SUBCORTICAL PROCESSING OF AUDITORY STIMULI IN THE PROFOUNDLY DEAF: CULTURAL AND EDUCATIONAL IMPLICATIONS

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B.Sc. (Hons. Spec.), B.A.

A Thesis
Submitted to the School of Graduate Studies
in Partial Fulfilment of the Requirements
for the Degree
Master of Arts

McMaster University

MASTER OF ARTS (1998)
(Anthropology)

McMaster University
Hamilton, Ontario

TITLE: Subcortical Processing of Auditory Stimuli in the Profoundly Deaf: Cultural and Educational Implications

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NUMBER OF PAGES: vii, 112

ABSTRACT

For the first time the equivalent of Blindsight has been demonstrated in the deaf. This phenomenon of 'deaf hearing' was observed in a proportion of profoundly deaf 18-22 year olds. The implications for deaf education are discussed.

Appreciating a confluence of factors including biology, the cultural construction of knowledge, and relations of power facilitates an understanding of how hearing society's impressions of the deaf affect their education. Deaf culture, although believed to be constructed by the deaf, may be subserved by hearing society's misconceptions of deaf capabilities. Deaf acceptance of their disability (possibly a form of complacency) in the form of a distinct culture, is justified in the literature as appropriate adaptation to illness. The present research suggests that those deaf educated with some oral/aural instruction, contra mainstream society's and Deaf culture's beliefs, are better adapted to meet their expressed needs, reaching higher educational standards in reading/comprehension versus those educated with sign language only. Anatomical considerations of subcortical processing in some deaf individuals may aid in providing insight concerning deaf capability. It is suggested that Deaf cultural postulates should come to include other 'natural' communication and educational modalities, other than American Sign Language (ASL) alone. Multi-disciplinary considerations counter the position that anthropologists should be wary of causal analysis, and concentrate only on meaning and interpretation.

ACKNOWLEDGEMENTS

Drs. Glanville and Willms for whom I have the utmost respect. They provided enthusiasm, guidance, support and encouragement which allowed me to effectively pursue my area of research. I am particularly indebted to Dr. Glanville for making exceptional learning contexts available throughout my time in the department.

Dr. Colarusso, who provided unique insight and guidance.

Dr. Warry, who helped make available the time I required to pursue my research, and other objectives within the department.

Ziya Faquih, who provided audiological as well as technical expertise and experience with the D/deaf study participants.

The E.C. Drury School for the Deaf as well as the D/deaf study participants from E.C. Drury and elsewhere for their kind participation, enthusiasm and support.

Janice Weir , Rosita Jordan and Isabelle Brymer for their friendly encouragement and help throughout my time in the department.

Special thanks to my parents, my brother Daniel, Monika, and close friends for their ongoing support.

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INTRODUCTION

The emphasis of the present research pertains to a convergence of etiological factors that have historically been addressed separately in the anthropological literature. Specifically, the challenge of realizing a theoretically informed approach (with regard to medical anthropological study) may be met via an understanding, or appreciation of how human biology, the cultural construction of knowledge and relations of power (Lindenbaum & Lock, 1993: :x) are integrated and subserve the experience of specific human illnesses. It is appropriate to note that this suggested integration may not in many cases be immediately recognizable as a homogenous influence of mixed factors. Indeed, it may be necessary upon approaching a problem to first assign equal value to competing explanatory frameworks, and reflect as to how distant etiologies converge. To seek an understanding of how an external axiom, unaccepted by the sufferer or by a culture, may actually influence or subserve illness is of great interest. This approach relates to the construction of illness by means of examining how 'facts' suggested and furthered by those in a position to dictate policy affect others and their own construction of identity, and legitimization of illness.

The present research also attempts via this method, to recognize the process of convergence in medical anthropology according to Weidman. This study addresses the integration of anthropological and medical (neuro-cortical) concepts, and implicates anthropological concepts and methods, as they apply to the Western medical system

(Weidman, 1971) . Specifically, anthropological consideration of cultural factors (to be addressed later) may suggest a different appreciation of cortical competence, and imply modification of current audiological testing in the profoundly deaf. The suggestion here is that this process of constructing the self and illness is as dependent upon historical context as medicine (Kleinman, 1995: 23).

Being deaf has been categorized as a "chronic illness" (Lindenbaum & Lock, 1993: 258). As a study population, the group is particularly interesting. The population has been presented as a "linguistic joining of identity with diagnosis" (Lindenbaum & Lock, 1993: 256), and it is this pathologization of the self that affords inquiry into the confluence of biological, social and power relations regarding the fusion of identity with illness. The "I am" illnesses where sufferers have yet to depathologize their particular affliction, have been characterized as mysterious and stigmatized, involving cognitive function (centred in the brain). In the case of such illness blame rests with the sufferer (Estroff, 1993 in Lindenbaum & Lock, 1993: 257). According to Estroff, this may be due to "I am" illness being associated with such factors as lack of moral conformity and responsibility for the illness being perceived as resting with the afflicted individual. The issue of how deafness relates to these issues will be explored in later chapters. Since objection might be raised to deafness being categorized as an illness, I will define illness in the context of the present research. It will refer to illness as the perception of debilitating experience, including the contribution of specific anatomical deficit (Young, 1982: 264). Adults with such chronic and mentally located affliction may also not attain levels of social functioning in line with mainstream societal expectation (Lindenbaum & Lock, 1993: 259). The associated lack of

positive social (and self) experience and the self-perception of incompetence (Thoits, 1983) via prolonged interaction with other sufferers, family members, and health diagnosticians/practitioners maintains the manner in which the afflicted are perceived by mainstream society (Swann & Predmore, 1985). The placement of blame for suffering with the afflicted, and the resulting lack of social progress for the sufferer, makes the study of illness etiology and an appreciation of other external factors contributing to illness, significant. The establishment of other external causative agents, may liberate the sufferer to the extent of a heightened realization of actual potential, and ability to function in mainstream society.

The deaf may link their auditory level of functioning with the self via their own proclaimed and distinct culture (Deaf culture). It is therefore of anthropological interest to make an inquiry into how closely this culture is linked with actual identity with regard to levels of eg. academic ability related to deafness, versus the role external factors play in the construction of this culture at the expense of realization of potential (a deconstruction of the illness). It may thus be possible to determine in part, how closely this "I am illness" is linked to the self in a subset of study participants, and whether this association is a legitimate self-representation.

The complexities of human interaction are associated in a bewildering array of beliefs. In order to establish a frame of reference to allow effective interaction with one another, stereotypes are constructed which can ultimately lead to prejudices. These prejudices may involve an overestimation of expected associations involved in the stereotype (Crocker, 1981; Hamilton and Sherman, 1989). An objective of the present

study is to utilize an emic anthropological approach, consisting of the direct interview of deaf individuals, in order to determine whether mainstream hearing society has constructed a stereotype which impacts on the deaf in such a way as to hinder their educational progress, and hence their integration into mainstream society. The distinction between Deaf (who subscribe to the postulates of Deaf culture, which will be addressed in Chapter 1) and deaf (who do not subscribe to Deaf culture) will be utilized throughout this study. The approach used follows a well defined trajectory, beginning in Chapter 1 with a consideration of the medical approach to illness and deafness, leading to the bio-medical objectification of the deaf. The counter interpretation of deafness is then considered according to the postulates of Deaf culture.

Chapter 2 utilizes anthropological, direct interview of D/deaf and hearing individuals in order to ascertain the source of presently accepted mechanisms used by the Deaf to deal with their lack of auditory perception. This includes Deaf culture, and education of the Deaf via sign language only. A comparison of reading/comprehension level between Deaf students educated either via sign language only, or via verbal communication and some sign language is used to establish whether one type of education indicates/facilitates higher information processing (with respect to reading and comprehension) ability.

Chapter 3 examines Blindsight, a phenomenon thought to be mediated via subcortical mechanisms involving extrastriate, collicular pathways. In Blindsight, blind patients are able to guess with a significant degree of correctness whether a visual stimulus was presented in their blind visual field (Weiskrantz, 1986). A brief consideration

of the patency of discrete subcortical pathways is then carried out. Examination of visual subcortical pathways lays the groundwork for the present study's consideration of the possibility of what I will term "Deaf Hearing". Here, the profoundly deaf may be able to subconsciously perceive auditory stimuli, due to close association of extrastriate colliculo-cortical pathways between the visual and auditory systems. This was considered in direct response to the profoundly deaf study participants' expressed desire to function within hearing society. The desire to utilize their voices prompted inquiry into non-invasive techniques, and natural abilities of the deaf auditory system which might help meet expressed societal needs and cultural standards.

Chapter 4 postulates an experimental design to determine whether 'Deaf Hearing' may exist in a subset of profoundly deaf individuals. This builds directly on the desires of the Deaf expressed in Chapter 2, as well as the theory of auditory capability in the profoundly deaf developed in Chapter 3.

Examination of stereotypes imposed on the D/deaf; their impact on the D/deaf; the reading comprehension levels of Deaf individuals educated via sign language only versus those educated with verbal assistance; and the possible detection of auditory stimuli available to some Deaf individuals may have significant implications. Specifically, if an inappropriate stereotype hinders the educational progress of the Deaf when in fact capabilities for integration into mainstream society are implied by the present study, it may be appropriate to re-evaluate how the Deaf are perceived, and to deliver support in a more appropriate manner. In view of the capabilities outlined in the present study, an argument in favour of some direct verbal instruction for the Deaf will be examined. The present

thesis examines whether anthropological consideration of cultural, physical and medical information pertaining to the D/deaf may be interpreted from an emic perspective. It is possible that what have historically been perceived as physiological deficits concerning the deaf may be reinvestigated and reinterpreted, and that this reinterpretation may hold significant cultural implication for both hearing and Deaf cultures.

CHAPTER 1

This Chapter presents deafness in a historical context. The medical view of deafness as pathological is addressed, as is the objectification of the deaf through invasive surgical technique, utilized to help them conform to mainstream hearing society's concept of the healthy individual. The countering viewpoint of Deaf culture is then examined in order to provide the basis for an emic approach to furthering the abilities of the D/deaf, according to their expressed desires (which are examined in Chapter 2).

THE MEDICAL APPROACH TO DEAFNESS

The present objective of modern Western medicine concerns an approach to illness or disability from a basis founded upon rational, scientific principles. The rationality of medicine is evident from its understanding of the disease process and healing, via natural laws founded in explicable processes. The scientific nature of medicine is observable in terms of how empirical knowledge is generated within the field, as well as collected and utilized toward the treatment of disease, via controlled observation and experimentation (Kinsley, 1996: 168). The verification of illness or disease is obtainable by the biomedical sciences, specifically by means of establishing that symptomology as presented by the patient is indicative of a deviation from the norm. Under objective, controlled conditions, the qualification of disease, an organic pathology (McElroy and Townsend, 1989: 49), obtained from collected clinical facts, subsequently leads to the establishment of a

causative agent, the pathobiological process (Helman, 1994: 102).

It is the role of the physician, not only to quantify but also to qualify illness, utilizing conceptual models, as postulated by Eisenberg (cited in Helman, 1994: 102), in order to promote the establishment of a medical reality. It is this reality which enables doctors to impose order and meaning on otherwise chaotic (pathological) circumstances. Toward this end, the biomedical definition of disordered health is based soundly upon the established biomedical definition of deviation, as observed through laboratory tests, and the clinical examination (McElroy and Townsend, 1989: 48). According to Feinstein (cited in Helman, 1994: 103), a recent shift in the methodology utilized by medical practitioners, has altered the manner in which information pertaining to disease is obtained. Feinstein states, that the traditional method of taking a clinical history from the patient, including symptoms as well as etiology (from the patient's perspective), has now to an appreciable extent, been replaced by the physician's reliance on a mechanistic approach, using diagnostic equipment to establish medical realities. This in turn replaces any notion of subjectivity, as was formerly contributed by the patient in the determination of the pathological process, with scientific tests. According to Kleinman (cited in Helman, 1994: 102), this reliance upon direct biological measurement has been characterized as reflecting 'reality' holding clinical significance. This is opposed to the less interesting discourse pertaining to socio-cultural realities as may be presented by the patient. This presumably protects the patient against unscientific beliefs regarding the notions of etiology and appropriate healing methods, as might be postulated by specific cultural or religious paradigms. Indeed, biomedicine seeks to formulate and respond to

illness independent from social context (McElroy and Townsend, 1989: 49). Biomedical treatment of disease follows an allopathic paradigm and seeks to intervene in the pathological process, changing the progress of disease through the induction (usually via pharmacological means), of physiological effects in direct opposition to those produced by the disease process itself (Kinsley, 1996: 170).

However, this medical approach to illness stands in contrast to others, which appear to designate a wider latitude of authority to the medical practitioner. For example, if a goal of medicine is to promote individual health, it may be appropriate to intervene in the interest of improving individual health when mental, social and physical well-being are compromised. According to the World Health Organization, these are also parameters of 'health', where the absence of biological disease alone does not necessarily confer 'good health' on an individual (Helman, 1994: 108). This perspective of medicine's realm of responsibility stands in clear contrast to previously discussed notions. The former concern notions of biological pathology alone, seeking to educate society in terms of a naturalist epistemology. Biomedicine may therefore, actually have responsibility concerning the promotion of health through therapeutic agents directly affecting physiological processes, as well as personal and socio-cultural aspects which may concern the etiology of disease. The present research will explore both the pathologization of deafness according to the biological parameters pertaining to medical intervention, and later, the challenge against both biological and socio-cultural medicalization as presented by advocates of Deaf culture.

THE BIOMEDICAL PATHOLOGIZATION OF DEAFNESS

A brief description concerning the anatomy of sound perception:

As discussed previously, the modern biomedical approach to illness and disease concerns an approach relating to the understanding of disease via natural laws founded in explicable processes (Kinsley, 1996: 168). It is therefore appropriate to briefly outline the basic anatomy associated with hearing, in order that medicine's qualification of deafness as an organic pathology (McElroy and Townsend, 1989: 49), may be more fully appreciated.

The various structural attributes of the external ear or auricle, facilitate the collection of auditory stimuli in the form of sound waves. These stimuli are concentrated toward, and pass through, the external auditory meatus (FIG 1). The resulting pressure exerted on the tympanic membrane subserves the medial compression of the membrane (the ear drum), causes the heads of the malleus and incus to move laterally, while the long process of the incus and stapes are pushed medially (Snell, 1992: 854). The fenestra vestibuli is excited via the force applied to it from the stapes, and movement of the fenestra vestibuli medially subserves the compression of perilymph in the scala vestibuli. At the helicotrema, the force resulting from perilymphatic compression is passed along via the scala tympani. This force results in the secondary tympanic membrane within the cochlea to bulge out laterally (FIG 1) (Snell, 1992: 852-54). Sensory hair cells located within the cochlea associated with the epithelium of the tympanic membrane are stimulus specific in terms of their response to auditory stimuli. For example, those hair cells located at the base of the cochlea respond best to high frequency stimuli, while cells

located nearer to the apex respond best to low frequency stimuli (Critchley & Henson, 1977: 4). At the base of the hair cells contact is made with fibres of the auditory nerve. The sensory portion of the nerve, the spiral ganglion of the cochlea, proceeds in a canal around the modiolus in the base of the spiral lamina. These nerve fibres comprise the cochlear division of cranial nerve eight, the vestibulocochlear nerve (Snell, 1992: 858). From the cochlear nuclei, ascending nerve impulses reach the superior olive, the inferior colliculus, the medial geniculate body of the thalamus and then the temporal gyrus of the auditory cortex (Goldstein, 1977: 424-5) (FIG 2). Interestingly, there is a maintenance of tonotopic specificity. Those neural pathways originating, for example, from the lateral aspect of the cochlear duct proceed to the same aspect of the temporal gyrus (Critchley & Henson, 1977: 39).

Some neural pathways cross, reaching the contra-lateral temporal gyrus or auditory cortex (Critchley and Henson, 1977: 39). Other fibres which do not cross over, reaching the ipsi-lateral auditory cortex, may send neural projections to the superior olive. In terms of medicine's pathologization of deafness, one may begin to appreciate the concept of a causative agent affecting a patho-biological process (Helman, 1994: 102). Specifically, the superior olive sends a pathway to the sensory cells of the cochlea and, in 'non-pathological' circumstances as a reflex pathway, alters stimulation of the cochlear nerve, changing the perception of an auditory stimulus (Smith, 1976: 257). This is facilitated by sensory hair cells being associated with both sensory afferent nerve fibres at their basal aspects, as well as efferent fibres (Critchley and Henson, 1977: 38). As the basilar membrane vibrates due to the sound stimulus, the sensory hair cells are shifted in

one direction or the other, either depolarizing or hyperpolarizing the cells. It is likely that depolarization releases a neurotransmitter which acts on the sensory nerves. Signals are passed on to cortical regions when an action potential is achieved, according to the specific amount of neurotransmitter released (Goldstein, 1989: 423). Sensory nerve fibres are primarily associated with outer hair cells (in three rows located distally to the spiral lamina) while efferent innervation is concentrated at the inner hair cells, more proximally situated to the spiral lamina (Critchley & Henson, 1977: 38). The superior olive, as well as other cortical relay centres, may affect the motor nuclei of the facial and trigeminal nerves (cranial nerves seven and five). By acting on the facial nerve in an inhibitory manner, the position of the stapedius muscle (which inserts on the stapes) is altered such that sound wave transmission via this bone is dampened (Snell, 1992: 854). Similarly, by acting on the trigeminal nerve (mandibular division), the perception of sound may be altered by the resultant tensing of the tensor tympany muscle and membrane. This occurs through action on the malleus (Snell, 1992: 854). These effects are desirable in a hearing individual under circumstances involving extremely loud sound stimuli, so that structures within the ear are protected from the insult. However, in individuals with sensory-neural hearing loss, or nerve deafness (Vaughan, 1976), the aberrant neuro-cortical connections, or structural damage along the auditory pathways in the brain, may suppress sound stimuli from reaching the temporal gyrus for subsequent decoding and interpretation. Nerve deafness may also result from other 'medical' conditions such as aging (involving neural degeneration), viral infections damaging the conductive properties of nervous tissue, or genetic factors. Conductive hearing loss, involving the anatomy of the middle ear may

arise from initial outer ear infection which subsequently migrates, or from the fixation of the ossicles of the middle ear. Where conductive hearing loss is extant resulting from infection, the condition may subside and then re-emerge during subsequent infections.

