Visual Assessment and the Rehabilitation of Hearing-Impaired Children and Adults

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A project on identification of visual impairments is discussed.[1] This project had three objectives: (a) to determine the most appropriate means for identifying National Technical Institute for the Deaf (NTID) students with visual impairments and make recommendations for medical and personal/social follow-up, (b) to determine the types and incidence of visual impairments among these students, and (c) to conduct research that would assist in the provision of appropriate counseling relative to academic and career opportunities/experiences for persons with both auditory and visual impairments. Given the importance of vision to persons with hearing losses, it is recommended that: (a) an ophthalmological examination be done routinely upon discovery of a hearing loss; (b) reassessment of visual and auditory functioning be done periodically for persons with hearing losses; (c) interpreters be used to help ensure adequate communication during visual assessment procedures and follow-up; and (d) information be provided for hearing-impaired persons, parents, and professionals concerning the importance of visual assessment and hygiene. The need for research relative to the status of the visual system and how to facilitate the use of the visual modality for academic and career experiences among hearing-impaired persons is emphasized.

IMPORTANCE OF VISUAL ASSESSMENT AND FOLLOW-UP

The theme of the conference for which this report has been prepared was, "Assessment and Habilitation of Problems Related to Hearing Impairment in

[1]A more in-depth report of this three-year project is in preparaton. This report will include an overview of the anatomy of the human visual system, a list of definitions for visual abilities, pathologies and assessment instruments/tests, a full description of the recommended visual screening program discussed in this paper, a description of a recommended ophthalmological examination procedure, and a summary of comments and recommendations from NTID content/technical experts relative to the importance of vision for their academic areas.

Children and Adults." The importance of visual assessment and follow-up in the habilitation of persons with hearing impairments has been stressed by Vernon (1977) and Hicks and Pfau (1979):

1. "The issue is that vision represents the key sense remaining in deaf people. Therefore, it must be assessed thoroughly." (Vernon, 1977, p. 4)
2. "In order to have a comprehensive and appropriate program, schools serving deaf children need functional visual screening and diagnostic techniques, an improved understanding of the characteristics and progressive nature of particular visual defects, and an up-dated awareness of the different referral agencies which can provide student services. . . . Most learning theorists concur that the vast majority - as high as 99 percent - of acquired information and knowledge is learned through the two sensory modalities of vision and audition. . . . Impairment of both dominant modalities not only compounds the problem, but significantly changes the type of educational or rehabilitative program required, and fosters an array of learning, methodological, social, psychological, and career implications." (Hicks & Pfau, 1979, p. 76)

OBJECTIVES OF STUDY

This paper discusses a vision project, conducted over a three-year period at the National Technical Institute for the Deaf (NTID), that had three main objectives: (a) to determine the most appropriate means for identifying NTID students with visual impairments and to make recommendations for medical and personal/social follow-up (Objective 1), (b) to determine the types and incidence of visual impairments among these students (Objective 2), and (c) to conduct research that would assist in the provision of appropriate counseling relative to academic and career opportunities/experiences for persons with both auditory and visual impairments (Objective 3).

This report is organized in the following manner: (a) methodology for Objectives 1 and 2; (b) results for Objective 1; (c) results for Objective 2; (d) methodology and results for Objective 3; and (e) summary, discussion, and recommendations.

METHODOLOGY FOR OBJECTIVES 1 AND 2

As indicated above, the data collection for Objectives 1 and 2 extended over a three-year period (1977-78-79), with 1978-79 data collection involving methodological changes based on data collected during the previous year(s). Several approaches were investigated as possible means for determining the most appropriate way(s) to identify NTID students with visual impairments (Objective 1). Subsequently, some of these approaches were used to

determine the types and incidence of visual impairments within this population (Objective 2). The approaches investigated were: (a) a vision questionnaire (personal/family ocular history) for students, (b) an off-campus general health physical examination, (c) an off-campus ophthalmological examination, (d) an on-campus ophthalmological examination (standard to which all other assesment results were compared), and (e) an on-campus visual screening program.[2] Table 1 provides a listing of these approaches and the year(s) during which each approach was used.

The on-campus visual screening program included the use of Bausch and Lomb Orthorater Vision Testers (a vision testing instrument used in assessing visual acuity, color vision, and binocular vision), the Ishihara Color Vision Test with MacBeth lamp for illumination (a test designed to evaluate the ability to discriminate colors), and Titmus Stereopsis Tests (a series of tests designed to assess the ability to perceive objects in three dimensions using both eyes). Visual parameters assessed included near and far (distance) acuity (the ability of the eyes to resolve or differentiate detail), color vision (the ability to discriminate colors), and binocular vision (muscle balance and depth perception).

RESULTS FOR OBJECTIVE 1: IDENTIFICATION OF VISUAL IMPAIRMENTS

On-Campus Approaches Recommended

Results of three years of data collection supported on-campus approaches to the assessment of visual functioning of NTID students; i.e., results supported the use of an on-campus visual screening program with follow-up on-campus ophthalmological examinations for all students failing this screening. An in-depth ophthalmological examination for students failing visual screening is essential to the provision of appropriate academic and career planning services, since such an examination is necessary to determine whether a student truly does or does not have a visual problem and to ensure that all possible medical follow-up is provided for students.

On-Campus Visual Screening Program

Based on the data collected, the following test instruments and tests have

[2]In addition to the visual assessment approaches discussed in this study, three psychophysical screening tests for the presence of retinitis pigmentosa (RP) (a progressive loss of vision due to retinal degeneration) were investigated; one approach involved a test for assessment of dark-adapted visual sensitivity (the ability to see in darkness or dim illumination), and the other approach involved two tests for temporal processing of visual stimuli. The test for assessment of dark-adapted visual sensitivity was developed by Ms. Anita M. Rothblum, and the tests for temporal processing of visual stimuli were developed by Dr. Thomas R. Corwin. For additional information about these tests, Ms. Rothblum and Dr. Corwin may be contacted at the Center for Visual Science, University of Rochester, Rochester, New York, 14627.

