

Vision Testing by Parents of 3½-Year-Old Children

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VISION PROBLEMS, as yet undiscovered, exist among preschool children. If nothing is done to correct these problems, permanent damage may develop. Workers at the Eau Claire City-County Health Department attempted to reach preschool children as early as 1962, but their efforts were ineffective. Only 10 percent of children between the ages of 3 and 4 were reached.

In July 1966, therefore, the department undertook to determine the extent parents were able and willing to carry out vision screening in their homes and how well a mother could identify a vision problem in her child. The department had carried out a do-it-yourself screening program for phenylketonuria, using parents, almost 4 years before the mandatory blood testing program in Wisconsin. This experience stimulated its interest in other areas where parents could help themselves.

Mr. Bacharach, director of the Eau Claire City-County Health Department, was director of this project. Mrs. Dernbach was the project nurse, and Mrs. Elliott was the project coordinator. Mrs. Lovlien is director of nurses for the department. Consultants to the project were Dr. Miller, an ophthalmologist in private practice, and Mrs. Gustafson, who has a master's degree in psychology. The project was supported in part by Public Health Service grant No. N 5305.

The 3½-year-old child was selected for study since many ophthalmologists feel that eye problems discovered at this age, especially in connection with amblyopia ex anopsia, are more easily corrected. There is ample evidence that few programs are reaching a high percentage of this age group (1, 2), and no attempt has been made to evaluate the effectiveness of those that do through a variety of do-it-yourself devices.

Materials Used for Project

A white cardboard, 8 by 5½ inches, was printed with two Snellen E's; one E was small for the 20/30 vision test at 15 feet and the other was a large 20/80 E for practice use. The card was folded so that both E's could not be seen at the same time. Inside were simple diagrams showing a "stick" mother, father, and child performing the test and a chart for recording test results. The 15-foot test was used because many private homes do not have well-lighted areas 20 feet long. An instruction sheet was devised for a game envisioning the E as a table; the child was instructed to show which way the legs of the table were pointing.

A questionnaire for parents to mail to the health department was developed with the help of the project psychologist. It included a chart for recording the results of the vision test and questions concerning the child's attitudes and

ability to play the game. Since the parents' reaction to the project was deemed necessary, questions to elicit their reaction were included in the questionnaire. A letter explaining the study and its purpose was included with each questionnaire.

Lists were made of all 3½-year-old children in Eau Claire from birth records in the health department. Kits packed with the materials were mailed at the beginning of the month after the child became 3½ years old. A total of 1,040 kits eventually were mailed. After the first 2 months of trial, the original screening instructions were found to be quite confusing to the parents and had to be simplified.

Methods and Objectives

The nurse visited every third child on the list, or 302 children, whether or not the parents completed the test and returned the questionnaire. This group, hereafter called the study group, represented a statistical sample of a magnitude that allowed us to determine (a) what conditions were prevalent among 3½-year-old children, (b) the prevalence of these conditions and incidence of amblyopia, (c) what conclusions could be drawn between the parents who did the test and those who did not, and (d) how effective parents were in contrast to the nurse in finding eye conditions that were detectable with the Snellen E (discussed by L. J. Taubenhuis in an unpublished study of vision screening of 3- through 5-year-old children in Brookline, Mass.). We also wanted to learn whether 3½-year-old children, generally, were capable of performing the test.

The nurse also visited all parents who received the kit and asked for help, whether or not they were in the study group, and those who marked the result chart with an X, indicating a vision problem. If questionnaires were not returned by the end of the month in which they were mailed, they were solicited by telephone. Volunteers encouraged parents to do the test and return the results. Persons without telephones were sent a followup form letter.

If the nurse considered it necessary to refer a child for professional examination, the parents were given a referral form and encouraged repeatedly to follow through. The professional examiner indicated his findings on a special

form and returned it to the health department. Followup was complicated because a 3-month delay for an appointment was not uncommon. All children were examined by one of the three local ophthalmologists. Most were examined by either Dr. Miller, our consultant, or his brother, who is in practice with him as an ophthalmologist.

