



# Ocular and visual status among children in special schools in Wales: the burden of unrecognised visual impairment

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## ABSTRACT

**Background/Aims** The high prevalence of visual defects among children with special needs is well reported and guidelines for vision screening are in place. However, recent research has suggested that vision care for such children is neglected. This study set out to evaluate the current status of vision screening and eye care in special schools in Wales.

**Methods** In phase 1, all 44 special schools in Wales received a questionnaire on current vision screening practices. In phase 2, full eye examinations were conducted with 173 pupils of five schools with no screening service; the pupils were aged 2–21 years. In phase 3, feedback about the service was obtained from all schools and from 15 parents whose children took part.

**Results** In phase 1, vision screening was patchy and inconsistent among the 39 schools responding. In phase 2, there is a high proportion of pupils (42%) reporting no previous eye examination. Overall, 17% of the pupils in the five schools presented with low vision (WHO definition, poorer than 0.3 LogMAR), 50% needed a first-time or updated spectacle prescription and 51% had some ocular abnormality that was either sight-limiting or warranted action to prevent risk to sight. In phase 3, school staff and parents reported that school-based eye examinations were valuable and, for those children with previous experience, likely to be more successful than clinic-based or practice-based examinations for this particular population.

**Conclusions** There is an urgent need for a school-based optometric service for this vulnerable group of children and young people.

## INTRODUCTION

Children with special educational needs (SEN) are more likely to have refractive errors and visual impairment than children without SEN.<sup>1–6</sup> In addition, it is well known that children and young people with learning disabilities often have coexisting impairments, such as hearing or visual impairment.<sup>7</sup>

The Hall report<sup>8</sup> recommends vision screening of all children aged 4–5 years and routine referral for children of any age with any ‘neurological or disabling condition’. These recommendations have been endorsed by the UK National Screening Committee, which advises UK ministers and the National Health Service on screening policy.

In spite of the guidelines, not all areas of the UK have established services. A recent Ophthalmic Service Guidance report for ophthalmologists outlined that ‘Not all healthcare regions fund school screening outside mainstream schools so children

## What is already known

- ▶ Earlier studies have shown that children with disabilities are at higher risk of ocular and visual problems than are typically developing children.
- ▶ Since the above is widely recognised, it would be reasonable to expect that, in the UK, children attending special schools would have a regular and an appropriate eye care.

## What this study adds

- ▶ Pupils of special schools in Wales are not receiving equitable eye care since screening is patchy.
- ▶ A significant proportion of children attending special schools have uncorrected refractive errors, that is, unnecessary visual impairment; others have uncorrectable impairment.
- ▶ Some of the pupils’ visual difficulties were previously unknown to parents and to the schools, so that their educational experience may be inappropriate.

with a learning disability are less likely to be able to benefit’.<sup>9</sup>

In a recent study of 228 children attending special schools in Glasgow, 12% had low vision or blindness (according to WHO criteria),<sup>1</sup> and uncorrected refractive error was a major cause of reduced visual acuity.

The present study, supported jointly by Welsh Government (grant number 503100) and Royal National Institute for Blind people (RNIB, grant number 502314), set out to determine the current status of vision screening and the prevalence of eye and vision problems among pupils of special schools in Wales.

## METHODS

### Phase 1

A questionnaire was designed to determine what vision screening service was taking place in schools and what information schools have about pupils with known eye or vision problems. The questionnaire was sent to each of the 44 maintained special schools in Wales in February 2010. Subsequent



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telephone interviews were carried out with schools that did not return the questionnaire. Responses were entered into an SPSS V.18 database.

## Phase 2

Five generic special schools that had reported that vision screening did not take place were selected, reflecting a range of locations (in South, North and West Wales) and demographics (urban and rural). Two optometrists, experienced in the assessment of children with special needs, conducted full eye examinations in each school. Parents were invited to attend their child's assessment if they wished. Parents provided previous ocular history. At each school, a room was assigned for eye examinations with blackout at windows so that the room could be darkened. Each pupil was accompanied by an adult; whenever possible, this was the one who knew the pupil well, that is, a parent/guardian, teaching assistant or school nurse.