The medicalization of deafness appears to be a rational consequence derived from pathological anatomy which deviates from the norm. The auditory system in its altered state of functionality may be regarded as 'diseased' according to the definitions of medical science, owing to its representation of organic pathology and abnormality (McElroy and Townsend, 1989: 49). Disease, in the case of deafness, is not self-engendered, but rather reflects measurable deviance. This deviance is directly observable through laboratory tests.

The measurement of deafness:

According to the biomedical belief system, deafness is a pathological reality of clinical significance to the patient which is determinable in the absence of subjectivity. The interpretation of hearing loss is made through assessment of the patient's audiogram (FIG 3). This consists of a chart displaying how loud in decibels (dB, expressed by the equation: $dB = 20\log(p/po)$ where "p" is the sound stimulus' amplitude, and "po" a reference pressure of $2\times10^{-5}\,N/m^2$) (Goldstein, 1989: 390), a presented sound stimulus must be at various frequencies or cycles per second (Hz), in order for it to be perceived and responded to by the individual being tested. After plotting the responses, one is able to observe the thresholds of auditory detection at each frequency presented (a measurement of the hearing threshold) (Vaughan, 1976: 120). The degree of the patient's

pathology or disease is characterized according to the extent of deviation from the norm (Engel, 1980). This medical reality is expressed as either 'slight' represented by a loss of 27 to 40 dB, 'mild' between 41 to 55 dB loss, 'moderate' between 56 to 70 dB, or 'profound' ≥91 dB hearing loss (Paul and Quigley, 1994:16). The descriptive terminology describes the extent of pathology and may help to categorize the pathology for purposes such as defining for the health care practitioner which intervention methods are best suited to bring the individual into the hearing world. This 'treatment' may range from speech therapy to hearing aids, and possibly more invasive technology which will be discussed shortly. Patients are further categorized in terms of when the hearing loss occurred (age of onset). Patients are categorized as either prelingually deaf (onset prior to two years of age), or postlingual (after language acquisition has occurred) (ibid: 15).

From the perspective of biomedicine, both the 'sufferer' and medical practitioner would likely seek to correct the physical abnormality if possible (Blume, 1997:39). This perspective also asserts that the alleviation of deafness would be of benefit not only to the afflicted individual, but also to society as well. The 'curing' of the auditory deficit is thought to increase personal productivity, as the lack of a properly functioning auditory system could result in disordered communication. This condition has been characterized as destructive to the social fabric due to the resulting suppression in personal productivity (Rubens, 1996). The deaf individuals are perceived as handicapped, relating to observable factors such as differences in linguistic expression, and the necessity in many instances, to be educated away from the mainstream in special schools. Such factors may be seen to support the medical imperative to restore functioning to pathological anatomy where

possible, in that the auditory deficit is perceived to hinder the linguistic and hence social development of the sufferer within mainstream society. Indeed, the lack of facility to communicate effectively has been characterized by the medical establishment as affecting individual health. As a result, there is an obligation to offer healing to the deaf, which medicine is bound to provide (McCaughy, 1995). The responsibility of medicine therefore is to restore functioning so that individuals may reflect society's perception of the healthy person, in that conformity represents good health. The biomedical approach to deafness as presented, involves a substantive intercommunication between societal expectations and treatment regimens, which determine what is in the best interest of the individual (Grodin, 1995).

Repairing the disease entity, surgical intervention and the restoration of health:

The medical imperative to restore functioning to diseased auditory anatomy may perhaps be appreciated best from examination of a surgical approach to this end. For a subset of profoundly deaf individuals who meet specific criteria: those having sensory-neural hearing loss bilaterally, who wish to function in the hearing world and have had limited benefit from the use of hearing aids, and where no psychosocial, medical or financial counter indications exist (National Inst. Health, 1995; Cochlear Corporation 1995:3), a surgical procedure exists which may permit some to experience auditory stimuli. Specifically, in instances where the cochlea is not functioning, an implanted device can be utilized in order to stimulate the auditory nerve.

The installation of the cochlear implant involves surgical exposure, posterior to the

auricle. Following exposure of the inner ear, microsurgical technique is utilized in order to insert the device's wire which will stimulate the auditory nerve through the membrane of the fenestra cochlea (round window). The wire is inserted throughout the length of the cochlea and is stabilized with sutures (Lane, 1993: 273-4). While the internal aspect of the device facilitates the transmission of auditory information to the brain, external aspects of the device pick up the auditory stimuli from the environment. These are then interpreted into an electric code which is then transferred to the implanted coil subserving the direct stimulation of cochlear nerve fibres (Cochlear Corporation, 1995).

The device however, does not facilitate hearing as it would be experienced by an individual possessing a "normally" functioning auditory system. Therapy is required which concentrates both on the implanted individual learning to interpret the auditory stimuli, and also on the production of normal speech sounds (Boothroyd, Geers, Moog and Moog, 1991; Spivak and Waltzman, 1990). The objective of the implantation procedure is to alleviate the "formidable handicap" of the profoundly deaf (Blume,1997: 35). In fact, the pathologization of deafness and bio-medicine's imperative to restore functioning override the risk of side effects resulting from the surgical procedure. Possible side effects include various inflammatory problems including meningitis (where infection and inflammation are associated with leakage of perilymph), inflammation and bleeding of the labyrinth, as well as neuralgia in the region of the auricle extending inferiorly into the neck region via facial nerve disturbances (Cohen, 1991: 708-14).

The decision (made for example, by parents) to implant the cochlear device in their child, may be further supported by the medical establishment. For example, the pathology

of profound deafness may be compounded from the medical perspective, when gross physical characteristics correlated with genetically subserved deafness are extant. It is possible that in such cases, both medical practitioners and parents feel morally obligated to provide treatment for a condition clearly associated with a bio-genetic error. The syndrome of physiological characteristics symptomatic of the genetic 'disease' process may include such factors (considered inert in 'normal' individuals) as widely spaced eyebrows and freckles (Fraser, 1987). The idea of one's child being 'afflicted' with a disease process due to familial inheritance (perhaps leading to feelings of guilt and responsibility), may also contribute to a decision to surgically implant a child with the cochlear device.

The position of biomedicine is clear. Deafness results from a 'loss' of patently functioning physiology, a condition which (depending on its extent) removes the afflicted from the realm of normalcy required for appropriate social functioning. As a disease, deafness is demonstrable by means of scientific tests which clearly display damage not extant in the majority of the general populace. The desire of the afflicted to be cured (Blume, 1997: 39) and the obligation of bio-medicine to provide healing (McCaughy, 1995), support the use of medical means to determine dysfunction and provide treatment, even at the expense of the patient experiencing harmful side effects (Cohen, 1991: 708-14). The 'formidable handicap' (Blume, 1997: 35) of deafness according to bio-medicine, rests clearly within its responsibility of care.

CONTESTING THE MEDICALIZATION OF DEAFNESS

The position of Deaf culture

Advocates of Deaf culture, in their concern that deafness may be characterized as constituting a pathological condition, postulate that deafness can be appreciated best in terms of natural membership in a distinct and cohesive cultural minority. This perspective prescribes to the belief that gestural language, for example American Sign Language or ASL, naturally meets the communication requirements of the deaf, while oral communication does not (Lane & Grodin, 1997: 233). Consequently, the imposition of hearing on the deaf, for example via cochlear implants, or attempts to teach oral methods of communication to the deaf, constitute an infraction on the values, customs and attitudes shared by their common culture (Lane, Hoffmeister and Bahan, 1996). The Deaf consider themselves to possess a rich cultural heritage comprised of such contributing factors as residential schools for the deaf, as well as a distinctive body of artistic expression. These exist in such forms as distinctive poetry and drama (Christiansen, 1991). Indeed, the Deaf claim the right to a lifestyle separate from that of mainstream society, a 'Deaf-World' expressed in sign language (Lane, et. al., 1996). Not only is acceptance of this lifestyle demanded from mainstream hearing society, but control over it as well. In 1988, the Deaf at Gallaudet University in Washington, DC (a University for the Deaf) demanded the designation of a Deaf president and the removal of the hearing president who had been appointed by a hearing board of directors. This was considered as a necessary move to help establish Deaf control over a significant aspect of their culture (field notes). The

establishment of control by the Deaf over such factors pertaining to their education may be seen to facilitate a culturally internal perception of progress and ability, according to unique abilities distinct from those of mainstream hearing society. This protects against the unwanted paternalism of medicalized views. Such views include those founded on outdated and inappropriate perceptions of the deaf, as suffering from an infirmity requiring a 'cure', whether troubling to the individual or not (Lane, 1992: 212). During the last century, the extent of such hearing centred paternalism actually subserved the establishment of sterilization laws aimed toward preventing the deaf from perpetuating their condition (Lane, 1984). Through embracing their particular sensory reality in terms of a culture distinct from that of mainstream hearing society, the Deaf exert control over the external interpretation and amplification of what is termed pathological (which is likely subject to change with the morals of the period in history). Advocates of Deaf culture are committed to such protection of their identity. This is seen in the negative characterizations expressed towards the deaf, who may choose to attempt functioning within the hearing world by means of oral/aural communication. Those who choose to live orally are perceived as having made incorrect life choices (Padden and Humphries, 1988: 44). Their choices are also perceived as resulting directly from the unchallenged acceptance of external, hearing ideologies (ibid: 53). Living orally/aurally is also seen as resulting from familial ideology which is likely centred in the hearing world (ibid: 44). This assertion gains plausibility from data suggesting that ninety percent of deaf children are born to hearing parents (CADS, 1992). The perception of Deafness as illness is therefore related to Estroff's notion of chronicity and disability being constructed by:

> ...the temporal persistence of self and other-perceived dysfunction; continual contact with powerful others who diagnose and treat; gradual but forceful redefinition of identity by kin and close associates who observe, are affected by, or share debility; and accompanying loss of roles and identities that are other than illness-related (cited in Lindenbaum and Lock, 259).

The Deaf characterize sign language as a "mother tongue" which is "marvellous to speak" (Blume, 1997: 46). Since ASL is accepted as a natural language and has been described as such, including complex grammar which is unrelated to oral communication (Valli and Lucas, 1995), advocates of Deaf culture challenge biomedical rationality. It follows therefore, that since ASL is a natural mode of communication, the condition of deafness itself may be a natural variation of the human condition. Deafness would not be regarded as a pathological deviation from the (normal) hearing condition. It is not a lack of sensory ability and thus no behavioural alteration would be required for the Deaf. Consequently the Deaf do not utilize the subjective experience of deafness as a change or loss of one of the five major senses, often used toward defining oneself as ill (Helman, 1994: 109), there is thus no basis for initiating any regimen which would seek to cure a Deaf individual from a condition which is actually non-pathological.

Deaf culture is fundamentally opposed to cochlear implants. It results in the direct imposition of a sensory attribute valued only by hearing society on the Deaf, and also threatens the cultural continuity and removal of the central sensory condition which the Deaf seek to maintain.

The generational continuity of d/Deafness is in fact sought by some Deaf parents by means of genetic selection (Davis, 1997). The ethical appropriateness of genetic

selection certainly may be questioned in instances where parents seek to select a genotype for their child that reflects a disability. From the perspective of bio-medicine as discussed earlier, the request for a genetically d/Deaf child would raise many concerns. The notion that deafness is a disability is articulated further by Davis (1997) who states that culture is passed on by beliefs and social forms which are independent of genotype (I will return to the specific issue of genetic selection later). The author concedes, for example, that parents raising an African-American child may have the obligation to impart a sense of racial identity on such a child. This is in order to develop in that child the pride to combat possible racism. According to Davis, one could argue that a child with a particular cultural heritage might also be given knowledge from a cultural past in order to feel a sense of pride with regard to ancestral accomplishment. In the case of a child born deaf however, Davis asserts that neither example applies since "deaf children who are fitted with perfect cochlear implants will not be treated by others as deaf", and "children of hearing parents obviously do not have deaf ancestors" (Davis, 1997: 255). While it is not the objective of the present research to form a judgement based on either the medical or Deaf culture perspective, it will be appropriate to briefly address the belief system as presented by Davis in order to make the reader aware of such challenges to Deaf culture and to reflect upon the accuracy of the assertions.

It may be appropriate to consider (contra Davis' notion) that the surgical implantation of the cochlear device is likely difficult to characterize as ever resulting in a perfect implant. For example, it has been noted that deaf children implanted with cochlear devices remain severely hearing impaired (Boothroyd, 1993; Lane, 1995a). The successful

installation of the device also does not facilitate normal oral/aural abilities. A search of the literature did not determine any instance of a child born with profound deafness acquiring the ability to communicate orally in a normal fashion once implanted. One may therefore question what a perfect implant constitutes. If a 'perfect' implant applies only to the post-lingually deaf, where some success in speech perception has been reported in approximately three percent of children with profound hearing loss (CADS, 1992), does this suggest that all pre-lingually deaf should be raised within the paradigm of Deaf culture? Should pride according to the unique abilities and differences of such a child not be taught, similar to the circumstance illustrated by Davis (with parents raising a child in such a way as to buffer racism?). The pre-lingually deaf child who does not benefit from hearing aids or the cochlear implant could at best hope to communicate via lip reading, and perhaps imperfect verbalization ability. It was this imperfection raised by bio-medicine, that contributes to the condemnation of the deaf as prisoners kept separated from mainstream society, who without the elimination of hearing loss may hinder society via a lack of productivity (Ruben, 1996). Individuals implanted with cochlear devices that do not effectively aid the perception of speech sounds or oral communication, could in fact result in the continuation of society's perception of them as deaf (and abnormal) contra Davis' (1997) assertion. Other factors also may argue specifically against the implantation of a "perfect" cochlear device. Even in circumstances where the perception of auditory stimuli is enhanced by the device, extensive oral/aural therapy is required (Shein, 1989). The length of time required for therapy may be of concern, since the child may not be implanted prior to two years of age (National Institute of Health, 1995). This

is significant, since the length of delay in the acquisition of either oral or ASL communication could prohibit the individual from obtaining full mastery of either language. The later ASL is acquired, the poorer the individual's command of the language (Petitto, 1993).

With regard to the statement that "children with hearing parents obviously do not have deaf ancestors" in which to take pride (Davis, 1997), this is a simple matter to address, as it is clear that several such instances could exist. For example, cases where a deaf child is adopted by hearing parents, or where a hearing child is born to parents who are considered hearing, but only due to their being surgically implanted with the cochlear device. Also, the deaf or hearing child born to a hearing parent who has an ancestor, e.g., a grandparent who is deaf... clearly many examples of a child with hearing parents and deaf ancestors in the family could potentially exist. In these instances, advocates of both Deaf culture and mainstream hearing society may support a child (either hearing or deaf) being informed about the particular heritage of the deaf ancestor, if not for the purpose of personally embracing Deaf culture paradigms, then to facilitate inter-cultural understanding and acceptance. Indeed, according to Thoits:

> ...Having multiple social identities contributes to increased psychological well-being, as failure in one area may be compensated for by competence in another. The progressive role constriction accompanying chronic illness contributes to simultaneous loss of valued, competent-role experiences and an increase in devalued, incompetent roles and experiences (cited in Lindenbaum and Lock, 1993: 259).

Although advocates of Deaf culture would not prescribe to the applicability of chronic illness to d/Deafness in the preceding statement, deafness may be thus recognized

according to the bio-medical view of deafness discussed earlier, which is shared by some deaf individuals.

Returning to the propagation of deafness by some advocates of Deaf culture via genetic intervention, culture may not be a distinct entity from the individual's genotype. Arguments, such as those put forth by Davis (1997) require careful scrutiny when such issues are raised to (insensitively?) deconstruct a cultural belief system. As can be seen from the considerations of Davis' argument earlier, circumstances used specifically to counter the claims of Deaf culture, when viewed from a different perspective, may actually act to support its paradigm. Contrary to views such as those held by Davis, deafness could feasibly be equated with culture as defined by Webster's International Dictionary (1993): "the body of customary beliefs, social forms, and material traits constituting a distinct complex of tradition of a racial, religious, or social group" (cited in Davis, 1997). Specifically, a non hearing individual "cut off" from mainstream hearing society forms specific modes of adaptation to the world, as facilitated by their lack of hearing. The Deaf, basing a significant proportion of their culture on sign language, fulfill the potential for which evolution has prepared them (Padden and Humphries, 1988). Therefore, if culture may be thus equated with deafness that may also be genetically caused, a condition which is embraced by advocates of Deaf culture, then any means utilized to disrupt the continuation of this culture could, from this perspective, be regarded as unethical.