Criteria for Referral

The project ophthalmologist established the following criteria for referring children requiring professional examination:

- 20/40 or worse in both eyes with symptoms
- 20/20 in one eye and 20/40 in the other eye
- 20/50 or worse in both eyes
- All cases of observable strabismus

Results

The results were tabulated for the total group and the study group and for the problems confirmed by professional examination. For tabulating purposes only, the questionnaires returned with test results before the nurse visited the homes and those parents still residing in the county were considered as having been done by the parents, which totaled 519 of the 981 possible returns. Fifty-two percent of the parents responded. Of this proportion, 30 percent responded within a month, and 22 percent needed further encouragement through telephone calls and letters. Returns from the first mailing date to the last did not improve significantly despite the publicity given to the project. Mailings and returns are tabulated below:

Kits mailed.....	1,040
Addressee had moved.....	59
Questionnaire returned promptly.....	297
Questionnaire returned after phone call.....	192
Questionnaire returned after letter.....	30
Questionnaire returned after visit.....	60
	579
Total returned.....	579

The nurse visited 437 homes—302 families in the study group and 135 families in the non-study group.

From the questionnaires returned to the health department, the following information was tabulated. The totals differ because not all the parents answered all the questions, and some only added comments at the end.

Were the instructions clear?	
Yes	548
No	4
If you had difficulty, was it with—	
Measuring the distance.....	6
Getting the child's interest.....	129
Doing each eye separately.....	39
Other	33
How many times did you do the test before you were reasonably sure of the results?	
Once	221
Twice	162
Three times.....	95
More	59
Did your child enjoy the vision game?	
Yes	458
No	43
Unsure	43
How did you feel about doing the test?	
Glad to have the opportunity.....	509
Too much responsibility.....	5
Feel this is a professional responsibility.....	36
Have you ever observed any of the following symptoms which may be related to vision problems?	
Rubbing one eye or the other.....	9
Pupils of eyes not straight.....	16
Stumbling, falling, or knocking things over....	6
Other	10
Has your child ever had a professional eye examination?	
Yes	42
No	517
Have you any comments?.....	213

Parents added remarks to 213 questionnaires of the 579 returned. Among their comments 83 indicated positive approval, four indicated qualified approval, nine were critical, 74 mentioned difficulty in doing the test, 31 said the child seemed too young, and 43 made unrelated comments.

The results of the questionnaire indicated that parents understood what they were supposed to do, but some had trouble getting the child's interest and doing the test. Many parents repeated the test a number of times before they were reasonably sure of the results. Most parents appreciated the opportunity the kit offered them to test their child's vision since 94 percent returning the questionnaire had never had their child's eyes examined. Although some parents noted "pupils of eyes not straight," six parents in the group visited by the nurse apparently did not realize the need for a professional examination because of this condition. Of five children examined, one is now under treatment, and one

parent agreed to make an appointment for examination but never did.

The replies further indicated that although 41 parents noted some symptoms, only 12 had the child examined. Of these, four needed treatment for crossed eyes and three required glasses. Two had no problem, and three did not indicate what type of problem the child had. Five parents would not allow the nurse to check the child, and four were not home after the nurse made repeated appointments to visit.

Study group results. The incidence of amblyopia in the 302 children visited was five cases, or 1.65 percent. Of the five cases, two were known and three were not. The nurse identified one case of amblyopia in a child whose mother failed to return the questionnaire. Two mothers identified "vision problems" in their child, which turned out to be amblyopia when examined professionally. Of the total number of troubles detected, 0.99 percent were newly discovered cases of amblyopia ex anopsia.

Nine problems in children were identified by the nurse for the group of 145 mothers who did not return the questionnaire, and five for the group of 149 mothers who responded and attempted the test. Of the nine, eight were confirmed; of the five, two were confirmed and two were not. The respective rates were 5.5 percent as compared with 2.0 percent.

In the nonresponding group, the nurse made four referrals (three confirmed) based on visual symptoms she observed and five (all confirmed) based on the use of the E test. Only one child in the responding group was referred by the nurse because of observed symptoms. The problem was not confirmed. Of four others referred, three were confirmed.

In the study group, a total of 182 parents did not test their child, 32 families moved, four could not be found at home, and one family refused to cooperate. Of the 145 remaining, the nurse was able to test 116 or 80 percent, while 19.8 percent could not be tested by the nurse because of immaturity. Two children (1.38 percent) had previously identified amblyopia and one (0.69 percent) had newly discovered amblyopia.

