Vision and Deafness: A Review of Ophthalmological Studies

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This paper is a review of ophthalmological studies conducted in hearing-impaired people. The incidence of visual problems in hearing-impaired people compared to normal-hearing people, the relationship between specific types of visual problems and etiologies of deafness, and the relationship between visual problems and educational performance are examined.

The major motivation for ophthalmological studies in hearing-impaired people has been early detection and correction of visual problems. This is important because auditory impairment relegates a primary role to vision as the modality for receiving environmental and educational information. These studies, which are typically the products of visual screening programs in schools, describe the types of visual problems hearing-impaired children have and at times compare the general incidence of occurrence of visual problems in hearing-impaired children to the incidence in normal-hearing children.

The visual problems identified in these studies range widely in their severity and their impact on normal visual functioning. Some problems are minor, like refractive errors which are readily corrected by glasses. Some are major, like retinitis pigmentosa which is a genetically transmitted progressive retinal disease that causes severe visual impairment or blindness and for which there is no known cure. Some involve eye abnormalities, like rubella retinopathy which is hyperpigmentation of the retina associated with rubella syndrome and which apparently has no consequences for normal visual functioning (Walters, Quintero, & Perrigin, 1982). The term "visual problem" is used in this paper as a general term referring to an ophthalmologically identifiable problem, without regard to the implication for visual functions.

This review of ophthalmological research is divided into three sections.

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In the first section the studies that have reported the incidence of visual problems in hearing-impaired people are reviewed. In the second section the studies that have investigated the relationship between the frequency and types of visual problems reported and specific etiologies of deafness are examined. In the third section information available on the relationship between visual problems and educational performance is discussed.

THE INCIDENCE OF VISUAL PROBLEMS IN HEARING-IMPAIRED PEOPLE

Several points should be kept in mind in reading the studies reviewed below. These studies, sometimes, vary in the types of visual problems they have assessed, the tests used, the criteria applied to determine the presence of a problem, and the categories used to report the incidence of visual problems. Not all studies have compared the incidence rates of visual problems they found with incidence rates in normal-hearing people using the same tests and criteria. Thus, the general incidence of visual problems in the total sample and the incidence rates for specific visual problems are often not directly comparable across studies.

The term "incidence" is used in this review to refer to the concept of the true proportion of a particular visual problem in the sample, regardless of the incidence of correction. Thus this statistic includes persons with problems which were newly identified during testing as well as those with problems previously identified and corrected. A word of caution: it is sometimes confusing to find that summing the incidence rate reported for each category of visual problems leads to a total of more than 100%. This is because it is a common convention to count the cases with multiple visual problems as separate cases in reporting the incidence rate for specific visual problems. Unless otherwise indicated, the categories may not be mutually exclusive.

Visual problems assessed by these studies can be classified into three broad categories: visual acuity problems, binocular vision problems and eye pathology. In this review, refractive errors like myopia, hyperopia, and astigmatism have been categorized under visual acuity problems. In the category of binocular vision problems, eye coordination or eye balance problems, anisometropia, strabismus, amblyopia, and stereopsis problems are included. The term "eye pathology" is used in this review to refer to abnormality in the physical or physiological status of the eye due to infections, diseases or hereditary factors. Logically, color vision defects come under this category; however, studies have generally reported this incidence separately from the incidence of other instances of eye pathology. The incidence of strabismus is reported by some studies under eye pathology while in others separately. In this review, the incidence rates for strabismus and color vision defects are given separately from the incidence rate for other instances of eye pathology to maintain consistency in reporting across