Table 1

Experimental Visual Assessment and Examination Procedures Requested of Students Entering NTID during Summer Sessions, 1977-78-79

Year and Number of New Students Enrolled	Vision Questionnaire	Off-Campus General Health Physical	Off-Campus Ophthalmological Examination	On-Campus Ophthalmological Examination (OCO)	On-Campus Visual Screening Program (OCVS)
1977 (N=321)	All Students	All Students	150 Randomly Selected Students; All Other Students Failing Visual Part of General Health Physical	All Students Failing Visual Part of General Health Physical and/or Off-Campus Ophthalmological Examination; 50 Students with Suspected Normal Vision	None
1978 (N=323)	None	All Students	All Students Failing Visual Part of General Health Physical	All Students Failing: Visual Part of General Health Physical; Off-Campus Ophthalmological; On-Campus Visual Screening Test(s)	All Students (With Correction *Only*, if Worn)
1979 (N=311)	None	All Students	Same Procedure as 1978	Same Procedure as 1978	All Students (*Both* Without and With Correction if Worn)

Note: Although certain procedures were requested with certain groups of students each year, not all students complied with these requests except in the case of the on-campus visual screening programs.

been recommended for the NTID visual screening program: (a) Orthorater Far Acuity Test,[3] (b) Ishihara Color Vision Test with MacBeth lamp for illumination, and (c) a vision questionnaire (personal/family ocular history) administered prior to or upon the student's arrival on campus (see the

[3]All NTID students failing the Orthorater Near Acuity Test also failed the Orthorater Far Acuity Test but not vice versa. The former test, therefore, was not included among the tests for the recommended screening program. Similar results may be expected for younger age groups as well. For older age groups, however, individuals may fail a near acuity test and pass far acuity. This may be due to reduced ability to accommodate or change the shape of the lens of the eye (presbyopia). Bifocal lenses may be appropriate when this occurs. Therefore, inclusion of near-acuity testing is recommended for persons 30 years and older.

Appendix for the vision questionnaire being used with 1980 entering NTID students). Table 2 provides a summary listing of the screening test instruments and tests recommended and not recommended and the referral criteria for an on-campus ophthalmological examination.

Table 2

Visual Assessment Instruments, Functions Assessed, and Referral Criteria for the NTID Visual Screening Program

Visual Assessment Instrument and Functions Assessed	Recommended	Referral Criteria for an On-Campus Ophthalmological Examination [a]
Orthorater		
Near Acuity	No	
Far Acuity	Yes	20/40 or Worse
Color Vision	No	
Phorias		
Near Lateral	No	
Far Lateral	No	
Near Vertical	No	
Far Vertical	No	
Stereopsis	No	
Ishihara Color Vision Test	Yes	7 or More Misses on First 13 Plates
Titmus Stereopsis Tests	No	
Vision Questionnaire (Personal/ Family Ocular History)	Yes	Any indication of visual problems

[a] If the student is presently under the care of an ophthalmologist and/or results indicate adequate remediation has been provided, then referral for an on-campus ophthalmological examination may be unnecessary.

The following two sub-sections provide the rationale for rejecting the off-campus visual assessment approaches investigated and for recommending an on-campus visual screening program with an on-campus ophthalmological examination for all students failing this screening.

Rationale for Not Recommending Off-Campus Visual Assessment Approaches

Three off-campus approaches were investigated as possible means of assessing the visual functioning of NTID students: vision questionnaire (personal/family ocular history), general health physical, and off-campus ophthalmological examination. None of the off-campus identification approaches was shown to be adequate for identifying NTID students with

visual problems.

For the student vision questionnaire, the return rate was not adequate and the information was often inaccurate. A revised questionnaire administered in a more controlled fashion might assist in solving these problems. It is doubtful, however, that information obtained in this manner would suffice without additional information from other visual screening procedures.

As in the case of the student vision questionnaire, deriving information concerning visual status of students from off-campus general health physical forms is not appropriate because of the poor return rate. In addition, although general health physicians have the skills needed to identify persons in need of an in-depth visual examination, lack of adequate communication with hearing-impaired patients is often a problem.

Recommending off-campus ophthalmological examinations for all prospective NTID students would not be cost effective since the majority of entering students either do not have significant visual problems or their visual problems have been given adequate medical treatment or follow-up as will be seen in the section of this paper that reports the results for Objective 2. Moreover, it is important that hearing-impaired students understand both the results of any visual examination they receive and *all* follow-up recommendations. Examinations by off-campus vision specialists who are unaware of the communication needs of hearing-impaired students may result in students who understand neither the implications of their visual impairments nor the follow-up that is essential for these visual impairments. For example, several NTID students seen for on-campus ophthalmological examinations did not understand how to appropriately use and maintain their contact lenses. In addition, among 13 students entering NTID during the years 1977-78-79 who were found to have retinitis pigmentosa (RP), 10 did not indicate an awareness either of the existence of this visual problem and/or of its significance. Use of qualified interpreters would likely help to alleviate some of the above problems.

Rationale for Recommending On-Campus Assessment Approaches

Tables 3, 4, 5, and 6 provide on-campus ophthalmological examination (OCO) and on-campus visual screening (OCVS) results for 1979 NTID students according to those who were identified as having ocular pathologies and those who were identified as not having ocular pathologies by the OCO. Table 3 provides a listing of observed ocular pathologies and the number and percentage of students having each pathology among the 207 students receiving an OCO. Also, it identifies observed pathologies for which periodic examinations by an ophthalmologist are warranted. Table 4 provides a pass-fail comparison of the OCO and OCVS results for all students identified to have a pathology by the OCO (as stated, the OCO was the standard to which

all other assessment results were compared).[4] Table 5 lists the number of acuity, color vision, and binocular vision problems identified by the OCO among students with and without pathologies. Table 6 provides a comparison of OCVS test results and subsequent OCO examinations for all students receiving an OCO.[5,6]

The results in these tables show the following:

1. Of the 207 entering NTID students receiving an OCO in 1979, 64 (30.9%) were identified as having an ocular pathology. Of these 64 students, 10 (4.8% of 207 students) were identified as having an ocular pathology for which periodic examinations by an ophthalmologist are warranted (see Table 3).
2. Only two students with serious ocular pathologies and one student with a serious acuity problem (20/40 or worse in both eyes) passed both the OCVS far acuity test and Ishihara Color Vision Test (see Table 4, footnotes c and d).
3. Of the 64 students identified as having ocular pathologies, 43 (67.2%) have acuity problems, color problems, binocular vision problems, or

[4]The amount of data collected and the complexity of this data precludes presenting the results of the six binocular screening vision tests administered to NTID students. In brief: (a) the majority of students found to have abnormal binocular vision by the on-campus ophthalmological examination were identified to be referred for an OCO by the on-campus visual screening Orthorater Far Acuity Test; (b) an analysis of screening binocular vision data using several pass-fail criteria failed to identify any single test or combination of binocular vision tests that yielded both acceptable false-positive (overreferral) and false-negative(underreferral) rates; and (c) the ophthalmologist conducting most of the OCO examinations stated that adequate diagnosis of binocular vision problems generally requires the combination of binocular vision tests which are administered and interpreted in conjunction with a patient's symptoms by a vision specialist, and binocular vision problems generally do not affect a person's ability to perform school and job-related tasks.