Embracing what is non-pathological to the Deaf, that which can be a familial/genetic reality worthy of passing on to progeny (as hearing individuals pass on what we consider to be normal physical attributes), is supported within the context of

hearing world ethics.

> ...The silence of the law on many areas of individual choice reflects the value this country places on pluralism. Nowhere is the need for freedom to pursue divergent conceptions of the good more deeply felt than in decisions concerning reproduction. ...The Commission recommends that those who counsel patients and those who educate the public about genetics should not only emphasize the importance of preserving choice but also do their utmost to safeguard the choices of those they serve (Presidents Commission for the Study of Ethical Problems in Biomedical and Behavioural Research, cited in Davis, 1997: 8-9).

In articulating the Deaf cultural belief system pertaining to its notion of normalcy, the characterization of D/deafness is clearly shown to comprise the presence of cultural substance rather than a lack of it. The transmission of the Deaf belief system is facilitated as discussed previously, by means of factors such as distinct sign language, poetry and specialized school systems. It is also supported further through various technological means including the TDD which permits the D/deaf individual to communicate via telephone with both the D/deaf and hearing populace. It may be noted however, that Deaf cultural reality is based on a successful articulation of those elements which are not considered as adaptations to illness. Rather, as a whole, these elements constitute a lived consciousness. This is based upon a different, but not pathological sensory reality. According to Turner (1994: 12), in order to appreciate a cultural concept (such as the rejection of the notion of deafness as disability by the Deaf, and hence the rejection of the cochlear implant), it is necessary to appreciate a functioning of the interrelated network of cultural elements, not the elements individually.

The rejection of restoring hearing to the deaf by advocates of Deaf culture, may be seen as resulting from a natural condition not of one's own choosing. The Deaf reject

their sensory reality as being pathological, and challenge the notion that deafness constitutes a disability rather than a culture, because deaf adults have the option of choosing to identify with Deaf culture or not (Davis, 1997: 253-4). According to the Deaf, no choice exists.

CHAPTER 2

According to advocates of Deaf culture, any attempt to incorporate the deaf individual into the hearing world is an assault on their identity based on mainstream society's incorrect, disempowering assumptions. Specifically, the Deaf reject the disarticulation of their corporeal condition from the essence of cultural consciousness. This paradigm is utilized by biomedicine to integrate the deaf into a hearing-centred life via the cochlear implant, and teaching oral/aural skills to the deaf. Aside from issues of cultural identity, the present research has raised issues of side-effects resulting from the surgical implantation of the cochlear device, as well as issues of consent where children are involved. These issues are significant, as they also relate to the majority of deaf individuals who do not ascribe to the beliefs of Deaf culture, and who do consider themselves as hearing people having a perceptual disability (Binnie, 1994). In the interest of facilitating the needs of the D/deaf in the absence of potentially harmful and invasive surgical procedures (of questionable benefit to the recipient as discussed previously), the following chapter makes inquiry into how the needs of the D/deaf (in social and educational terms)are best met. This is carried out in accordance with the notion that an appropriate anthropological model may seek to appreciate interrelated networks of cultural reality (Turner, 1994: 112). It is my hope that the lived realities of D/deaf individuals may provide a more direct appreciation of what best facilitates their expressed needs: conforming to Deaf cultural postulates, conforming to the biomedical view that

complete rejection of aspects of oral/aural communication is debilitating, or some combined reality comprised of aspects of both paradigms.

The nature of Deaf culture from the perspective of the Deaf, empowering or disempowering response to auditory disability?

This Chapter makes an epistemological inquiry into the nature of Deaf culture from the perspective of the Deaf, and reflects Goods' semantic illness network (cited in Young, 1982: 263). This involves the feelings, words, situations and symptoms associated with being deaf, which provide meaning, or basis of interpreting the world from the perspective of the afflicted. Whether it is an adaptive, empowering response to specific auditory sensory reality, or whether it is constructed and imposed upon the Deaf via members of hearing society is considered. This section is therefore concerned with the impact of hearing culture on the Deaf, utilizing direct interview of the Deaf concerning their interpretations. The attempt is to refrain from a reflexive study in which one's own society provides the perspective of examination (Hahn & Kleinman, 1983: 305). Empowering will be construed as those conditions that allow the Deaf to exert positive control over their lives. The present research also attempts to answer the question whether an inappropriate stereotype is associated with the Deaf leading to the construction of Deaf culture, which may hinder their educational progress, as well as the basis of any such stereotype.

Although we may recognize each person in society as a unique individual, if our approach towards each person always took into consideration this uniqueness without any scheme of what 'people' or groups are like, we would likely be unable to establish a frame

of reference to communicate effectively. This is due to the resulting uncertainty and complexity involved with each person or group of people. We therefore use categories to organize our world in terms of easily recognizable characteristics. It has been suggested that mental representations of a typical example of a category (prototypes) are often used to identify people (Cantor and Mischel, 1979). A stereotype may be defined as a specific prototype of which there is a consensus among members of a group with regard to the attributes of the individual under consideration (Taylor, 1981). Since social reality may be extremely complex, it is necessary to use the prototype and stereotype to process information quickly and efficiently. However, preparing us to deal with types rather than individuals via expectations may also afford the development of prejudice. Prejudice results when stereotyping leads to illusory correlations. Bias in the processing of information can result due to an overestimation of the expected association between characteristics (Crocker, 1981; Hamilton and Sherman, 1989).

The impetus for the present inquiry was derived from information communicated directly to the author by educators of the deaf. Specifically, it has been suggested that the integration and advancement of the deaf in mainstream hearing society is hindered by an intrinsically low reading level resulting from the condition of deafness itself. This 'condition' leads to difficulty in communicating with hearing people, and necessitates the deaf being educated via sign language in a special school. Inquiry was made into whether the preceding assessment was accurate, or whether in fact, there was an indication that a deaf stereotype exists which played a role in establishing low reading level, the exclusion of the deaf from mainstream (hearing) education, and contributed to the formation of

Deaf culture.

Deaf students exist basically in two educational categories. One consists of those who have been educated via sign language only as postulated by Deaf culture, since it excludes the imposition of hearing-centred context. The other category consists of those who have had verbal (and perhaps some sign language) education, sometimes at a regular school. This study is concerned with whether these two groups perceive Deaf culture differently, as well as whether choices made for the Deaf by members of hearing society, with regard to educational placement, act to help or hinder educational and social development, according to the wishes expressed by the D/deaf interviewed.

METHODS

Study Participants

Thirty participants, 20 deaf students and 10 hearing students took part in this study. The students ranged in age between 19 and 22 years of age. Participants 1 - 10 consisted of profoundly deaf students who had been educated via sign language only, in deaf schools. Participants 11 - 20 consisted of profoundly deaf students who had been educated for a time in a hearing school, via verbal communication and some degree of sign language. Subjects 1 - 20 were all attending a School for the Deaf at the time of this study and were instructed via sign language only.

Participants 21 to 30 consisted of hearing students attending McMaster University.

PROCEDURES

All deaf participants were pre-tested via a short standardized test of verbal reading grade level via the Wide Range Achievement Test or "WRAT-R" in order to facilitate comparison of reading level between deaf students educated via sign language only, versus those educated with some oral/aural instruction and some sign language as well. Due to the nature of the participants' deafness, the test was modified to a reading/comprehension test. Each subject was asked: "do you know the word?" to take into consideration the fact that only word pronunciation deficit was being measured. If students could not correctly read the word, they were given the opportunity to display knowledge by using it correctly in a sentence via sign language. The number of correctly read/comprehended words added to 25 facilitated grade level identification for the student, via the raw score grade equivalent scoring chart by JASTAK ASSESSMENT SYSTEMS.

The deaf students were interviewed as to their perception regarding the nature of Deaf culture, as well as the existence and nature of any stereotype being associated with the Deaf. For questions presented to the D/deaf participants, please refer to APPENDIX A. For questions asked of the hearing students, please refer to APPENDIX B. These questions were utilized to help determine whether hearing people might ascribe a stereotype to the Deaf, as well as the nature of any such stereotype. In order to maintain an emic perspective, all questions were based on information/concerns/topics conveyed to the author by other deaf individuals under informal circumstances.

Those who had been educated via sign language only did not wish to interact in the interviews via verbal communication, while students educated via verbal communication

and some sign language did. However, all students (for reasons of consistency) communicated with the interviewer by means of an interpreter who was a hard of hearing student (not profoundly Deaf) who used American Sign Language or "ASL" with the participants, and communicated answers verbally with the interviewer. The deaf student interviews were conducted in a small room with only the student, interpreter and interviewer present. The hearing students were interviewed in the Ewart Angus Centre at McMaster University and received $10.00 for their time.

RESULTS

Pretesting

Participants 1 - 10 educated via sign language only, perseverated heavily during the WRAT-R test. They also were observed to segment words as they read them, using vocalization which appeared to divert their attention from attaining any fluency in reading unknown or novel words. The WRAT-R score average for participants 1- 10 educated via sign language only was 71, which was indicative of a fourth grade reading and also comprehension, level.

Participants 11 -20 educated verbally with some sign language were observed to be more fluid in their approach to the reading test. The perseveration noted for participants 1 - 10 was absent. The average WRAT-R score for these participants was 100, indicative of a post grade 8 reading level. It must be noted that the test used only allowed for indication of a score of 100, therefore reading/comprehension level may have been higher for these study participants.

INTERVIEW

Participants 1-10

(Deaf students' responses to questions. Refer to Appendix A for further information pertaining to the questions asked)

Question 1: How do hearing people think of the deaf? Please provide examples of personal experiences which have caused you to form your opinions.

Participants 1 - 10 **educated via sign language only**, characterized hearing peoples' perceptions of the Deaf, as perhaps being stupid or slow. Hearing people spoke slowly in an exaggerated manner (often smiling) which made the deaf participants feel as though the hearing people perceived them as being mentally slow. The deaf students felt that hearing people thought that the Deaf were different; they make fun of them, e.g., imitating their sign language or attempts to vocalize. Two of the participants felt that although they were perceived as being slow, that this was only due to differences in modes of communication between themselves and hearing people.

Question 2: Have the views of others (hearing people) influenced your opinion of yourself? How?

In terms of self opinion being influenced by others, six of the participants felt influenced initially by hearing peers, in that the hearing people made fun of them, and the Deaf therefore felt unintelligent. They did not have many friends as a result. All study participants felt better about themselves when communicating with deaf peers as they could communicate effectively with one another. They were also made to feel intelligent via this communication. Five of these ten participants were made fun of and were

isolated from hearing peers by their mothers. They felt "different" from hearing children. These participants "speak" (communicate) only with the Deaf now and feel much more confident.

Question 3: Have the opinions of hearing people influenced with whom you associate (deaf or hearing?)

The opinions of hearing people as characterized by participants 1 - 10 have influenced with whom they associate. Six of the ten interviewed will not approach unfamiliar hearing people due to having been made fun of as children, but will associate with familiar, friendly people who communicate via sign language. All were influenced in this regard via the opinions of hearing people (hearing professionals) who told parents that their children would have to attend a school for the deaf. They therefore only associate with deaf students.

Question 4: Does associating with D/deaf people help you adapt better to the environment of everyday life? How?

In terms of adaptation to the environment, participants 1 - 10 felt that communication was facilitated via sign language which allowed them to obtain answers to their problems, and be self-sufficient in terms of note taking in class. Since the deaf interacted via sign language on a regular basis, associating with the deaf was characterized as being easier, flowing better, and was not related with anxiety or problematic, as opposed to trying to associate with hearing individuals.

Question 5: Are you able to communicate with hearing people? How? Do you want to?

In response to the question of whether or not they were able to communicate with hearing people, participants responded they didn't use their voice due to having been made fun of. They expressed a desire to communicate with hearing people (everyone). Five of ten indicated the possibility of verbal communication since they could be understood by family members when they made the attempt. Five participants indicated that they wished to communicate with hearing people but sign language would have to be involved.

Question 6: Would you feel comfortable working with hearing people only?

To the question of working with hearing people, seven participants indicated hesitation: "they wouldn't want to hire me"; "sign language would have to be involved"; "my reading level is a little behind", but some said they might consider it depending on the nature of the job (if it was not too involved). All indicated they would feel comfortable if their verbal abilities and writing skills were improved. All perceived they could "say" so much more using sign language. Four of the participants felt at ease with a situation where some sign language and some verbal communication would be involved.

Question 7: Please describe Deaf culture.

With regard to this question, those educated via sign language only, described Deaf culture as having been constructed by the Deaf. It concerned terms such as "natural strength" with regard to the Deaf "sticking together", enabling them to obtain respect from the hearing world. When asked to qualify this statement, eight of ten participants responded that Deaf culture was something that defined them. It set down rules by which

hearing people had to conform; the Deaf did not have to use their voice when communicating, and they could not be shut off from the opportunity to be educated (via deaf schools which were part of their unique culture, and gave them a venue to learn necessary skills). It gave them strength because so many similar people were attending deaf school, all with similar experiences, and specifically, difficulties in early childhood (due to their exclusion by hearing children). Four of these ten participants had difficulty qualifying their descriptive terms. When prompted again as to what they thought Deaf culture may be comprised of, they responded that it was just part of them, it made them distinct (different) from the rest of the hearing world. When asked how it made them different, they responded that being different meant they were Deaf, not hearing people, but that this (Deaf culture) was their world and had to be respected.

Participants 11-20

(Questions 1-7 are identical to those posed to Participants 1-10)

The results for participants 11 - 20 educated via **verbal communication and some sign language** are summarized as follows.

Question 1:

Hearing people think of the Deaf as being different. Deaf students are teased but once the deaf student used verbal communication to assert him/herself, the perceptions of the Deaf as being slow subsided.

Question 2:

The views of others have influenced self opinion. All participants' parents

encouraged vocalization. Although the hearing schools' employees were usually unwilling to "help out", and made the student feel unwanted and "bad", the use of oral language allowed them to persevere and eventually feel good about themselves.

Question 3:

The views of educators, instead of being uplifting and encouraging, were a source of bad feelings as they focused on what they did not want to provide. The opinions of hearing people (e.g., similar age children, other hearing people in general), were perceived as having led initially to isolation from the hearing world. The opinions of their parents allowed them to associate with both deaf and hearing people.

Question 4:

Associating with deaf people was characterized as helping with adaptation to the environment in terms of allowing them to have self-directed control over aspects of information gathering in school, for example.

Question 5 & 6:

Study participants felt they were able to communicate with hearing people and would feel comfortable in a job situation with hearing people. All expressed that they would feel comfortable if judged on their job performance, and not via any prejudice or ignorance which some said they would attempt to deal with personally.

Question 7:

With regard to the question: "please describe Deaf culture?", many could not

define what it was. When asked whether it affected their lives they responded, "no". Participants were then asked: "who is responsible for Deaf culture?" Three responded that it was constructed to give the Deaf an identity. When asked what was meant by this, all responded that many Deaf could not communicate or function with anyone other than the Deaf. It thus was a term that provided a base with which they could identify. It said they were different, but part of a group of others who were all similar and understood one another. They were then asked again, who is responsible?, the Deaf? - the answer provided was "no". Of the remaining who had not been able to define Deaf culture, when asked who was responsible for Deaf culture?, they responded that it was the Deaf community. Others also attributed Deaf culture to the Deaf, and defined it as a way of dealing with the world, based on the Deaf identity. When asked what this was, they responded that the Deaf identity involved not being able to hear, and being misunderstood by hearing people.

"Misunderstood" was qualified in terms of many Deaf as being unable to utilize their voice, or hearing people being unable to use sign language, as well as the Deaf being unable to make their needs known to those who had not experienced their problems. When participants were asked if they had reported Deaf culture as not affecting their lives because they could use their voice they responded "yes", but also because they had primarily been in contact with hearing people, and had never been aware of any need outside of that society. One participant said that Deaf culture meant nothing to him, and that it was constructed by hearing society to deal with how to keep the Deaf happy, by making them feel they could easily associate with other similar individuals.

Participants 21-30

(Hearing students' responses to questions. Refer to Appendix B for further information pertaining to the questions asked):

Question 1: How do you perceive the deaf, in terms of their social and scholastic abilities in mainstream hearing society?

Eight of the respondents characterized the deaf as being socially difficult to interact with. In some cases, this was due to the existence of a language barrier between the hearing and the deaf. The deaf were also believed to exclude themselves at times, as the hearing individuals had only recalled noticing the deaf in groups amongst people with a similar "condition". This practice of affiliatory behaviour was characterized as resulting not only from choices made by the deaf themselves, but also from a "natural barrier" that was believed to exist due to the hearing loss the deaf "suffered from".

