The Visual Appraisal of the Mentally Retarded

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SUMMARY

Owing to their intellectual handicap, it is of utmost importance that visual deficiencies of retarded children be recognised and corrected to provide maximum potential for learning.

Visual deficiencies in this group are difficult to assess without special skills on the part of the vision practitioner. Methods of testing these children are described. It was found that the incidence of squints is ten times higher than in a normal population. The majority were found to be hyperopic (long-sighted).

Comparative studies are discussed.

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Owing to their intellectual handicap, it is of utmost importance that visual deficiencies of retarded children be recognised and corrected to provide maximum potential for learning. Unfortunately, many of these children never have a visual examination; further, if one is performed, reliable data may be difficult to obtain. The children may be difficult to deal with, and frequently the eye-care practitioner does not have a satisfactory method of examination. In working with a group of children who have mental handicaps, a practical system for their visual evaluation was developed which is described in this article.

At this stage one should differentiate between sight and vision. Sight is a response to light so that, by reflex action, the eyes turn toward light and come to focus upon it. This is where the comparison to a camera ends. Vision is the process of interpreting what is seen. It is the skill of integrating what has been seen with information received from the other sense organs.

The optometrist is in a position to examine the sight and vision of the retardate. It therefore becomes clear that optometry's role today is no longer mainly the correction of sight defects, but that, by providing the proper physical basis for efficient seeing, the optometrist with a background in vision development can help the retarded child to learn by protecting and guiding his visual development. Visual evaluation only is discussed, and not the vision development or visual perceptual evaluation.

METHOD OF EXAMINATION

Most screening tests used consist basically of visual acuity (VA), a test for long-sightedness (hyperopia) and an eye muscle balance test.

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Visual Acuity Tests

Snellen E chart: This is the most commonly used test for VA. The main disadvantage of this test is well stated by Lippmann,[1] who says, 'young children do not have the concept of direction and therefore the Illiterate E is usually unreliable.' He also reported that these children require identification of one symbol at a time, a concept employed in our determination of VA using the Ffooks Symbol Test.

Stycar vision test (revised edition 1968 by Mary Sheridan): This test employs cut-out symbols placed on a table to be matched with similar objects at a distance. Lawson and Schoofs[2] state that this system did not prove successful because children with mental retardation frequently do not comprehend the concept of likeness or similarity.

In our study we find that the concept was understood and that the majority of the retardates gave reliable results. The recognition of differences and similarities is a part of the Hamlet School's study programme (see later).

Graded balls test (subtest of the Stycar vision test, by Mary Sheridan): Balls of various sizes and colours are dropped from the child's eye-level, and moved about within the child's assumed field of vision, giving some indication of VA.

Allen[3] pictographs: Lawson and Schoofs[2] attempted to use symbols familiar to children. Many children, however, were unable to recognise the symbols.

Lawson's 'Apple Chart': Lawson and Schoofs[2] photographed selected food items from the Peabody Language Development Kit Series, in colour, to provide a series of slides to be used with a projector. Because of the resolution of the projected picture, smaller symbols could not be satisfactorily reproduced. They therefore designed a wall chart, printed in colour, using the food items (apple, banana, hot dog, and ice-cream cone) calibrated for the standard 6-m distance. Each symbol can be framed by an adjustable framer to stimulate attention. This method proved successful in a high percentage of cases.

Snellen VA Chart: This proved to be of no value unless the individual knew his alphabet well.

Ffooks symbol test: This test consists either of two cubes, each side having a single circle, square or triangle on it varying in size, or of the booklet we used, which consists of all circle, square and triangle forms on each page. The standard VA range of 6/60 to 6/5 was represented. To present one form at a time, we blocked out the other two or three forms on the page.

This test has sound basis. Lipman[4] states that 'colour recognition and discrimination appear to be the first skill to be learnt. When children of different ages are shown, one at a time, a series of coloured geometrical forms — stars, circles, squares and the like, and are asked in each case to choose between matching the figure with another

similar in form and size but different in colour, or with one of the same colour but different in form, it has been found that children under $2\frac{1}{2}$ years of age usually match on the basis of form. At about $2\frac{1}{2}$ - 3 years of age, a swing towards colour appears. Thereafter an increasingly greater percentage of matching is made in terms of colour, ignoring differences in form, until a maximum preference for colour is reached at about $4\frac{1}{2}$ years. Then the tide of interest turns. Form and not colour decides the issue in more and more choices until adult level is reached, at which time about 90% of matching is made in terms of form and only about 10% in terms of colour, because colour has been firmly established and learned and therefore the individual discriminates between colour and form.

Amigo[5] also reported on studies by Fantz, Bower and others, proving that pattern and form discrimination is present in the 6 - 8-week-old infant. Bower found evidence for some degree of size constancy in the 40 - 70-day-old infant. He also reported demonstrable trends for shape constancy in the 50 - 60-day-old child.

