Screening of vision in school: Could we do better by doing less?

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Abstract

Assessment of vision in schoolchildren is routinely performed, but the effectiveness of the screening programmes has not been reviewed. A survey of health district screening programmes for vision in schools was performed at the end of 1984. The response rate from districts in England and Wales was 81%. All 165 of the districts that responded screened for loss of distant visual acuity; 96% screened for loss of colour vision, 73% for squint, and 67% for loss of near visual acuity. The frequency with which districts screened varied considerably. Some districts screened yearly, and various different types of tests were used. In many districts children were screened in unsuitable places, such as corridors, assembly halls, and toilets. Criteria for referral varied from one district to another, and few districts collected data appropriate for monitoring their screening programmes.

Many districts screened more intensively than could be justified on the basis of the conditions tested for and the likely benefit of remedial treatment.

Introduction

Assessment of vision in schoolchildren has been standard practice in Britain since 1908, but its purpose has changed considerably. Screening tests were introduced as part of medical inspections in schools after the 1907 Education Act to provide national data on the prevalence of disability and disease in the school population.[1] Local authorities were not obliged to offer treatment to children identified as sick or disabled until several years later (1918 for primary schoolchildren and 1944 for secondary schoolchildren). Currently vision is tested to identify children with unsuspected remediable conditions, so that treatment can be offered before educational and social progress is affected. In contrast to the early part of this century the information acquired is no longer collated nationally to provide estimates of the prevalence of disease.

The point at which the original "national health survey" became a "national screen" is not clear, but it certainly predated the scientific consideration of screening programmes in the 1960s that produced well defined criteria for screening.[2] As a result testing has never received the type of appraisal necessary if it were to be introduced as a screening programme in schools today.

Testing of vision is one of the few aspects of the school medical inspection that has survived into the 1980s; this may be because from early on it was delegated to the school nurse along with weighing and measuring. Doctors continued to examine only aspects of health that were not as amenable to measurement. These parts of the routine medical inspection have now largely been discontinued (most authorities undertake only selective medicals both at school entry and throughout the child's school career), but the parts dealt with by the nurse remain little changed.

We present the results of a survey of health districts undertaken at the end of 1984 that aimed at recording the national pattern of vision screening in schools and discuss the aspects of the screening programmes that particularly need rationalisation.

Methods

In November 1984 we sent a detailed questionnaire to the district medical officers of all health districts in England, Wales, and Scotland, asking for details of their screening programmes for vision and hearing in both school age and preschool children. Responses were received from 165 districts in England and Wales (81·3%) and from 18 districts (64·2%) in Scotland; results from only England and Wales were included. Response rates from the different regions in England varied, but 11 of the 14 had response rates of 80% or more. The few regions with low response rates were Mersey (40%), North West and North East Thames (69%), and Trent (75%).

Results

Frequency of testing—Screening of distant visual acuity was universal among the 165 districts, and all screened on at least two occasions; 159 (96%) also screened for loss of colour vision, 145 (73%) for squint, and 109 (66%) for near visual acuity (table I). The numbers of screening tests that districts aimed at performing during a child's school career varied considerably, ranging from 2 to 13 times for screening of distant vision and from 0 to 13 for near vision. Forty six districts screened distant visual acuity more than once every two years, and 13 screened yearly. The other screens were not carried out as often, but nine districts screened near visual acuity more often than once every two years, 25 districts screened for squint on three or more occasions, and nearly half of all districts screened for loss of colour vision more than once.

TABLE I—*Frequency of testing vision in school in 165 districts in England and Wales. Values are numbers of districts*

No of screens	Test			
	Distant acuity	Near acuity	Squint	Loss of colour vision
0		56	45	6
1		23	65	82
2	4	66	23	52
3-5	90	48	23	25
6-9	49	16	9	
10-13	20	2		
Not specified	2	4		

Types of test—All 165 districts used the Snellen chart

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TABLE II—*Visual screening tests used in 165 districts*

Test	No of districts
Distant acuity	
Snellen	165
Sheridan Gardiner	46
Stycar	44
Keystone	38
"E" and hand test	2
Telebinocular	2
OXO test	1
Near acuity	
Sheridan Gardiner	24
Reduced Snellen	25
Stycar	24
Keystone	20
Others	8
Squint	
Cover test	103
Keystone	19
Corneal reflection	12
TNO stereopsis	11
20D Base out prism	3
Eye movements	3
Telebinocular	1
Others	2

TABLE III—*Location of screening*

	No of districts
Medical rooms	165
Corridors	64
Classrooms	39
Assembly hall	35
Staff room	13
Cloakroom and toilets	8
Playground	7
Library	6
Head teacher's office	5
Gymnasium	2
Canteen or dining room	2