Two of the participants characterized their social interaction with the deaf as being the same as that which was enjoyed with their hearing peers. This was due to the hearing participants having a knowledge of sign language. In one case, where one deaf person was out with a group of hearing people, only one hearing person knew sign language and had to translate for the group. In this case, the deaf individual did not lip read or use oral communication. The participant noted some difficulty with constantly translating for everyone. In another case, the profoundly deaf individual did lip read and used oral communication as well as sign language. This was noted to facilitate interaction with the hearing people present. These two respondents were the only ones who actually knew a deaf person. In terms of perceived scholastic ability of the deaf, five participants described the deaf as possessing normal scholastic ability for their condition, which was thought to

hinder learning ability to some extent. For example, two respondents mentioned that when educated in specialized schools for the deaf, the deaf would probably do fine, but would still be below the academic standard for hearing students. This was qualified, in that sign language was symbolic and might not allow for the learning of certain grammatic principles. Three of the respondents considered the deaf being in a regular (hearing) classroom scenario. In these cases, the deaf were characterized as being likely to possess lower academic skills compared to hearing students. This was due to the perception that the deaf student would likely have to receive remedial instruction. Such instruction was thought to necessitate the use of simplified language in order to permit easier transmission of complicated concepts to the deaf, which would perhaps result in a fairly competent, but less proficient grasp of concepts compared with hearing peers.

The other five hearing participants characterized deaf scholastic capabilities as being normal, that is, at the same level of proficiency as hearing peers. Three of the participants mentioned that this was possible if the deaf student was educated in a special class with other students with the same "disability". The deaf were not believed to be able to function properly (not qualified) in a regular hearing class due to language barriers. Two of the hearing participants responded that deaf students could perform at the same academic levels as hearing students. The success of the deaf in mainstream schooling was characterized as being dependent on whether the deaf individual communicated via sign language only, or with some oral communication. In either case, special support was thought to be useful, e.g., a sign language interpreter being provided to help the signing student, and perhaps a note taker to ensure that all lecture material was received. These

two respondents were the only participants who knew and had regular contact with a deaf person.

Question 2: Have the views of others influenced your opinion of the deaf, how?

Six of the participants responded that others had influenced their perceptions with regard to the deaf. In some cases, participants knew of a friend who went to a school where at some point there was either a deaf student in the classroom, or the school had a specialized class of deaf students separated from the mainstream. Second hand accounts of deaf students needing special help; being different; sticking together; vocalizing strangely ("making weird sounds"); being disruptive with regard to the amount of noise they made when together; or the withdrawn and strange behaviour sometimes exhibited, were characterized as contributing to the knowledge base concerning the deaf provided by people or friends who had "experienced it". In these six cases, participants felt they had reliable insight into the behaviour and capabilities of the deaf, which formed the basis of their views.

Three participants said they had been influenced by television programmes and various magazine articles which "explained the damage to the auditory system", and the "loss of hearing which affects the ability to form normal speech patterns". Two participants mentioned seeing a group of deaf students in a Toronto subway station, and expressed their feeling sad for the disability these other young people had to live with.

Two participants (who actually knew and interacted with deaf people), mentioned that prior to knowing deaf people personally, their opinions were influenced by other

peoples' views such as those voiced by people who had contact with the deaf. However, the views of the deaf people they know personally were characterized as being responsible for changing their views. Specifically, misinformation was corrected, concerning for example, the options available for the deaf to communicate with the mainstream either orally or via the telephone communication device (TDD). This allows signing and oral deaf people to communicate well with their hearing peers. The views of their deaf friends influenced these participants' perceptions of the deaf in terms of lowering the perceived level of difference from the hearing, which increased their perception of deaf capabilities to communicate effectively (either via sign language or spoken word), and understanding that some deaf prefer signed communication and have a distinct culture, while others want to function as speaking individuals in mainstream society.

Question 3: Have the opinions of others influenced whether or not you personally associate with the deaf?

Six of the participants did not feel specifically, that the opinions of others had dictated whether or not they would accept a deaf person into their group of friends. Two of these participants expressed a possibility that their perception of the deaf arose through informed means, such as scientific television programmes. These explained the deficit in auditory functioning and related problems, suggesting the necessity to learn sign language to communicate with the deaf, which they expressed they would do.

Two participants mentioned that from what they understood through television, and from friends who knew and had interacted with the deaf, as well as through the opinions of specialists and educators who dealt with the deaf, they were likely to have

been affected in terms of their association with the deaf. For example, the opinions of what was best in terms of educational standards and methods of instruction for the deaf as dictated by specialists, were likely to separate the deaf from the hearing at an early age. Therefore, association with the deaf in educational circumstances was dictated by the opinions of others. This segregation in learning situations was not perceived to influence the possibility of social friendships being formed with the deaf. However, one individual mentioned that most friendships were formed in school/classrooms, and therefore it would be difficult to form associations with the deaf. In this case, the individual believed that the educational policy concerning the segregation of many people perceived as disabled (blind, deaf, hard of hearing) was probably often inappropriate or unnecessary.

Two participants who had deaf friends expressed that the nature or personality of the individual, and not the views of others "who might not even know how to communicate with the deaf", were the only factors which influenced whether or not they associated with a particular deaf person. However, one of these subjects mentioned that not all deaf individuals are willing to associate/communicate with a hearing person who is unable to use sign language. In some cases this was simply due to the fact that the deaf person could only sign while the hearing person could not. In other cases, some deaf refuse to associate with hearing individuals for various reasons (not explained by the participants).

Question 4: Are you able to communicate with deaf individuals, how? Do you want to?

Seven participants expressed the inability to communicate with the deaf. They did

not know sign language, and never had the opportunity to attempt any oral communication with the deaf. These individuals mentioned that they would be open to learning sign language, but since the likelihood of interacting with many deaf people was slight, they would resort to using written notes, or would attempt to speak slowly in order to communicate with a deaf person.

Two participants could communicate with the deaf via sign language. One subject had learned sign language out of general interest, and the other out of necessity after meeting and forming a friendship with a deaf person.

One subject, who had a deaf friend, was able to communicate orally as the deaf friend had been taught both sign language as well as oral communication.

Question 5: Would you feel comfortable interacting with deaf people professionally at your workplace, why?

Seven participants indicated reservations. Specifically, there could be problems with communication. Problems were anticipated if everyone in the office could not communicate effectively. Miscommunication would lead to lost productivity and errors. Four participants expressed reservations as they 'were aware' that the deaf were 'generally behind' in academic development, and that slow learning could influence job performance. If communication was facilitated effectively, and no other problems were extant, seven participants expressed willingness to have the deaf as co-workers.

The two participants who could use sign language foresaw no problems, and were willing to work with the deaf. The remaining participants who only had experience communicating orally with the deaf, expressed the possibility that key people who worked

with the deaf individual might need a knowledge of sign language. It was thought that this might result in some resentment on the part of co-workers who would have to allocate personal time to accommodate a deaf individual in the office. The participant suggested that a TDD could be utilized which would help facilitate communication. It might however be necessary for an individual who only utilized sign language to be equipped with some sort of device which should produce spoken words when, for example, a keyboard was utilized.

DISCUSSION

Pre-interview WRAT-R data indicated that deaf study participants educated via sign language only were reading at a grade 4 level, while those educated via verbal communication and some sign language were reading at, at least a grade 8 level. Interviews indicated that deaf students may be sent to a deaf school based only on the recommendations of educators who may be unwilling to teach a deaf student, and who made an appeal to the stereotype that the needs are better met in a special school which the WRAT-R scores contradict.

A stereotype is perpetuated from different aspects of society. By educators as discussed, as well as by children who may view the apparent inability of deaf children to communicate as they would expect, to be an indication of mental difficulty, or their simply being different. As discussed at the outset of the present chapter, stereotypes are a means of simplifying and making sense of a complex social world. However, according to the deaf students educated via some verbal communication, the educational stereotypes

and social stereotypes appear to be incorrect. According to the interview results of both Deaf and hearing study participants, the D/deaf are categorized based on differences perpetuated by the stereotype itself, which categorizes them as being more different from mainstream society than perhaps need be. It also appears that the stereotype may have led to the existence of separate education for the deaf. Deaf culture may also disempower the Deaf in some cases. Students educated verbally are empowered via higher educational and verbal standards being reached , an opportunity usually taken away from the deaf as they are referred to special schools. When not educated in such schools, Deaf culture was not integrated into the social framework. It may have been imposed under circumstances which make it appear that the deaf developed this construct to deal with their disability. However, the stigmatization of individuals based on deviation from the norm may certainly also perpetuate the development of coping strategies. These strategies, as a means to deal with mainstream societal devaluation, may evolve as subcultural adaptations in the presence of sufficient stigmatized individuals (Becker, 1981: 312). The establishment of Deaf culture could be such an adaptation. In this case, Deaf culture may not be the result of natural adaptation to a specific sensory reality as postulated by advocates for Deaf culture, as discussed earlier in Chapter 1 of the present research. Specifically, the Deaf base a large portion of their distinct culture on sign language, which fulfills the potential for which evolution has prepared them (Padden and Humphreis, 1988). This may represent the Deaf identity actually being shaped by social, not natural factors, involving mainstream hearing stereotypes. These appear to be related to perceived physical and expressive abnormality. Rather than Deaf culture being the only 'natural' option available,

it may be appropriate to consider the possibility that hearing world perceptions of the deaf lead to stigmatization, and bias toward the deaf. Such factors may in turn lead to the establishment of the 'sign language only' communication utilized by the Deaf, which through association with similar others, engenders a positive image of the self. Sign language as a symbolic badge of identity (Becker, 1981) may subserve the normalization of the deaf via discrete social interaction. However, according to the findings of the present research, some Deaf individuals do wish to interact with hearing individuals. Also, where oral communication has been incorporated into the educational paradigm at some point, those Deaf may be better prepared to meet their expressed need of mainstream (oral) communication.

According to Becker (1981) the process of normalization, a concept introduced by Davis (cited in Becker, 1981: 14) may subserve the establishment of Deaf culture. Here, self-esteem is fostered via interaction and identification with an 'in-group'. Individuals identify with, and show allegiance to those peers with whom they share a perceptual reality, in the absence of attempts to reconcile any dilemma associated with trying to function in hearing society (Becker, 1981: 314). Conforming to the group norms via conscious and subconscious processes, establishes a realm of normalcy, heightening feelings of competence. Becker (1981: 314) reports that self-esteem is promoted in Deaf communities where the Deaf are relaxed, confident and talkative (via sign language). However, when in the presence of hearing persons, these individuals become withdrawn. Withdrawing when in the presence of hearing individuals is characterized by Becker as reflecting an adaptation to potentially stigmatizing situations.

The results of the present research indicate that deafness may be more debilitating (in terms of certain verbal communication abilities) in some learning contexts (sign language only) but not in others (inclusion of some verbal communication). It must be noted that those deaf participants educated via sign language alone, objected to the term "disabled" being applied to them, while eight of ten subjects educated verbally with some sign language did not. This may relate to the former groups' assertion that Deaf culture made them different, ie. to them deafness is simply a different world reality to the mainstream hearing world, and must be respected on these terms. For example, being Deaf is not a disability that can be "dealt with" in order to better their situation in any way. Deaf culture had also been described by these individuals, as allowing them to communicate on their own terms (without voice), and to not be shut off from the opportunity of education (via deaf schools). This may be indicative of complacency (induced via the context of Deaf culture) in those educated in deaf schools via sign language only. They may use the term as an explanatory framework to understand (not only assert) their position in the world. They are thus withheld according to the findings of the present research, from achieving the educational levels extant in those Deaf educated verbally, who do not appear to utilize or incorporate the term "Deaf culture" into their lives. Deaf participants educated via sign language only are also prevented from attempting any verbal skills by hearing educators in a position to dictate educational policy. These policy setters, via an inappropriate stereotype regarding the integration and advancement of the Deaf in mainstream society (that education is hindered by an intrinsically low reading level due to deafness), may induce the educational and social

segregation of the Deaf. Therefore, in some respects, Deaf culture must be described as disempowering according to the definition given at the outset of the present chapter. Specifically, while potentially increasing self-esteem within Deaf culture peer groups, it may enhance awkward tensions when the Deaf are in the presence of hearing individuals. This may help to perpetuate the notion of deviance, and stigmatization of the deaf by hearing individuals, which further increases the perception of difference between the deaf, and hearing worlds.

Deaf culture is an extremely powerful construction. Indeed, deaf persons who are well socialized into mainstream society and have been educated with some oral communication, may eventually reject mainstream society in order to interact within the social (Deaf) group of, for example, a marriage partner (Becker, 1981: 14). When the deaf are made to feel as normally functioning individuals within Deaf culture peer groups, self-esteem may be enhanced, a highly desirable result. However, ascribing to Deaf culture and perhaps even furthering the good of this Deaf community (Becker, 1981: 314) at ones' own expense (in terms of rejecting, or not developing communication potential which might allow one to function within mainstream society) may not be a desirable artifact of Deaf social conformity (considering the views expressed by D/deaf participants in the present research). The term Deaf culture appears to be a result of structural violence against an already marginalized population (eg. separate schools, separate language, not easily employable). Deaf culture used as an empowering entity by some (eg. gives strength), may be a Deaf social adaptation to the potential educational and social abilities (power) taken away by others. Specifically, those isolated in terms of being

educated via sign language only (although perhaps forced into this predicament by hearing society) protect themselves by subscribing to Deaf culture, which may be a representation of suppressive circumstances imposed by hearing society. It is then used by the Deaf to assert those differences, and to demand respect for them even though the deaf educated verbally dismiss these differences. Therefore, those Deaf educated via sign language only, and who empower themselves via Deaf culture, may be said to be subject to a colonization of consciousness. Specifically, they come to accept and believe that the assertions of Deaf culture are natural or self-induced, although they may in actuality be to a great extent, imposed on them via hearing society.

The stereotype imposed by hearing people does not serve society in forming a correct category for purposes of generalization, and hinders the educational and social avenues open to the Deaf. Prejudice has resulted as per the definition at the outset of the present chapter. Where verbal communication is used, reading level is higher, and the ability to function in mainstream society is indicated. The low reading level in some deaf students may be a by-product of the very educational system set up to meet their special needs. It appears that much of the deaf stereotype is based on ignorance of deaf capabilities, and an unwillingness to integrate students for fear of class disruption. The interviews indicated that a primary need was for deaf students to obtain class notes to study, and to obtain remedial reading lessons to improve comprehension. The remedial teaching could be circumvented by teaching deaf students specific grammar rules at the outset of their education.

Some studies conclude that manual communication systems such as ASL should

have the status of a human language (Newport, 1984). This is based on findings that ASL is structured on similar grammatical principles as verbal communication. However, the fact remains that the deaf students educated via sign language alone performed more poorly on the WRAT-R in the present study. This confirms findings that sign language, in teaching reading and writing actually acts as a second language, the result being that the Deaf are less expert in these skills than hearing peers (Gibson, Shurcliff and Yonas, 1970).

Although all students communicated via sign language during the interview, those educated via sign language alone were less organized in terms of sentence formation and thus communication. This may be difficult to detect, especially when an interpreter reformulates symbols into a coherent sentence structure which may not be reflected in the deaf individual's reading/writing abilities. Since learning past puberty may not be well facilitated due to anatomical/neuronal changes in the brain (Lenneberg, 1967) it may be appropriate to incorporate intense reading and writing, as well as vocal exercises, into the early educational studies of deaf students. Specific support concerning the appropriateness of some oral/aural education for the deaf is explored in Chapter 4. Such education could alleviate the differences perceived by mainstream hearing society, and may facilitate the incorporation of a seemingly often underdeveloped potential (of students educated via sign language only) into mainstream society. It must be noted that sign language may be necessary in allowing the Deaf to adapt best (more completely) to the environment, which includes both hearing individuals, as well as those deaf who personally prefer to use sign language only. However, without the use of oral language, an inappropriate stereotype seems to be reinforced, which appears to hinder educational

progress. Unfortunately, the reversal of established stereotypes may be learned slowly, as well as forgotten more quickly than either neutral or confirming information (Hamilton and Rose, 1980). For the inappropriate Deaf stereotype to be abolished, both mainstream hearing society as well as the Deaf must have the mutual goal of interdependent and cooperative action to terminate the illusory correlations as described. These appear to have led to the Deaf stereotype, and possibly Deaf culture as well (Amir, 1976).

CHAPTER 3

From a medical anthropological perspective, the understanding of the D/deaf experience is challenging. In considering the emic analysis of deafness from the perspective of Deaf culture advocates, as discussed earlier in Chapter 1, no illness exists. Contrary to the biomedical view of deafness which focuses on the bio- pathology of the auditory system, the Deaf assert their place in the world as fully functioning individuals. Although some D/deaf individuals were able, according to the present research, to use their voice and function within mainstream hearing, as well as Deaf society, the Deaf reject the development of any such capability as an unnatural imposition. According to this belief, the deaf perceptual reality has been evolutionarily prepared, or equipped, to function by means of sign language only (Padden and Humphries, 1988).

