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Visual Reaction Time in Congenitally Deaf Children.

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ABSTRACT

The maturing nervous system is remarkably plastic and, in the presence of a sensory impairment there occurs some degree of reorganization within one or multiple sensory modalities and thus a deficit in one sensory system, such as deafness, might detract from the function of another sensory system, such as vision. To compare the visual reaction time between congenitally deaf and normally hearing subjects. 30 congenitally deaf children aged between 10-14 yrs and 30 age matched normally hearing subjects were tested for visual reaction time using reaction time apparatus. There was no significant difference in the reaction time between deaf and normally hearing subjects for both red and the green light suggesting that not all aspects of vision are altered in deaf individuals.

Keywords: congenital deafness**,** visual reaction time.

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INTRODUCTION

Visual perception between individuals with congenital deafness and those with normal hearing may be invariably different because the life experiences of congenitally deaf individuals place large demands on the visual system. From infancy, deaf individuals must rely on visual input, such as supplementing oral communication with lip reading or learning a manual mode of communication. Most neural connections are laid out during fetal development and undergo continuous refinement throughout childhood, with strong influence from prevailing patterns of neural activity and synaptic transmission [1]. Accordingly, congenital sensory impairment in one modality may lead to a reorganization of neural connections and consequently, perceptual differences [2]. The loss of a sensory system early in the development causes profound neural reorganization, and in particular an enhancement of the remaining modalities, a phenomenon also termed as cross modal plasticity. Therefore, a deficit in one sensory system, such as deafness, might detract from the function of another sensory system, such as vision.

Reaction time has implications for all facets of a person's life, especially for accident prevention and community independence. It is duration between application of a stimulus to onset of response. Reaction time acts as a reliable indicator of rate of processing of sensory stimuli by central nervous system and its execution in the form of motor response [3]. Visual reaction time is time required for response to visual stimuli. Since the maturing nervous system is remarkably plastic, it is reasonable to expect some degree of reorganization within one or multiple sensory modalities in the presence of a sensory impairment. Also studies have suggested that deaf individuals demonstrate enhanced visual processing in the periphery [4]. Thus the present study was undertaken to know whether the reaction time was altered in deaf individuals compared to normal individuals.

MATERIALS AND METHODS

The study was conducted on 30 congenitally deaf children aged between 10-14 yrs residing at victory boarding school for hearing impaired, Kuppam and 30 age matched normally hearing subjects studying in government primary school, Rallabudagur, Kuppam. The ethical clearance for the study was obtained from the Institutional Ethical Committee (IEC).The subjects were briefed about the procedure and a written consent was obtained. Then each of them were tested for visual reaction time using reaction time apparatus. As the light stimulus was produced, the participants were instructed to react by pressing a button. Prior to testing, participants were given instructions and allowed to practice reacting to visual stimuli and then the actual testing was done. Minimum of 5 readings were taken and average of the 5 readings were considered as his / her visual reaction time. The reaction time measurements were taken for both eyes by asking the subject repeat the procedure with the other eye which was not used previously. To ensure that environmental factors did not interfere with reaction times, tests were conducted in a quiet, isolated room within the school building.

RESULTS

The Data was analyzed using the Statistical Package for Social Sciences (SPSS) version 11.0 .The results of the tests were expressed as mean and differences between two groups were analyzed by applying the unpaired "student t" test. P values <0.05 were considered to be statistically significant. The results of the present study did not show any significant difference in the reaction time between deaf and normally hearing children for both red and the green light.

Table 1: Scores of reaction time between deaf and normally hearing subjects

Variables	DEAF (Mean ± SD)	HEARING (Mean ± SD)	P VALUE
VRT(RR)	0.12± 0.02	0.12± 0.01	0.68
VRT(RL)	0.12± 0.01	0.12± 0.01	0.21
VRT(GR)	0.13± 0.01	0.13± 0.01	0.55
VRT(GL)	0.12± 0.01	0.12± 0.01	0.70

VRT (Visual reaction time),RR(Red light ,Right eye) , RL (Red light , Left eye),GR(Green light ,Right eye),GL(Green light ,Left eye)

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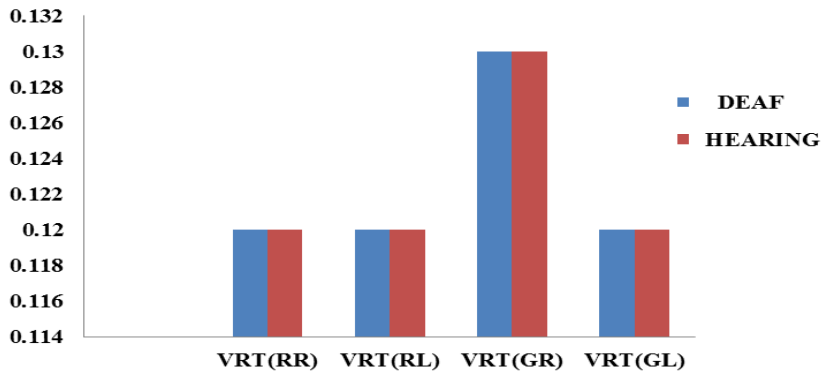

Figure 1: Reaction time between deaf and normally hearing subjects

DISCUSSION

Previous studies comparing visual perceptual abilities of deaf and hearing participants have given variable results because deaf population are quite diverse in regards to their preferred type of communication, the age of acquisition of their native language, the hearing status of their parents and their hearing loss etiology .

Though the deaf individuals typically benefit by the phenomenon of cross modal plasticity, enhanced spatial visual attention or the redistribution of attention towards the periphery of the visual field occurs quite slowly. The redistribution is observed around 11-13yrs old and becomes marked around 14-17 yrs eventually resulting in a clear behavioral advantage by pre-adolescence on a selective visual attention task [5].

While deaf individuals do display differences in visual attention, it is important to note that not all aspects of vision are different in deaf and hearing people suggesting rather specific effects of cross modal plasticity. The findings of Eva M. Finney et.al suggest that purely sensory visual abilities ,like the ability to discriminate shades of grey are similar in both deaf and hearing individuals [6] and the findings of Matthew W.G. Dye confirm that the ability to distinguish between quickly flashing items ,are similar in both deaf and hearing individuals supporting the present study [7]. These results thus dispels the widely accepted idea that loss of hearing leads to changes in abilities related to other senses .

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