TABLE IV—*Criteria for referral after screening distant vision*

	No of districts
Visual acuity:	
6/9	46
6/9 on two occasions	12
6/9 then 6/12	7
6/12	70
6/18	1
Unequal acuity ≥1 line	8
Unequal acuity ≥2 lines	8
Visual acuity related to age:	
<7 : 6/12, ≥7 : 6/18	1
<7 : 6/12, ≥7 : 6/9	1
<5 : 6/9, ≥5 : 6/12	2
<5 : 6/12, ≥7 : 6/9	1
<5 : 6/18, ≥5 : 6/12	1
<8 : 6/9, ≥8 : 6/12	1
Other:	
Complaints of visual problems	4
Parental concern	1
Family history of squint	1
Not specified	22

for screening distant visual acuity, but various other tests were also used, mostly in younger children. Forty districts used automated (Keystone or Telebinocular) testing (table II). Among the districts testing for near visual acuity there seemed to be less agreement about the optimum test (table II). Almost equal numbers of districts used the Sheridan Gardiner, the reduced Snellen, the Stycar, and the Keystone tests. The cover test was the most common test used to identify latent or manifest squints, but various other tests were also used. The districts were not asked to specify their tests for colour vision.

Location of screening—Table III shows the location of screening. In all districts some children were tested in school medical rooms. In most, however, some children had to be tested in other places; corridors were the most common places followed by classrooms and assembly halls, but toilets, playgrounds, libraries, and dining rooms were used by some authorities.

Criteria for referral—For screening distant vision, we asked districts at what level of acuity children were referred for investigation (table IV). Seventy districts referred children at a level of 6/12 in one or other eye, but 46 referred at a level of 6/9. A further 19 districts recalled children with 6/9 acuity after a specified period of time; some of these referred children if their acuity was still 6/9 in either eye, others referred only if it had deteriorated to 6/12. Sixteen districts included in their criteria for referral unequal acuity in the two eyes; in half the difference had to reach two lines of the test, but in the other half a difference in one line was sufficient for referral. Some districts described detailed age dependent criteria for referral, and table IV includes these. Opinion seemed to differ whether the level of acuity for referral should rise or fall with age.

Monitoring of screening—One hundred and twenty seven districts collected information on the number of children seen by school nurses each year, but only 113 could identify the number of children who had been screened. In contrast, only a minority of districts (70) could report on the number of children referred for further investigation, and even fewer could report on the rate of referral; in the districts that could the rate varied from less than 2% to more than 10%.

Discussion

The conditions that are commonly detected in vision screening in school are refractive errors (myopia, astigmatism, and hypermetropia), amblyopia, and ocular muscle imbalance (latent or manifest squint). All children with severe congenital disorders are identified before school entry by their parents or by the child health services; the only other conditions that can be detected on screening in school are therefore rare progressive visual disorders (such as retinitis pigmentosa). Not only are these cases extremely rare but they are also rarely treatable. Although the identification of these cases may be a useful byproduct of screening programmes, it cannot be used to justify continued screening. Such a justification has to rest solely on the value of detecting and treating refractive errors, squint, and amblyopia in schoolchildren.

Screening tests of distant vision should identify children with appreciable degrees of myopia, astigmatism, and amblyopia. The degree will of course depend on the referral criteria. Children with severe hypermetropia will also fail such tests, but those with milder hypermetropia are unlikely to, and some of these children will be identified by a screen of their near vision.

Of the three different types of refractive error, only myopia commonly develops during school age.[3,4] No definitive studies have been performed to establish the optimum frequency at which tests for myopia should be repeated, and clearly health authorities vary greatly in what they consider to be an appropriate frequency. Because the data are lacking there can be no hard and fast rules on the "optimum programme," but districts that are screening yearly certainly need to reflect on whether their schoolchildren perform better than those in districts that screen only rarely. The evidence that children with myopia, both those with and those without spectacles, perform considerably better than their peers is clear,[5] and it is questionable whether undetected mild myopia can appreciably impair performance. Whether minor degrees of hypermetropia are of consequence to schoolchildren is being debated; some evidence suggests that the condition may interfere with learning to read,[5] but the case is far from proved. If mild degrees of hypermetropia are not important the test of near vision becomes unnecessary at any age. If, however, mild hypermetropia causes problems with reading or indeed other symptoms at this age that can be corrected with spectacles then it should be detected. As the condition does not, however, develop during the school years a single test of near visual acuity at school entry is all that is required.

Unlike refractive errors, which are readily and simply treatable, rates of success for treating amblyopia and squint vary.[6,7] High rates are reported from centres of excellence, but evidence for the effectiveness of treatment of a school population at a district general hospital is not so encouraging (R M Ingram, personal communication). The effectiveness of treatment for both these conditions declines further after the age of 6 or 7. As preschool screening programmes for squint and amblyopia become more common the chances of detecting unsuspected amblyopia or squint at school entry will decline. Districts may still consider that screening for these conditions at school entry is justified, but whether the benefit that can be derived from treating the conditions after school entry warrants the effort and cost of detection, diagnosis, and treatment is highly questionable.

