St. Vital Vision Screening Study

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Abstract

This paper discusses briefly, in general terms, the principles and objectives of school screening programmes, some of the screening techniques available and the choice and training of lay operators. In particular, it outlines the objectives for a province-wide screening project proposed by the Manitoba Vision Conservation Committee, a multi-disciplinary group.

Abrégé

Ce travail débute avec une brêve discussion générale des principes et buts des programmes de dépistage, de quelques techniques de dépistage disponibles et du choix des opérateurs. Plus specifiquement le travail expose les objectifs d'un programme visuel provincial proposé par un comité multi-disciplinaire, le Manitoba Vision Conservation Committee.

Introduction

School is where children attend to sensory stimuli and integrate these experiences through cognition. A successful demonstration of this very complex process is learning. Any system that is not intact in this process contributes to the child's failure to demonstrate learning. Wilson and Wold[1] point out that 80-90% of what is learned is mediated by vision. An intact and efficient visual system, therefore, is of key importance. The incidence of vision problems has been estimated to be between 20-30% (Sloane and Rosenthal)[2]. At the very beginning of our learning chain is the visual sensory system. An ideal method for insuring that every child's visual system is intact would, according to Sloane[3] ". . . be to have every child subjected to a very complete eye examination as early in life as possible . . : " (p.13). It would be difficult to achieve this ideal, so a second alternative is to provide a screening program. Reber[4] suggests that the purposes of a school's screening program are "to detect those children who have visual problems that affect the physiological or perceptive processes of vision and to find those children who have visual problems that interfere with performance in school." (p.675). Reber aims at a complete screening program encompassing physiological and perceptive processes. Determining perceptual difficulties that contribute to learning problems is a critical issue in the educational setting and needs to be addressed with interdisciplinary research and clinical efforts. However, without attempting to detract from the above statement by Reber, this discussion will only address physiological vision screening.

An important study in the literature which was reported by Reber was the Danbury study, done by Leverett in 1955. Several new concepts were introduced in this study:

1) The screening program was discussed with optometrists and ophthalmologists before the study.
2) Children already under care were treated differently than those without spectacles.
3) All failures were retested.

In the Danbury study, the Massachussetts Vision Test was used. It was found that there was a small over-referral rate.

Reber also discussed another important study in the vision screening literature: The Orinda study[5], which was read before the annual meeting of the American Academy of Optometry in Boston on December 13, 1958. This study was a joint venture of the School of Optometry at the University of California and the School of Medicine at Stanford University. The two best screening techniques reported by this study were, in order of effectiveness:

1) Modified Clinical Technique
2) Massachussetts Vision Test

The Modified Clinical is a comprehensive battery of tests that needs to be administered by a professional eye care practitioner. Because this technique requires professional involvement, the cost for this program would likely be prohibitive for most school divisions. The second screening program, the Massachussetts Vision Test, is based on the use of three tests: a) visual acuity b) plus lens c) muscle balance.

The Members of the Provincial Vision Conservation Committee of Manitoba developed a number of screening techniques and modified instrument criteria with the use of lay screening personnel, similar to the Massachussetts test, and also meeting the criteria as established in the Orinda study.

Implementation of the vision screening program in Manitoba had five goals (Rathgeber and Spearman)[6].

1) To develop a screening process to identify children who may have a) reduced acuity b) hyperopia or c) a phoria which may interfere with academic performance.

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2) To set up an effective system that would encourage eye-care practitioners in local communities: a) to support the screening process, b) to be available for consultation to schools, c) to provide clinical feedback to the Provincial Vision Conservation Committee.
3) To involve school personnel in the screening process to increase their knowledge base with respect to vision and its implication for learning.
4) To develop a program that would allow school divisions to manage and maintain an effective vision screening program.
5) To expand the scope of the Provincial Vision Conservation program beyond the identification of vision problems and teacher education to three additional areas: a) parent education, b) pupil instruction, c) visual environment.

In addition to having comprehensive goals to guide the committee, as suggested by Gregg[7], the cooperative effort by optometry and ophthalmology in Manitoba is similar to a unique feature of the Danbury study of 1957 (reported in Reber). The actual vision screening techniques are reported in Rathgeber and Spearman.

The purpose of this paper is to report a study supported by the Manitoba Provincial Vision Conservation Committee in the spring of 1979.

Method/Procedure

Subjects were students in the St. Vital School Division–an urban school division within the metro Winnipeg area. The population was selected from schools which represented the various socio-economic levels in the community. 732 children from kindergarten, Grades 1, 3, 5, and 7 were screened for myopia, hyperopia and phorias. The children were screened by resource teachers employed by the school division. Screeners received one day of instruction and practical experience prior to the start of the program. They were instructed in the use of the Random Dot E*., Goodlite Insta-line**, and Bioptor*.

In addition, the Program was carefully administered and monitored by the Chairman of the Manitoba Vision Conservation Committee, Mr. A. Rathgeber, in consultation with the three optometrists and two ophthalmologists who were instrumental in the development of the program.