[5]A pass-fail criterion of 20/40 has been used for all far acuity test results reported in this paper (OCVS and OCO). Results of 1979 far acuity screening were also analyzed using 20/50 and 20/30 pass-fail criteria. The 20/50 criterion yielded a significant increase in false negatives (underreferrals) when compared to a 20/40 criterion; i.e., the 20/50 criterion yielded 16 false negatives and the 20/40 criterion 5 false negatives. Taking into account those false positives presumably caused by suppression, the 20/50 criterion yielded 12 false positives (overreferrals) and the 20/40 criterion 14 false positives. The 20/30 criterion yielded 64 false positives without reducing the number of false negatives when compared to a 20/40 criterion. Therefore, both 20/50 and 20/30 were rejected in favor of the 20/40 pass-fail criterion for far acuity screening.

[6]This information should be considered as an *estimated* incidence of pathologies within the 1979 entering student population (N=311). There are some students who may have a pathological condition but are essentially symptom free. The 13 cases of rubella retinopathy listed as normal in Table 5 are examples of this phenomenon. Some students like this may not have been referred for an OCO. However, given the high false-positive rate (overreferrals) for OCVS binocular vision test results and the use of personal/family ocular history information for OCO referral, it is likely that most, if not all, entering students with pathologies (active and inactive) were seen for an OCO.

combinations thereof. Of the 143 students with no pathological condition, 23 (16.1%) have acuity, binocular, or acuity and binocular vision problems (see Table 5).

4. Table 6 includes all 1979 NTID students who would have been referred for an OCO based on the results of OCVS testing using the new pass-fail criteria. Also, this table lists the OCO results for all of these students. These data show the following:
   a. Fifty-one students would have failed the OCVS, and been referred for an OCO. Note: The figure 51 may be derived from the data in Table 6 in the following manner: (1) subtract the 28 suspected suppression cases (see Table 6, footnote b) from the total 64 students that failed the OCVS far acuity test (N=36); (2) add the number of students failing the OCVS test for color vision (N=11); and (3) add the number of students failing both the OCVS far acuity and color vision tests (N=4).

Table 3

Numbers, Percentages, and Types of Visual Pathologies and Two Resulting Pathological Conditions Identified during On-Campus Ophthalmological Examinations Performed on Students Entering NTID during 1979 Summer Session (N=207)

Type of Pathology [a]	Number	Percent
1. (No Pathology)	(143)	(69.08%)
2. Maculopathy	3	1.45
3. Retinitis Pigmentosa (RP)	2	.97
4. Neurofibromatosis	1	.48
5. Chorioretinitis	1	.48
6. Hypopigmented Fundus	2	.97
7. Follicular Conjunctivitis	1	.48
8. Rubella Retinopathy	17	8.22
9. Color Deficiency [c]	15	7.25
10. Strabismus [c]	17(19) [b]	8.21(9.18) [b]
11. Chorioretinal Scar(s)	4	1.93
12. Anisocoria	1	.48
Total Number of Students with Pathologies	64	30.92%

[a] The 10 students (15.4% of 64 students with pathologies) exhibiting the pathologies listed in items 2 through 7 are in need of periodic examinations by an ophthalmologist because of the possible progressive nature of these visual problems. However, 6 (60%) of these students did not indicate an awareness of their pathologies prior to the performance of the on-campus visual screening assessments and ophthalmological examinations.

[b] Two cases of maculopathy also have strabismus.

[c] Color deficiency and strabismus (a binocular vision problem) are the results of pathologies. The cause(s) of color vision deficiency is (are) currently not agreed upon, while strabismus may be the result of a number of pathologies.

Table 4

Pass-Fail Results for On-Campus Visual Screening (OCVS) Considering Far Acuity and Ishihara Color Vision Assessment for 1979 Summer Session Students Identified as Having Ocular Pathology by On-Campus Ophthalmological (OCO) Examinations (N=64)[a]

OCO	OCVS	
	Pass	Fail
Pass (acuity, color, and binocular)	16 (2)[b,c]	5 (1)
Fail (acuity, color, and/or binocular)	8[d](0)	35 (7)

[a]Results are for best correcton; i.e., if students had corrective lenses, they wore them during the testing.

[b]Numbers in parentheses refer to students who should be seen for periodic examinations by an ophthalmologist.

[c]The two students passing the screening with pathologies who should be seen for a periodic examination included one student with follicular conjunctivitis and one student with a hypopigmented fundus. The former student was under the care of a physician at the time of the OCO, and the latter student's eye problem, although it should be followed, is not serious.

[d]Five of these students had abnormal binocular vision only, one had abnormal binocular vision and an acuity problem, and two had acuity problems only. Of the three students with acuity problems, two had 20/30 acuity in one eye and one had 20/40 acuity in both eyes.

b. Of these 51 students, 47 would have been found to have a pathology, far acuity problem, color vision problem, binocular vision problem, or a combination thereof; and 4 students would have been found to be normal by the OCO; i.e., there would have been 4 false positives (overreferrals).
c. There would have been 33 students who would have passed the OCVS and failed the OCO; i.e., 33 false negatives. Among these 33 students, however, only 1 had a serious ocular pathology. Also, all but 1 of these 33 students had 20/30 or better far acuity in one or both eyes. This latter student had 20/40 far acuity in both eyes.

