VISION DEFECTS IN DOWN'S SYNDROME AT NEWCASTLE SCHOOL FOR SPECIFIC PURPOSES

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Abstract

Nineteen mongoloid children of the 64 pupils attending Newcastle School for Specific Purposes were screened for visual acuity, muscle balance and stereoacuity. Results show a high proportion of children with poor visual acuity, possible refractive error, esotropia, and very few with good stereo vision. Those children who had the advantage of corrective glasses appeared to have more useful visual function in terms of acuity, muscle balance and stereopsis. Regular screening and early intervention with correction of visual defects may be of value to such groups to allow each child the opportunity to reach his or her full potential.

Key words: *Mongolism, screening, visual acuity, esotropia, stereoacuity, glasses.*

INTRODUCTION

Down's syndrome is a genetic defect and is the most common serious developmental problem seen in the newborn. The child has potential but this is limited and has been so from the very beginning of that pregnancy. "At risk" pregnancies are now screened for this defect so that affected parents may have counselling and possible termination of that pregnancy. Down's syndrome is a genetic imbalance where there is an extra set of genes on an extra chromosome, i.e. there are 47 chromosomes instead of 46 in every cell in the body. An average of one in 640 births has Down's syndrome. The risk increases progressively with the mother's age. It can occur in any family, any race and any social class.[1]

The old term "mongolism" for this condition is misleading and is not now used. In 1866 Langdon Down, an English physician first described the clinical features of this syndrome which now bears his name. These features include slanting of the palpebral fissure, blepharitis, epicanthal folds, esotropia, cataracts and nystagmus. True nystagmus of central origin is infrequent, but that which is seen is usually due to ocular defects. The incidence of esotropia is high—about 40%—and Brushfield spots may occur in up to 85% of cases.[2]

Many studies have reported a high incidence of eye defects in retarded children and have supported the view that persons who have experience in examining eye defects have been more successful than others in screening visual function in these children.[3-12] The school authorities at the Newcastle School for Specific Purposes were keen to supplement the existing vision screening of their pupils when this project on Down's syndrome children was proposed.

The Newcastle School for Specific Purposes is run by the N.S.W. Department of Education for pupils with various handicaps who fit into the 35-55 I.Q. bracket. These classes for retarded children are known as OF classes and at this school there are 64 pupils with ages ranging between 8 and 18 years.

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TABLE 1
General Presenting Features in 64 Children at N.S.S.P.

Slow development	10
Down's syndrome	19
Epilepsy	10
Cerebral palsy	7
Hydrocephalus	3
Diabetes, autism, hypoglycaemia, hypocalcaemia, Huntington's chorea (1 each)	5
Unknown	10
Total	64

Down's syndrome 27%

Examination of the school records shows that 27% of the enrolment has Down's syndrome. Slow development, epilepsy and "unknown" (each 15.6%) were the other main reasons given to the school as the possible cause of the retardation (Table 1).

Information about vision on the report cards is usually only an estimate of visual acuity where the child has been able to co-operate with the standard tests, and the teachers at the Newcastle School for Specific Purposes were keen to know what the visual status of each of their pupils was and whether it could be improved. It is the 27% of the children who have Down's syndrome who are the subject of this paper.

MATERIAL AND METHOD

Visual screening involved tests of visual acuity, ocular muscle balance and binocular function. All tests were chosen so that the children could understand what was required and tests were geared to the level of comprehension and ability of each child. No child failed to co-operate in each of the three systems tested. By this means a reasonably accurate estimate of the child's visual status was possible.

There were 9 males and 10 female Down's syndrome children aged between 8 and 18 years among the 64 pupils enrolled at the school. This group of 19 pupils has been divided into 8 to 12 year old and 13 to 18 year old groups. Although the older age group may be High School age they do not learn at High School level. Nevertheless it may be useful to study them in these age groups as visual development is tapering off between 8 and 12 years and should be reasonably stabilised after 12 years of age except perhaps in cases of myopia.