A full eye examination comprised:

- ▶ General observations of visual behaviour
- ▶ Uncorrected and corrected (if appropriate) visual acuity with tests suited to the child's age and ability
- ▶ Refractive error by retinoscopy (with cycloplegia if clinically required)
- ▶ Accommodation by dynamic retinoscopy
- ▶ Ocular alignment by Hirshberg and/or cover test
- ▶ Motility/eye movement control and fixation
- ▶ Ocular health by ophthalmoscopy
- ▶ Slit-lamp microscopy and tonometry if clinically warranted

Following the examination, spectacles were prescribed if needed if there was uncorrected refractive error or because there was a change of prescription greater than the repeatability of refraction<sup>10</sup> or because the present spectacles were unsuitable through fair wear and tear. Parents and school were provided with a report, and if required, the child was referred to the general practitioner, hospital eye service and/or sensory support service at the Local Education Authority.

Information was coded and entered into an SPSS V.18 database. Written consent was obtained from parents of all pupils. The study complied with the tenets of the Declaration of Helsinki.

## Phase 3

Following the eye examinations, feedback about the value of the service was obtained from the schools by postal questionnaire and from 15 parents of children who had participated by telephone questionnaire.

The questionnaire to schools comprised 20 questions. Nine were closed questions requiring a 5-point scale response ranging from 'very poor' to 'very good' or 'not at all' to 'very much' and asking questions such as 'Overall, what did you think about the information that we provided when we initially invited your school to take part in the pilot phase?' and 'To what extent do you feel the vision care programme benefitted the pupils, staff in school and the school as a whole?'

Two were yes/no questions such as 'Did the project identify any pupils, who staff did not have any previous concerns about, as needing glasses?' The remainder were open questions asking for comments, such as 'Please use this space to let us know how you think we could maximise the consent rate in the future'.

Fifteen parents (about 10%) were randomly selected and invited to complete a questionnaire administered over the telephone. The telephone questionnaire comprised 13 questions. Two were closed questions with a 5-point scale response ranging from 'very poor' to 'very good'. The two closed questions were,

'Overall, what did you think about the information we sent you when we initially invited your child to take part in the project?' and 'Overall, what did you think about the consent form?' Nine questions were 'yes/no/don't know' questions, such as 'Do you think it was useful for your child to have their eyes tested in school?' and 'Would you give your consent again in the future for your child to have an eye test in school?'

The remaining two questions were open questions. The first was, 'How do you think we could improve the consent form?' and the second was to enable parents to make any additional comments.

## RESULTS

### Phase 1, survey

In total, 39 (89%) of the 44 schools responded: 26 completed the questionnaire and 13 completed telephone interviews. The schools were distributed throughout Wales and represented 3298 pupils.

In total, 20 out of 38 schools (53%) reported that vision screening took place in school:

- ▶ 47% by orthoptists
- ▶ 36.8% by school nurses
- ▶ 31.6% by qualified teachers of pupils with visual impairments (QTVIs)
- ▶ 15.8% by optometrists
- ▶ Other professionals conducting vision screening in isolated schools included QTVI on the school staff, the community paediatrician and the school doctor

NB: Some schools had more than one professional 'screening'; hence, the total is more than 100%.

Among the schools in which screening took place, 19 reported the stages at which screening happened. Thirteen (68%) reported that it was limited to the foundation phase (3–5 years), 10 schools (53%) in key stage 2 (7–11 years), 12 (63%) in key stage 3 (11–14 years) and 9 (47%) in key stage 4 (4–16 years). When questioned about spectacle wear among pupils, 21 schools provided information; of 2067 pupils, 464 (22%) were reported to wear spectacles. Among the schools reporting vision screening, 27% of pupils wore glasses, while among schools reporting no screening, 15% wore glasses, and this difference was statistically significant ( $t=2.34$ ,  $p=0.03$ ).

Twenty-four schools reported the number of pupils who had visual impairment recorded as their primary or secondary SEN: 138 (6%) of 2257 pupils.

### Phase 2, eye examinations

Data were available for 173 children pupils who took part. The total number of children in the five schools was 558, so this represents a take-up rate within the time limit of the study of 31%. All had a full eye examination, although a few pupils were unable or unwilling to take part in one or more components—the details are given in the relevant section. Ages ranged from 2 years 10 months to 21 years 4 months.

### Previous ocular history

From parental reports, 73 pupils (42.2%) had never had a previous eye test. These pupils ranged in age from 4 years 11 months to 21 years (mean 12 years 9 months).

### Spectacle wear

Of the 100 pupils who had a previous eye test (at hospital/optometric practice), 46 (46%) had been prescribed spectacles. However, on the day of testing, only 23 pupils were wearing spectacles.