In summary, the data discussed in items 1 through 4 above and Tables 3 through 6, show that if the recommended OCVS test procedures are used (refer to Table 2 for the recommended visual screening test battery and referral criteria): (a) students with serious ocular pathologies should fail the OCVS and be referred for a subsequent OCO; (b) false-positive results (over-referrals) should be maintained at a minimum; and (c) among the OCVS false negatives (underreferrals), few, if any, should have a serious far acuity problem in both eyes. In addition, the use of a vision questionnaire (personal/family ocular history) as part of the OCVS procedures may reduce the number of false negatives. For example, of the 33 OCVS false negatives in

Table 5

Pathologies, Resulting Pathological Conditions, Far Acuity, Color Vision, and Binocular Vision Problems among Entering 1979 NTID Students Seen for On-Campus Ophthalmological (OCO) Examinations (N=207) [a,b]

Type of Pathology	Totals		Problems Identified during OCO							
	N	%	Far Acuity	Color	Binocular	Far Acuity Binocular	Color Binocular	Far Acuity Color Binocular	Normal	Totals
1. No Pathology	143	69.08	13		5	5			120	143
2. Maculopathy	3	1.45	1			2				3
3. Retinitis Pigmentosa	2	.97	2							2
4. Neurofibromatosis	1	.48				1				1
5. Chorioretinitis	1	.48							1	1
6. Hypopigmented Fundus	2	.97							2	2
7. Follicular Conjunctivitis	1	.48							1	1
8. Rubella Retinopathy	17	8.22	2			2			13	17
9. Color Deficiency	15	7.25		13			1	1		15
10. Strabismus	17	8.21			13	4				17
11. Chorioretinal Scar	4	1.93				1			3	4
12. Anisocoria	1	.48							1	1
Totals	207	100.00	18	13	18	15	1	1	141	207

[a]Results are for best correction; i.e., if students had corrective lenses, they wore them during the testing.

[b]Of the 64 students identified as having ocular pathologies, 43 (67.2%) have acuity problems, color problems, binocular vision problems, or combinations thereof. Of the 143 students with no pathological condition, 23 (16.1%) were identified by the OCO as having acuity, binocular, or acuity and binocular vision problems.

Table 6

Comparison of Results of On-Campus Visual Screening Assessments and Subsequent On-Campus Ophthalmological Examinations Performed on Students Entering NTID during 1979 Summer Session (N=207) [a]

On-Campus Ophthalmological (OCO) Results	On Campus-Vision Screening (OCVS) Results						
	Agreement (Pass)	False Negatives (Pass)	False Positives (Fail)	Far Acuity [b]	Color	Acuity Color	Totals
1. Normal	97		(25)	24	1		122
2. Far Acuity		3		6			9
3. Binocular		4(6[c])		2[c]			6
4. Far Acuity, Binocular				6			6
5. Pathology		16		5			21
6. Pathology, Far Acuity		1		4			5
7. Pathology, Color		1			10	2[b]	13
8. Pathology, Binocular		5		8			13
9. Pathology, Far Acuity, Binocular		1		8		1	10
10. Pathology, Color, Binocular				1			1
11. Pathology, Far Acuity, Color, Binocular						1	1
Totals	97	31(33[c])	(25)	64	11	4	207

[a]Results are for best correction; i.e., if students had corrective lenses, they wore them during the testing.

[b]Among the 68 students who failed the far acuity OCVS test (see far acuity and acuity/color column), 42 passed the OCO and failed the OCVS with 20/40 screening criterion. It is believed that 28 of these 42 students would not have failed if they had been checked for suppression in one eye. Suppression results when one eye is "stronger" than the other. If the "weak" eye is being tested and a masking stimulus is visible to the "strong" eye, the result may be a reduced acuity score for the weak eye when using the Orthorater. This problem may be prevented by turning off the visual masking stimulus so that it is not visible to the strong eye when the weak eye is being tested. If this procedure had been followed, there probably would have been 14 false positives, rather than 42, with a pass-fail criterion of 20/40. (See Van Noorden, 1966, for further discussion.)

[c]If the recommended procedures for solving the problem of suppression had been used, two students identified by the OCO to have binocular vision problems would probably not have been referred, and the number of false negatives would have been increased by two.

1979, 16 had a pathology only (see Table 6). As stated, many of these students may be identified by use of a good ocular history.

One additional comment should be made concerning the NTID recommended visual screening tests for far acuity and color vision. NTID used Bausch and Lomb Orthorater Vision Testers because they were capable of being used to test not only far and near acuity but color vision and five types of binocular vision abilities as well; i.e., near and far lateral phoria, near and far vertical phoria, and stereopsis. Since the research results demonstrated that NTID visual screening should utilize the Orthorater for testing only far acuity, other types of acuity test instrumentation that are less expensive might suffice. For example, the National Society to Prevent Blindness (NSPB, 1979) recommends various forms of the Snellen Chart, according to chronological age level, to test far acuity. It may be that these forms of the Snellen Chart are as appropriate as the Orthorater for far acuity visual screening. This will need to be demonstrated through research, however, before recommending such a change for the NTID visual screening program.

For students failing visual screening, an in-depth visual examination by an ophthalmologist is essential to the provision of appropriate academic and career planning services. For NTID, an ophthalmological examination performed on campus (OCO) will help to ensure that student visual information is available at the earliest possible time and that students in need receive appropriate medical, personal/social, and academic/career remediation and follow-up. A dilated funduscopic evaluation (the pupil of the eye is dilated with cycloplegic drugs to enable examination of the periphery of the fundus with an ophthalmoscope) needs to be a part of the OCO. This is necessary because without the pupils dilated it is extremely difficult for the ophthalmologist to view the internal periphery of the eye to determine the presence of some pathological conditions.

Interpreters should be used, as appropriate, during visual screening and ophthalmological examination of hearing-impaired persons to ensure adequate communication. This is necessary not only in terms of obtaining valid and reliable test results but also in ensuring that the hearing-impaired person understands any visual problems that s/he may have and the recommended follow-up.[7]

RESULTS FOR OBJECTIVE 2: TYPES AND INCIDENCE OF VISUAL IMPAIRMENTS

Introduction

This section discusses types and *estimated* incidence of visual pathologies and acuity, color, and binocular vision problems among students entering

[7]For a discussion of communication and interpreting with deaf-blind persons, see Caccamise and Stangarone (1980) and DiPietro (1978).

NTID during the three-year course of this research project. Emphasis is placed on the word "estimated" since in this study all visual problems reported were not ophthalmologically confirmed; i.e., some visual problems were indicated by visual screening procedures but were not ophthalmologically confirmed (also, see footnote 6).

Pathologies and Pathological Conditions

Table 7 lists the variety of pathologies and two pathological conditions found among entering NTID students receiving on-campus ophthalmological examinations (OCO) over a three-year period (1977-78-79). As shown in Table 7, strabismus, rubella retinopathy, color deficiency, and retinitis pigmentosa, respectively, were the four leading visual pathologies and pathological conditions found among 1977-78-79 entering NTID students. If the reader compares Table 3 (1979 data only) and Table 7 (1977, 78 & 79 data combined), s/he will note that, although the variety and number of pathologies increases over the three-year period as might be expected, the primary visual pathologies and pathological conditions within the NTID population remain essentially the same.