TABLE 2
Down's Syndrome Pupils

	Total	8-12 years	13-18 years
Male	9	7	2
Female	10	2	8
Total	19	9	10

Visual acuity was tested using a Snellen's letter chart at 6 m for the older children. The younger children used the Illiterate 'E' at 6 m. But some (two in the younger group and one in the older group) were unable to manage the latter and were tested with the Catford Visual Acuity Drum at ½ m (this may have been some advantage to a myopic subject).

Ocular movements were tested in the usual way using an interesting target. Cover test was performed for near and distance, again using interesting targets.

Binocular function was tested using the TNO Stereo Test (with red and green goggles) and the new Lang Stereotest (no filters necessary).

RESULTS

Visual acuity test results were divided into four categories:

Satisfactory	6/9 in both eyes or better
Unsatisfactory A	6/9 one eye <6/9 other eye
Unsatisfactory B	<6/9-6/60 in one or both eyes
Unsatisfactory C	<6/60 in one or both eyes

Of the 12 pupils wearing glasses, six were hypermetropic, four had hypermetropic astigmatism, only one was myopic and one had myopic astigmatism.

More pupils were wearing glasses in the younger age group and more younger children had better visual acuity than the older children.

Of three children who had satisfactory visual acuity in the younger age group, one was straight and the other two had a variable esotropia.

Ocular muscle balance was tested by observing the pattern of movement of the two eyes in the nine cardinal positions of gaze. Only one child showed a defect on this test—overaction of the

TABLE 3
Results of Visual Acuity Test

	Total	Satisfactory	Unsatisfactory		
			A	B	C
8-12 years	9 (8)	3 (3)	5 (5)	1 (0)	0
13-18 years	10 (4)	0	4 (2)	5 (2)	1
	19	3	9	6	1

Number wearing glasses in parentheses.

inferior oblique in a child in the younger age group with satisfactory (6/9BE) visual acuity and variable esotropia. Cover test for near and distance was used to ascertain the nature of the ocular muscle balance. This was defined as eso', exo' or straight (E, X, O. See table 4).

The one pupil with exotropia wore glasses for marked myopic astigmatism and could control her deviation at near. She comes into the "Unsatisfactory A" visual acuity group. Both children in the older age group who were straight were amblyopic and did not wear glasses.

Screening of binocular function was carried out using the new Lang Stereotest which does not require the wearing of dissociating filters to achieve disparity of the retinal images. If useful binocular vision (with stereopsis) exists, the lifted up pictures of a cat, a car and a star are immediately apparent to the viewer of the random dot pattern. The TNO test also depicts a random dot pattern but red/green filters have to be used to produce the binocular disparity pattern. The children seemed to prefer viewing the TNO test.

TABLE 4
Results of Cover Test

	Total	E	X	O
8-12 years	9	7 (6)	0 (0)	2 (2)
13-18 years	10	7 (3)	1 (1)	2 (0)
	19	14	1	4

Number wearing glasses in parentheses.
E = eso. X = exo. O = straight.

Perhaps this was because even if they were not binocular they could still see something which gave them a feeling of participating in the "game". Both these tests operate for near vision and are testing stereoacuity as distinct from global stereopsis which was not subject to screening in this study. The Lang test showed greater differentiation of positive versus negative results in both age groups whereas the TNO allowed more quantification of the middle range results.

TABLE 5
Results of Binocular Tests

	Total	Lang			TNO		
		Good	Some	-ve	Good	Some	-ve
8-12 yrs	9	3 (2)	2 (2)	4 (4)	1 (1)	5 (4)	3 (3)
13-18 yrs	10	1 (1)	0	9 (3)	0	4 (2)	6 (2)
	19	4	2	13	1	9	9

Number wearing glasses in parentheses.

The Lang test appears to be a more definitive screening type test although no proper comparison of these two tests is valid in such a small sample. Nevertheless, it can be seen that whichever test was used the children in the younger group appeared to have more useful binocular function for near and this group also had a greater number wearing glasses.

DISCUSSION

If we look at Tables 3, 4 and 5 it is clear that the children in the younger age group have better visual acuity and better binocular function than those in the older age group. However the incidence of esotropia is about the same in each group. It should also be noted that more of the younger children are wearing glasses and indeed seem happy to do so. Very few children have a satisfactory visual performance and those who have, have worn glasses for some years and have had regular eye treatment. Another factor which may prove relevant, is that all the younger children live at home whereas at least half of the older group have been (and are) cared for in an

institution. They have only recently been attending the Newcastle School for Specific Purposes.