## Presenting visual acuity

Acuity measurement was successful for 166 pupils. Tests used were Cardiff Acuity Test (45 pupils), Kay Pictures LogMAR (30 pupils) or Keeler LogMAR (91 pupils). Of the children who did not participate in acuity testing, only one was uncooperative and the other six pupils did not have sufficient visual responses to take part.

Presenting visual acuity was acuity at the outset of the examination with spectacles if the pupil had them. For analysis, the better acuity of the two eyes was used or binocular acuity in the 15 pupils who refused monocular testing. Twenty-three pupils had presenting acuity poorer than 0.3 LogMAR, which is the WHO classification for low vision. Including the six pupils too visually impaired to allow acuity recording, there were 29 of 172 pupils (16.9%) with low vision. The age range of these pupils was 2 years 10 months–18 years 2 months (mean 12 years 2 months). For six of these pupils, the visual deficit was not previously known (ie, parents were unaware of any visual problems and school had no record of visual problems), and this included one of the pupils whose vision was too poor to permit acuity testing.

Of the 73 pupils who had not had a previous eye examination, 8.2% (6 pupils) had low vision.

In the Hall report, the criterion recommended for referral from vision screening is a visual acuity of 6/12 or less (0.3 LogMAR or poorer) in either eye, using a LogMAR letter chart. If this acuity criterion were applied in the present study, then 34.7% (60 pupils) would have been referred, including 11 pupils for whom no visual problem was known to parents or school. In this study, a letter chart was not always used, but ability appropriate acuity tests. If anything, the Cardiff Acuity Test or Kay Picture Test would be expected to overestimate acuity compared to a letter chart, which means that, if the Hall recommendation were strictly adhered to, even more pupils would be referred.

## Refractive errors

All 173 pupils were cooperative for refraction. Cycloplegic drops were administered in only 9.2% of cases (16 pupils). To analyse refractive errors, we used the same definitions as Das *et al.*<sup>1</sup> Only the error of the eye with better acuity was analysed, or the eye with the lowest ametropia in cases in which only binocular acuity or no acuity measure was obtained. Myopia was defined as spherical equivalent (sphere plus 0.5×cylinder) of  $\leq -0.50$ D, hypermetropia as spherical equivalent of  $\geq +2.00$ D and astigmatism as  $\geq 0.75$ D.

Table 1 shows the distribution of refractive errors in the current study and, for comparison, that of Das *et al.*<sup>1</sup>

## Prescription of spectacles

Spectacles were prescribed for 87 pupils (50.2%). Of these, 41 (47.1%) were first-time spectacles (age range 3 years 5 months–

21 years 4 months, mean 13 years 4 months). Refractive errors for these pupils ranged from  $-2.50$ D to  $+6.50$ DS (equivalent sphere, better eye) and 0 to 2.00DC (cylindrical correction). The remainder were for 25 pupils with a changed prescription (age range 3 years 9 months–17 years 11 months, mean 12 years 11 months) and 22 pupils needing replacement spectacles because of fair wear and tear (age range 3 years 4 months–19 years 4 months, mean 12 years 2 months).

Of the 73 pupils with no previous eye examination, 22 (30.1%) were prescribed spectacles. The pupil requiring a correction of  $+6.50$ D had no previous eye examination and was aged 12 years 3 months.

## Accommodation

In all, 161 pupils cooperated for the assessment of accommodation. Norms as reported by McClelland and Saunders<sup>11</sup> were applied. Of the 161 subjects, 25 (15.5%) showed inaccurate accommodative responses, with the majority (23, 14.3%) underaccommodating.

## Ocular alignment

Only one pupil was uncooperative for cover test or Hirshberg test. Thirty-eight pupils (22.1%) had strabismus at distance or near or both. The classification of strabismus is shown in table 2. Among the pupils who had no previous eye test, four (5.5%) had strabismus.

## Eye movement control

Data were available for all 173 pupils, of whom 17 (9.8%) had nystagmus and 29 (16.8%) had ‘other’ control difficulties. Excluding these pupils from the analysis of fixation, 96.8% had steady fixation, while four (3.2%) had fixation difficulty in one or more directions of gaze.

Of the 73 pupils who had not had a previous eye examination, 2 had nystagmus and 9 had ‘other’ eye movement abnormalities.

## Ocular health

Ocular abnormality was defined as any condition that was sight-threatening, likely to threaten sight if left unattended, warranted further investigation to determine risk or warranted attention to improve ocular comfort. Table 3 presents the findings from slit-lamp and ophthalmoscopic examination. Overall, 50% (86 pupils) had some ocular abnormality. This included 38.2% (28 pupils) of the 73 pupils with no previous eye examination.