In summary, of 573 NTID students seen for an OCO over a three-year period, 179 (31.2%) exhibited some type of ocular pathology. Among these students were 50 (8.7%) who exhibited the types of pathologies for which a periodic examination would be recommended by the ophthalmologist because of the possibility of reoccurrence or the possible progressive nature of the problem. Forty of these 50 students, however, did not indicate an awareness of their problem before the OCO. This fact further accentuates the need for an ongoing visual screening program with an appropriate medical referral system and medical, personal/social, and academic/career follow-up.

Estimated Incidence of Functional Visual Problems among Entering NTID Students

Table 8 presents data concerning the estimated incidence of far acuity, color deficiency, and binocular visual problems among students entering NTID during 1978 and 1979.[8] As previously stated, caution must be used in interpreting this table since it was necessary to use two information sources to obtain data on the entire student populations entering NTID during these two years. These two sources were the results of the OCVS and the OCO. It was necessary to derive the data in this fashion since students who had visual problems which were detected during the OCVS were not referred for an OCO examination if they appreared to have appropriate correction.

[8]As stated in the Tables, all far acuity results reported in this paper are with best correction, except for the "estimated incidence" data reported in Table 8.

Table 7

Number, Percentages, and Types of Visual Pathologies and Two Resulting Pathological Conditions Identified during On-Campus Ophthalmological Examinations Performed on Students Entering NTID during 1977-78-79 Summer Sessions (N=573)

Type of Pathology [a]	Number	Percent
1. (No Pathology)	(394)	(68.8%)
2. Retinitis Pigmentosa (RP)	13	2.3
3. Retinopathy	9	1.6
4. Conjunctivitis	7	1.2
5. Iritis	4	.7
6. Maculopathy	4[b]	.7
7. Hypopigmented Fundus	2	.3
8. Corneal Guttata	2	.3
9. Nyctalopia (Non-RP)	2	.3
10. Neurofibromatosis	1	.2
11. Chorioretinitis	1	.2
12. Retrolental Fibroplasia	1	.2
13. Embryonal Cataract	1	.2
14. Optic Atrophy	1	.2
15. Glaucoma	1	.2
16. Drusen Optic Nerve	1	.2
17. Strabismus	(51)[b,c]	(8.8)
18. Rubella Retinopathy	43[c]	7.5
19. Color Deficiency	(34)[c]	(5.9)
20. Chorioretinal Scar	4	.7
21. Anisocoria	1	.2
Total Number of Students with Pathologies	179	31.2%

[a]The 50 students (27.9% of 179 students with pathologies) exhibiting the pathologies listed in items 2 through 16 are in need of periodic examinations by an ophthalmologist because of the possible progressive nature of these visual problems. However, 40 (80%) of these students did not indicate an awareness of their pathologies prior to the performance of the on-campus visual screening and ophthalmological examinations.

[b]Two cases of ocular maculopathy also have strabismus.

[c]One strabismus case and one rubella retinopathy case also had color deficiency.

Table 8 shows that of 620 students entering NTID during 1978 and 1979, 363 (58.4%) were identified as having either a far visual acuity problem, a color deficiency problem, a binocular vision problem, or combinations thereof. Thus, it is estimated that during any single year it may be expected that approximately half of the population of students entering NTID may have one or more of these types of visual problems.[9]

[9]The data reported in Table 5 show that among the entering 1979 NTID students (N=311, at least 21 (6.7%) with ocular pathologies did not have far acuity, color, and/or binocular vision

Table 8

Estimated Incidence of Acuity, Color, and Binocular Vision Problems among Entering NTID Students Based on the Results of On-Campus Ophthalmological Examinations (OCO) and On-Campus Visual Screening (OCVS) Results

	Far Acuity[c]		Color[d]		Binocular[e]	
Year (N)	Normal	Abnormal[f]	Normal	Abnormal[f]	Normal	Abnormal[f]
1978(N=309)[a]	141(45.6%)	168(54.4%)	299(96.8%)	10(3.2%)	277(89.6%)	32(10.4%)
1979(N=311)[b]	177(56.9%)	134(43.1%)	296(94.9%)	15(5.1%)	273(87.8%)	38(12.2%)
Totals (N=620)	318(51.3%)	302(48.7%)	595(96.0%)	25(4.0%)	550(88.7%)	70(11.3%)

[a]For 1978, estimated incidences were based on the OCO results for 190 students and the OCVS results for 119 students.

[b]For 1979, estimated incidences were based on the OCO results for 207 students and the OCVS for 104 students.

[c]Pass-fail criterion for far acuity was set at 20/40 or worse without correction.

[d]Pass-fail criterion for color was set at 7 or more misses on the first 13 plates of the Ishihara Color Vision Test.

[e]Pass-fail criterion for binocular vision was the result of the OCO examination since the OCVS binocular vision test procedures were found to be inadequate.

[f]Among those students in the "abnormal" columns, 330 (53.2% of the total N of 620) were abnormal for one of the visual abilities listed in this table, 32 (5.2% of the total N) were abnormal for two of these visual abilities, and 1 (.002% of the N) was abnormal for all three abilities. This yields a total of 363 students (58.4%) who had problems in far acuity, color vision, binocular vision, or combinations thereof.

Especially significant for academic/career considerations are those students with ophthalmologically confirmed noncorrectable far acuity problems. Of the 573 NTID students seen for an OCO during 1977-78-79, 25 (4.4%) could not be corrected to better than 20/40 far acuity in either eye. An additional 86 students (15.0%) could not be corrected to better than 20/40 in one eye only. These results, especially in the case of the former group, have strong implications for both personal/social and academic/career counseling. There are also implications in terms of the types and nature of support services necessary for these students to be successful in academic and career environments. Also, similar consideration needs to be given to those students who have near acuity problems (may impact on reading and other near distance tasks) and color vision problems.