Perhaps the most remarkable finding of our survey is that relating to screening of colour vision. Loss of colour vision is a condition that is stable and present from birth; it is also untreatable, and the disability it causes is fairly minor. Although educationalists have raised the possibility that defects in colour vision may interfere with learning,[8] such a cause and effect relation has yet to be proved, and at present the only purpose of detecting this condition is to steer children away from occupations from which they might be consequently debarred. Currently available tests are more reliable in older than young children, in whom false negative and false positive cases are common.[8] Therefore screening for loss of colour vision more than once or early in childhood cannot possibly be justified, yet nearly half of all districts aimed at screening children more than once.

Our survey was unable to assess the reliability of the screening programmes, but the wide range of screening locations and the number of different instruments used for testing suggests that optimum conditions are not common and reliability is unlikely to be high. The variation in referral criteria must lead to large differences in the number of children investigated and treated in the different districts. At age 10 one in five children have 6/9 acuity in one or other eye but only 7% have 6/12 acuity.

Our results suggest that a high proportion of districts devote more resources to screening vision in school than can be justified on the basis of the likely benefit. There seems to be considerable scope for improving the effectiveness of these programmes by increasing reliability while simultaneously reducing the frequency of screening. Few districts attempted to collect data to monitor the performance of their

screening programmes. It is tempting to speculate that if more districts had done this some of the superfluous activity would already have been curtailed.

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The Enniskillen bomb: a disaster plan

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Introduction

On Sunday 8 November 1987 at 10 40 am a bomb exploded in Enniskillen at the Cenotaph before the start of the Remembrance Day parade. The site of the explosion was less than a mile (1·6 km) from this hospital. As a direct result of the bomb 11 people died and 54 were injured. We discuss the overall management of the incident in relation to evacuation of casualties and treatment at this hospital.

The hospital

Erne Hospital is an acute district hospital with 213 beds and serves a population of 55 000. It is part of the acute general hospital services to the western area of Northern Ireland, which has a population of 225 000. The area hospital (400 beds) is situated in Londonderry at Altnagelvin 65 miles (104 km) away. Belfast is 90 miles (144 km) from Enniskillen.

The surgical department has an allocation of 70 beds and is normally staffed by two consultant surgeons, one registrar, three senior house officers, and two preregistration house officers. There are two operating theatres, four postoperative recovery beds, and one bed with facilities for ventilating patients. The surgical department is responsible for providing a 24 hour casualty cover. The casualty department consists of one resuscitation bed for serious cases and four trolley beds for serious and minor cases. The surgical department deals with a wide range of conditions but refers patients for cardiothoracic surgery, major orthopaedic or plastic procedures, major faciomaxillary procedures, or complicated spinal and head injuries to specialist units in Londonderry or Belfast.

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PRESS ASSOCIATION

FIG 1—*Bomb site*

STAFF

At the time of the bomb explosion the following surgical staff were in the hospital: a locum senior surgical registrar (one consultant was on sick leave), a senior house officer covering casualty, and a preregistration house officer. One staff nurse and a plaster orderly were on duty in the casualty department.

RESPONSE

The explosion occurred at 10 40 am; ambulance control at the hospital received a 999 call at 10 45. The duty ambulance, of which there is normally one at weekends, was immediately dispatched and arrived at the scene at 10 49. A second ambulance was dispatched at 10 50 after the crew had reported in. There were also two minibus ambulances available in Enniskillen which collected patients with minor injuries. One of the two duty ambulances from Omagh (28 miles (45 km) from Enniskillen) was requested to attend the scene. The first patients arrived at the casualty department at 11 03 am.

Many wounded people made their own way to hospital. A Territorial Army minibus that was at the Cenotaph was also used.

THE SCENE

The explosion occurred in the youth club building (fig 1), which overlooks the Cenotaph, before the annual Remembrance Day parade. Many spectators had gathered outside this building and stood beside the gable wall before the parade. The explosion caused the gable wall to be blown out over the spectators (fig 2). Those who were killed or seriously injured were nearest the gable wall.

The only trained personnel initially at the scene were an army paramedical officer, off duty nurses, and a senior member of the ambulance service. The ambulance man acted as incident officer to liaise with ambulance control when the first ambulance arrived at the scene. Further medical staff, a consultant anaesthetist, and a surgical senior house officer were sent to the scene from the hospital. They set up intravenous lines and gave analgesia to seriously injured people and to those who were buried in the rubble. The members of the armed forces and Royal Ulster Constabulary and uninjured spectators helped to dig survivors and bodies from the rubble. The last of the injured people were removed from the site at about 12 40 pm.