## Phase 3, feedback

All five schools reported that it would be ‘very useful’ for pupils to have future eye examinations in school (‘very useful’ was the highest on the 5-point scale, which began with ‘not at all’). The reasons given were familiarity with the surroundings, difficulties

**Table 1** Refractive errors in the present study and that of Das *et al.*<sup>1</sup> using the same criteria

Refractive error	Present study N=173		Das <i>et al.</i> <sup>1</sup> N=228	
	No. of pupils	Per cent	No. of pupils	Per cent
Myopia	24	13.9	22	9.6
Hypermetropia	25	14.5	52	22.8
Astigmatism	32	18.5	73	32

Note that Das *et al.* used cycloplegic drops for all children, while in the present study cycloplegia was used only when the optometrist deemed it necessary.

**Table 2** The prevalence and classification of strabismus among 172 pupils

	Distance No. of pupils (%)	Near No. of pupils (%)
Esotropia	27 (15.7)	28 (16.3)
Exotropia	8 (4.7)	8 (4.7)
Hypertropia/hypotropia	2 (1.2)	2 (1.2)
Dissociated vertical deviation	1 (0.6)	1 (0.6)

**Table 3** Ocular anomalies among 173 pupils

Condition		No. (%) of all pupils	No. (%) of pupils with no previous eye examination
Lids/lashes	Blepharitis	46 (26.6)	14 (19.2)
	Meibomian gland dysfunction	32 (18.5)	14 (19.2)
	Cysts/scars/other	2 (1.2)	0
Cornea	Scarred	10 (5.8)	1 (1.4)
	Hazy	7 (4.0)	4 (5.5)
	Other	3 (1.7)	0
Lens	Hazy	11 (6.4)	2 (2.8)
	Cataract—unilateral	1 (0.6)	0
	Cataract—bilateral	1 (0.6)	1 (1.4)
	IOL	1 (0.6)	0
Disc	Tilted	6 (3.5)	1 (1.4)
	Atrophy	3 (1.7)	2 (2.8)
	Other	17 (9.8)	5 (6.8)

for parents taking their child to optometric practices and the many other appointments that the children have.

In response to the open question ‘What do you think were the main benefits of the vision care programme for the pupils, staff and school as a whole?’ the schools reported a marked increase in staff awareness regarding visual impairment and greater awareness of the needs of specific pupils.

All 15 parents reported that it was useful for their child to have an eye examination in school; this was a yes/no/don't know question. The main reason given was the familiar environment, which allowed their child to feel more relaxed. Two parents described the difficulty they had in taking their child to an optometry practice: ‘it would cause panic attacks and too much stress’ and ‘I have tried for 10 years to find an optometrist who could test our child’. Even the two parents who had never attempted to take their child to an optometry practice reported that an in-school eye examination would be useful.

## DISCUSSION

The present study showed that vision screening in special schools in Wales is patchy with 47% of schools having no vision check provision at all. The remainder, which have some vision screening schemes in place, differ in which professionals provide the service, and in most, screening appears restricted to certain ages of pupils.

Phase 1 demonstrated inconsistency in vision screening for special school children. The results of phase 2 eye examinations suggest that the priority for children in special schools should be the promotion of annual sight tests and consideration of where they are provided, rather than the improvement in vision screening services.

First, screening using acuity measurement would only identify amblyopia and refractive error. This study has shown that pupils in special schools were also at a high risk of other eye conditions that would not be detected by vision screening but would be detected, and in some instances potentially remedied (eg, blepharitis that affected 27% of pupils), as part of a sight test.

Second, screening requires that there is one test that is repeatable, sensitive, specific, simple and acceptable to the majority of the population.<sup>12</sup> The Hall report recommends acuity measurement using a LogMAR letter chart<sup>8</sup> for vision screening in children. In this study, acuity measurement required three different

test procedures, dependent on pupils' abilities. In children in special schools, unlike those in mainstream schools, age does not predict ability and so three tests would be needed even if children were screened at one age range only.

Third, screening tends to concentrate on children at one age range; in Wales, the majority of screening takes place at foundation level. In this study, pupils right across the age range had poor visual acuity and (or because of) uncorrected refractive errors. As the two quotes from parents show, even if defects are picked up at a young age, eye care is not necessarily maintained and there are barriers to follow-up in the hospital and optometric practice.