Table 9 reveals that most, but not all, of the students entering NTID have had adequate professional care, at least for far acuity problems, by the time they reach the postsecondary school level (the average chronological age of

problems. Therefore, the estimated incidence of *all* visual problems among entering NTID students, when pathological as well as functional problems are considered, is approximately 65%.

students entering NTID is approximately 19.5 years). However, among those students entering NTID in 1978 and 1979 who were found to have far acuity problems (N=302), 20 (6.6%) did not own corrective lenses, 7 (2.3%) were found to have inadequate correction, and adequacy of correction was unknown for 84 (27.8%) students (see footnote a of Table 9).

Table 9

Adequacy of Correction for Far Acuity Problems among Entering 1978-79 NTID Students Based on On-Campus Ophthalmological (OCO) Examinations and On-Campus Visual Screening (OCVS) Results

Year (N)	Number of Students with Far Acuity Problems	Have Correction		Correction Adequate		
		Yes	No	Yes	No	Don't Know[a]
1978 (N=309)	168	164(97.6%)	4(2.4%)	113(67.3%)	4(2.4%)[b]	51(30.3%)
1979 (N=311)	134	118(88.1%)	16(11.9%)	98(73.1%)	3(2.2%)[c]	33(24.7%)
Totals (N=620)	302	282(93.4%)	20(6.6%)	211(69.9%)	7(2.3%)	84(27.8%)

[a]The "don't know" column includes students who wore correction during th OCVS and were not seen for an OCO. Sixty-two of these students were 20/30 or better in both eyes on the OCVS far acuity test, indicating that most, if not all, of these students did have adequate correction. Eight of these students were 20/30 or better in one eye and two were 20/40 or worse in both eyes on the OCVS far acuity test. Ten of these students stated they had correction, but they did not bring their glasses/contacts to the OCVS assessment.

[b]Three students had correction at the time of the OCO; one did not.

[c]None had correction at the time of the OCO.

Again, these data emphasize the importance of strong visual screening programs with good follow-up professional care for all programs serving hearing-impaired persons.

METHODOLOGY AND RESULTS FOR OBJECTIVE 3: ACADEMIC AND CAREER OPPORTUNITIES/EXPERIENCES

> Calling a child cerebral palsied or blind provides little information about his functional levels. Such terms do little more than call attention to the fact that he is subject to some deviation from what is considered 'normal.' The extent to which this deviation interferes with learning or social behavior or whether the child can respond to therapy, use prostheses, or perform 'activities of daily living' is not reflected in the label. Yet, all too often, it is the diagnostic label that affects educational placement and the specific qualifications of his teacher. (Connor, Hoover, Horton, Sands, Sternfeld, & Wolinsky, 1976, p. 240)

The issues that the above quotation raises reflect a basic concern of the NTID Vision Task Force members in addressing Objective 3 (to conduct

research that would assist in the provision of appropriate counseling relative to academic and career opportunities/experiences for persons with auditory and visual impairments). This basic concern was that of *stereotyping*. Given this concern, it was decided to identify principles that, if followed, would assist in avoiding stereotyping in the investigation and reporting of information relative to Objective 3. After several discussions, the following principles were agreed upon by the NTID Vision Task Force members:

1. All academic and career opportunities/experiences are appropriate for for persons with auditory and visual impairments unless shown otherwise.
2. Environmental modifications designed to meet the needs of persons with auditory and visual impairments are an important part of academic and career planning.
3. It is important to distinguish among the concepts of impairment, disability, and handicap:
   a. *Impairment* refers to the pathology or the actual physical damage to the body; e.g., a damaged spinal cord.
   b. *Disability* refers to a loss of function, or more specifically, a loss of physical function due to an impairment; e.g., an inability to walk (*disability*) due to a damaged spinal cord (*impairment*).
   c. *Handicap* refers to the disadvantage in functioning experienced by an individual due to the combination of a disability (or impairment) and a specific environment or situation; e.g., if your *impairment* was a damaged spinal cord and the resulting *disability* that you cannot walk, one *handicap* may be that you cannot get to your job in the library because of the steps you need to ascend to enter the building.

It is important to distinguish among the above three terms or concepts because of the need to differentiate between what is cause-effect (i.e., impairment-disability) and what is not (impairment-disability and handicap).[10] In brief, a handicap involves *both the person and the environment in which s/he is expected to function.* For example, building a ramp will mean that the handicap discussed above no longer exists; i.e., a person who cannot walk and uses a wheelchair will now be able to get to her/his job in the library by using this ramp. Further, it is important to recognize that the same impairment or disability in two different people may not be equally handicapping for a variety of reasons; e.g., personality,

[10]The terms impairment, disability, and handicap have different meanings to different people, and they are sometimes used as synonyms for one another. In fact, in this paper the term visual impairment is used to refer to both visual pathologies (e.g., retinitis pigmentosa) and functional visual problems (e.g., far acuity problems). The important point being made is not the terminology per se but rather the need to recognize the impact of the environment (both physical and attitudinal) on a person who is in some way physically different from the so-called "normal" person.

background, and age-of-onset of the impairment/disability. In summary, IMPAIRMENT/DISABILITY + ENVIRONMENT + INDIVIDUAL = HANDICAP. The impact of an *impairment/disability* on an individual's functioning, therefore, may be alleviated *by attempting to change the person her/himself and/or by modifying the environment or situation.*

Considering the above three principles, a methodology was designed to investigate appropriate counseling relative to academic and career experiences for persons with hearing losses and visual impairments. Briefly, this methodology included: (a) a review of the literature; (b) interviews with content/technical experts at NTID to identify both visual skills believed to be important for students to succeed in various technical areas and academic and career recommendations relative to students with visual problems, including possible environmental modifications;[11] and (c) in-class and on-the-job follow-up for NTID students and graduates having visual impairments (e.g., observations and interviews). Pilot work has been completed on the first two parts of this design, and the results and recommendations from this work may be summarized as follows:

1. A review of the literature indicated that existing information and experience does not permit ruling out specific academic and career opportunities for persons with hearing losses and visual impairments.
2. Interviews were conducted with a total of 29 NTID content/technical experts in six different technical areas.[12] A summary of the comments of these content/technical experts in terms of visual skills important for their areas and recommendations, including possible environmental modifications, is in preparation for publication. Briefly, the comments of those interviewed are consistent with the literature reviewed; i.e., although there are visual skills that are generally important for each of the technical areas, the content/technical experts stated that, given appropriate counseling, each person should be given the opportunity to pursue academic and career areas of their choosing. A strong desire to succeed can often counterbalance the impact of a visual impairment on how a person functions. Further, environmental modifications are important, feasible, and often the legal right of persons with auditory and visual impairments.
3. In the provision of academic and career counseling, availability of support services and job potential should be considered. Given the needs of students with both auditory and visual impairments, it is probably better for a few postsecondary educational programs to provide well-planned, supported programs rather than to have a large number of

[11]Visual skills discussed with interviewees included visual acuity, field of vision, depth perception, color vision, dark-adapted visual sensitivity, and visual attention.