Whether or not the D/deaf suffer from an illness may be wholly dependent upon the specific context within which deafness is analysed, either biomedical or Deaf cultural. However, the D/deaf may be left open, as a result of their particular auditory reality, to such factors as: social ostracism from mainstream hearing society, or from Deaf society if the individual chooses (or the choice is made)to be educated with some oral/aural instruction; stigma, involving devaluation of the individual based on perceived difference; discrimination, and a lowered self-esteem (Becker, 1981: 310-313). The findings of the present research therefore present the existence of a disturbing situation pertaining to the deaf which warrants further consdieration. Specifically, the deaf must choose, or a choice

must be made on their behalf (for example in the case of a child)to enter either the hearing world and utilize the spoken word, or enter the Deaf world and utilize sign language only. Either choice may be limiting to the deaf. If the choice is made to use oral/aural communication, the deaf individual is not introduced at all to a mode of communication (sign language), which could otherwise facilitate learning and introduce the individual into a community of perceptually similar individuals. This community may help increase the efficacy of coping with individual difficulties associated with being deaf. However, advocates of Deaf culture, as discussed earlier in Chapter 1, do not accept spoken communication for the deaf. As expressed by some study participants in the present research, the desire exists even in those who subscribe to the postulates of Deaf culture, to communicate and work with the hearing. Here, a discrepancy is extant through which it is difficult to navigate. How may the hearing or Deaf educator devise an educational methodology syncretistic in nature? One, for example, which recognizes the possibility (as found in the present study) that facets of both oral/aural and sign language seem to facilitate the deaf individual realizing a higher grade reading/comprehension level, and that the desire of the D/deaf individuals (as noted in the present study) to function in hearing society could be thus realized?

An issue of significant interest, especially to an emic medical anthropological approach, concerns respect for the perspective of the Deaf. In order to accomplish this task it is not sufficient to present findings which suggest some D/deaf individuals do wish to function better within the social context of the hearing world. Specifically, it is necessary to appreciate and attempt to function within the belief system of Deaf culture,

while considering the expressed desires of the study participants interviewed.

As presented in Chapter 1, the Deaf subscribe to a belief system which may be interpreted as embracing the natural abilities of the deaf sensory-perceptual reality. From an appreciation of the natural nature of ASL (Valli and Lucas, 1995), and the proposition that the Deaf function with sign language, thus fulfilling their evolutionary potential (Padden and Humphries, 1988), one could perhaps ethically (from the Deaf perspective) only suggest intervention for the purpose of furthering the D/deaf potential[1] by considering natural D/deaf abilities.

In order to function within this ethically sensitive realm, the present research shifts to a consideration of biological factors which could help explain why some deaf individuals are better able to meet their needs as defined by them in Chapter 2. It is not the intention of this research to suggest that all deaf individuals should follow the desires of the small study sample utilized. However, in this sample, some Deaf individuals did wish to be understood by members of hearing society, and could in some cases be understood by others (family members), when they attempted to use their voice. It was also noted that their voice was not used, only because others had made fun of such attempts.

The profoundly deaf individuals in the present study who were educated with both sign language and oral/aural communication seemed closer (via oral ability and higher reading/comprehension levels), to realizing the desire also expressed by many educated via

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[1]. 'Furthering potential' is qualified for the purpose of the present research, as anything which will contribute to the D/deaf reaching the goals expressed in the present research. Specifically: to function within hearing society, and to communicate effectively with both deaf and hearing individuals.

sign language only. This was to communicate with the hearing in various social contexts. If there is some mechanism in the auditory system which facilitates oral/aural communication even in some deaf individuals, this would be of significant interest to the D/deaf. Specifically, deaf individuals who choose to use their voice may not necessarily be excluded from Deaf society. Any natural abilities regarding audition and vocalization could theoretically be embraced by advocates of Deaf culture, since such ability would be as natural as ASL communication (Blume, 1997: 46).

Any such auditory capabilities may operate outside the realm of conscious awareness, such as is the case with Blindsight which will be discussed later. Such capability, even in a subset of the D/deaf may help to lessen the perceived differences between hearing and deaf individuals. By decreasing the perceived 'otherness' extended by the hearing toward the deaf and vice versa, it may become possible to better facilitate acceptance between perceptual realities. Significantly, an emic approach to Deafness is specifically implied, as there is no notion of medicalizing the D/deaf physiology or social identity. Nor is there the notion of imposing hearing on the deaf (as is the case with cochlear implants), and there is no suggestion that residual hearing should be encorporated into the ideological construct of Deaf culture. The D/deaf remain so, with the only difference being the possibility that some degree of oral education and communication may be implicated. This in turn may allow more D/deaf individuals who express the desire to communicate effectively with the hearing, and to fucntion in some aspects of hearing society e.g., in the work place, to do so. They would still be able to maintain ties to their Deaf ideology of respecting and functioning within the realm of their natural physical

capabilities, as expressed in Chapter 1. As mentioned earlier, it has been suggested that multiple social identities (eg. hearing and Deaf), may contribute to psychological well-being. In such cases, failure in aspects of either the hearing or Deaf world, could be compensated for by competance in the other. This in turn inhibits role constriction (as may be imposed by the necessity of the deaf individual to function in either the hearing or Deaf world), and may increase competant-role expereinces (Thoits, cited in Lindenbaum and Lock, 1993: 259).

The present research will address both theoretical considerations concerning auditory capabilities in the deaf, as well as experimental inquiry into the actual existence of such a phenomenon.

Is there a cortical mechanism that subserves subconscious auditory perception in the profoundly deaf (similar to the phenomenon of Blindsight) which could help explain higher reading/comprehension in those educated verbally?

A phenomenon in the auditory system may exist that is similar in nature to, and mediated via subcortical mechanisms, as has been proposed with regard to the phenomenon of Blindsight (Ptito, A., Lepore, F., Ptito, M. & Lassonde, 1991). The current literature regarding the phenomenon of Blindsight will be briefly discussed in order to establish support for the possibility of discrete functioning of subcortical mechanisms. An anatomical relationship between sub-cortical structures associated with visual and auditory perception will be established in order to lend support to the possibility of subconscious capabilities being utilized by some deaf individuals. This mechanism may subserve higher reading level being achieved by the deaf when some verbal instruction is

made available to them. Studies involving lesions to higher cortical structures in the neo-cortex will be analysed in order to further extend validity to discrete, sub-cortical functioning. The assumption made in the present research is that in some deaf individuals, the auditory deficit is located in the neo-cortex and in some instances, sub-cortical structures may mediate the subconscious perception of auditory stimuli. Such subconscious perception may help the D/deaf to realize new capabilities, and impacts on social constructs as discussed.

A Description of Blindsight

The phenomenon termed Blindsight commonly refers to residual unconscious vision in an anopic visual field following damage to the striate cortex and encompasses "visual capacity in a field defect in the absence of acknowledged awareness" (Weiskrantz, 1986). This damage may arise via posterior cerebral artery infarction (Corbetta, Marzi, Tassinari and Aglioti, 1990) or from cortical lesion/ablation of the geniculocalcarine pathway. Some patients have also reported varying degrees of conscious awareness following such damage, including waves (Weiskrantz, 1986) and white halos (Perenin and Jeannerod, 1978). More frequently reported residual visual capacities involve the ability to detect moving displays such as striped bars (Blythe, Kennard and Ruddock, 1987) and the ability to use hand movements to localize visual stimuli in the blind field (Perenin et. al., 1978), where hand grasp is adjusted to match an unseen target. Common task paradigms used to evaluate Blindsight include forced choice responses. Specifically, subjects are presented with visual displays in their blind field and are required to choose between alternative

stimuli, the stimuli not being in conscious awareness (Mohler and Wurtz, 1977). Another approach involves evaluating the effect of simultaneously presented stimuli in the damaged and undamaged visual field.

The position that Blindsight is mediated via the extrastriate, secondary visual pathway

Research regarding Blindsight arguing for the discrete competence of subcortical, extrastriate, secondary visual pathways is best represented where ablation of primary visual cortex has been carried out. The argument is straightforward; if Blindsight exists when striate cortex is absent, then visual information is not thus relayed to higher centres in the brain. Rather, information is bypassing the striate cortex and is relayed via extrastriate pathways.

Ptito et. al., (1991) examined subjects who had undergone a procedure whereby an entire cerebral hemisphere was removed. These subjects, who incurred severe head trauma shortly following birth underwent surgery where one cerebral hemisphere was removed, sparing the thalamus and caudate nucleus. The age of the subjects during the operation ranged between 8 to 14 years. Due to the fact that these subjects had complete removal of a cerebral hemisphere, any residual vision could not be attributed to a spared striate cortex.

Participants were tested regarding their ability to detect and localize targets, some of which were stationary, moving, or flashing, and they indicated detection by pointing. Blank trials where no stimuli were presented were randomly interjected. Subjects could differentiate between real versus blank trials with > 80% accuracy. In their blind fields, all

subjects were observed to have the ability to detect stimuli to a significant degree. Subjects occasionally reported sensing the existence of the target in the blind field but pointed to the wrong field of stimulation. Subjects varied in their abilities to detect relative velocity trials involving presentations of discriminative pairs eg. rapid-rapid, rapid-medium etc. (Ptito et. al., 1991).

Ptito's group, in using hemispherectomized patients, appears to dismiss any involvement of striate cortex in accounting for patients' Blindsight.

The view that residual vision is exclusively subserved by extrastriate mechanisms has also been supported by studies concerning the Macaca mulatta monkey. This involves experiments where lesions in the striate cortex and superior colliculus (or both) resulted in specific visual deficits concerning the guidance of accurate visual saccades towards stimuli (Mohler and Wurtz, et. al., 1977). Specifically, Mohler's group carried out partial collicular lesions and discovered an increased latency for visual saccades and an increase in the frequency of corrective visual saccades in stimulus detection. When unilateral partial ablation of the striate cortex was undertaken, the monkeys were unable to detect a spot of light or make visual saccades in the direction of the stimulus. After 1 month of practice, the subjects were able to detect the stimuli and make saccades towards them. When lesions of the striate areas as well as the superior colliculus were performed, the subject was blind in the field related to the region corresponding to the area where the striate and collicular lesions were performed. It is therefore feasible that the superior colliculus alone, in the absence of functional primary cortex, is sufficient to allow for the subjects' detection of stimuli and initiation of saccades towards those stimuli. Although lesions in

either pathway produce visual anomalies, Mohler's study supports the hypothesis that the extrastriate pathway is an alternative to the striate, and may in fact be a compensatory mechanism in correcting for the deficits created by striate lesions (Mohler and Wurtz, 1977).

The information reviewed argues for the ability of the secondary extrastriate visual pathway to mediate residual vision or "Blindsight" in a region of cortical blindness. Specifically, a secondary pathway appears to function discretely from any influence of mediation via the striate cortex especially in hemidecorticated patients.

The auditory system and anatomical relationship to the visual system. Does anatomy suggest a phenomenon analogous to Blindsight in the auditory system?

A basic representation of the auditory pathway from the ear to the cortex is as follows. The vestibulocochlear nerve (cranial nerve 8) consists of two sets of fibres, the vestibular, extending from the vestibule and ampullae of the superior, lateral and posterior semicircular ducts and the cochlear fibres, extending from the cochlear duct and spiral ganglion of the cochlea. Nerve fibres extending from the cochlea synapse first in the ventral and then the dorsal cochlear nucleus, then in the superior olivary nucleus, then ascend lateral and then dorsal to the medial lemniscus, to the lateral lemniscus. This bundle then extends to the inferior colliculus, continues as the brachium of the inferior colliculus to the medial geniculate bodies and then via the sublenticular limb of the internal capsule to the auditory cortex in the anterior temporal gyrus (Snell, 1992: 814-30; Critchley and Henson, 1977: 39-40) (FIG 2). The complex anatomy of the auditory system has yet to be investigated in sufficient detail to yield an understanding of the neural

pathways between subcortical nuclei.

There is a close anatomical relationship between the auditory and visual systems. Beginning after the optic fibres have crossed at the optic chiasm, the optic tracts extend postero- laterally, superficial to the basis peduncli to the inferior pulvinar surface. The fibres of the optic tract terminate primarily via synapses with LGN (lateral geniculate nucleus) cells. Other fibres synapse in the pretectal nucleus and superior colliculus. From the LGN, fibres enter the cortical hemisphere in the sublenticular limb of the internal capsule, then via Meyer's loop, pass towards the temporal pole in the lateral wall of the ventricle and turn back to reach the visual cortex in the calcarine sulcus (Snell, 1992: 814-30; Critchley and Henson, 1977: 39-40). It is possible that the auditory system, due to its close anatomical relationship with the visual system, particularly with regard to the pathway of fibres extending through the superior and inferior colliculi, possess capabilities specific to subconscious perception of stimuli. Such capabilities may include a phenomenon in the auditory system analogous to Blindsight in the visual system.

The subcortical collicular pathways link visual and auditory perception

The hypothesized subcortical association between the visual and auditory systems via the collicular pathways has support from various studies. The knowledge of multi-sensory inputs to the colliculus is recent and not fully understood. For example, some visual saccade-related neurons in the deep and intermediate collicular layers discharge more vigorously when the signal for movement is a simultaneous audio-visual target, versus use of a single target of either modality in isolation (Peck, 1987). The superior

colliculus displays a great variety of projections (from a wide variety of neurons) to diverse areas of the central nervous system (Merideth and Stein, 1986). Stein, Merideth, Huneycutt and McDade (1987), have shown that behavioural orienting response is enhanced when auditory stimuli are presented at the same specific location as a visual target. Performance and neural response were observed to be depressed when auditory stimuli and visual targets did not correspond with regard to spatial location. Many collicular neurons have been found to not respond with equal vigour to a sound source, if the eyes were positioned in different directions from the sound source. Perhaps those cells encode the amplitude as well as the direction of the movement that is necessary for orientation towards a sound. This has been implicated in cells of the primate superior colliculus as well (Jay and Sparks, 1987). The implication seems to be that auditory information is gated by the position of the eyes in the cranial orbit. Thus, changes in eye position may alter audio-visual interaction.

Further evidence for the discrete functioning of subcortical areas

The discrete functioning of subcortical areas prior to the emergence of a functional neocortex has been determined by 2 - deoxy - [18 F] fluoro - D - glucose or FDG, positron emission tomography (PET) (Chugani, Phelps and Mazziotta, 1987). The energy demands of the brain are met by oxygen and glucose. By measuring the rates of these principal substrates' utilization, areas of cerebral functioning may be determined. The non-invasive technique utilizing PET with FDG, involves the kinetic measurement of compounds labelled with positron-emitting isotopes, and allows for the visualization and

quantification of local cerebral metabolic rates for glucose. Chugani et. al., (1987), found that human infants ≤ five weeks of age displayed the highest glucose levels in the thalamus, midbrain-brainstem, sensory motor cortex and cerebellum, particularly the phylogenetically older portion of the cerebellum, or vermis, while glucose utilization rates in the basal ganglia and remaining cortex were very low. Glucose level increase in much of the cerebral cortex and cerebellum was extant by approximately three months of age. By 7.5 months to 1 year of age, prominent utilization was extant in frontal and association cortices, and was similar to adult levels. This study also found that at birth, the caudate and lenticular nuclei were hypometabolic compared with the thalamus, but by 3 months glucose utilization approached mature levels. The pre and post-central gyri of the motor cortex and transverse temporal gyrus including the primary and association sensory areas, increased in activity from birth to 4 months. The primary and association visual cortices as well as the anterior cingulate gyrus and middle frontal gyrus, while inactive at birth, all increased in glucose levels over one year (Chugani, et. al, 1987). Since the human auditory cortex is not likely mature until approximately three months of age, it follows that the auditory abilities of neonates are intimately associated with subcortical midbrain functioning.

With regard to the auditory system, Evans (1968) found in cats, that any trend in tonotopic organization in the auditory cortex was likely to be representative of a residuum of subcortical levels. Evans (1968) found that some cortical neurons responded to tonal onset, termination, both onset and termination or to complex bursts of tone, clicks etc. Fifty percent of all cortical neurons were found to be either specifically or preferentially

sensitive to the location of the sound source. Conversely, responses of the auditory nerve and primary auditory neurons as measured individually via micro electrodes were excited by specific deflections of the basilar membrane in one direction. Neural discharges occurred which corresponded to its displacement towards the tectorial membrane (Brugge, Dubrovsky, Aitkin & Anderson, 1969). Thus, a single nerve fibre may derive its output from a specific location along the basilar membrane. It follows from this data that the auditory nerve and subcortical pathways which have yet to be investigated in great detail, may subserve detection of pure tones or specific sound frequency as coded at the basilar membrane (Schuknecht, 1958). In cases where human patients are inflicted with eg. temporal lobe lesions or acoustic neurinoma, such lesions (which may leave subcortical centres intact), could result in an auditory system that is capable of transmitting simple signals eg. pure tones, but can not process complex speech stimuli in complete detail.

It is evident not only from lesion studies ,but also from the observation of neonatal capabilities as discussed, that subcortical mechanisms are able to function discretely from higher visual and auditory centres. Although the auditory cortex is not likely to function at mature levels in the neonate, the subcortical detection and processing of auditory stimuli may actually be quite complex. In instances where patients are deaf due to various pathologies, it is feasible that a phenomenon analogous to Blindsight may exist in the auditory system, and is similarly mediated by subcortical mechanisms intimately associated with those that subserve Blindsight. It may be this subconscious auditory capability that subserves higher reading/comprehension levels for the orally/aurally educated, profoundly deaf individuals as noted in Chapter 2.