In phase 2, recruitment to the full eye examination was 31%. There may be many reasons for a relatively low take-up rate. Of course some children may be seen regularly and successfully at the local hospital or optometry practice; parents of these children were unlikely to return the consent form. Other parents may have felt (rightly or wrongly) that their child had good eyesight and did not need an examination. Other parents may have simply failed to read the information pack or may have been unable to read the consent form; a proportion of parents of pupils in special school have learning disabilities themselves, and in retrospect, the preparation of material could have taken this likelihood into account. From the data available, there is no way of knowing what differences there may or may not be between the pupils examined in this study and those not seen. Nevertheless, even if the pupils not seen for this study are not representative of all pupils in special schools, the data revealed a high prevalence of vision and eye disorders not being addressed by current services. The findings are consistent with those reported by Das *et al*<sup>1</sup> (see table 1). The finding of 16.9% low vision (WHO criterion) in the presenting state compares with Das *et al*'s report of 12.1% low vision.

Most disturbing, in spite of a known risk of visual disorders in children with special needs, 42% of pupils in the present study had never had an eye examination prior to this project. These pupils were not dissimilar to the others in the prevalence of low vision (8.2%) or of refractive errors requiring spectacle correction (30%). One 12 year old with no previous eye examination had high hypermetropia of +6.50D. These pupils were clearly not the youngest, for whom perhaps parents had not yet got around to organising an eye examination; they spanned the full age range. In addition, a significant proportion had ocular defects that should have been conspicuous to parents and teachers, such as hazy cornea, strabismus, nystagmus and other eye movement abnormalities, and yet the eyes' appearance had not triggered an eye examination. When children have special needs, it appears that learning disabilities and physical limitations take precedence, and eyes and sight are often overlooked.

Almost 17% of special school pupils had low vision in their presenting state according to the WHO criterion. However, the phase 1 survey revealed that only 6% of pupils had visual impairment recorded on their Statement of SEN. It may be, of course, that the pupils' other disabilities are of more major concern as far as education is concerned, particularly for those children with complex needs. Nevertheless, it is also clear that some children have a visual difficulty of which parents and teaching staff are unaware. If this is so, then the educational programme for these children is inappropriate, since they are assumed to see well, and no modifications to teaching materials are made to compensate for poor sight. Then, if pupils struggle to learn or carry out a task, failure will be considered as due to a learning disability or physical limitation, which may not be the case.

Overall, 50% of pupils were found to need spectacles, which included 22 pupils who had not had a previous eye examination. This study concentrated on schools with no screening service. The survey in phase 1 showed that schools with a screening service had a higher proportion of pupils with spectacles, but even these schools reported a much lower proportion (27%) than full eye examinations suggested need spectacles. It is therefore quite likely that uncorrected refractive errors exist even in schools that have a screening service. Whatever the true numbers of pupils with uncorrected refractive errors across Wales, there can be no excuse for children whose sight can be improved simply with a pair of spectacles, being denied this correction. However, the observation that half of all pupils who had been prescribed spectacles beforehand were not wearing them means that simple issue of spectacle prescriptions may not be enough to ensure that pupils' vision is improved. Some children may have broken or outgrown previous spectacles and parents had been unable or unwilling to arrange replacements. An in-school service with a regular follow-up should improve wear in such cases. Other pupils may have been unwilling to wear spectacles because of peer pressure and/or fear of teasing. Much more needs to be done to uncover the reasons why so many pupils fail to wear their spectacles, and the barriers need to be tackled alongside an in-school service.

Das *et al*<sup>1</sup> stated that 'the manner in which an eye test is conducted is most important' and emphasised the importance of carrying out tests in a familiar environment. The present authors agree with these comments. In this study, all pupils were successfully refracted, and only one pupil was uncooperative for acuity measurement. This success rate was undoubtedly due to the test being conducted in school and to the considerable expertise of the optometrists taking part. Feedback from schools and parents confirmed the importance of a familiar and stress-free environment.

It is quite clear that the current status of eye care among special school pupils in Wales is inadequate. It is also clear that an extension of the vision screening programme to include all schools will not be cost-effective, since pupils need testing at all ages and the screening referral rate will be high. As staff and parents suggested, the success rate of testing on referral to hospital clinics is likely to be lower than the success rate for full eye examinations in schools. A service incorporating a full eye examination for all pupils right across the age range carried out within the school premises by specially trained optometrists is clearly needed, in order that Wales' most vulnerable children are offered the eye care that so many of them need.

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