Table 1

The Incidence Rates of Visual Problems found by the Opthalmological Studies

Year	Study	N	Myopia	Hyperopia	Astigma-tism	Aniso-metropia	Eye Balance	Amblyo-pia	Strabis-mus	Eye Pathology	Color Vision Defects
1938	Braly	422	←	38.0%	→	—	—	—	—	—	—
1952	Stockwell	960	2.3%	1.0%	41.8%	—	—	—	2.1%	3.4%	—
1964	Myklebust	191	←			51.0%			→		—
1967	Suchman	103	←	25.0%	→	←		16.0%		→	—
			←			17.0%				→	—
1970	Lawson & Myklebust	80	7.5%	27.5%	11.2%	5.0%	—	5.0%	2.5%	8.7%	3.7%
1970	Dayton	150	7.3%	24.7%	26.0%	—	61.3%	—	1.2%	25.3%	—
1971	Frey & Krause	308	—	—	—	—	—	—	—	—	10.7%
1974	Pollard & Neumaier	511	13.3%	8.0%	7.3%	5.9%	8.9%	1.8%	4.9%	3.6%	5.6% (Boys Only)
1976	Mohindra	77	5.8%	29.8%	14.2%	—	10.3%	5.2%	9.0%	14.4%	6.9% (Boys) 2.1% (Girls)
1977	Greene	156	6.7%	25.0%	8.9%	—	46.1%	12.2%	12.1%	25.5%	—
1976	Levin & Erber	165	←	12.7%	→	←		3.2%		→	3.0%
1982	Walters et al.	1951	←	16.5%	→	—	—	—	—	11.2%	2.2%
1982	Johnson et al.	620	←	48.7%	→	←		11.3%	→	17.1%	4.0%
1959	Blum et al.: The Orinda Study	2030	5-15%	6.0%	3.0%	3.4%	8.0%	1.2%	4.8%	2.0%	8.0%

studies. For easy reference, Table 1 shows the incidence rates found by studies for the types of visual problems discussed above. Also included are the incidence rates of visual problems for normal-hearing children found by the well known Orinda study (discussed below).

The earliest studies cataloging the incidence of visual problems in deaf people were conducted by Braly (1938) and Stockwell (1952). Using the Snellen E test of visual acuity, with a criterion of 20/20 vision, Braly found that 38% of his sample of 422 hearing-impaired children failed the test compared to 22% of the sample of normal-hearing children in public schools. The sample size for the normal-hearing children was not reported. Based on ophthalmological examination of 960 hearing-impaired children over 10 years, Stockwell reported that 433 (45.1%) showed refractive errors. From her reported data it can be calculated that the incidence rate for myopia was 2.3%, hyperopia 1%, and astigmatism 41.8%. The incidence rate for strabismus was 2.1% and for eye pathology 4%.

Using the Keystone Telebinocular test (which is a battery of tests that measure visual acuity, monocular and binocular vision, and eye balance), Myklebust (1964) found that 51% of the 191 hearing-impaired children he tested had one or more visual problems.

Suchman (1967) tested 103 hearing-impaired children for problems in visual acuity, eye balance, stereopsis, and eye pathology. She found that 58% of those tested showed visual problems. Of this 58%, 25% showed refractive errors using a 20/20 criterion on the Snellen, 16% had "visual anomaly," defined loosely as the presence of eye pathology, or problems with eye balance, or stereopsis, and 17% had both visual acuity and visual anomaly problems. About 6% had problems which were not correctable. Interestingly, 87% of those whose problems were identified and correctable were not aware of them prior to this study.

Lawson and Myklebust (1970) tested for refractive errors, binocular vision problems, and eye pathology of 80 hearing-impaired children. They found that 53.7% of their sample had visual problems. 41.2% had single problems while 12.5% had multiple problems. 16.2% of the total sample were not aware of their problems at the time of testing. Although no one had neuro-ophthalmological problems, hyperpigmentation of the retina was found in 8.7% of the cases. (This incidence is reported under eye pathology in Table 1.) From their results it can be calculated that 27.5% of the children had hyperopia. The incidence rates for color vision defects and strabismus were low, 3.7% and 2.5% respectively. The incidence of astigmatism was 11.2%, myopia 7.5%, amblyopia 5% and anisometropia 5%. In calculating these percentages the cases with multiple visual problems were counted as separate cases for each of the problems.

Dayton (1970) tested 150 hearing-impaired children and found that about 60% of her sample showed visual problems. Fifty-eight percent showed refractive errors, 1-2% had strabismus, and 60% had abnormal eye devia-

tions. From her results it can be calculated that the incidence of hyperopia was 24.6%, astigmatism 26%, myopia 7.33% and eye pathology 25.3%.

Frey and Krause (1971) tested for color vision defects using the Dvorine Pseudo-Isochromatic test. Of the 308 hearing-impaired children, 10.7% were found to be color deficient as opposed to 4.4% found in the general population by Vaughan, Cook, and Ashbury (1962), who used the same test. These findings are at odds with the rest of the studies which, using the Ishihara or the A.O.HRR Pseudochromatic plates, have found the incidence of color vision defects to be lower than that found in normal-hearing children (see Table 1). The higher incidence in the Frey and Krause study may, thus, be test specific.

