Auditory discrimination and auditory sensory behaviours in autism spectrum disorders

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Autism Spectrum Disorder (ASD)

- Complex neurodevelopmental disorder
  - Genetic factors
  - Environmental factors
- Characterized by:
  - Social impairments
  - Communicative impairments
  - Restricted interests
  - Repetitive behaviors
- Characterized on a spectrum (DSM-5)
- Previous research has suggested that ASD shows enhanced auditory perception
Current Study Aims

- **Aim 1:** Characterize auditory discrimination profile in a large ASD sample
  - Perhaps enhanced sound perception is part of the ASD profile
- **Aim 2:** Examine the association between auditory discrimination sensitivity and self-reported sensory behaviors in ASD sample
  - Perhaps due to fundamental differences in processing of auditory information
Method

- Participants
  - 72 adolescents with ASD
  - 48 adolescents without ASD

### Table 1
Mean age (years; months), verbal IQ, performance IQ and full scale IQ (SD in brackets) for the non-ASD and ASD groups.

<table>
<thead>
<tr>
<th></th>
<th>Non-ASD</th>
<th>ASD</th>
</tr>
</thead>
<tbody>
<tr>
<td>( n )</td>
<td>48</td>
<td>72</td>
</tr>
<tr>
<td>Male:Female</td>
<td>46:2</td>
<td>66:6</td>
</tr>
<tr>
<td>Age</td>
<td>15;6 (5.9)</td>
<td>15;6 (5.7)</td>
</tr>
<tr>
<td>Verbal IQ</td>
<td>87.25 (19.70)</td>
<td>84.31 (17.41)</td>
</tr>
<tr>
<td>Performance IQ</td>
<td>92.83 (21.15)</td>
<td>93.36 (17.44)</td>
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<tr>
<td>Full scale IQ</td>
<td>89.33 (21.53)</td>
<td>87.79 (17.32)</td>
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</tbody>
</table>
Method

• Design and Procedure
  ➢ Hearing screening
    ➢ Pure tone audiometry
    ➢ Otoacoustic emissions
    ➢ Tympoanometry
  ➢ Auditory discrimination tasks
    ➢ Frequency discrimination
    ➢ Intensity discrimination
    ➢ Duration discrimination
Auditory Discrimination Tasks
Method

- **Design and Procedure**
  - Hearing screening
    - Pure tone audiometry
    - Otoacoustic emissions
    - Tympoanometry
  - Auditory discrimination tasks
    - Frequency discrimination
    - Intensity discrimination
    - Duration discrimination
  - Self report of auditory sensory behaviors
    - AASP
      - Low registration
      - Sensation seeking
      - Sensory sensitivity
      - Sensation avoidance
Results: Auditory Discrimination Thresholds

- No significant group differences for any of the tasks
- 19.7% of ASD participants had exceptional performance on frequency discrimination task
- 4.3% of ASD participant had exceptional performance on intensity discrimination task
- 14.1% of ASD participants had exceptional performance on duration discrimination task
- Overlap between skills was limited
Results: Auditory Discrimination Tasks

- Characteristics of the subgroup with exceptional frequency discrimination and ASD

![Table 4](image-url)

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>VIQ</th>
<th>PIQ</th>
<th>FSIQ</th>
<th>1st words</th>
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<tbody>
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<td>92</td>
<td>44*</td>
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<tr>
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<td>80</td>
<td>119</td>
<td>98</td>
<td>40*</td>
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<tr>
<td>Autism</td>
<td>86</td>
<td>115</td>
<td>100</td>
<td>48*</td>
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<tr>
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<td>107</td>
<td>111</td>
<td>18</td>
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<tr>
<td>Autism</td>
<td>100</td>
<td>106</td>
<td>104</td>
<td>48*</td>
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<tr>
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<td>109</td>
<td>103</td>
<td>14</td>
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<td>114</td>
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<td>15</td>
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<tr>
<td>Autism</td>
<td>99</td>
<td>110</td>
<td>106</td>
<td>40*</td>
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<td>Other ASD</td>
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<td>96</td>
<td>99</td>
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<tr>
<td>Other ASD</td>
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<td>115</td>
<td>109</td>
<td>30*</td>
</tr>
<tr>
<td>Other ASD</td>
<td>88</td>
<td>93</td>
<td>88</td>
<td>30*</td>
</tr>
</tbody>
</table>

Mean (SD): 94.3 (15.6) 105.3 (15.7) 99.2 (14.6) 29.0 (13.3)

*Delayed first words (>24 months), according to ADI criteria.
Results: Auditory Sensory Behaviors

Fig. 1. ASD group: mean scores (and standard error) for auditory items on the Adolescent/Adult Sensory profile, grouped into quadrants. A higher score indicates more self-reported auditory sensory behaviours. The maximum score on sensation seeking is 10; the maximum score on the other three items is 15.
Results: Auditory Sensory Behaviors

(a) | low discrimination threshold | high discrimination threshold
---|-------------------------------|--------------------------|
low registration | 8                             | 8                        |
sensory sensitivity | 9                             | 9                        |
sensation avoiding | 7                             | 7                        |

(b) | low registration | sensory sensitivity | sensation avoiding
---|------------------|---------------------|---------------------|
low registration | 10               | 8                   | 8                   |
sensory sensitivity | 10               | 10                  | 8                   |
sensation avoiding | 8                | 8                   | 8                   |

(c) | low registration | sensory sensitivity | sensation avoiding
---|------------------|---------------------|---------------------|
low registration | 10               | 10                  | 8                   |
sensory sensitivity | 10               | 8                   | 8                   |
sensation avoiding | 8                | 8                   | 8                   |
No differences at the group level, however ASD subgroup differences
Consider the possibility of ASD subgroups given the heterogeneity of the disorder
- Results suggests ~1 in 5 individuals with ASD may exhibit exceptional frequency discrimination skills
- Why is frequency processing unique in the ASD group?
Greater degree of self-reported auditory sensory behaviors in ASD
- Further exploration of the link between auditory perceptual processing and auditory sensory behaviors
Thank you!