STUDY OF AUDITORY PROCESSING IN CHILDREN WITH AUTISTIC DISORDER

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- Autism spectrum disorder (ASD), a major neuropsychiatric condition in children, is generally recognized as a developmental condition in origin but very little is known about its etiology.
- There are no universal agreements with regard to abnormalities of the brain structure, and no biomarkers have been detected for confirmation of clinical diagnosis.
• Diagnosis is mainly made on the basis of a variety of clinical features such as qualitative disturbance in communication, social interaction, and restricted interests or activities.

• Aberrant features in their speech such as unresponsiveness to questions, echolalia, choosing inappropriate words, poor ability of binaural separation, and having a left ear advantage.

• It was also suggested that some children may not be able to decode auditory language.
Central Auditory Processing Disorder (CAPD) is a complex and heterogeneous group of auditory-specific disorders usually associated with a range of problems within the processes responsible for generating the auditory evoked potentials and other behaviors such as auditory localization or lateralization, auditory discrimination and auditory pattern recognition.

AIM OF THE WORK
a. To study the auditory profile at different levels of the auditory system in children with autistic disorder.

b. To verify the role of (Central) Auditory Processing Disorder as an essential pathology of the autistic disorder or as an associated co-morbidity.

PATIENTS
The study included 30 children with definite autistic disorder according to DSM-IV-TR criteria among those attending the outpatient neuropsychiatry clinic of Alexandria University Children Hospital at El Shatby.

An informed consent was taken from all patients in this part of the study. Confidentiality of the records was concerned.

**Inclusion criteria:**
1. Patient who met (DSM–IV-TR) criteria for autistic disorder.
2. Age 3 years - 7 years.
3. Normal peripheral hearing.

**Exclusion criteria:**
1. Syndromic features on clinical examination.
2. Children with known infectious, metabolic, neurological, or genetic diseases; chromosomal abnormality that may be presented with autistic features.

**METHODOLOGY**
All Cases included in the study were subjected to the following:

- A  History taking:
- B  Comprehensive neurological examination.
- C  Diagnosis of autism was based on:
  1) Criteria of the Diagnostic and Statistical Manual of Mental Disorders (DSM–IV-TR).
  2) Autism Diagnostic Interview-Revised (ADI-R).
- Sensory checklist for auditory/listening skills.

- Basic audiological evaluation as follows:
  1) Otoscopy.
  2) Pure tone audiometry (if applicable)
  3) Impedancemetry.

- Language assessment:
  1) Comprehensive Arabic Language Test (CALT)
  2) Test of Acquired Communication Skills (TACS)

- Auditory electrophysiological evaluation:
  1) Auditory brainstem response.
  2) Cortical evoked response.
RESULTS

Distribution of the studied cases according to response to auditory stimuli in Sensory Checklist for auditory profile

- Normal: 4 (13.3%)
- Hypo-responsiveness: 6 (20.0%)
- Hyper-responsiveness: 12 (40.0%)
- Mixed: 5 (16.7%)
- Seeking: 3 (10.0%)
Comparison between the autistic group and the norms according to ABR in right side

![Graph showing ABR comparison in right side](image)

Comparison between the autistic group and the norms according to ABR in left side

![Graph showing ABR comparison in left side](image)
Comparison between the autistic group and the norms according to N1c Latency

Comparison between the autistic group and the clinical norms according to N1c amplitude
Comparison between N1c amplitude between right and left sides in both cases and norms separately

![Graph showing comparison between N1c amplitude between right and left sides in both cases and norms separately.]

Correlation between TACS (language domain) and ABR right and left sides in the study group

<table>
<thead>
<tr>
<th></th>
<th>Right side</th>
<th></th>
<th>Left side</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABR I</td>
<td>0.093</td>
<td>0.627</td>
<td>-0.026</td>
</tr>
<tr>
<td>ABR III</td>
<td>0.012</td>
<td>0.952</td>
<td>-0.029</td>
</tr>
<tr>
<td>ABR V</td>
<td>0.088</td>
<td>0.645</td>
<td>-0.009</td>
</tr>
<tr>
<td>ABR I -III</td>
<td>-0.019</td>
<td>0.920</td>
<td>-0.024</td>
</tr>
<tr>
<td>ABR III-V</td>
<td>0.028</td>
<td>0.883</td>
<td>-0.029</td>
</tr>
<tr>
<td>ABR I-V</td>
<td>0.022</td>
<td>0.910</td>
<td>-0.028</td>
</tr>
</tbody>
</table>
Relation between response to auditory stimuli on Sensory Checklist and N1c Amplitude in right side and left sides

<table>
<thead>
<tr>
<th>N1c Amplitude (µV)</th>
<th>Response to auditory stimuli</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Normal</td>
<td>Hypo</td>
</tr>
<tr>
<td>Right side</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Min. – Max.</td>
<td>2.91 – 4.43</td>
<td>1.66 – 3.14</td>
</tr>
<tr>
<td>Mean ± SD</td>
<td>3.71 ± 0.70</td>
<td>2.20 ± 0.56</td>
</tr>
<tr>
<td>Median</td>
<td>3.74</td>
<td>2.17</td>
</tr>
<tr>
<td>Left side</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Min. – Max.</td>
<td>1.54 – 2.40</td>
<td>1.11 – 3.77</td>
</tr>
<tr>
<td>Mean ± SD</td>
<td>2.14 ± 0.40</td>
<td>2.18 ± 1.0</td>
</tr>
<tr>
<td>Median</td>
<td>2.31</td>
<td>2.04</td>
</tr>
</tbody>
</table>

Correlation between language score on Test of Acquired Communication Skills (TACS) and N1c Amplitude on right side

\[ r = 0.716^* \]
\[ p < 0.001 \]
CONCLUSIONS

1. (Central) Auditory Processing Disorder is an essential pathology of the autistic disorder.

2. Abnormal auditory response is found in most autistic children with hyper-responsiveness to auditory stimuli being the most common one.

3. Autistic children possess a dysfunctioning or an immature central auditory nervous system at both the brainstem and cortical levels.

4. Right hemisphere is the dominant one in the processing of auditory stimuli by autistic subjects which is predominantly processed in the left hemisphere in normal subjects.

5. The more immature the auditory processing of the autistic child, the lower the language score and the more severe the abnormality of the Cortical Auditory Evoked Potential (CAEP).
References:


THANK YOU