In recent years more extensive studies have been conducted by ophthalmologists. Pollard and Neumaier (1974) screened 511 hearing-impaired children for several types of refractive errors, binocular vision problems, color vision defects, and eye pathology. They found that 33.1% had one or more visual problems. They compared their incidence rates with those found in a well known, large scale study conducted in Orinda, California (Blum, Peters, & Bettman, 1959) which evaluated visual problems in normal-hearing children. This study, referred to as the Orinda Study in the literature, was conducted in an elementary school in California from 1954-1956, with 2030 children evaluated during the three years. Pollard and Neumaier reported that hearing-impaired children showed higher incidence rates for all evaluated visual problems than normal-hearing children except for color vision defects. The incidence of color vision defects was 5.6% for hearing-impaired children (only males tested) compared with 8% reported in the Orinda study for the combined sample of male and female children. The incidence rates for eye balance problems, strabismus, amblyopia and eye pathology were slightly higher than those for normal-hearing children (see Table 1). The criteria used by Pollard and Neumaier for determining the presence of refractive errors and anisometropia were slightly different from those in the Orinda study and, therefore, they adjusted the percentages from the Orinda study to correspond to their criteria. The adjusted incidence of hyperopia in normal-hearing children was 3% while its incidence in hearing-impaired children was 8%. The adjusted incidence of myopia in normal-hearing children fell within the range of 3.2-10%, while it was 13.3% in hearing-impaired children. The adjusted incidence rates of astigmatism and anisometropia were 1.4% each for normal-hearing children while the incidence rates were 7.3% and 5.9% respectively for hearing-impaired children.

Mohindra (1976) tested 77 hearing-impaired children for visual acuity problems, binocular vision problems, eye pathology, and perceptual motor functions. Because many children failed to perform at their age level on the perceptual motor tests in this study, the general incidence of children showing "visual problems" is as high as 75%. The tests for perceptual motor

functions measured visual memory, visual spatial organization and form reproduction and thus, involved cognitive and spatial skills. As such, it is not appropriate to group these tests with ophthalmological tests in calculating the general incidence of *visual* problems. However, even when these tests are excluded, the general incidence rate remains relatively high. Approximately 60% showed one or more visual problems. Compared to the Orinda study, hearing-impaired children showed a higher incidence of all visual problems except for color vision defects and myopia. The incidence of color vision defects was 6.9% for hearing-impaired males and 2.1% for hearing-impaired females, compared to 8% reported in the Orinda study for the combined sample of male and female normal-hearing children. The incidence of myopia for hearing-impaired children was 5.8%, falling within the range of 5-15% over years reported in the Orinda study. The most common problems were hyperopia (29.8%), astigmatism (14.2%), and eye pathology (14.4%). Their incidence rates in normal-hearing children were only 7%, 3%, and 2% respectively. The incidence rates for eye balance problems, strabismus, and amblyopia were 10.3%, 9%, and 5.2% compared to 8%, 4.8%, and 1.2% reported in the Orinda study.

Greene (1977) tested 156 hearing-impaired children for refractive errors, binocular vision problems, eye balance problems, and eye pathology. He also compared his results with the Orinda study since he had used the same criteria. He did not report the results of the test for color vision defects (the Guy's Color Vision Test for Young Children) because it was found to be unreliable. He found, like Mohindra, that hearing-impaired children had a much higher incidence of all visual problems except for myopia. The incidence of myopia was 6.7%, thus falling within the 5-15% range reported in the Orinda study. Hyperopia was four times more prevalent: 25%, compared to 6% reported in the Orinda study. If children demonstrating low hyperopia (refractive error between +.75 and +1.25) were included, 55% of the hearing-impaired children could be considered hyperopic. Greene stressed the importance of determining refractive error since the low hyperopia could have gone unnoticed using the standard Snellen visual acuity test. There is, however, controversy about whether hyperopia of less than 1.25 diopters has any perceptual consequence (Sloane & Rosenthal, 1960). Like Dayton, Greene found extremely high incidence rates for eye balance problems (46.1%) and eye pathology (25.5%). The incidence rates in the Orinda sample were 8% and 2% respectively. There was a high incidence of amblyopia (12.2%) compared to the Orinda sample (1.2%). The incidence rates for astigmatism (8.9%) and strabismus (12.1%) were also greater than incidence rates for these problems (3% and 4.8%) reported in the Orinda study.