Method Used in This Study

The 47 subjects studied were drawn from two institutions in Johannesburg, the Hamlet School for Retarded Children and the Selwyn Segal Home (for handicapped persons). The former supplied 29 subjects with mental ages of $1\frac{1}{2}$ to 4 years (they were all classified as IQ under 50) and from the latter home 18 retardates were studied, their ages varying from 5 to 31 years and with IQs of 40 to 75.

The subjects were examined at their respective institutions, with the teacher or some familiar person present for identification and assurance. It often proved to be beneficial for the next subject to watch the procedure, to gain confidence and to know what to expect. Because these children generally have a short attention span and are easily distracted, the test procedures were performed as rapidly as possible, without affecting the test validity. When a test proved to be beyond the comprehension of a subject, it was eliminated and the next procedure presented.

Description of the Tests Used

Far VA (6 m): Ffooks VA book discussed previously.

Titmus Stereofly (depth perception test): Polaroid glasses were placed over the eyes and the subject was required to try to touch the wings of the fly and to point out which animals appeared to be raised off the page. Some were unable to understand the concepts of 'off the page' or 'which one is nearer to you', etc. even after demonstration of nearer and further with other objects in the room, and hence the test could often not be performed satisfactorily.

Cover test (test of eye muscle balance) at far and near: To maintain and stimulate fixation and attention at far, the teacher held up familiar objects and asked the subject about them. At near, various toys were used, or a shiny silver ball in which the subject could see the reflection of his own face to stimulate fixation.

Convergence: Targets similar to the cover test near targets were used. The examiner noted the NPC (near point of convergence) objectively, i.e. when one or both eyes moved out or broke fusion when following a target in towards the nose on the median plane.

Ocular motility: Similar targets were used. Eye movements were checked in horizontal, vertical and oblique directions.

Retinoscopy (objective measurement of refractive error): A static retinoscopy was performed, with subject fixating objects held up by the teacher. The reflex was neutralised as quickly as possible. Fixation was often difficult to maintain.

Ophthalmoscopy: Direct ophthalmoscopy was performed as adequately as possible in the usual way. Again wavering fixation of the subject's eye was a problem.

External examination: The usual checking of the external eye (cornea, reflexes, sclera, etc.) and adnexa for pathology was performed.

RESULTS

Visual Acuity

In this study, using the Ffooks charts, only 10% of the population did not respond to the test satisfactorily.

TABLE I. UNCORRECTED (Better Eye)

6/6	44%	
6/9	14%	76%
6/12	18%	
6/18	10%	
6/24	4%	
6/36	2%	24%
6/60	—	
Less than 6/60	8%	
	100%	

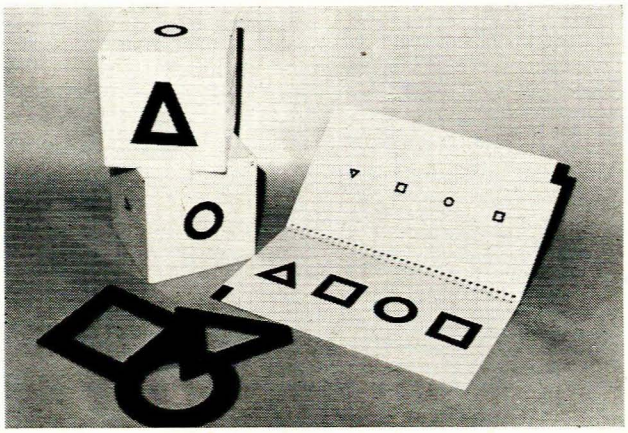

Fig. 1. Ffooks symbol test for VA.

Table I shows VAs determined satisfactorily for 42 of 47 patients (i.e. 90%). Lyle *et al.*[6] quote 6/12 or better 67%,

6/12 or worse 32%; these figures represent VAs determined satisfactorily for only 18 of 44 patients and represent a significant decrease of VA compared with a normal population of similar age groups.

Stereopsis (Depth Perception)

Using the methods previously described, 56% were able to perform the test, and of these 9 out of 28 patients (30%) perceived the gross stereoscopic fly and all three animal figures correctly (100 seconds of arc stereo); and 19 of 28 patients (70%) perceived the gross stereoscopic fly, with the required finger touch on the 'raised' wings of the fly.

There appears to be little literature to date regarding stereopsis in the mentally retarded population.

Far Cover Test

Four out of 47 (9%) gave unreliable results because of poor fixation; 50% did not exhibit any muscle imbalance as measured on the cover test; 4% exhibited exophoria; 18 (37%) exhibited a squint, 60% being esotropic (convergent deviation) 30% of these being exotropic (divergent deviation) and 1% showing a hyper-component (vertical deviation).

Near Cover Test

Once again 18 of 47 exhibited a squint (37%); 60% being esotropic and 40% being exotropic.

Convergence

The criterion of 7 cm or less from the bridge of the nose to target was taken as adequate. Of 47 patients, 30 had adequate convergence, keeping in mind that 13 were esotropes; of 13 with adequate convergence 5 were exotropes; 4 subjects exhibited such poor fixation, that measurement was impossible.

Ocular Motility

Thirty-six (70%) showed full eye movements; 8 (18%) showed a restriction of movement in one or more directions of gaze (i.e. eye muscle paralysis); 2 (5%) showed poor fixation and could not be evaluated; 3 (7%) exhibited nystagmus.

