

RESULTS of A PEDIATRIC VISION SCREENING PROGRAM

IRA KRUMHOLTZ, O.D.

Abstract

More than 100 children, who were part of a larger group of students, were screened twice over a two-year period. It provided the opportunity to determine and compare general failure rates between the two years. This study concentrated on those children who passed the first screening and failed the second. The study revealed that although there was no significant difference in the failure rate between the two years, the new failure subgroup did differ significantly as to the specific screening tests that were failed. Although no conclusions can be drawn from these numbers as the sample was not varied enough, it is an interesting trend that as these children progressed through school it was functional vision problems not "eyesight" (acuity) problems which became more frequent.

Key Words

vision screening, functional vision, visual acuity, compliance

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he State University of New York/University Optometric Center conducts vision screenings in public schools located in lower socio-economic areas in the New York Metropolitan area. The New York State Optometric Association (NYSOA) vision screening battery^{1,2} is administered by second year optometric students supervised by staff optometrists. To ensure that these students are familiar with the screening protocol, they are given a two-hour introductory lecture which includes a hands-on demonstration of the techniques used.

The children of one Manhattan public school were screened during April-June 1994 and then again during the same months of 1996. The same testing battery and criteria were used in each screening as listed below (see Methods). Screening the same school on two occasions over the two-year period gave us the opportunity to:

1. Compare the overall failure rate for the two screenings,
2. Compare the results of the screening in a group of children who had been tested in both 1994 and 1996,
3. Determine the compliance rate for children who had been prescribed glasses in 1994.

The school population consists of children ages 5-13 (Grades K-6). In 1994, 223 children were screened, while in 1996, 214 were screened. There was a subgroup of 132 students who had been screened on both occasions. (In 1994, they were in grades one through three; in the 1996 screening, were in grades three to six.)

Methods

The first test in the screening battery is visual acuity. Distance acuities are measured, using the standard Snellen wall chart. Near acuities are measured with the reduced Snellen chart. The children are brought in single file from a separate room to prevent others in line from memorizing the chart. The criteria for failure for both distance and near acuity is 20/40 or poorer.¹

After acuities, a screening for latent hyperopia is performed. The child views the distant Snellen acuity chart through a pair of +2.00 D lenses. If there is less than a two-line decrease of acuity, the child fails the test.

Nearpoint of convergence (NPC) is performed with the target being a pen or pencil. Failure for this test is a nearpoint of greater than four inches.¹

Stereopsis is evaluated using the circles of the stereofly.³ Failure occurs at less than circle #7, which is 50 seconds of arc.

Fusion is tested using the Keystone Visual Skills fusion cards^b at both distance and near. Failure results in any response other than three balls (fusion).

Accommodation is probed with the +/- 2.00 flippers. Using a 20/30 size near target, monocular and binocular accommodation are tested. For the binocular phase, a suppression control consisting of a Polarized bar reader and Polaroid glasses is used. Passing criteria for this screening is clearing the print greater than five cycles per minute (a cycle consists of clearing both the plus and the minus lenses).

The other tests included in the screening battery, but not described here as their

data was not used in this study, are: NYSOA King Devick test,³ Color Vision and Ophthalmoscopy.

The procedure for the SUNY screening is to refer any child who fails at least one of the above tests for a complete visual examination either performed at the elementary school by a SUNY staff optometrist or by a practitioner of the parents' choice.

We were particularly interested in the new failures of 1996 (i.e., children who passed in 1994 but failed in 1996). To analyze the new failures, we divided the tests into two groups as used in a previous study we conducted: acuity tests and functional tests.⁴ (See Table 1.)

Table 1. Breakdown of the Specific Screening Tests

| Acuity Test Group | Functional Test Group |
|-------------------|--------------------------|
| distance acuity | accommodation |
| near acuity | stereopsis |
| hyperopia | fusion |
| | nearpoint of convergence |

A child failing any of the acuity tests was automatically placed in the failed acuity group. Once the child failed any of the acuity tests, we determined that functional testing results would not be valid since the testing would be performed without benefit of the proper refractive correction. In fact, once a child failed the acuity section, we most frequently did not carry out the functional testing. If the child passed the acuity tests but failed one or more of the functional tests, he/she was placed in the failed functional test group.