Levin and Erber (1976) screened 165 hearing-impaired children for visual acuity, binocular vision problems, color vision defects, and peripheral vision problems. They reported that 19% of the sample failed one or more tests. From Levin and Erber's results the general incidence of confirmed visual

problems in their total sample can be calculated to be 20.6% (34 children). Out of 34, five showed color vision defects (3%), eight "uncorrectable disorders" (4.8%), and 21 refractive errors (12.7%). Of those with refractive errors, five failed the screening tests for binocular vision problems. That is, the incidence of binocular vision problems was 3.2% in the sample. No one failed the peripheral vision test. The authors suggest that the low general incidence figure may be due to the criteria they used in the visual screening tests or due to problems of administration of tests by staff not trained in ophthalmology. Because they have not specified the different types of refractive errors, it is not possible to compare these results with studies that report incidence rates for hyperopia or myopia separately. The vagueness of the term "uncorrectable disorders" makes it impossible to know what type of visual problems 4.8% of the sample had.

Walters, Quintero, and Perrigin (1982) conducted visual screenings of 1951 hearing-impaired children in the states of Texas and Louisiana for possible visual problems. It can be calculated from their results that 16.5% of the sample were referred for refractive errors, 2.2% for color vision defects, and 11.2% for eye pathology. It should be noted that these referral rates for refractive errors cannot be directly compared with the *incidence* rate reported in other studies since the authors did not report the number of cases in whom these problems have been identified and corrected prior to screening. Furthermore, since the authors have only one category for refractive error referrals, it is not known what the referral rates were for hyperopia and myopia.

Recently, an extensive vision screening program was undertaken by Johnson, Caccamise, Rothblum, Hamilton, and Howard (1981) to test the post-secondary hearing-impaired students entering the National Technical Institute for the Deaf (NTID). Of the 573 hearing-impaired students tested by ophthalmologists during 1977-1979, 8.8% had strabismus, 5.9% color vision defects, and 17.1% other types of eye pathology. Based on the results of the visual screening tests and subsequent ophthalmological examinations, Johnson et al. estimated that the general incidence of visual problems was approximately 65% in 620 students entering NTID in 1978 and 1979. The incidence rates were estimated as 48.7% for myopia, 11.3% for binocular vision problems, and 4% for color vision defects. No explanation is given in the report as to why the 1977 sample was not included to derive the estimated incidence rates. However, Johnson (Johnson, 1983) has indicated that the 1977 sample was not included because complete information was not available on it. It should be noted that no estimated incidence rates are given for strabismus or eye pathology specifically for the 1978-1979 sample. Thus, the rates reported in Table 1 for these problems show those found in the 573 students seen by ophthalmologists during 1977-1979. Over the last three years (1981-1983) the percentage of NTID students who need referrals for ophthalmological examinations has remained roughly the same; i.e., about

21.7% (Johnson, 1983). This finding stresses the need for visual screening programs in schools as it suggests that about one-fifth of the college level hearing-impaired population do not utilize the visual sense optimally and are unaware of their visual limitations.

In conclusion, the results of these studies showed that there is a high incidence of visual problems in hearing-impaired people. In general, the incidence of all visual problems reported in Table 1, except for myopia and color vision defects, appears to be higher in hearing-impaired children and young adults than in normal-hearing children. The incidence of myopia falls within the range and incidence of color vision defects is lower than that found for normal-hearing children. The most common visual problems in hearing-impaired people are hyperopia, astigmatism, and eye pathology. Some studies have reported a high incidence of eye balance problems, but this needs to be corroborated by further studies.

RELATIONSHIP BETWEEN VISUAL PROBLEMS AND DEAFNESS

Some of the studies discussed above have considered the possibility of a relationship between etiology of deafness and the incidence of visual problems. Braly (1938) reported "a significantly" higher incidence of refractive errors in the congenitally hearing-impaired than in the adventitiously hearing-impaired children in his sample; however, the specific incidence rates or statistics were not reported. In contrast, Stockwell (1952) found similar incidence rates for refractive errors in congenitally hearing-impaired children (47%), and adventitiously hearing-impaired children (47%). Lawson and Myklebust (1970) examined the relationship between etiology of deafness and the incidence of visual problems by comparing the number of children with and without problems. Data about the specific etiologies of deafness were available on only 29 out of 80 hearing-impaired children they tested. These etiologies were a) familial, b) rubella, c) other maternal illnesses and pregnancy complications, d) RH incompatibility, e) premature birth, f) birth injuries, g) meningitis, and h) other childhood diseases. They reported that "no single etiology appeared to contribute unduly to the number having ophthalmological disorders: cause of deafness whether endogenous or exogenous was not significantly related to visual status" (p. 19). Lawson and Myklebust did not report what statistical test they used. Since the number of subjects within each category is small, or at times nil, it is doubtful if they could make a reliable statistical comparison. Dayton (1970) reported that hearing-impaired children with rubella had the highest percentage of congenital eye defects and deformities, and those with cerebral palsy had the worst type of eye balance problems.