CHAPTER 4

INTRODUCTION / PURPOSE

In order to help substantiate the possibility of auditory detection being utilized by some profoundly deaf individuals, it is appropriate to consider not only the theoretical and anatomical research presented earlier, but also a practical experimental application. In order to accomplish this task, the present research utilized practical methodology familiar to the D/deaf, in order to simplify comprehension of the task at hand for the study participant, and also to facilitate the gathering of data. Specifically, common audiometric equipment, procedure, and familiar personnel likely allows the subject to participate more comfortably, and expertly, in a task which may go against the common sense of the study participants (ie. although you can not hear the sound stimuli, guess whether a sound was extant or not).

The objective of the experiment was to determine whether a phenomenon in the auditory system of the profoundly deaf may exist, which is similar in nature to Blindsight discussed earlier. The D/deaf may experience many audiological assessments during their lives in order to determine such factors as stability of their hearing loss (whether there is an improvement or decrement in the ability to detect sound stimuli, and whether adjustments in any assistive hearing devices are implicated), as well as to categorize the nature of the hearing loss (refer to Chapter 1). In utilizing appropriate equipment, and the assistance of a competent/experienced audiologist, the present study attempted to control

for any possible experimental bias regarding the determination of auditory capability in the study participants.

In the case of the present research, the specific etiologies of each participants' deafness was not known, i.e., whether physiological determinants of the deafness could be attributed to the middle ear, inner ear, cortical factors, etc. Therefore, the experiment potentially utilized a group of individuals similar, in one way, in that all were profoundly deaf, but perhaps quite different physiologically. The objective therefore was to take this possibility into consideration and to look upon the experiment as a pilot study to determine whether the phenomenon existed in some deaf individuals as a natural ability. The experimental procedure was also set up in such a manner as to account for the fact that a truly randomized control versus experimental group could not be distinguished, due to the unknown etiologies. Specifically, the study could have included some deaf individuals where deafness resulted from physical anomalies relating to the ossicles. In such cases, no sound stimuli would likely proceed to the subcortical or cortical structures that might permit a form of auditory processing. In other cases, where sound may pass up to subcortical structures (similar to the case in Blindsight discussed earlier) such perception might be facilitated. Since the only diagnosis available for the study participants was that of congenital deafness, it was not possible to know what type of deafness was being tested, for existence of a 'Deaf Hearing' phenomenon.

In functioning as a pilot study, the results obtained were meant to serve as an indication for future research possibilities, where a larger study sample with determined etiologies could be used in order to help determine specifically which profoundly deaf

individuals may show the phenomenon. Limited statistical analysis was carried out to help determine whether future research is indicated. The objective of the present research was also to help suggest reasons as to why those deaf individuals (see Chapter 2) educated orally/aurally with some sign language, were able to use their voice and displayed higher reading comprehension, versus those profoundly deaf educated via sign language only. The purpose of the experiment was also to determine any natural capabilities of the deaf. These could help shape the D/deaf identity and suggest the inclusion of some oral/aural options to the Deaf for consideration, which according to Deaf culture, were unnaturally imposed by hearing society. If some deaf individuals are able to perceive sound stimuli in some form, the inclusion of such natural ability may be incorporated into Deaf culture. If this results, the present research could help to raise reading/comprehension levels in some D/deaf individuals, lower stigmatization of the D/deaf by hearing society, as well as help the D/deaf realize their social goals as expressed in Chapter 2 of this study.

EXPERIMENTAL METHOD

Subjects/Participants

Sixteen volunteer subjects (18 years of age or older), seven males and nine females participated in the experiment. Numbers were used (1-16) to identify subjects for reasons of confidentiality. Study participants were all attending, or had attended the E.C. Drury School for the Deaf in Milton, Ontario. All were obtained via the posting of notices inside the school, and by the audiologist participating in the experiment asking students whether they would like to participate in the research study. All study participants were

profoundly deaf, which was confirmed via a diagnosis of congenital hearing loss, characterized by a sloping symmetrical hearing loss with a profound magnitude by the participating audiologist. The audiologist described the deaf participants as having no ability to perceive sound stimuli at normal levels of conversation when unaided. Other than profound hearing loss, no physical or other complications were extant in any of the participants. All individuals were prelingually deaf, and had throughout their education communicated with sign language only. No participant utilized their voice to communicate, and all were compensated for their participation.

MATERIALS

The auditory stimulus presented to study participants consisted of a 50dB narrow band noise, centred around 500Hz. The specific stimulus was selected by the participating audiologist as being appropriate of the purposes of the study (the stimulus must be outside the level consciously detectable by the study participants). The stimulus was presented via a GSE (Grason-Stadler) 16 audiometer through a speaker located inside a soundproof booth.

PROCEDURE

Each study participant was presented with one trial, consisting of thirty experimental presentations. These required a guess (forced choice paradigm as used in the determination of Blindsight (Mohler and Wurtz, 1977)), as to whether a sound stimulus had occurred. In order to randomize the presentations into stimulus (where a sound was presented) or non-stimulus (where no sound was presented), thirty pieces of paper, on

which fifteen were written stimulus and fifteen non-stimulus, were drawn from a container sixteen times. This yielded a unique experimental trial sequence for each participant, for a total trial length of 30 stimulus/non-stimulus sequences for each.

Prior to commencing the experimental trial, each study participant was asked to read a passage. The passage informed them that they would not, and were not expected to hear the experimental sound stimulus. However, they were to guess whether an auditory stimulus (a sound/noise) of some sort occurred when the audiologist asked them for a response (yes or no). After participants read the passage, they were also instructed with regard to the passage and requirements by the audiologist via sign language. The experimental environment was identical to that utilized in a typical audiological assessment. Study participants sat in a sound proof room facing the audiologist through a clear window. The sound stimuli were presented through a speaker located in the soundproof room. The sound/no sound stimulus was delivered by the author who did not face the participants. The audiologist was not aware whether a stimulus had been presented or not. This controlled for the possibility that facial expression exhibited by the person in contact with the participants might elicit a particular response, and potentially bias the results. Study participants were instructed when to guess whether or not an auditory stimulus occurred by the audiologist who signed "guess now". Following the guess, the next experimental presentation occurred. The atmosphere was relaxed, and the timings of the experimental stimulus presentations or non presentations were determined by the audiologist, after the participants made their guess. The experimental procedure therefore followed a paradigm familiar to the study participants.

Table 1 (see Results) represents the specific experimental stimulus presentations for each participant and the observed responses. When the participant guessed that a stimulus had occurred, a checkmark was recorded next to the box which indicated what had actually been presented. This facilitated calculation of the number of guesses (out of 15 actual stimulus presentations from the total 30 for each trial), that a stimulus had been presented when it actually had, versus when no stimulus was presented. All participants were tested without hearing aids. According to the audiological information available to the audiologist, the sound stimulus could not be heard by any of the participants. No participant reported being able to hear any of the stimuli presented.

The study participants who displayed a better than chance guess that an auditory stimulus had been presented when one actually had, had their results tabulated (refer to Table 2, Results).

A directional, dependent, 2-sample t-test was then carried out to analyse whether the mean of their correct guesses (guessing an auditory stimulus had been presented when one actually occurred) was significantly higher than the mean of incorrect guesses (subjects guessed that a stimulus had been presented when none occurred). As participants were only required to guess when a stimulus had occurred, if an individual guessed that no stimulus occurred when no stimulus was presented, this was not included as a correct guess. The present research was not specifically concerned with the correct perception of the absence of auditory stimuli. If the individual guessed that no auditory stimulus occurred when one actually had, this was scored as a different error than if the subject guessed that a stimulus had been presented when none had. This was also

compared via a directional, dependent 2-sample t-test, to determine whether the mean of correct guesses (that an auditory stimuli had been presented when one occurred) was significantly higher than the mean of incorrect guesses (please refer to Table 3, Results).

RESULTS

(section begins on next page)

TABLE 1

(Participants 1-8, presentation number 1-14)

Auditory discrimination results: guesses to auditory stimulus presentations and non-presentations

KEY: Pr = presentation number, Ap = actual presentation, R = response, Y = yes, N = no, ✔= indicates participant guessed that a stimulus had been presented

	PARTICIPANT NUMBER																			
	1		2		3		4		5		6		7		8					
Pr	Ap	R	Ap	R	Ap	R	Ap	R	Ap	R	Ap	R	Ap	R	Ap	R	Ap	R	Ap	R
1	Y	✔	Y	✔	Y		N		Y	✔	Y	✔	Y	✔	Y		Y		Y	
2	Y		N		Y		Y	✔	Y		N	✔	N		N		N		N	
3	Y	✔	N		N		Y		Y	✔	Y	✔	Y	✔	Y		Y		Y	
4	N		N		Y		Y	✔	N	✔	N	✔	N		N		N		N	
5	Y	✔	N		Y		Y	✔	N	✔	Y		Y		Y		Y		Y	
6	N		Y		Y		N		Y		N		N		N		N		N	
7	N		Y		N		Y	✔	N		Y		N	✔	Y	✔	Y	✔	Y	✔
8	Y	✔	N		Y		Y		Y	✔	Y	✔	N		N		N		N	
9	N		Y		N		N	✔	Y	✔	N		N		Y		N		Y	
10	N	✔	N		Y		N		Y	✔	Y		Y	✔	N	✔	Y	✔	N	✔
11	Y	✔	Y		Y		N	✔	N	✔	N		Y	✔	Y		Y	✔	Y	
12	Y	✔	N		N		N		N	✔	N		Y	✔	N		N		N	
13	N		N		N		Y	✔	N		Y		N		Y		N		Y	
14	N		Y		N		N	✔	N		Y	✔	Y		N		N		N	

TABLE 1

(participants 1-8, presentation number 15-30)

KEY: Pr = presentation number, Ap = actual presentation, R = response, Y = yes, N = no, ✔= indicates participant guessed that a stimulus had been presented

	PARTICIPANT NUMBER																			
	1		2		3		4		5		6		7		8					
Pr	Ap	R	Ap	R	Ap	R	Ap	R	Ap	R	Ap	R	Ap	R	Ap	R	Ap	R	Ap	R
15	Y	✔	N		Y		Y		N		Y		N	✔	Y					
16	N		Y	✔	Y		N		N		N		Y		N					
17	Y		Y	✔	Y		N		Y		Y		N		Y	✔				
18	Y		Y		Y		Y	✔	Y	✔	Y		Y	✔	Y	✔				
19	N	✔	Y		Y		Y		N	✔	Y		Y	✔	Y					
20	N		N		N		N		Y		N	✔	N		N	✔				
21	Y	✔	Y		N		N		N		N		N		Y					
22	Y		Y		Y		Y		Y		N	✔	Y	✔	N					
23	N		Y		N		N		N		N		Y	✔	N	✔				
24	Y	✔	N		N		N		N		Y		Y		N					
25	N		N	✔	N		N		Y	✔	N		N	✔	N					
26	N	✔	N		Y		Y	✔	Y	✔	Y		N		Y	✔				
27	Y		N		N		N	✔	Y	✔	Y		Y		Y					
28	N	✔	N		N		Y	✔	N	✔	N		Y	✔	Y					
29	Y		Y		N		Y		N		N	✔	N		N					
30	N	✔	Y		N		Y		Y		N		N	✔	N					

TABLE 1

(participants 9-16, presentation number 1-14)

Auditory discrimination results: guesses to auditory stimulus presentations and non-presentations

KEY: Pr = presentation number, Ap = actual presentation, R = response, Y = yes, N = no, ✔= indicates participant guessed that a stimulus had been presented

	PARTICIPANT NUMBER																			
	9		10		11		12		13		14		15		16					
Pr	Ap	R	Ap	R	Ap	R	Ap	R	Ap	R	Ap	R	Ap	R	Ap	R				
1	Y	✔	N	✔	Y		N		N	✔	Y	✔	Y	✔	N					
2	Y	✔	Y	✔	Y		Y	✔	N		N	✔	Y	✔	Y					
3	Y		Y		N		N	✔	N		Y		N	✔	Y					
4	N	✔	N		N	✔	Y		Y	✔	Y		N	✔	Y					
5	Y		Y		Y		N		Y	✔	N		Y		N					
6	N		N		Y		N		N	✔	Y		N		N					
7	Y		Y		Y		Y	✔	N		N		Y		Y	✔				
8	N		N	✔	N		N	✔	Y		N		N		N					
9	N		N		N		Y		Y		Y		Y		Y					
10	N		N		Y		N		N		N		N		N					
11	Y		N		N		Y		Y		N		N		Y					
12	N		N	✔	Y	✔	N		Y	✔	N		Y		Y	✔				
13	Y	✔	Y		Y		N		N		Y		N		N					
14	N		Y		N		Y		Y		Y		N		Y					

TABLE 1
(participants 9-16, presentation number 15-30)

KEY: Pr = presentation number, Ap = actual presentation, R = response, Y = yes, N = no, ✔= indicates participant guessed that a stimulus had been presented

	PARTICIPANT NUMBER																			
	9		10		11		12		13		14		15		16					
Pr	Ap	R	Ap	R	Ap	R	Ap	R	Ap	R	Ap	R	Ap	R	Ap	R	Ap	R	Ap	R
15	N		Y		Y		N		N		Y		N		N		N			
16	N		Y		Y		Y	✔	N	✔	Y		Y		Y					
17	N		N		Y		Y	✔	Y		N		N		N	✔				
18	Y	✔	Y	✔	N		N	✔	N		N	✔	N		N					
19	Y	✔	N		N		Y	✔	Y		N		Y	✔	N					
20	Y	✔	Y		Y		N		Y		Y		Y	✔	Y					
21	N		N		Y		Y	✔	Y		Y		N		N					
22	N		N		N		Y	✔	N	✔	N		Y	✔	Y					
23	Y		Y		Y		N	✔	N		Y		Y	✔	Y					
24	Y	✔	Y		N		N		N		N		N	✔	N					
25	N	✔	N	✔	Y		Y	✔	Y		Y		N	✔	Y					
26	Y		N		N		Y	✔	Y		N		Y		N	✔				
27	N		Y		N		Y	✔	N		Y		N		Y					
28	Y		Y		N		N	✔	Y	✔	Y		Y	✔	Y					
29	N		N	✔	N		N	✔	N		N		Y	✔	N	✔				
30	Y	✔	Y		N		Y		Y	✔	N		Y	✔	N					

Of the sixteen profoundly deaf individuals who took part in the experiment, seven (participants: 1,4,5,7,9,12,15 (please refer to Table 1)), exhibited better than chance guessing that an auditory stimulus had occurred when one actually was presented. The following table summarizes these observations.

TABLE 2

Summary of auditory discrimination results:
Number of guesses out of 15, that an auditory stimulus had been presented when it actually had (correct) versus guesses that a stimulus occurred when no stimulus was presented (incorrect)

Study Participants	Correct Guesses	Incorrect Guesses	±D	D^2
1	9	5	4	16
4	8	4	4	16
5	9	6	3	9
7	10	4	6	36
9	8	2	6	36
12	10	6	4	16
15	9	4	5	25
TOTAL	$\sum = 63$	$\sum = 31$	$\sum = 32$	$\sum = 154$
	$\bar{x}_{correct} = 9$	$\bar{x}_{incorrect} = 4.43$		

A directional, dependent, 2 sample t-test was carried out, analysing whether the mean of correct guesses (participants guessed an auditory stimulus had been presented when one had actually occurred) was significantly higher than the mean of incorrect guesses (participants guessed that a stimulus had been presented when none occurred)

according to the data contained in TABLE 2:

$H_o : \bar{x}_{correct} = \bar{x}_{incorrect}$

$H_I : \bar{x}_{correct} > \bar{x}_{incorrect}$

$$SD = \frac{\sqrt{\frac{\Sigma D^2 - \frac{(\Sigma D)^2}{n}}{n-1}}}{\sqrt{n}} = \frac{\sqrt{\frac{154 - \frac{(32)^2}{7}}{6}}}{2.65} = 0.43$$

$$t\,(n-1) = \frac{\bar{x}_{correct} - \bar{x}_{incorrect}}{SD}$$

$$t\,(6) = \frac{9 - 4.43}{0.43}$$

$t_{observed} = 10.63$

$t_{critical} = \pm 1.943$

$\propto = 0.05$

$\therefore$ **$t_{observed} > t_{critical}$**

$\therefore$ **reject null hypothesis**

$\therefore$ **$\bar{x}_{correct} > \bar{x}_{incorrect}$ ($p < 0.05$)**

Therefore, the mean of correct guesses that an auditory stimulus had occurred when one was actually presented, was significantly greater than the mean of incorrect guesses that an auditory stimulus had occurred, when in fact none had been presented.