All three instruments were used in kindergarten and Grade 1. In Grade 3, 5, and 7 the Random Dot E was eliminated.

The trained screeners screened 732 children on the first screening. 216 (30%) of the children failed the first screen. The children failing the first screen were screened a second time. Second screening is the administration of those tests failed in the first screen. In the second screen, more time was taken to administer those tests failed the first time. 113 (15%) failed the second screen.

TABLE 1:
Screening Results
(kindergarten, Grade 1, 3, 5 and 7)

No. screened	732
No. who failed first screen	216 (30%)
No. who failed second screen	113 (15%)

Children failing on the second screen were examined by either an optometrist or ophthalmologist who was affiliated with the study. One half of the children were examined by the optometrist in his office and the other half were examined by the ophthalmologist at the Manitoba Health Science Center Eye Clinic. Adapted criteria from the Orinda study were used for the professional examination and are noted in Rathgeber and Spearman.

Results

1st Grade

Of the 216 children screened in kindergarten and the 1st Grade, 74 (34%) failed the first screen. On the second screen, 26 of the 74 children failed. Therefore, 12% of the total number of 216 failed the second screen. These children were professionally examined. 10 of the 26 children (38%) demonstrated no problem, but 16 (62%) of the 26 were in need of professional care. These children needed immediate care in the form of glasses or vision training, or a potential vision problem was noted.

The student was considered to have a potential vision problem when he/she failed one of the screening tests. For instance, the student might fail the plus lens test and the professional examination might show + 1.50 of hyperopia. Yet no symptoms and no problem in classroom achievement will appear. The child might show a visual acuity of 20/30 (slight myopia) but have no difficulty in everyday function. The phoria might be just outside the parameters of the established criteria but again the child shows no symptoms or difficulty with classroom achievement. These children were considered "at risk" in that they did not require immediate professional attention but should be seen for review in six or twelve months.

3rd Grade

In the 3rd Grade, 178 children were screened. On the first screen 38 (21%) of the 178 children failed. After the second screen, 19 (11%) of the total of 178 failed. These 19 children were professionally examined. 6 (32%) children demonstrated no difficulties, but 13 (68%) of the children required a prescription immediately or a potential vision problem was noted.

5th Grade

In the 5th Grade, 185 children were screened. On completion of the first screen, 57 (31%) of the children failed. After the second

* The Random Dot E and the Bioptor are available from Bernell Corporation, 422 East Monroe St., South Bend, Ind. 46601.
** The Goodlite Insta-line is available from Goodlite Company, 7426 Madison St., Forrest Park, Ill. 601130.

screen, 45 (24%) of the 185 children failed. Following a professional examination, 15 (33%) of the 45 children demonstrated no problem and 30 (67%) of the 45 required professional care. These children required a prescription or a potential vision problem was noted.

7th Grade

In the 7th Grade, 161 children were screened. On the completion of the first screen, 55 (34%) of the children failed. After the second screen, 31 (19%) of the 161 children failed. Following a professional examination 7 (23%) of the 31 children demonstrated no problem, whereas 24 (77%) of the 31 required a prescription or a potential vision problem was noted.

Under – Referral

A small percentage of randomly selected children at the kindergarten and Grade 1 Level (15%) and at the Grades 3-5-7 levels (7%) were professionally examined after passing the screening tests. This was done in order to estimate the under-referral rate, which is the number of children who would not be referred for a professional examination based on the screening instruments and would require professional attention. In every screening program an under-referral rate is expected due to instrument deficiencies and the fact that lay people do the screening. The under-referral rate for this program was approximately 3%. This is well within the range reported by similar programs. However, a strong committment to teacher in-service impacted on this program's respectable under-referral rate.

Discussion and Considerations

In most cases after the professional examination, more than 2/3 of the children required some care. Either this was an immediate prescription or some potential vision problem was noted by the eye-care practitioner. In addition to being an effective program to identify children with vision difficulties, this program also appears to miss a minimum of children requiring vision care. This is reflected in the low under-referral rate.

TABLE 2:
Screening Results by Grade Level

	Fail 1st Screen		Fail 2nd Screen		Professional Examination Results Of Those Failing The Second Screen			
					Care Needed		No Problem	
Kindergarten & 1st Grade	No.	Per-cent	No.	Per-cent	No.	%	No.	%
No. = 216	74	34%	26	12%	16	62%	10	38%
Grade 3 No. = 178	38	21%	19	11%	13	68%	6	32%
Grade 5 No. = 185	57	31%	45	24%	30	67%	15	33%
Grade 7 No. = 161	55	34%	31	19%	24	77%	7	23%

Several factors are noted from our experience in Manitoba;