We also followed up on those children who had received a spectacle correction in 1994 to determine how many of them were still wearing their glasses in 1996.

Results

Initially we determined the overall failure rate (i.e., specificity and sensitivity) for the two screenings to determine the validity of comparing the results between the two years. In 1994, 223 children were screened. Eighty-two failed and were referred for further care. Sixty-two children failed acuity tests, while 20 children failed functional tests. In 1996, 214 children were screened, with 68 failures. The

breakdown was 47 acuity failures and 21 functional failures (see Table 2).

Table 2. A Comparison of the Overall Screening Results

| | 1994 | 1996 |
|-------------------|-----------|-----------|
| Total Screened | 223 | 214 |
| Total Failed | 82 36% | 68 32% |
| Failed Acuity | 62/82 76% | 47/68 69% |
| Failed Functional | 20/82 24% | 21/68 31% |

The differences between the two years are within the standard error of measurement. In the subgroup of 132 children screened both years, in the 1994 screening, 30 of these children failed acuity while 16 failed functional testing. In 1996, 40 out of the 132 children failed the screening, 23 failed acuity tests and 17 failed the functional testing (see Table 3).

Table 3. Results of the 132 Identical Children Screened in 1994 and 1996

| | 1994 | 1996 |
|-----------------------|-----------|-----------|
| Target Group Screened | 132 | 132 |
| Failed Screening | 46/132 | 40/132 |
| Passed Screening | 86/132 | 92/132 |
| Failed VA | 30/46 65% | 23/40 58% |
| Failed Functional | 16/46 35% | 17/40 42% |

Twenty of the 86 children who passed the screening in 1994 failed in 1996; six of these were acuity failures and 14 were functional (see Table 4).

Table 4. Breakdown of the Children who Passed Screening in 1994 but failed in 1996

| | 1996 New Failures | |
|------------|-------------------|-----|
| Acuity | 6/20 | 30% |
| Functional | 14/20 | 70% |

The remaining 20 failures in 1996 had also failed the screening in 1994. Out of

the 46 who failed in 1994, 26 passed in 1996. This can be explained by the fact that many of the failures had received appropriate optometric intervention to remediate their problems. The predominance of the new acuity failures (four out of the six) were presently in the third grade.

Finally, in 1994, of the 46 who failed the screening, 30 failed the acuity section. Out of those 30, 22 were examined. Two were found to have had very mild hyperopia and actually 20/20 vision. Of the remaining 20, 12 received glasses from the Optometric Center for Vision Correction. (The other two did not follow up on our recommendations.) There were another five children who received glasses to remediate a functional problem such as accommodative insufficiency/infacility and esophoria at near. In 1996, 13 out of 17 (76%) were still wearing the glasses dispensed to them.

Conclusions

There was no significant difference between the general failure rate of all children tested in 1994 compared with all those screened in 1996. However, the trend within the entire school population did show that 1996 had a higher ratio of functional failures to acuity failures than in 1994 (see Table 2). For new failures in the subgroup that were tested in both 1994 and 1996, there was a statistical significance at the .05 level when comparing the tests that were failed. Acuity failures were not statistically significant between the two years (this took into account the children who were optically corrected in 1994). However, the functional test failure rate dramatically increased in the two years when compared to the rate of acuity failures.

Discussion

Although no specific conclusion can be drawn from this study as the population was not randomly selected and all participants had the same socioeconomic and geographical situations, it does reveal an interesting trend that hopefully can prompt further research. As the children who were twice screened got older, they developed more functional vision problems than "eyesight" (acuity) problems. This may arise from the fact that as children enter third grade, functional visual demands increase since the child is then "reading to learn," whereas in earlier



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grades the child is "learning to read." As the child advances through school, there are increasing demands placed on the visual system and it is at this point that functional problems become apparent. Further, the overall rate of referral between the two years, along with the apparent increase in failure in the functional tests certainly validates screening the pediatric population at least every two years, and indicates the need to test visual functional areas in addition to acuity.

Finally, when looking at the compliance rate of those children who were given spectacle corrections in 1994 and were still using them in 1996, the number of children still wearing the glasses speaks volumes about initiating programs where children who are in need of health care have it brought directly to them.

Sources

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Corresponding author:
Ira Krumholtz, O.D.
SUNY State College of Optometry
100 East 24th Street
New York, NY 10010
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