (amorphic biopic) and fresnel prisms for enhancement of peripheral field awareness is made in this study. A biopic amorphic system was developed to provide horizontal visual field expansion to individuals with severe visual field constriction. When used in conjunction with fresnel prisms, retinitis pigmentosa patients that were evaluated found that they could maneuver more safely and with increased confidence in unfamiliar environments. Parameters of the lens system along with patient selection criteria will be discussed.

Low Vision Performance as a Function of Task Characteristics

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Three assessment tasks measuring aspects of visual functioning, such as visual search, pattern identification, and visuomotor control, were developed and administered to a) 48 sighted subjects with simulated visual losses, and b) 43 low vision clients in the rehabilitation system. Tasks were performed under a variety of stimulus conditions including variations in illumination, contrast, size, target speed, and presentation mode. Analyses of variance allowed for comparisons of effect size to be made between stimulus variables and between the two populations studied. Similar stimulus effects were found for each group, but groups differed somewhat in terms of the extent and consistency of experimental effects. The low vision group exhibited far greater variability in performance across tasks and conditions. A number of interactions were identified between task variables and between subject groups and task variables.

Pathology Characteristics and Optical Correction of 900 Low Vision Patients

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A random sampling procedure was used to compare the pathology of 900 patients attending a hospital low vision clinic with their near vision performance and type of low vision aid issued. The sample included over 30 pathology groups of which the major were senile macular degeneration (40%), myopic degeneration (9%), diabetic retinopathy (8%) and glaucoma (6%). Patient ages spanned

from 5 to 95 years with a range of visual acuities on presentation from N8 to N48. The types of low vision aid used included high powered spectacles, spectacle microscopes and spectacle telescopes covering a magnification range of 2X to 20X. Many multivariate analyses have been undertaken to test several hypotheses. For example, an analysis of the optical magnification required by patients when expressed as a function of their uncorrected near vision shows that on average those with "better" visual acuities at presentation require slightly higher magnification than expected, whereas the "poorer" visual acuities require slightly lower magnification than would be predicted from theoretical calculations. This can be explained in part by the nature of the prevailing pathology and whether there is predominantly macular or para-macular disturbance to vision. Emphasis will be placed on practical clinical implications of the findings.

The City Study into Aging and Visual Disability: Optometric Data, Preliminary Report

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The City Study is a multi-disciplinary prospective study of people entering retirement. Disciplines involved include physical medicine, epidemiology, ophthalmology, optometry, and statistics. Over 1000 subjects have been reviewed and data collected on smoking, alcohol consumption, work, and both personal and medical history. Each subject had a full eye examination which included refraction, central field, intra-ocular pressure, biomicroscopy, ophthalmoscopy and fundus photography. Blood samples were analysed, and blood pressure recorded.

The first subjects were seen in April 1983, and it is proposed to repeat the assessments at intervals of three years. Some interesting correlations have been found between certain activities and vision. Optometric data on the first assessment is presented.

Senile Macular Degeneration of the Eye and Parkinson's Disease

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This study was undertaken to determine any association between Senile Macular Degeneration of the eye and Parkinson's disease, both of which occur in old age and involve pigmented tissue of brain origin.

Patients attending the University of Alberta Low Vision Clinic between August 1984 and November 1985 were examined for cog wheeling of the elbow and for at rest tremors. All patients 65 years and older with a diagnosis of Senile Macular Degeneration (SMD) made by referring ophthalmologists were included. Cog wheeling motion of the elbow and tremor were found in 29 of 176 patients. Among the 66 males, the ratio of those with Parkinson like findings to those without was 15:51, and

for the 100 females 14:96. The expected prevalence of Parkinson's disease is 6.6 for those 65 years and over. This may be a chance occurrence or may indicate a similar etiology of two diseases. Low vision aid design needs to be adjusted for patients with tremor.

To Determine if the Silver Pages Telephone Directory Provides Easier Access to Information for Sighted and Partially Sighted Elderly

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The purpose of this study was to determine whether the larger print of the Silver Pages Telephone Directory provided easier access to information for both normally sighted and partially sighted elderly subjects. Prior to its publication a brief survey of the elderly was made to identify which listings and/or advertisements were easiest to see, however, no actual comparison to standard directories was made. Subjects in this study were over 55 years of age; all subjects were tested for central and peripheral field loss and were classified according to their visual acuities. Subjects' performance using the Silver Pages Directory was compared to their performance using a normal directory during three tasks: 1) reading a predetermined portion of the index of each volume, 2) locating five listings from each volume, 3) locating and copying five selected listings from each volume.

A Hierarchy of Perceptual Training in Low Vision

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Recent evidence has demonstrated that having subnormal corrected vision does not mean that perceptual abilities cannot be improved. Barraga and her colleagues have proposed a perceptual development model for visually impaired children. This model is composed of 8 individual stages of development each dependent on the other. These stages are: 1) visual attention, 2) efficient eye movements, 3) manipulation of concrete objects to match model, 4) copy/draw shapes from model, 5) match single element picture to complex picture, 6) figure-ground discrimination, 7) letter and word recognition and 8) reading efficiency. We have chosen to investigate this model's relationship with the adult visual system impaired due to ocular pathology. The questions asked were: When an adult visual system is impaired, does this system and the perceptual abilities related to it regress to earlier stages of the developmental model proposed by Barraga? If such a regression occurs to a specific stage of development, do the stages remain sequential? That is, if

the system has broken down at level 5 does this mean that they cannot perform levels 6, 7, and 8, or is it specific to one level? Considering these and other related questions we have set out to design materials and techniques that could evaluate visual functioning at the different perceptual levels and train perceptual abilities necessary to function at these levels. These techniques will be demonstrated along with data.

Effect of Magnification and Field Size on Reading Speed Using a CCTV

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Patients with low vision require optical or electronic aids to magnify the images of objects of interest and thus enhance their visual performance. This is particularly so for reading tasks. Spectacles, simple magnifiers, telescopes and Closed Circuit Television (CCTV) systems can all be used as low vision aids to assist with reading. CCTVs tend to be used by those with severe visual impairments who require higher magnification than is readily available with optical aids or who need wider fields of view and freedom from the viewing distance restrictions inherent in high magnification optical systems. With the facility for interfacing CCTVs with microcomputers, more persons with low vision are using CCTVs. Different size monitors and a wide range of magnification and/or field size affect the reading speed of people using CCTVs.

The project involved two experiments; in the first we measured the reading speeds of 19 subjects with normal vision and 10 with low vision for each of 20 conditions (5 magnifications x 4 field sizes) on the CCTV. In this experiment the reading material was on a platform which the subjects moved at their own speeds, such that they could read quickly and correctly the print projected on to the CCTV screen. To investigate the influence of the subjects' dexterity with the platform movement, 11 subjects repeated the experiment under 16 conditions (4 magnifications x 4 field sizes), this time with the platform being moved mechanically at varying speeds which were increased until the subjects began to make errors in their reading. The results indicate that reading speed is limited by increasing magnification and decreasing field size, and that dexterity and familiarity with CCTVs do influence reading performance.

Predicting Reading Performance in Low-Vision Patients with Age-Related Maculopathy (ARM)

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In an earlier study of low-vision reading (Legge, G.E., Rubin, G.S., Pelli, D.G. and Schleske, M.M.