[12]Appreciation and credit is extended to Wanda Barbour for conducting the interviews for this part of the NTID Vision Project.

programs with inadequate environmental planning and staff necessary to meet the needs of these students.

4. The need for further investigation relative to Objective 3 of this project is recognized. In-class and on-the-job follow-up (observations, interviews, etc.) with students identified to have visual problems are most important. The following issues are considered to be of primary significance:
   a. Research should be conducted that will assist in the provision of appropriate counseling relative to academic and career opportunities/experiences for persons with both auditory and visual impairments.
   b. Programs should be designed to inform students, staff, and faculty about visual issues of special concern to them, including: (1) the general importance of vision for hearing-impaired students; (2) visual hygiene; (3) effective use of vision in academic and career environments; (4) effective use of other modalities in academic and career environments; and (5) the impact of different visual problems on the academic and career experiences of hearing-impaired students, including possible environmental modifications to facilitate the functioning of *all* hearing-impaired students in various technical areas (both in the classroom and on the job).
5. Further, it is recommended that more programs serving hearing-impaired persons include professionals whose expertise is in the area of vision and that programs serving visually-impaired persons include professionals whose expertise is audition. Support for the importance of this recommendation to both persons who have a hearing impairment only and persons who have both auditory and visual impairments is evident in the following quotation:

> The visual aspects of his environment are crucial to a deaf person's performance, while they may be a relatively minor source of distraction or interference for the hearing person. Indeed, most buildings are characterized by physical factors which can seriously obstruct a deaf person's effective processing of visual information, and it is these visual aspects of schoolrooms and public buildings which are truly the architectural barriers encountered by deaf people. . . . We are without guidelines for building instructional environments which will allow the deaf clients to use his or her visual skills most effectively. . . . Good architecture . . . can be an effective way to bring deaf people into their communities. It can promote learning and work through rational design standards for classrooms, factories, and public buildings--standards that will allow a deaf person to use the full potential of vision. *(Deafness Research & Training Center Progress Report 12*, 1978, pp. 18-19)

SUMMARY, DISCUSSION, AND RECOMMENDATIONS

A project on identification of visual impairments and follow-up conducted

by the National Technical Institute for the Deaf (NTID) has been discussed. Research methodology was designed to address three objectives: (a) to determine the most appropriate means for identifying visual impairments among NTID students and to make recommendations for medical and personal/social follow-up, (b) to determine the types and incidence of visual impairments among these students, and (c) to conduct research that would assist in the provision of appropriate counseling relative to academic and career opportunities/experiences for persons with both auditory and visual impairments.

Based on the results of both off-campus and on-campus approaches to assessing the visual functioning of NTID students, it was concluded that a battery of visual screening tests administered on campus, with on-campus ophthalmological follow-up examinations for students failing this screening, is an appropriate means of identifying visual problems (Objective 1). The visual screening should include tests for far acuity, color vision, and a vision questionnaire (personal/family ocular history).

Research conducted relative to the second objective (types and incidence of visual impairments) yielded an estimated incidence of 31% for visual pathologies and 58% for far acuity, color, and binocular vision problems within entering NTID student populations (see footnote 9). Among these students it may be expected that not all of the far acuity problems will have been corrected, and some students with corrective lenses may have inadequate correction. There were also many students who were either not aware of the existence of their visual problem and/or did not understand the extent or nature of their problem. Many students who were in need of periodic visual reassessment due to the possible progressive nature of their pathology did not indicate an awareness of this need and/or their pathology. Lack of knowledge of visual hygiene, especially among those students who wear contact lenses, was determined to be a fundamental problem.

Pilot work was completed toward achieving Objective 3, the provision of appropriate academic and career counseling for persons with both auditory and visual impairments. In brief, a literature review and interviews with content/technical experts at NTID indicated that existing information and experiences do not permit ruling out specific academic and career opportunities at NTID, and elsewhere, for persons with both auditory and visual impairments. It was concluded that further research is needed in order to obtain additional information that will assist in the provision of appropriate academic/career counseling for persons with both auditory and visual impairments.

Given the general importance of vision to persons with hearing impairments and the results of the three-year project reported in this paper, the following recommendations are made:

1. An ophthalmological examination should be performed routinely for

all persons upon discovery of a hearing impairment.

2. All persons having severe to profound hearing losses should receive periodic auditory and visual reassessments/examinations.
3. Interpreters should be used, as appropriate, during visual screening, ophthalmological examinations, and follow-up (medical, personal/social, academic/career) with hearing-impaired persons in order to ensure that adequate communication occurs.
4. All programs serving hearing-impaired persons:
   a. Should include professionals whose expertise is in the area of vision, and these professionals and professionals whose expertise is audition should work closely together.
   b. Should ensure that identification procedures for visual problems and follow-up for these problems are available for their clientele.
   c. Should assist their clientele in learning to best use both their *visual* and *auditory* modalities.
   d. Should assist their instructional/professional staff to become aware of the signs and symptoms of visual impairments, to learn about visual hygiene, and to work with students/clients having both auditory and visual impairments.
   e. Should provide counseling/advice for professionals, parents, and hearing-impaired persons concerning the importance of visual assessment/examination and visual hygiene for persons with hearing impairments. (Visual hygiene should include information relative to proper use and care of corrective lenses and prevention of vision problems; e.g., periodic visual assessments/examinations.)
5. There need to be better and more systematic types of cooperation among schools and vocational programs, the community, the state, and the federal government to provide services for persons who have both auditory and visual impairments (Hicks & Pfau, 1979).
6. Given the needs of persons with both auditory and visual impairments, a few well-planned, supported, postsecondary educational programs are preferable to a large number of programs with inadequate environmental planning and staff.
7. Research endeavors need to place greater emphasis on both the status and functioning of the visual system among hearing-impaired persons and on academic and career experiences appropriate for persons with both auditory and visual impairments. Specific suggestions relative to needed research include:
   a. For visual screening further research should investigate: (1) test procedures that take into account age levels and economic considerations, (2) pass-fail criteria (reduction of underreferrals and overreferrals), and (3) use of vision questionnaires (personal/family ocular history).

b. For identification of retinitis pigmentosa, further research should investigate possible screening tests, including: (1) dark-adapted visual sensitivity tests and (2) temporal visual processing tests.
c. For academic and career experience/opportunities: (1) further interviews should be conducted with content/technical experts relative to visual skills needed (technical and communication) for their areas and recommendations, including possible environmental modifications; (2) the impact of environmental modifications should be studied; and (3) persons having both auditory and visual impairments should participate in longitudinal studies relative to their functioning in classroom, laboratory, and on-the-job experiences.