TABLE 3

Summary of auditory discrimination results:
Number of guesses out of 15, that an auditory stimulus had been presented when it actually had (correct) versus guesses that no auditory stimulus occurred when one actually had (incorrect)

Study Participants	Correct Guesses	Incorrect Guesses	±D	D^2
1	9	6	3	9
4	8	7	1	1
5	9	6	3	9
7	10	5	5	25
9	8	7	1	1
12	10	5	5	25
15	9	6	3	9
TOTAL	$\sum = 63$	$\sum = 42$	$\sum = 21$	$\sum = 79$
	$\bar{x}_{correct} = 9$	$\bar{x}_{incorrect} = 6$		

A directional, dependent, 2 sample t-test was carried out, analysing whether the mean of correct guesses (participants guessed an auditory stimulus had been presented when one actually occurred) was significantly higher than the mean of incorrect guesses (participants guessed that no stimulus had been presented when one actually had) according to the data contained in TABLE 3:

$H_o : \bar{x}_{correct} = \bar{x}_{incorrect}$

$H_I : \bar{x}_{correct} > \bar{x}_{incorrect}$

$$SD = \frac{\sqrt{\frac{\Sigma D^2 - \frac{(\Sigma D)^2}{n}}{n-1}}}{\sqrt{n}} = \frac{\sqrt{\frac{79 - \frac{(21)^2}{7}}{6}}}{2.65} = 0.62$$

$$t\,(n-1) = \frac{\bar{x}_{correct} - \bar{x}_{incorrect}}{SD}$$

$$t\,(6) = \frac{9 - 6}{0.62}$$

$t_{observed} = 4.84$

$t_{critical} = \pm 1.943$

$\propto = 0.05$

$\therefore$ **$t_{observed} > t_{critical}$**

$\therefore$ **reject null hypothesis**

$\therefore \bar{x}_{correct} > \bar{x}_{incorrect}$ **($p < 0.05$)**

Therefore, the mean of guesses that an auditory stimulus had occurred when one was actually presented was significantly greater than the mean of incorrect guesses that an auditory stimulus did not occur, when one had been presented.

DISCUSSION

The results of the preceding experiment suggest the possibility of a natural phenomenon (not enhanced via hearing aids, surgical procedures, etc.) existing in the auditory system of some profoundly deaf individuals. This phenomenon appears to subserve the subconscious perception of auditory stimuli, permitting them to guess correctly that an 'inaudible' stimulus occurred when one was presented. Indeed, in seven of the sixteen profoundly deaf study participants, this correct guessing was shown to be significantly higher than incorrect guessing. This was true for both error types, i.e., guessing that a stimulus occurred when none was presented, as well guessing a stimulus had not been presented when one actually had.

One must interpret the results of the experiment with caution. Certainly the small sample size does not imply that all profoundly deaf individuals share this perceptual capability. Indeed, it is possible that many, or perhaps most profoundly deaf may not. It would also be appropriate in future research on this topic, to have available the specific etiologies pertaining to the individuals' deafness. This information was not available in the present research, and so it remains unknown which mechanisms subserved the phenomenon, and whether those individuals who did show the phenomenon all shared a similar etiology. It is also not known whether the ability to detect auditory stimuli as exhibited by some in the experiment, is a transitory phenomenon (the ability may not be reliably available). It is also possible therefore, that the individuals who did not display the phenomenon may have the capability, but were unable to utilize it during the present experiment. Clearly longitudinal study would be of benefit, although no precedent exists

for a determination of an appropriate length of study to track possible improvement in 'detection' of stimuli.

All participants had read the instructions for the experiment, and also had the instructions conveyed to them via sign language, which all participants stated they understood. However, the concept of 'guessing' whether a sound was presented or not appeared to remain an uncomfortable request for some of the participants. Specifically, some of the individuals who did not appear to detect any of the auditory stimuli made comments (even during the experimental trial), such as: 'I can't hear anything'. None of the seven participants who appeared to display the phenomenon made such comments. It also remains unknown whether Deaf culture contributed to participants' mind set during the experiment. It is possible that some who participated in the experiment were not comfortable (although interested and volunteered for the study, and understood they could terminate the experiment at any time), with concentrating on anything which had to do with utilizing their auditory sense. All participants were told that the intention of the experiment was not to make an attempt to determine if they could 'hear' the stimulus. However, it is feasible to make the assumption based on comments such as: 'I can't hear anything', that the task required may have been difficult to comply with on some level. All participants were quite familiar with being tested for residual hearing, but the concept of guessing if an auditory stimulus was extant without being required to specifically listen for it may understandably be a difficult request for some. It is possible that for some profoundly deaf individuals, the ability to guess correctly that sounds consciously inaudible to them occur, requires some form of training involving feedback for correct/incorrect

responses. It remains unknown whether some may be able to become sensitive to such capability. This may be similar to the concept of 'learning to listen', which involves those deaf with residual hearing being trained to make better use of such capability via training (Vaughan, 1976: 52).

Another aspect worthy of future consideration concerns the specific aspect of a sound stimulus which subserves the phenomenon observed in the present study. In this experiment, a broad band stimulus was used, as it was not known which aspect of an auditory stimulus (if any) would be processed by the profoundly deaf participants. It was assumed that any subconscious detection of auditory stimuli in the profoundly deaf might be mediated by subcortical mechanisms. This was based on various factors: the phenomenon of Blindsight, as discussed, which has been shown to likely involve such cortical regions (Rafal, Smith, Krantz, Cohen and Brennen, 1990: 118), and the close anatomical link between the visual and auditory senses specific to these regions (as outlined in the present research, refer to Chapter 2). Also, human neonates utilize subcortical structures prior to the emergence of patent neo-cortical functioning, and these subcortical abilities, while perhaps not lost, are suppressed by higher cortical centres later on in life (Morton, 1987). As mentioned, training could perhaps reverse suppression of subcortical capabilities. It is possible that such capability might also be brought into conscious awareness on some level. However, another possibility remains which could not be addressed in the present study due to technical constraints. Specifically, the possibility remains that neural plasticity subserves the phenomenon of Deaf Hearing taking place via other higher, rather than subcortical, centres. Perhaps future research could

utilize FDG (2-deoxy-[18F]-fluoro-D glucose), PET (positron emission tomography) (Chugani, Phelps and Mazziotta, 1987). As the energy demands of the brain are met by oxygen and glucose, one could establish specific areas of cerebral functioning during 'inaudible' sound stimulus presentations. This would be possible by measuring and comparing the rates at which glucose is utilized in these cortical areas during sound stimulus trials.

Why might only subconscious detection of auditory stimuli in the profoundly deaf exist?

It is indeed a great challenge to approach the D/deaf world from an emic approach with regard to anthropological study. This is especially the case when one attempts not only to understand/accept and represent the emic point of view, but also attempt to explore what I will express as an attempt at a sensitive, yet wholly encompassing inquiry into aspects of the D/deaf world. Significant difficulty arises in attempting to understand what it means to not function as a hearing individual. As mentioned earlier in the present research, the reality of deafness is experienced differently by those who subscribe to Deaf culture, versus those who do not. At the outset of this study, the medical view of deafness was shown to include a consideration of treatment options, some physically quite invasive, which sought to correct damage to a pathological system. As discussed, some deaf share this view, and wish any possible deficit to be surgically repaired or made less traumatic via hearing aids. Others, who embrace Deaf culture clearly do not.

The experiment of the present chapter attempted to present natural ability not disability. This thesis does not seek to medicalize the D/deaf sensory/social reality, and

does not wish to contribute to the propagation of stigma toward the D/deaf by hearing society as suggested in Chapter 2. Any natural ability may be embraced by the Deaf, as is sign language, which was also described as a natural adaptation to the sensory reality of deafness. The following brief hypothesis concerns why/how subconscious auditory perception may exist in some deaf individuals.

This information may be used by the D/deaf as a possible means of understanding why specific auditory ability may be a natural part of their sensory experience, while conscious hearing may not. This is an attempt to help demystify the deaf physiological reality.

A theoretical substrate for subconscious perception of auditory stimuli

Thalamo-cortical projections convey information to the cortex in terms of signals sent to the thalamus via subcortical collicular nuclei. These nuclei convey to the cortex the perception pattern as recognized by the thalamus. The cortex in turn sends a back projection to the thalamus. This consists of data which has been integrated with regard to parts of the auditory stimulus as perceived via the subcortical collicular nuclei, and then via the thalamus to the cortex (Jones and Powel, 1971). The integrated data remains out of conscious awareness until non-specific thalamic projections synapse over a large portion of the neocortex (Jones, 1985). The thalamus may thus project back to the cortex integrated data, which only then is perceived on a conscious level. When interference in this cortical back projection is extant, it is possible that only subconscious auditory processing remains.

According to Crick (1984) the thalamus acts as a gateway to the cortex, and the reticular complex (a layer of cells on the thalamic surface through which neural connections between the thalamus and neocortex pass) acts as a guard to this gateway. The reticular complex acts in an inhibitory role, sending inhibitory projections within the complex itself, as well as to the thalamic origin. Inhibition by the reticular complex may occur when an error is detected. Specifically, an error might consist of a discrepancy between the neural signal sent via the thalamus from subcortical representations of the stimulus, and the return signal sent from the point-to-point cortico-thalamic fibres following integration of the complex auditory signal.

The mature neocortex as discussed, sends a massive projection of neurons back to the thalamus. In order for these neurons to find their way through their environment to targets in the thalamus, the neural targeting of cortico-thalamic projections is pioneered by early transients. These traverse a specific pathway and are thought to be required for the establishment of mature projections (Norlander, 1987; Norris and Kalil, 1990). The pathways established by pioneer neurons are followed by later neurons after pioneers die, and mature axonal pathways are established (Kuwada, 1986). Kuwada (1986) determined in ablation studies that mature neurons may fail to develop normally in vertebrates in the absence of pioneers. Subplate neurons (transient pioneer neurons) which establish neural pathways between the neocortex and thalamus, extend the first neocortical neurons, are generated around day 24 post conception (or embryonic "E" 24) (Luskin and Shatz, 1985b), and project to both the thalamus as well as the colliculi (McConnell, Gosh & Shatz, 1989).

Pioneer neurons, establishing the cortico-thalamic pathway of mature neurons

which would be involved in the return projection of integrated auditory stimuli, are found to be much more complex in terms of their arborizations compared with mature neocortical neurons (Norlander, 1987; Kim, Shatz & McConnell, 1991). Therefore, it is feasible that if the subplate neurons do not die in some cases, but rather anastomose with later forming, mature neurons, a situation could arise where cortical back projection to the thalamus is interfered with. This could result in a mismatch between the fundamental nature of the initial stimulus, and the back projection information which should represent an elaboration and integration of the initial stimulus (Bransford, Barclay & Franks, 1972). Instead of the elaboration of the initial stimulus, patent subcortical functioning may subserve the detection of some aspects of the stimulus, but not others. In support of this hypothetical situation, it has been noted that in the developing spinal cord, Rohon-Beard neurons (pioneers of the longitudinal spinal cord tract) must die off in order for mature neurons to form properly (Kuwada, 1986). Another feasible possibility is that due to an as yet undetermined mechanism, the subplate neurons do not subserve the correct guidance of mature neuron trajectory to their targets. In such an instance, the initial auditory stimulus would perhaps pass up to the correct neocortical target. However, the descending projection could lead to an incorrect aspect of the thalamic nuclei. This may propagate a mismatch, and inhibition via the reticular complex of that information being passed by the thalamus to diffuse areas of the neocortex for conscious perception. Contributors to the pathological development of cortico-thalamic subplate pioneers could also involve morphogens acting on the fetus during early formation of the central nervous system.

FURTHER CONSIDERATIONS

The results of the present experiment suggested that a natural phenomenon may exist in some deaf individuals, which allows for correct guessing when auditory stimuli of unknown specificity occur. It is of interest to determine how such natural ability might impact on the deaf person who possesses it. This is also of interest to those individuals who may subscribe to Deaf culture, and wish to consider what may be available to perhaps better meet their needs. Recall in Chapter 2 that those profoundly deaf who had been educated orally/aurally with some sign language, displayed higher reading/comprehension ability, versus those who had been educated via sign language only. The following considerations concentrate on how the natural abilities (as are accepted by Deaf culture) in some profoundly deaf, may indicate some oral/aural education.

How the profoundly deaf may utilize the subconscious perception of auditory stimuli in oral/aural context - implication of the appropriateness of some oral/aural education for the profoundly deaf

If the profoundly deaf are able, in some cases, to subconsciously perceive auditory stimuli, one can not assume that the stimuli are perceived in their entirety. For example, if subcortical mechanisms subserve such subconscious detection which is available (as the experimental paradigm in the present research suggests) on some level, it would likely include immature capability. The capability is likely immature in the sense that perception via subcortical mechanisms does not include the elaboration of stimuli as higher order cortical processing would. Such higher order processing by the auditory cortex may be extant beginning around three months of age in the human neonate. During this time EEG

patterns (Berg and Berg, 1987), as well as neural arborization in the cerebral cortex (Conel, 1963) begin to reach mature adult levels.

Prior to three months of age however, human infants are capable of processing various aspects of sound stimuli. Such capability is likely mediated by the functional subcortical pathways discussed earlier. For example, subcortically mediated capabilities regarding the auditory system in humans are known to exist. For example, three days after birth, neonates who were read stories by their mothers while still in utero, preferred to hear the story read by their mothers' voice over other voices reading the same story (DeCasper and Spence, 1986). Also, human fetuses between 35-38 weeks gestation are able to discriminate sounds via habituation paradigms (Lecanuet, Granier-Deferre and Busnel, 1989). It is feasible that the transmission of sound (externally and then through various bodily structures of the mother to the fetus), does not subserve clear fetal perception of the distinct nature of various spoken words. Such auditory stimuli would likely be quite 'muted' or 'muffled'. Therefore, subcortical processing of auditory stimuli can not likely differentiate the minute detail of auditory stimuli. Nevertheless, fetuses who only have at their disposal subcortical processing in the absence of a mature neocortex, are still able (even with affected auditory stimuli presented to them) to recognize, distinguish, and prefer specific sounds.

Subcortically mediated processing (extant in fetuses, neonates and perhaps the profoundly deaf in the present research) must operate therefore, on a different, less detailed aspect of the auditory environment. This aspect may comprise the specific prosody of auditory stimuli. The prosody which may be processed includes such factors

as the rhythm, pitch, stress or intonation of speech. It is perhaps interesting to note that infant directed speech, which is distinct from patterns of adult speech, includes increased pitch, slower tempo, greater pitch range and rhythmic regularity (M. Papousek, H. Papousek and Bornstein, 1985) and is naturally elicited by human caregivers in the presence of an awake infant (Fernauld, 1984). Also, exaggerated speech patterns and a smiling face were often presented by hearing people toward the deaf (see Chapter 2 of the present paper). Perhaps in the case of infants, this prosody and gestural specificity facilitates the processing of auditory stimuli. In the profoundly deaf however, such speech patterns are perceived by the deaf as exaggerations extended to them by the hearing, because the hearing perceive them as being mentally slow (refer to Chapter 2). It is ironic that the perception by hearing society of the deaf, as their requiring special attention (Chapter 2), with regard to meeting hearing communication standards, acts to perpetuate the stereotype and stigma, which may place the deaf in educational settings that do not utilize speech. The special attention offered, including sign language only, further ensures that mainstream communication ability is not achieved by the deaf. Yet, the 'special' attention may actually more appropriately include some oral/aural education for the profoundly deaf, in addition to sign language. The prosody of speech conveys important contextual cues of spoken language. For example, rising pitch and increased rhythm may convey excitement, and uneasiness on the part of the speaker, while lower pitch and slower speech rhythm may indicate the opposite. These are significant cues pertaining to the nature of communication which may enhance appreciation of social situations. Appreciation of other individuals' state of mind may then subserve a correct, situation

specific response. If some profoundly deaf are capable of gaining access to subcortical processing which transmits prosodic aspects of oral/aural language, this has implications for Deaf culture. Specifically, it may be appropriate to consider enhancing oral/aural abilities in some D/deaf, which may alter the segregated nature of the Deaf community from mainstream society.

With regard to the utilization of some oral/aural education for the profoundly deaf, it may be necessary to consider specific aspects of training which relate to subcortical ability. For example, phonological recoding ability, pertaining to linking graphemes to phonemes, and being able to reproduce these associations may require special care. In order to enhance the automaticity in visual word recognition and pronunciation, and reduce perseveration in oral production of graphemes, it may be effective to establish a specific prosody for the presentation of distinct letter combinations at first (eg. the word 'no' presented as a specific pitch with distinct rising or falling pitch contour), and later with entire words. Indeed, Tulving and Thomson (1973) indicated that even in hearing individuals, learned (written) words could not be successfully orally generated when contextually encoded, unless the original linguistic context was present. Since some profoundly deaf individuals may be able to subconsciously detect auditory stimuli including prosodic elements of speech, it may be necessary to establish and retain a specific prosody for words during oral/aural training involving written words. This would help lessen the prosodic incongruence utilized in everyday speech which may contribute to the frustration some deaf could experience in oral/aural learning contexts. A non-challenging grapheme to phoneme learning environment may enhance oral/aural expertise

in those profoundly deaf who may possess the physiology that permits the subconscious detection of some aspects of auditory stimuli. As discussed earlier in the present research, this physiology remains unknown, and further research is indicated. Eventually, it may also be possible to initiate a longitudinal study, in order to determine whether the subconscious detection might be brought into conscious awareness via a reward/feedback paradigm when the deaf individual so desires.