Lyle *et al.*[6] report a 15% incidence of nystagmus in their subjects, and Lawson and Schoofs a 10% incidence. The incidence of nystagmus in a normal population is very much less than this.

Retinoscopy

This included measurement of refractive error in equivalent sphere. Ten per cent had poor fixation and could not be evaluated. Seven per cent showed emmetropia or no refractive error. Forty-five per cent showed low hyperopia (0 to +2,00). Thirteen per cent showed medium hyperopia (+2,00 to +5,00). Fifteen per cent showed low myopia (0 to −2,00). Three per cent showed medium myopia (−2 to −5,00), and seven per cent showed high myopia (greater than −5,00).

These results correspond with Lyle's findings.

External Examination

Three subjects had undergone surgery for esotropia and among the rest the following were found: conjunctivitis—2; blepharitis—3; pterygium—1; horizontal nystagmus—3; two-tone iris—1; epicanthus—3; ptosis—1 and ectropion—1.

Lawson and Schoofs[2] found 20% with blepharitis, while Lyle *et al.*[6] found 41%.

DISCUSSION

Comparative Studies in the Field of Visual Testing

Courtney[7] cites other authorities who found hyperopia to be more prevalent than normal in a mentally retarded group. Some thought could be devoted to the implications of the hyperopia found in the mental retardate. Super and Karseboom[8] state: 'It is interesting that 40% of the university population and 66% of the honours' students in the USA are myopic. This may well represent an intelligent or physiological adaptation of the human organism when it cannot sustain the stress of protracted near work. At the opposite end of the scale, our findings indicate that the mentally retarded show a slightly greater degree of hyperopia than the normal, and a lower degree of myopia, showing that perhaps they have not made the intelligent adaptation.'

Hirsch, cited by Courtney,[7] found a small but statistically significant tendency for those with lower intelligence to be more hyperopic than those with higher intelligence. The relationship was not strong enough to have predictive value and he suggested that the type of IQ test used could give the myope an advantage in terms of sustained visual perception.

More recently, Grosvenor[9] reported on refractive data obtained on 707 schoolchildren between the ages of 11 and 13 years. His findings were generally consistent with others in that there is a tendency for myopes to perform better than hyperopes in both verbal and non-verbal IQ tests and in academic placement at intermediate and secondary school levels.

Other Screening Programmes

The Detroit Department of Health[10] carried out a battery of tests which included a 20/30 Snellen E test, a +1,75 sphere lens test (a test for far-sightedness) and a phoria (muscle imbalance test) and Hirschberg test. Children under 6 years of age, however, were given only the Snellen test. It should be pointed out that age should not be a criterion when choosing tests to be used in a mentally retarded population, and also that the more objective the tests the more valid will be the results. Hence, instead of the +1,75 test, which relies on subjective responses, we preferred to use retinoscopy.

In another study the Detroit Department of Health used a stereoscopic instrument. The tests included were

the E chart for visual acuity, +1,75 Sphere test, and a muscle balance test. The latter test included a rectangle seen with one eye and a red dot seen by the other eye. When seen together the rectangle and the dot are superimposed. They comment that a few children had difficulty with the visual acuity test in attempting to indicate the direction in which the 'legs' of the Snellen E were pointing. They appeared to lose their spatial orientation upon looking into the stereoscopic instrument. Another disadvantage with the instrument in this population, is keeping the subject positioned at the instrument for any length of time. To report when the rectangle and dot are superimposed is also too subjective and above the capabilities of a large percentage of mental retardates. We preferred to use the cover test.

The Michigan Junior Vision Screening test,[11] usually used to screen pre-school children, is sometimes utilised.

The 37% incidence of squints in our group compares with that found in Lyle's study (36%). They also found esotropia to be more common. Super and Karseboom,[8] working with a similar group, found the incidence of strabismus in a mentally retarded population to be 68%, with 66% of these being exotropes and 34% esotropes. Lawson and Schoofs also found the incidence of strabismus in this type of population to be ten times as great as the normal, with 64% of them esotropic. A normal population exhibits 3 - 7% of strabismus,[12] with 60% - 95% esotropes and 5 - 40% exotropes.

It is interesting to note that many authorities consider myopia to be correlated with IQ.

A question which often arises is 'Why fix visual input (e.g. giving clear sight with lenses) when integration or cognitive function and output or response are not functioning at a normal level?'

CONCLUSIONS

From the above study it can be seen that the mentally retarded may be examined visually with certain modifications to existing tests. It is found that the Ffooks test is best for assessing visual acuity. Esotropia is the most common ocular motility problem, and the majority of the mentally retarded population is hyperopic.

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ADDENDUM

The Stycar vision tests are available from NFER Publishing Co. Ltd, 2 Jennings Building, Thames Avenue, Windsor, Berks. SL 4 I QS England.

Lawson's 'Apple Chart' is obtainable from Medical Contact Lens Service, 1225 Circle Tower, Indianapolis, Indiana 46204, USA.

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