A recent Gallaudet College survey (Hicks & Pfau, 1979) reported that 8% of the 53,258 hearing-impaired students they surveyed had "visual impair-

ments." The authors have reported that the severity of hearing loss and the percentage of students having visual impairments was not related; however, etiology of hearing loss seemed to be related to concomitant visual impairments. Of the 2826 cases with visual impairments in whom the cause of deafness was known, the major etiologies associated with the visual impairments were maternal rubella (54.6%), prematurity of birth (10.2%), hereditary factors (7.4%), other complications of pregnancy (6%), birth trauma (4.6%), and meningitis (4.6%). Since they did not define the term "visual impairments," these statistics have limited interpretive value. It is not known what types of visual problems are associated with these etiologies. Furthermore, a comparison of other research studies which compared etiologies is not possible. Finally, the incidence of "visual impairments" (8%) seems low compared with other studies, but it is unclear whether this figure is an accurate reflection of the incidence of *visual problems* in the Hick and Pfau's sample or is simply a result of the criteria used to define "visual impairments."

It is not possible to conclude from these studies if there is a strong relationship between *frequency* of visual problems and etiologies of deafness. However, it is well known that certain *types* of eye pathology are associated with certain etiologies of deafness. Deafness caused by some maternal infections during pregnancy is associated with specific eye pathologies (Campbell, Polomeno, Elder, Murray, & Altosaar, 1981). For example, the congenital rubella syndrome shows deafness associated with eye defects such as cataracts, glaucoma, and retinopathy. Certain congenital hereditary syndromes involve both auditory and specific visual impairment (Campbell et al., 1981). Usher's syndrome, which is defined as congenital deafness in conjunction with retinitis pigmentosa (RP), is one such example.

RP is a progressive disease of the retina which causes severe visual impairment or blindness. The most common manifestations of the disease are night blindness and visual field constriction. Though RP is estimated to be rare in the general population (3:100,000), its prevalence in the congenitally hearing-impaired population is estimated to be 3-6%. It is estimated that $^{2}/_{3}$ of all deaf blind people in the United States suffer from Usher's syndrome (Vernon, 1969). Usher's syndrome is a particularly serious problem for the hearing-impaired population since there is no known cure for RP. Many times RP is coupled with olfactory insensitivity, which means that an Usher's syndrome person may be impaired in three of the five senses (Vernon, 1969). RP is also associated with vestibular problems, color vision defects, and disorders affecting the central nervous system (Merin & Auerbach, 1976). It is imperative that RP be detected as early as possible for optimal occupational counseling and rehabilitation, and for the purposes of genetic counseling.

A recent study (English, 1978) of 698 hearing-impaired children from four states showed that the incidence of Usher's syndrome was 7.9% in 189

hearing-impaired children from the state of Louisiana and only .98% in 509 hearing-impaired children from Arkansas, Oklahoma and Missouri. Within the Lousiana sample, the incidence rate of Usher's syndrome in Caucasian children was 15.8% while it was nil for black children. The study attributed the larger incidence to the Acadian influence in the region. This close-knit ethnic group has practiced intermarriage for generations, and RP is found to be more common in communities with a high rate of consanguineous marriages. It is estimated that about 30% of congenitally hearing-impaired children born to Acadian parents will have Usher's syndrome (Kloepfer, Lagnaite, & McLanrin, 1966). These findings are important because they support the need for regularly scheduled visual screenings of congenitally hearing-impaired children born to Acadian parents. They also indicate that the national figure of 3-6% incidence of Usher's syndrome cannot be used to predict its incidence rate in individual states in the United States.