The American Academy of Ophthalmology recommends vision screening and considers it to be the most important factor in the eye health care equation.[13] They estimate that 80% of learning during the first 12 years of life is through seeing.[14] The visual screening of physically and/or mentally handicapped children by suitably trained people is desirable,[4,8,9,11] in view of the high incidence of visual defects in such children.[3,7,10,15,16,17] It has been recommended that all Paediatric Assessment Centres should offer a full ophthalmological and orthoptic examination as part of their programme.[3,5,6,8,10]

Children with Down's syndrome are a special subgroup of those who are mentally retarded and present with an even higher incidence of visual defects especially of strabismus.[2,10,18] We should initiate adequate screening programmes and follow up eye treatment facilities for this group. At present these children are greatly deprived and they cannot fit into the regular system. Edwards[7] goes further and puts forward a plea for routine full ophthalmological examination for all mentally retarded children because the ocular defects of many of them would otherwise go unrecognised and untreated. This study supports this view.

It seems clear that more should be done to treat visual dysfunction as early as possible. Esotropia, visual acuity defects and anomalies of binocular function are obviously inter-related, and each factor should receive adequate treatment as early as possible. Not only will the child benefit from seeing better but he will also fit into the community more easily. As a result there should be a more effective use of public resources.

Small though this group is, it vividly illustrates the hidden deprivation Down's syndrome children suffer due to unrecognised ocular and binocular weaknesses. The greater lack of correction of visual defects in the older group may indicate a tendency to accept a lower standard of achievement as the child matures in other ways. Whatever the reasons, there appears to be ample room for improvement in the visual care of these Down's syndrome children.

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References

1. Smith DW, Wilson AC. The child with Down's syndrome (Mongolism). Saunders Publishers, U.S.A. 1973: 1-2.
2. Eissler R, Logenecker LP. The common eye findings in mongolism. Amer J Ophthalmol 1962; 54: 398-406.
3. Kennerley Bankes JL. Eye defects in mentally handicapped children. Brit Med J 1974; 2: 533-535.
4. Brown SA. The results of visual screening of 80 mentally retarded children. Aust Orthop J 1979-80; 17: 53-55.
5. Clewer JE. Observations on the role of the orthoptist in a paediatric assessment centre. Brit Orthop J 1983; 40: 46-55.
6. Collett S. The orthoptist as a safety net. Aust Orthop J 1983, 20: 37-39.
7. Edwards WC, Price WD, Weisskeoff B. Ocular findings in developmentally handicapped children. J Paed Ophthalmol 1972; 9: 162-167.
8. Erby J. The subjective visual assessment of the severely mentally handicapped child. Aust Orthop J 1979-80; 17: 48-52.
9. Freeman G, Loughhead J. Visual function in 58 intellectually handicapped children. Aust Orthop J 1983; 20: 47-50.
10. Gardiner PA. Visual defects in cases of Down's syndrome and in other mentally handicapped children. Brit J Ophthalmol 1967; 51: 469-474.
11. McKenzie L. Results of Lion's Club amblyopia surveys. Aust Orthop J 1983; 20: 57-58.
12. Venables WA. The incidence of squint in minimally handicapped children. Brit Orthop J 1967; 24: 53-55.
13. American Academy of Ophthalmology Statement to the Select Panel for the Promotion of Child Health 1980.
14. Better Vision Institute. Vision problems for children. Pamphlet (U.S.A.) 1980.
15. Bader D. The visual appraisal of the mentally retarded. S Afr Med J 1974; 48: 2077-2080.
16. Hatfield EM. Methods and standards for screening preschool children. Sight Saving Review, Summer 1979; 71-83.
17. Loring E. The handicapped eye. Insight June 1971; 3.
18. Hiles DH, Hoyme SH, McFarlane F. Down's syndrome and strabismus. Amer Orthop J 1974; 24: 63-68.