Nine (5.4 percent) in the group of 166 parents returning the questionnaires were not able to do the tests. The nurse was not able to contact

one family of the nine. Of the eight contacted, all the children were found to be free of problems by the E test.

Of 157 parents who returned the questionnaire and were able to do the test, the nurse visited 149. Four of the group had moved, two refused to let the nurse test the child, and two could not be found at home.

Of the 149, both the parents and the nurse found 136 (92 percent) to be free of eye problems. One problem found by the nurse but not by the parent was confirmed by professional examination. The nurse was unable to test four children (2.7 percent) that the parents had tested and found to be all right. The nurse found nothing wrong with five (3.4 percent) whom the parents had tested and found with a problem. Both the nurse and parents found that two children had a problem. The results of tests of 10 children (6.7 percent) by parents were inaccurate. Over-referral by the nurse consisted of two children (1.35 percent).

Fourteen problems (4.6 percent) were identified in the study group of 302 children visited by the nurse; 11 (3.7 percent) were confirmed by professional examination. The nurse identified nine of the 11 problems, and eight of the nine were confirmed by professional examination. Of the nine problems identified by the nurse and confirmed, eight were among the group of nonresponding parents. Five problems were identified visually by the nurse; of these, three were confirmed. The nurse and professional examiner confirmed one case of amblyopia; the nurse, parents, and professional examiner found two cases; and two cases had been previously identified—a total of five cases of amblyopia. Three children (0.9 percent) were referred unnecessarily by the nurse for testing. The problems of six children (2 percent) had previously been identified.

Parents who responded and used the E test did not miss any eye problems. Of the 14 referrals in the study group, the nurse was unable to test three children, but because of observed symptoms she referred them for examination. Of the three, only two were found to have a problem when examined professionally. Two other referrals were made on visual evidence by the nurse, although the test was normal. One was not confirmed on examination. The remain-

ing nine children were referred by use of the test. Of the nine examined, eight were found to have some vision problems.

The results indicated that only one child with a confirmed problem would have been missed in 149 children whose parents did the test, or 0.68 percent of the study group.

Results of study group and nonstudy group. Comparison of the study and the nonstudy groups showed little difference in participation since both averaged 52 percent in returning the questionnaires. The only exception was in the number of questionnaires returned after the nurse's visit. In the study group, all parents receiving the questionnaire were visited, and 14.4 percent of the parents returned the questionnaire after the nurse's visit in contrast to 6 percent in the nonstudy group (see table).

Parent participation in both groups was 30 percent without any urging. The telephone calls by volunteers increased returns by 19 percent; the letter was least effective and increased returns only by 3 percent. The referral rate for each group was different. In the study group were 14 referrals or 4.6 percent in contrast to eight or 2.1 percent in the nonstudy group.

The eight referrals in the nonstudy group included four by the nurse because of observed symptoms, although the test was normal. In all four cases, the parents indicated that they were aware of "eye turning" or crossed eyes in their child. Two children had a professional examination and were found to have a problem. Two children were not examined.

Two parents asked for help because they were unable to do the test. The nurse was able to complete only one of these tests, but both children were referred for professional examination and both were found to have problems.

If the proportion of children in the study group tested by parents who returned the questionnaire were applied to the proportion of children (228) in the nonstudy group tested and found to be all right by parents only, we estimate that 1.6 problems or 0.68 percent would have been missed by these parents and that three cases or 1.35 percent would have been identified. Of the three cases expected, however, only one was identified by the parent.

If the percentage of total problems identified by the nurse among children whose parents

did the test and among those who did not do the test in the study group were applied to the 308 children not tested by parents or the nurse, we could estimate the number of cases not found. The total number of problems, identified and confirmed, that could be expected to exist among children whose parents did not do the test was 3.7 percent times 308 or 11.4 problems.

Newly discovered amblyopia would equal 0.98 percent times 308, or three cases. Thus we could expect that a maximum of 11 unknown vision problems would be found of which two could be amblyopia—one was identified—among the children whose parents did not respond and who were not visited by the nurse.