CHAPTER 5

CONCLUSION / RESEARCH APPLICATIONS

This thesis attempted to further knowledge that would contribute to the understanding of chronic disability pertaining to the Deaf. It is concerned with how they are perceived by mainstream society, and how misperceptions of the D/deaf contribute to their perception of self, and the hinderance of their progress in terms of education and cultural integration into the mainstream. This was a contra-materialist inquiry (Hahn and Kleinman, 1983) emphasizing the importance, not only of material anatomical deficiency vs capability, but also non-material considerations of culture, and the influence of consciousness and perception toward the understanding of illness and disease. It appears that an intercultural dynamic is established between the hearing and the Deaf, which ultimately may disempower the Deaf. This is expressed in low levels of reading/comprehension in some D/deaf, which may reduce the possibility of those educated via sign language only, to have the self-confidence to integrate successfully into mainstream society. This desire was expressed by the D/deaf individuals in the research presented. The possibility of a "Deaf Hearing" phenomenon in the auditory system in a subset of profoundly deaf individuals, that is similar to the established phenomenon of Blindsight, (supported via close association of visual and auditory subcortical architecture) is interesting. It lends support to the findings in this thesis, that those Deaf individuals educated via oral/aural communication and some sign language, had achieved a

reading/comprehension grade level many years ahead of those educated via sign language alone. It appears that the chronic nature of deafness, when perceived as a dysfunction by those in mainstream society who are in a position to dictate educational policy, and the continued exclusive association of the Deaf with others similarly afflicted, may be significant. The exclusion of the D/deaf from mainstream society results from mainstream society's acceptance of segregation from dysfunctional persons. However, as exhibited in the present research, societal role restriction of the deaf educated via sign language only, as exhibited in lower communication facility (reading/comprehension education level), may be an avoidable artifact of mainstream societal prejudice. The higher reading levels and verbal communication ability exhibited by those profoundly deaf educated by means other than the univalent 'sign language' only approach, suggests that the construction of the Deaf identity may in some cases be inappropriate. Specifically, the accompanying role loss of some D/deaf individuals in mainstream society, and deaf identification with a cultural construct (Deaf culture) which appears in part to be subserved by mainstream misperceptions of deaf abilitites from a young age, may very well be other than illness related (Estroff, 1993: 252). Indeed, this illness identity is perpetuated, according to Snow and Anderson (1987), via such concepts as distancing, for example, of the deaf from hearing society via the perception of greater disability than actually exists in terms of ability to function in mainstream society, leading to separate education. Another such concept is that of embracing, for example, of the deaf toward disability via restricted association with similar others in educational settings, set up by hearing society to "meet needs". The appropriateness of the establishment of a separate culture for the deaf, which

according to interviewees in the present research is partially warranted because they are different (deaf not hearing), may not only serve to establish an appreciation of disability or difference, but may identify functioning within a limited range of societal possibilities (Estroff, 1993). Future scientific consideration of how any auditory capability might be made available to the Deaf (for those individuals where specific structural deficits in the auditory or cerebral anatomy are not extant) might include the development of some form of auditory sensitivity training. Could subcortically mediated perception of auditory stimuli be brought into conscious awareness to help the Deaf? In order to attempt to bring subconscious detection of auditory stimuli into conscious awareness, a conditioning paradigm would have to be implemented which would award individuals for e.g., correctly judging from which direction a "subconsciously" perceived sound originated. The ability for subcortical mechanisms to process such information is not unfeasible. For example, the central nuclei of the inferior colliculi receive input from lower binaural centres in the superior olivary complex which arises from the lateral superior olive, dorsal nucleus of the lateral lemniscus and periolivary nuclei, and there are connections between left and right inferior colliculi (Fitzpatrick, 1975; Merzenich and Reid, 1974; Rockel and Jones, 1973). These could perhaps permit directional judgments to be formed on the basis of intact subcortical functioning in the absence of a properly functioning auditory cortex.

It is possible that although the complex cortical modulation of ascending subcortical signals may be lost, the initial sensory representations of the sound stimulus as encoded by cochlear nerve fibres is still available to some deaf individuals. It may be indicated therefore, that if such auditory representations are available, psycho-acoustic

research regarding the appropriate compensation for cortical hearing loss might more appropriately address which (subcortical or cortical) surviving auditory capabilities are of most benefit to the individual. In this way enhancement of either subcortical capabilities via sensitization, or higher cortical capabilities could be applied (prosthetically with hearing aids).

It has been observed that hearing children who receive phonics instruction read with a higher degree of proficiency than those who were instructed to read via whole word identification (Becker and Gersten, 1982), which may perhaps be similar to ASL signing? Also, reducing target behaviour to components and formulating them into a whole (Koorland, 1986) could be studied extensively to determine more effective methods of language acquisition. The discovery of possible subconscious auditory perception is encouraging, and may play a role in addressing the chronic 'disability' of the deaf. Regardless of such a possibility, those profoundly Deaf individuals with some oral/aural education appear to be hindered to a lesser extent by the disempowering stereotypes which may be attributed to the Deaf by mainstream society. This is characterized by fulfilment of integration into mainstream society, an expressed wish of all study participants, as well as higher reading/comprehension levels, versus non-orally educated Deaf individuals.

This thesis opens possibilities for consideration which could alter the inappropriate stereotype ascribed to the Deaf by hearing society, and result hopefully in a more fully encompassing realization of opportunities available to the Deaf, as well as improve the self-image of some Deaf individuals. The benefits of some verbal education for the Deaf

are implicated in altering the power relations which objectify them, and perpetuate the identification of the self with illness and disability.

The multi-disciplinary considerations utilized in the present research counter the position that anthropologists should be concerned with meaning and interpretation at the expense of causal analysis of the problem at hand (Geertz, 1973). Indeed, as suggested by Hahn and Kleinman (1983), it appears that appropriate inquiry into bettering a particular chronic/pathological condition may necessarily include a dialectic of biological, socio-cultural and resulting psychological aspects. Utilizing these considerations (which hold truths individually in the medical understanding of deafness, mainstream hearing culture, and Deaf culture), may aid in the alleviation of noncomprehension and mututal non-recognition between the 'disabled' D/deaf, and mainstream hearing society. This may ultimately lead to a betterment of the deaf life reality.

The D/deaf world consists of a complicated domain. In an anthropological study of this population, a completely emic approach is extremely difficult, especially due to the fact that diverse factions exist within the D/deaf world. While the deaf are willing to subscribe to a medicalized approach to 'bettering' their physiological differences (as compared with the hearing world) the Deaf are not. The outcome of these two cultural categories are however readily observable. Specifically, the Deaf participants in this research were not able to meet their expressed desire to function appropriately within hearing contexts, while the deaf, with some oral/aural education were. It appears from the observations of the present research, that the application of technical paradigms (associated by the Deaf with medicalized views, refer to Chapter 1) to study deafness may

constitute an appropriate inquiry into the potential of the D/deaf. As discussed in Chapter 1, the medicalized view of deafness has historically been viewed by the Deaf as a dehumanizing, oppressive construct. They reject the medicalized view of deafness, as a narrowly described physical concept. This cultural group, in challenging biological reductionism, calls into question whether objective knowledge of the human body is the best knowledge to apply in appreciating what it means to live as a deaf individual. However, it appears that technical studies concerning subconscious detection of auditory stimuli in the profoundly deaf, open a substantial pathway toward addressing culturally salient issues. In utilizing a multidisciplinary anthropological approach, great care was taken in an attempt to ensure that the discourse would not dehumanize the D/deaf as medicalized views may (eg. involving repair of the 'condition'). This inquiry sought to draw upon diverse constructs, and multi-disciplinary anthropological inquiry. In so doing, the research also attempted to avoid any imposed (unnatural?), professional transformation concerning the D/deaf experience.

* * *

When I began researching the D/deaf, I questioned whether an anthropological study utilizing biological considerations, would be accepted by Deaf culture advocates. Historically, the notion of otherness ascribed to the D/deaf was created by a pathologization of biological factors concerning their auditory functioning. As a result, I also questioned whether any further study of the auditory system would be appropriate in a study which attempted to satisfy the diverse emic stances of deaf and Deaf individuals. However, I discovered that contrary to the postulates of Deaf culture, some Deaf

individuals were in fact in favour of interacting with hearing people, using their voices. My 'intrusion' into possible auditory capabilities was thus warranted, and was derived from an emic source. I also wished to retain a sensitive and respectful position toward those individuals who might remain uncomfortable with any research which could be seen as presenting the D/deaf in a light that supported a medicalized (pathological) view of their auditory functioning. This was achieved by concentrating on possible natural abilities of the auditory system of the profoundly deaf. The biological consideration of deafness, when considered in a culturally sensitive anthropological context (and to a great extent culturally dictated), opens new pathways of medical, cultural and physical anthropological inquiry. It has been shown in the present research, that a physiological factor interpreted by one culture in such a way as to stigmatize and disempower another, may be considered in a manner which may subserve the integration, rather than alienation of different cultural groups.

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APPENDIX A

(Questions asked of Deaf participants)

Question 1: How do hearing people think of the deaf? Please provide examples of personal experiences which have caused you to form your opinions.

Question 2: Have the views of others (hearing people) influenced your opinion of yourself? How?

Question 3: Have the opinions of hearing people influenced with whom you associate (deaf or hearing?)

These questions were asked in order to help determine whether mainstream stereotypes contributed to specific aspects of socialization: within Deaf culture, within mainstream hearing society and educational placement (ASL or oral/aural).

Question 4: Does associating with D/deaf people help you adapt better to the environment of everyday life? How?

Question 5: Are you able to communicate with hearing people? How? Do you want to?

These questions were posed in order to help address the suggestion posited by advocates of Deaf culture that sign language constitutes a natural language (Valli and Lucas, 1995) that is marvellous to speak (Blume, 1997: 46) and on its own, meets the communication needs of the Deaf.

Question 6: Would you feel comfortable working with hearing people only?

This question was asked in order to help determine any D/deaf desire to be incorporated into mainstream society, and on what grounds.

Question 7: Please describe Deaf culture.

This question was posed in order to help ascertain any difference between D/deaf perception of the postulates of Deaf culture, and whether it served to influence specific educational context.

N.B. All questions were derived from issues brought up in casual discussion with deaf individuals.

APPENDIX B

(Questions asked of hearing students)

Question 1: How do you perceive the deaf, in terms of their social and scholastic abilities in mainstream hearing society?

Question 2: Have the opinions of others influenced your opinion of the deaf, how?

Question 3: Have the opinions of others influenced whether or not you personally associate with the deaf?

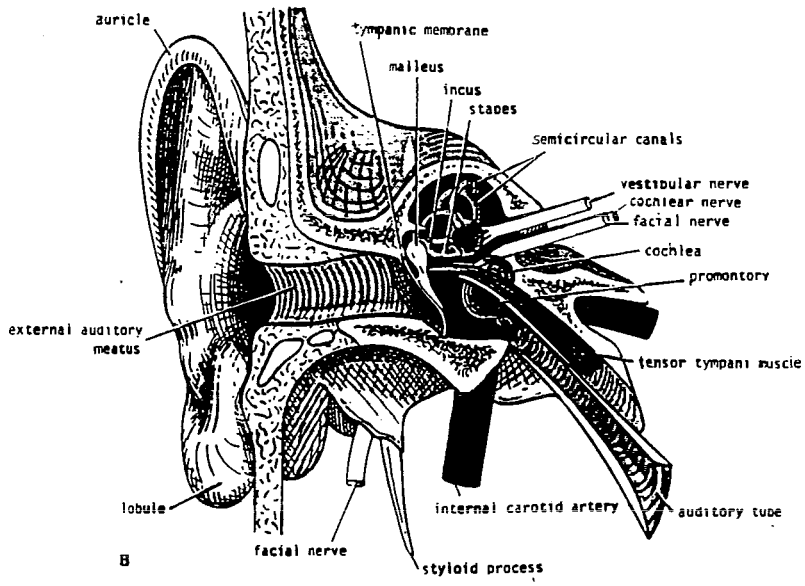
Question 4: Are you able to communicate with deaf individuals, how? Do you want to?

Question 5: Would you feel comfortable interacting with deaf people professionally at your workplace, why?

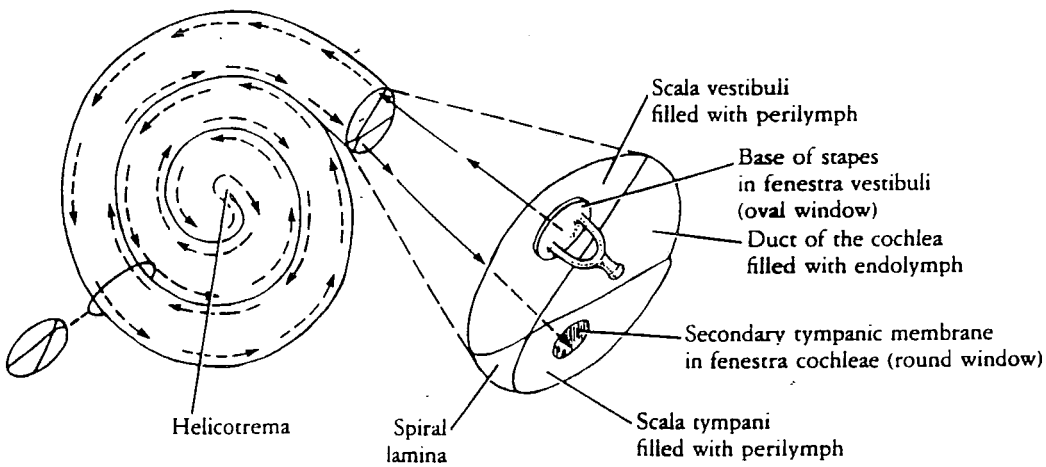
N.B. The preceding questions were adopted from those posed to the D/deaf in order to help ascertain the existence of any stereotype ascribed to the D/deaf by hearing individuals. These similar questions also serve to permit an examination of whether opinions voiced by the D/deaf concerning hearing society's perception/treatment of the D/deaf are similarly reflected by hearing individuals' views.

FIGURE 1

(A) Basic anatomy of the ear (from Snell, 1992: 849)



(B)



As the stapes articulates with the fenestra vestibuli, perilymph is mobilized. At the apex or helicotrema of the cochlea, the wave of perilymph passes on toward the scala tympani. This results in the secondary membrane of the fenestra cochlea to bulge outwards (from Snell, 1992: 855).

FIGURE 2

Ascending and descending connections of the auditory pathways
(Critchley and Henson, 1977: 39, after Galambos, R., 1957)

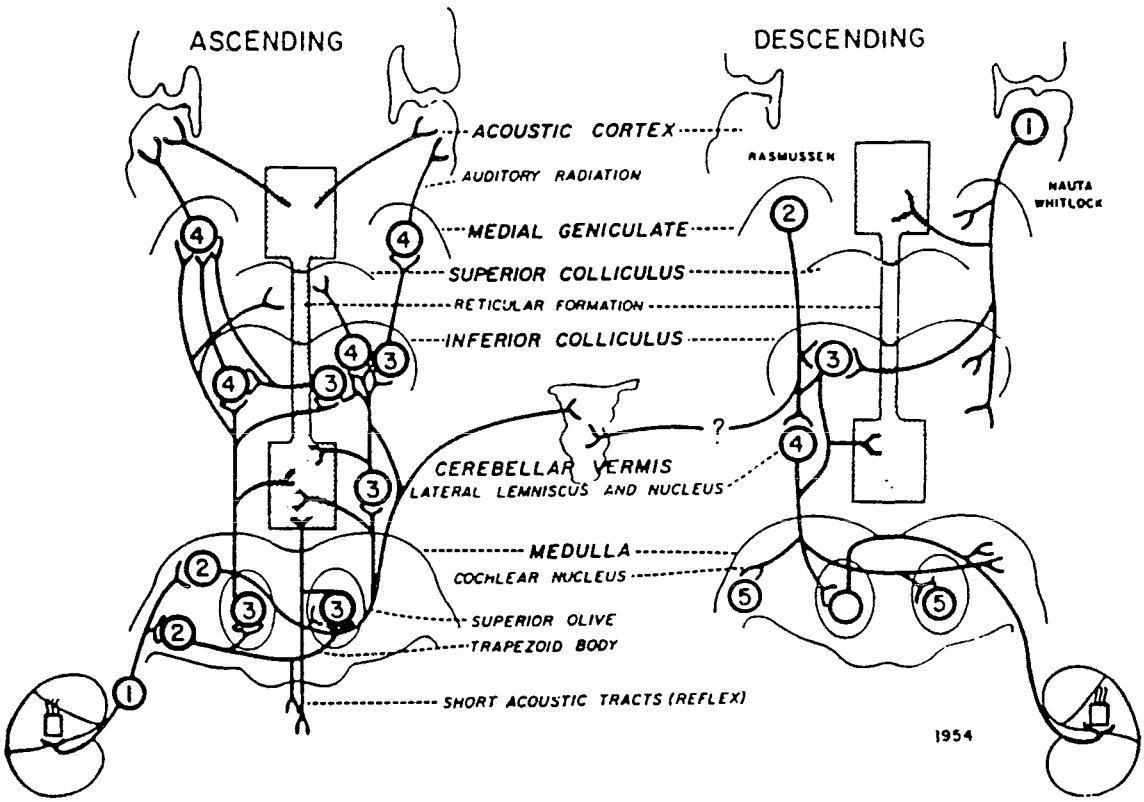


FIGURE 3

Audiogram displaying analysis utilized to categorize auditory functioning/deficit
(source: personal communication)