8. The above information should be disseminated, as appropriate, to hearing-impaired persons, parents, audiologists, speech/language pathologists, educators, medical personnel (school nurses, otologists, otolaryngologists, ophthalmologists), optometrists, and opticians.

As stated in the introduction, this paper was prepared for a conference whose theme was, "Assessment and Habilitation of Problems Related to Hearing Impairment in Children and Adults." While recognizing that the use of residual hearing is important to the (re)habilitation process with hearing-impaired individuals, it is also true that vision plays a significant role in this process. Further, as the hearing loss becomes more severe, the role of vision in the total development of hearing-impaired individuals (personal/social skills, language/communication skills, and academic/career development) becomes more significant. Many hearing-impaired persons, by choice and by necessity, will be primarily *visual learners;* and therefore, those of us who have the opportunity to work with deaf and hard-of-hearing persons have a *need* and a *responsibility* to better understand and make more effective use of the visual modality.

ACKNOWLEDGEMENTS

This study was conducted under the course of an agreement with the Department of Education.

The authors wish to express their appreciation to the members of the NTID Vision Task Force who helped lend direction to the variety of activities which have made this report possible. In addition to the authors, Task Force membership has included Sue Vos, Ellen Wolf, Dr. Hugh Butler, Lee Twyman-Arthur, Patty Lago, Larry Quinsland, Pat Coyle, and James Biser.

We are appreciative of Eastman Kodak Company for making Dr. Jack Guthrie, Dr. Jack Jordan, and Dr. Joseph Gleason available for training visual screening personnel.

Medical specialists involved in performance of on-campus ophthalmological examinations and various follow-up activities were Dr. Albert Snell, Dr. Malin Howard, and Dr. Karl Marchenese. Their involvement with the students, as well as identification with the entire project, has meant a great deal in terms of the quality of research.

Nancy Fabrize, Nancy Kadunc, Kathy Finks, Carol Sentiff, and Linda Hoke have contributed

both time and energy to project activities, including student scheduling, student awareness, arrangement of Vision Task Force meetings, and performance of visual screening.

Our thanks to Marilyn Mitchell-Caccamise and Anna Witter-Merithew for making interpreters available to conduct both visual screening and aid the medical specialists during the performance of ophthalmological examinations. The interpreting staff involved is to be congratulated on their high level of skill, dedication, and sensitivity to the needs of the NTID student population.

REFERENCES

Caccamise, F., & Stangarone, J. Interpreting for deaf-blind persons. In F. Caccamise, R. Dirst, R. DeVries, J. Heil, C. Kirchner, S. Kirchner, A. Rinaldi, & J. Stangarone (Eds.), *Introduction to interpreting.* Silver Spring, Maryland: Registry of Interpreters for the Deaf, 1980.

Connor, F., Hoover, R., Horton, K., Sands, H., Sternfeld, L., & Wolinsky, G. Physical and sensory handicaps. In N. Hobbs (Ed.), *Issues in the classification of children (Vol. 1).* San Francisco: Jossey-Bass Publishers, 1976, 239-260.

Deafness Research and Training Center Progress Report 12. New York: New York University School of Education, Health, Nursing and Arts Profession, 1978.

DiPietro, L. (Ed.) *Guidelines on interpreting for deaf-blind persons.* Washington, D.C.: Gallaudet College, Public Service Programs, 1978.

Hicks, W., & Pfau, G. Deaf-visually impaired persons: Incidence and services. *American Annals of the Deaf,* 1979, *124*(2), 76-92.

National Society to Prevent Blindness (NSPB). *Vision screening of children (P-257).* New York: NSPB, 1979, 1-12.

Van Noorden, G. Visual acuity in strabismic amblyopia under monocular and binocular conditions. *Archives of Ophthalmology,* 1966, *71,* 72.

Vernon, M. Editorial. *American Annals of the Deaf,* 1977, *122*(1), 4.

APPENDIX

NTID VISION SCREENING QUESTIONNAIRE AND RESULTS FORM

Name _____ Date _____

Social Security No. _____ Interviewer _____

1. When is the last time that you had your eyes tested? Date _____
   Did the doctor use eyedrops? Yes _____ No _____
2. Do you wear glasses or contact lenses? Yes _____ No _____ Both _____
   Comments (e.g., wears lenses and uses glasses when tired): _____
   _____
   _____
3. Without glasses/lenses, do you have problems with your eyes/vision?
   Left _____ Right _____ Both _____
4. With glasses/lenses, do you have problems with your eyes/vision?
   Left _____ Right _____ Both _____
5. How old are your glasses/lenses? Years: _____

6. When do you wear your glasses/lenses? Check all of the situations that apply:
   All of the time _____ Driving _____
   Movies/television _____ Other _____
   Reading _____
7. Do you have problems seeing in the dark? (e.g., Are you aware of bumping into things? Do you drive at night?) Yes _____ No _____
   Explain _____
8. Have you ever injured your eyes? Yes _____ No _____
   Left _____ Right _____ Both _____ Explain _____
   _____
9. Have you ever had eye surgery? Yes _____ No _____
   Left _____ Right _____ Both _____ Explain _____
   _____
10. Do you know if you have had any of these eye problems?
    Check all of the situations that apply:
    Lazy eye _____ Cataracts _____
    Eye(s) not straight _____ Glaucoma _____
    Retinitis Pigmentosa (RP) _____ Other (Explain) _____
    (Usher's Syndrome)
11. Does anyone in your family (grandparents, parents, brothers, sisters, etc.) have any serious eye problems that you know about? Yes _____ No _____
    Explain: _____
    _____

Ishihara Color Vision Test (Number of Plates Missed out of 13 Plates) _____

Far Visual Acuity:

(Both) _____

(Right) _____

(Left) _____

Comments:

Referred for Ophthamological _____