1) The committment of both optometry and ophthalmology to work together to develop an effective screening program for the children of Manitoba was of critical importance.
2) The adaptation of the Massachussetts Vision Test to reflect local practitioners' standards of care proved to be an essential component.
3) Criteria recommendations from the Orinda study were very valuable in the development of the Manitoba Screening Program.
4) The future success of such a program will depend upon the control of two major variables.
   a) *instrument criteria* – assessed by feedback from practitioners and subsequent modification of criteria, if necessary.
   b) *Lay screener reliability* is very much dependent upon thorough training sessions and monitoring of techniques.
5) Annual in-services for teachers and screening personnel are necessary, as new teachers and screeners may be utilized each year.
6) The support of all vision and eye care practitioners is important. All practitioners should be well-informed of the details of the program in order to avoid unrealistic negative criticisms to parents or pupils.
7) The referral letter to the parents should indicate which screening tests were passed or failed by the student so that the practitioner may pay particular attention to the reason for referral.
8) The program has created a greater awareness among teachers and parents of the importance of vision and eye care and the relationship of vision to learning.

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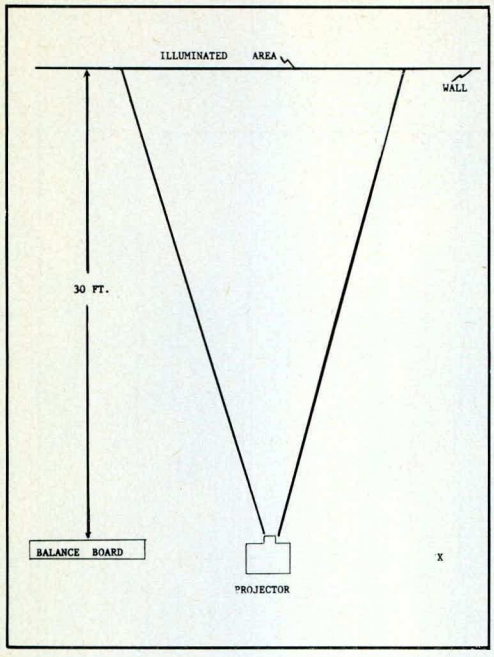

Fig. 2
This diagram presents the position of training equipment for the first exercise. The exercise is designed to train the eyes to make quick and accurate fixation movements.

trained in this manner (Fig.3). The third and fourth exercises were jump ductions[1b] for accommodative facility training and the Biopter for motor and sensory fusion training.

Exercises were prescribed twice daily. Due to the exceptional distance from the School to the patient's home in Los Angeles, there was only one visit other than the diagnostic examinations before and after the training program. During this visit, exercises were explained and demonstrated. Progress was monitored by telephone.

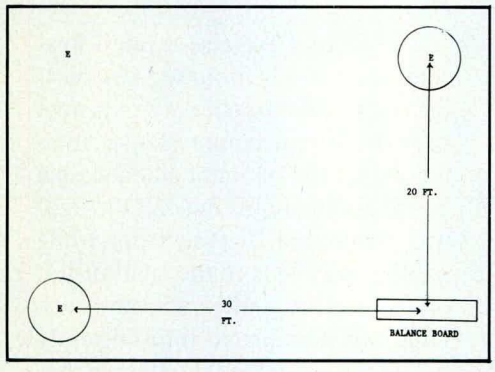

Fig. 3
This diagram presents the position of training equipment for the second exercise. The exercise trains the eyes to fixate quickly and accurately targets which flash randomly.

Results

The patient complied with the therapy, exercising two hours daily. His compliance was exceptionally good. Many patients, given home training over such a long period of time, would not have kept to the schedule. After three months of at-home training he was re-examined. Rogie felt his tennis and golf games, which he played in the off-season, had improved. He was able to see 'better' and more 'clearly' and was 'more aware of his eyes'. His binocular findings were now 1$^{\Delta}$ esophoria at 6m and .4m. His fusional reserves were x/12/10$^{\Delta}$ B.I. and x/30/25$^{\Delta}$ B.O. at 6m and x/24/16$^{\Delta}$ B.I. and x/40+$^{\Delta}$ B.O. at .4m. He did not experience either blur or breaking of fusion up to 40$^{\Delta}$ B.O. which were the limits of the rotary prisms used for measurements. His gradient ACA ratio and binocular plus and minus acceptance remained unchanged. He still did not report a fixation disparity. Accommodative facility measured one second per cycle for both eyes. His stereoscopic threshold remained the same at 6m but improved to 20 sec arc on the Stereofly and Randot tests at .8m, and 53 sec arc on the Random Dot E test. Examination of Eye Trac traces showed both eyes now had similar reaction times. The left eye had steady fixation and no longer made overshoots (Fig.1).

Conclusions

Therapy was effective in producing a level of binocular coordination wherein both eyes performed more equally. Accommodative facility and fusional ranges improved. Suppression no longer occurred with introduction of base out prism. Even stereoscopic discrimination improved. The patient reported relief of symptoms and subsequently improved his goaltending performance.

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***Note:** Special thanks to Provincial Vision Conservation Committee Members:
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A. Karsgaard, M.D.
M. Fawcett, P.H.N.
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