Other Findings

Many parents assumed that because the Eau Claire City-County Health Department had sent them a kit, their child should be capable of performing the test. If the child did not comply with the expected norm, the parents were concerned about the normalcy of their child; consequently no questionnaire was returned. These feelings were expressed to the nurse when she visited some families.

To test this point, for 2 months we sent out kits to parents of 4½-year-old children not included in these results and found that the initial response of these parents jumped from 30 to 40 percent. The increase in returns for 4½-year-olds needs to be equated in terms of a 1-year age differential and loss of effective treat-

ment potential among the older group as contrasted with that of 3½-year-olds. The unfortunate arbitrary designation of what a "normal" child can do at age 3½ in vision screening and its potential effect on the parent need to be considered. The fact that the nurse could not test 19.8 percent of the children who were in the group of nonresponding parents further indicates that our assumption about 3½-year-olds was incorrect and generally applicable. It is plausible to assume that children capable of doing the test represented the majority who participated, while some of the remaining segment represented children with problems and those not conforming to the expected capability of a 3½-year-old child. Perhaps a 4-year-old child would represent a reasonable compromise.

The telephone survey of 135 in the study group of nonresponding parents after 1 month indicated that 19 tried and were unable to do the test and that eight needed assistance, representing 20 percent of those called. A total of 45 offered no explanation, and 16 indicated that they lost the material or threw it away. These apparently indifferent parents represented 45 percent of the group. The remaining 35 percent indicated that they would do the test but neglected to do it, did not receive it, forgot, or offered some other reason. The project nurse also indicated that the inability of the child to do the test was considered by some parents as their inability to instruct the child properly.

In addition to testing the 3½-year-old child,

Results of vision testing by nurse and parents, 3½-year-old children of Eau Claire, Wis.

Action of nurse	Action of parent				Total
	Did not perform test or return questionnaire	Did not perform test, returned questionnaire	Performed test, no problem found	Performed test, found problem	
Study group:					
Tested okay.....	111	8	136	5	260
Found problem.....	5	0	2	2	9
Unable to test.....	29	0	4	0	33
Not tested.....	37	1	8	0	46
Nonstudy group:					
Tested okay.....	24	9	84	10	127
Found problem.....	1	1	1	1	4
Unable to test.....	4	2	0	1	7
Not tested.....	308	11	228	7	554
Total:					
Tested okay.....	135	17	220	15	387
Found problem.....	6	1	3	3	13
Unable to test.....	33	2	4	1	40
Not tested.....	345	12	236	7	600

mothers used the kit to test older children in the family. From results reported to us, two 4½-year-old children had vision problems—confirmed by professional examination. A third child, 6 years old, was discovered by the mother's testing to have amblyopia—also confirmed by professional examination. The frequency of amblyopia among relatives was an interesting finding. Twenty-three relatives of children in the study were reported to have amblyopia or "lazy eye."

Conclusion

Mothers can effectively screen their children for amblyopia ex anopsia when provided with a simple E test kit. In a study of the Eau Claire City-County Health Department, mothers were as effective as a nurse in finding eye problems with the kit. The study results indicated that 52 percent of 3½-year-old children can be effectively reached, inexpensively, when mailings are followed by telephone calls to remind parents. The prevalence of amblyopia among 3½-year-olds in a study group of 302 children was 1.65 percent, of which 0.98 percent were previously unknown. The proportion of newly discovered vision problems confirmed by professional examination was 3.7 percent. Previously identified problems totaled 2 percent.

Mothers were not effective in identifying observable vision problems in need of professional attention. Frequently they were able to identify the symptoms but did not think professional help was warranted. All eye test kits should include information on observable visual problems and the need for professional attention. The majority of parents appreciated the opportunity to test the vision of their children.

We could not account for the number of parents who examined a child and found a vision problem but did not inform us of this fact. We suspected that this occurred. These children could be included only in the group of previously identified.

Because the percentage of children that could not be tested by the nurse was high, we think that 4-year-old children would be a better choice for testing than 3½-year-olds. The older children could increase participation by 10 percent and prevent unnecessary parental concern in regard to the normalcy of the child or their own

capability because they were unable to test the child.

(In a 1969 study, kits were sent to parents of 4-year-olds, and participation increased to 57 percent of 685. Two problems were found by parents, one requiring surgery, the other treatment. The children were examined by ophthalmologists. Two previously known cases of amblyopia were reported and three vision problems.)