It has been suggested that there may be two distinct genetic forms of Usher's syndrome transmitted by two different autosomal recessive genes (Merin, Abraham, & Auerbach, 1974). Type I may involve RP associated with congenital, profound deafness and vestibular disorders, while Type II may involve RP associated with progressive hearing loss and normal vestibular functions. Recently, Karp and Santore (1983) have reported case histories of patients who seem to have Type II Usher's syndrome since they have RP asociated with postlingual, progressive hearing loss. Given these recent findings, it seems reasonable to suggest that future research should concentrate on variables such as geographical area and geneology; i.e., variables known to be related to the incidence of RP.

RELATIONSHIP BETWEEN VISUAL PROBLEMS AND EDUCATIONAL PERFORMANCE

When visual problems are present which reduce visual acuity, color vision, or the size of available visual field, it seems reasonable to expect that these problems would influence educational performance. Guidelines on improving the environmental conditions for hearing-impaired students with visual problems have been discussed by Caccamise, Meath-Lang, and Johnson (1981), and Karp and Santore (1983). Parasnis and Samar (1982), and Siple (1978) have discussed how the limitations of a normally functioning visual system may influence communication performance. However, not much data are available on the relationship between visual problems and educational performance of deaf people.

Lawson and Myklebust (1970) classified 59 hearing-impaired children on whom information about their "success in speechreading" was available into two categories: poor learners and good learners. They found that these two groups were not significantly different in the number of children with visual problems. Lawson and Myklebust did not report how success in speech-

reading was measured and what criterion was used to classify poor and good learners. Furthermore, they apparently grouped children with corrected and uncorrected visual problems into one category as children with visual problems. It is not clear why the hearing-impaired children who had corrected vision would have similar experience in learning to speechread as those with uncorrected vision. These methodological problems may have masked the relationship between visual problems and speechreading skill. Furthermore, speechreading skills are probably closely related to perceptual, memory, and language skills of the child. Unless these factors are controlled, a relationship between visual problems and speechreading may not be observable. Erber (1979) reported that degradation of optical clarity experimentally reduces accuracy of speechreading. Hardick and Oyer (1970) found a significant relationship between visual acuity differences and lipreading performance in normal-hearing college students who had no prior training in lipreading. Research with careful controls is necessary to determine whether these results can be generalized to the performance of hearing-impaired people with visual problems.

Greene (1977) reported that 14 of the 156 hearing-impaired children he tested were "identified as non-achievers by extensive multi-disciplinary testing including both psychological and perceptual evaluations" (p. 41). He notes that "these children exhibit a much higher incidence of accommodative insufficiency, low hyperopia and over-convergence than their fellow students" (p. 42). Although these data show a relationship between visual problems and classification as non-achievers, it should be remembered that whether the greater incidence of visual problems is *causally* linked with the psychological and perceptual functioning of these children cannot be determined from these correlational data.

CONCLUSION

In conclusion, ophthalmological studies indicate that, in general, there is a higher incidence of all specific visual problems tested among hearing-impaired children and young adults than in normal-hearing children, except for myopia and color vision defects. The most common visual problems associated with deafness are hyperopia, astigmatism, and eye pathology. Many studies reported that subjects were often not aware of their visual problems, and have stressed the importance of a visual screening program in schools.

Scant information is available on the relationship between the *frequency* of visual problems and etiologies of deafness. However, certain *types* of eye pathology seem to be related to specific etiologies of deafness. It was noted that the high incidence of RP among hearing-impaired people makes detection of RP very important for occupational counseling and rehabilitation, and genetic counseling programs.

There is a dearth of studies on the relationship between visual problems and the educational performance of deaf people. Furthermore, the functional significance of these visual problems for developing perceptual skills has not been investigated. Thus, it is not known whether the visual system functioning differences indicated by these studies lead to differences in perceptual and cognitive skills between hearing-impaired and normal-hearing people. This is a topic which requires future research. Studies which define the functional significance of visual problems are the crucial step in translating visual assessment into concrete educational recommendations.

The present review is limited to the issue of deafness associated ophthalmological functioning. This issue is of particular concern to educators and clinicians who must rely daily on the visual functioning of their students or clients to achieve general educational and remedial goals, and, as such, must take into account the integrity of the visual system on a person by person basis. However, it is clear that the influence of deafness on visual functioning may not be limited to ophthalmological status. Deafness may also influence higher order visual perceptual processing in ways which are educationally significant (Parasnis & Samar, 1982). In a companion article (Parasnis, 1983) previous research on deafness and visual perceptual skills is reviewed.

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