

SHORT COMMUNICATION

Estimation of Hearing Threshold Levels in Autistic Children

Motassim al-roosan* and Hussein al-qassem

ENT Dept., King Hussein Medical Center, Jordan
roosan89@hotmail.com*; 00962777774852

Abstract

This study investigated the hearing threshold levels in autistic children using behavioral and objective audiological tests. About 32 children aged between 3 and 6 years of both sexes were included in the present study. Children underwent otoscopic examination, tympanometry, acoustic reflexes, otoacoustic emission, pure tone audiometry, visual reinforcement audiometry and auditory brain stem. Measurements were carried out between Jan 20012 to Dec 2013 at the Audiology department at King Hussein medical centre. Children were uncooperative in behavioral tests which yielded false estimation of hearing threshold levels. On the other hand, objective audiological tests revealed that hearing threshold levels of the children were within normal levels. It can be concluded that the objective audiological tests are more accurate than subjective behavioral tests in estimation of hearing threshold levels of autistic children.

Keywords: Autistic children, audiological tests, acoustic reflexes, otoacoustic emission, behavioral tests.

Introduction

Autism is a developmental disorder characterized by a triad of symptoms: qualitative impairments in social interaction, qualitative impairment in communication restricted, repetitive and stereotyped patterns of behaviors, activities and interests (APA, 1994). It is commonly believed that children with autism exhibit a variety of auditory complications; little empirical evidence exists to support this longstanding premise. A study of home videotapes of first birthday parties revealed a failure of toddlers with autism to orient to their name (Osterling and Dawson, 1994). Other reported auditory problems associated with childhood autism include hypersensitivity to sound, painful hearing and abnormalities in auditory processing (Anne *et al.*, 2006). Kancherla *et al.* (2013) examined the prevalence and characteristics of VI, HL (hearing loss) and co-occurring autism spectrum disorder (ASD) among 8-year-olds in metropolitan Atlanta 2000-2008 and concluded that the frequency of co-occurring ASD with VI and HL is higher than the population prevalence of ASD.

Beers *et al.* (2014) systematically reviewed the literature describing the relationship between ASD and peripheral hearing loss including literature recommendations for audiological assessment and auditory habilitation in cases where peripheral hearing loss and ASD coexist. They concluded that a controversy exists in the literature regarding prevalence of hearing impairment among individuals with ASD and the prevalence rates of hearing impairment among individuals with ASD continue to be debated. At present, there is no conclusive evidence that children with ASD are at increased risk of peripheral hearing loss.

A complete audiological assessment is recommended in all cases where, ASD is suspected so as not to delay the diagnosis of hearing impairment in the event that hearing loss and ASD coexist. Objective assessment measures should be used to confirm behavioral testing in order to ensure reliability of audiological test results. In our clinic, families of children who have delayed speech and language development have great concern regarding their hearing levels as most of these families reported that their children do not respond to their names when calling their names or follow their parents speech when asking them to bring something or respond to their, but when they watch some special songs in the TV or watching special games, they start listening and interacting with the song which make the parents anxious and have a negative impacts that their children are at risk in term of their hearing status and speech development. This concern initiated us to investigate the hearing of these children, so the purpose of the present study is to estimate the hearing threshold levels of uncooperative children who do not respond to sound and who were primarily diagnosed as autistic child apart from having any disabilities.

Materials and methods

Study population: Thirty two children aged between 3 and 6 years of both sexes were included in the present study at the Audiology and vestibular department at the King Hussein medical centre between Jan 2102 and Dec 2013. All participants were referred to ENT clinic from other medical sectors such as pediatrician, neurosurgery, speech pathologists and special education to stand on the hearing status of these children, first of all children were examined by ENT physician and then referred to audiologists.

Investigations: All children underwent otoscopic examination and then parents reported the case history for their own child. The audiological assessment performed by an qualified audiologist as follows: Tympanometry using diagnostic GSI to rule out any middle ear abnormalities, followed by acoustic reflexes threshold estimation for both ipsilateral and contralateral testing to rule out any auditory pathways abnormality, then otoacoustic emission using biologic ilo88 diagnostic distortion was used to investigate if otoacoustic emissions are present or not and to differentiate between cochlear from retro-cochlear lesion. After that, behavioral responses from pure tone audiometry, visual reinforcement audiometry using interacoustic AC 40 audiometer was used to evaluate hearing threshold levels for each child and finally auditory brain stem measurements using Auditory Steady State Response (ASSR) using CE-Chirp technique to minimize the effect of noise contamination with the signal at the frequency range (500-4000 Hz), using 80 dB nHL. All measurements were carried out in an isolated test room by the same audiologist. Measurements were repeated twice for reliability and accuracy. Any children who have hearing loss or any middle ear abnormalities were included in the present study.

Results

All children showed unreliable responses to behavioral testing's (pure tone and visual reinforcement audiometry) that is why we said that these children at the beginning were uncooperative in behavioral tests which yielded false estimation of hearing threshold levels. One of the behavioral tests revealed that these children could have normal hearing is that when we observed the child eyes blinking when producing sounds such as hands clapping, eyes blink to sound stimuli give us that each child must underwent objective tests such as acoustic reflex threshold, otoacoustic emissions and auditory brain stem response tests. Most of the children exhibit restlessness and abnormal behaviors comparing with normal children of the same age who are not autistic or have behavioral disturbances before commencing the objective tests, so we decided to give the patients after getting a medical permission to use chlorhydrate syrup to sedate the child so we could perform the tests. Tympanometry results revealed that each child had middle ear abnormalities, whereas, acoustic reflex measurements revealed that all children reflex threshold values were detected between 90-100 dB nHL indicating hearing threshold levels within normal (15-25 db nHL). Distortion otoacoustic emission revealed that emissions are present in both ears of each child indicating normal functioning of outer hair cells. The criteria used to judge if emissions are present as if the amplitude of distortion product otoacoustic emissions exceeds the noise floor more than 6 dB nHL. Auditory brain stem evoked potentials using the ASSR protocol with CE-Chirp in which estimated audiogram can be obtained in the frequency range (500-4000 Hz), showed audiograms were within normal levels indicating that all

autistic children participated in the present study have normal hearing.

Discussion

The purpose of the present study was to investigate the hearing threshold levels of children aged between 3-6 years who showed no response to speech sound of their parents while they can respond and interact with some specific sounds and this group was selected to check any other disabilities that could result in speech and language developmental delay. This group of children is in critical stage of speech development and language acquisition, the parents were concern about their children hearing status. As mentioned in the introduction, there is still a debate about the hearing of autistic patients whether they have hearing loss or not, the present study group revealed that hearing was not affected in this group of children. Therefore, the differences between our findings and previous research study could be contributed either to the fact that they depend only on the behavioral responses not on the objective measures and may be hearing impairment. One of the interesting thing that we found that most of the parents of these children are working and their children either staying with a baby sitter or grandfather and mothers who did not provide a good acoustic environment for these children and most of these children were left for more than one year just watching specific program designated for young children. So their environments were just either the TV or old people and this could be one of the causes that why their children did not respond to other voices that are not familiar. We encouraged the parents of these children to avoid them from watching TV or other games and to be enrolled in KG and school and to participate with their peers. In fact, after several sessions of evaluating their behaviors, most of the parents of these children reported that their children have progress in responding and developing speech and language.

Conclusion

Findings of the present study showed that behavioral tests are not enough to evaluate and estimate the hearing threshold levels of autistic children, objective tests must be performed in parallel with behavioral tests and caution of interpreting findings has to be relay on scientific measures.

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