The results indicated a higher yield of vision problems among children of the nonresponding parents than among the children of parents who responded. The nurse referred four children of the nonresponding group because of observed symptoms and five as a result of the E test. The confirmed results indicated 5.5 percent of vision problems among children of the nonresponding parents as compared with 2.0 percent among those of the responding group. No explanation is offered for these results; however, they are significant in terms of anticipated yield among the nonresponding group. Assuming that the total population at risk of eye troubles could be reduced by 50 percent through a do-it-yourself program, the yield among the remaining group could be estimated at two times that of the group that responded. Thus the financial justification for screening the children of the nonresponding parents would be strengthened.

Summary

The Eau Claire City-County Health Department undertook a 1966-68 demonstration project to determine if more children with vision problems, especially amblyopia, could be found among 3½-year-olds by having parents screen their own children.

A kit with a questionnaire and instructions for using the illiterate E (Snellen) test was developed and mailed to the parents of 1,040 children who were 3½ years of age; 579 questionnaires with results were returned; 30 percent responded within a month, and 22 percent after being encouraged by a telephone volunteer. Ninety-four percent of the parents responding indicated that their child had never had an eye examination. The nurse visited every third child on the list whether or not the parents completed the test and returned the questionnaire. The investigators found that mothers could

screen their children effectively with the test provided and that 52 percent of the 3½-year olds could be reached inexpensively.

The prevalence of amblyopia among the study group of 302 children was 1.65 percent, of which 0.98 percent were previously unknown. The proportion of newly discovered vision problems confirmed by professional examination was 3.7 percent; 2 percent were previously known.

Among parents in the study group who did not do the test, 5.5 percent of the children were found to have previously unknown problems, in contrast to 2 percent among parents who did the test. Among parents who did not respond, 19.8 percent of the children could not be tested by the nurse. Among those who did respond, only 2.7 percent could not be tested by the nurse. This finding has significant implications for community screening.

It was found that children with amblyopia frequently have relatives with this condition. Mothers were effective in identifying observable vision problems but did not seem to realize that professional help was needed. Other findings indicated that not all 3½-year-old children could do the test and that 4 or 4½ years might be a more desirable age for the test to increase parent participation.

REFERENCES

- (1) Press, E.: Screening of preschool children for amblyopia: Administration of tests by parents. *JAMA* 204: 767-770, May 27, 1968.
- (2) Ross Laboratories: Currents in public health. Vol. 3, Columbus, Ohio, November-December 1963.

Tearsheet Requests

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Contract Between Regional Medical Programs Service and the American Neurological Association

A contract to develop guidelines and criteria for the care of stroke patients, including prevention, diagnosis, treatment, rehabilitation, and related specialty training, has been awarded to the American Neurological Association by the Regional Medical Programs Service of the Public Health Service's Health Services and Mental Health Administration. The Joint Committee for Stroke Facilities has been formed to carry out the contract.

The committee will coordinate a multidisciplinary approach to the care of stroke patients by designated representatives from national professional organizations including several Federal organizations. Representatives from the participating organizations will be appointed to the advisory groups of the committee based on their special competence or interest in the broad spectrum of cerebrovascular disease. Their expert knowledge will be used to determine the requirements for the facilities, personnel, and training programs necessary to provide high-quality care for stroke patients.

The American Neurological Association will coordinate the activities of the committee and

will be the fiscal agent for the contract, which supports the first year of a 3-year program designed to permit the implementation of section 907 of Public Law 89-239—the legislation establishing Regional Medical Programs. The legislation's purpose is to enable physicians and hospitals to provide the most advanced techniques of prevention, diagnosis, treatment, and rehabilitation to patients with heart disease, cancer, stroke, and related diseases. In accordance with section 907, national professional organizations have been enlisted to help develop guidelines for evaluating the capability of medical facilities to provide care as well as advanced specialty training.

When completed, the findings and recommendations of the Joint Committee for Stroke Facilities, as well as those from efforts relating to cancer and heart disease, will be published as a series of guidelines and made available to the medical profession, hospitals, the 55 Regional Medical Programs, and to interested government agencies. Information in these reports will enable physicians and institutions to evaluate their capabilities and will be a basis for assessing local community potential.