Gender Differences in Diagnosis and Social Characteristics of Children With Autism (ASD) from a US Registry

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Background

• Male-to-female ratio in ASD ~ 4.5:1 (CDC 2014); consistent over locations and time
• Developmental patterns of ASD development may be different between boys and girls
  – Age of diagnosis
  – Core symptoms
• Few large studies address the different social response and communication characteristics in boys and girls.
Objective

1. Explore trend of gender differences in age of diagnosis;
2. Compare symptom severity by gender.
Design and Methods

• Data from Interactive Autism Network (IAN), web-based family-powered registry for ASD
• Parent-reported data
• Data collected from November 2006 to January 2013 for children under age 18 years
  – Parent-report DSM-4-TR diagnosis (AD, PDD, AspD)
  – Age of first diagnosis
  – Social Responsiveness Scale (SRS)
• Family-centered research network
• Current enrollment ~ 50,000 participants
  – 15,000 children with ASD (~1.4% of the affected US pediatric population)
  – 5,000 adults with ASD
  – Family members
• Research portal (www.IANresearch.org)
• Public website (www.IANcommunity.org)
Statistics

• Two-sample t-tests to compare by gender:
  – Age of first diagnosis
  – ASD diagnostic categories
  – SRS Symptom severity
    • Total score
    • Subscales
      – Social awareness
      – Social cognition
      – Social communication
      – Social motivation
      – Autistic mannerisms
Results

- Sample: 15,644 children
  - Male: female = 4.54 to 1
  - Age of first diagnosis: 9,932 children
  - Social Responsiveness Scale (SRS): 5,103 children
# Results

## Age of Diagnosis (years)

<table>
<thead>
<tr>
<th></th>
<th>Girls</th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
<td>1s</td>
<td>2s</td>
<td>p</td>
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<tr>
<td><strong>Autistic Disorder</strong></td>
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<td></td>
<td>4356</td>
<td>3.2</td>
<td>1.88</td>
<td>3.2</td>
<td>1.73</td>
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<tr>
<td></td>
<td>F=769; M=3587</td>
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<tr>
<td><strong>PDD-NOS</strong></td>
<td>1597</td>
<td>4.0</td>
<td>2.47</td>
<td>3.8</td>
<td>2.28</td>
<td>0.03</td>
<td>0.06</td>
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<tr>
<td></td>
<td>F=486; M=2260</td>
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<td></td>
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<tr>
<td><strong>Asperger’s Disorder</strong></td>
<td>2746</td>
<td>7.6</td>
<td>3.38</td>
<td>7.1</td>
<td>3.02</td>
<td>&lt;0.01</td>
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<tr>
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<td>F=244; M=1353</td>
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</table>
Results: Autism Symptoms (SRS) \([n=5103 (4235M:868F)]\)

<table>
<thead>
<tr>
<th>SRS Score</th>
<th>Girls</th>
<th></th>
<th>Boys</th>
<th></th>
<th>t-test p (1s)</th>
<th>t-test p (2s)</th>
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<tbody>
<tr>
<td>Total</td>
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<td>SD</td>
<td>Mean</td>
<td>SD</td>
<td>NS</td>
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<td>106.7</td>
<td>30.3</td>
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<tr>
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<td>Mean</td>
<td>SD</td>
<td>NS</td>
<td>NS</td>
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<tr>
<td></td>
<td>13.9</td>
<td>4.0</td>
<td>13.9</td>
<td>4.0</td>
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<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
<td><strong>0.04</strong></td>
<td><strong>0.08</strong></td>
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<td>Social Communication</td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
<td>NS</td>
<td>NS</td>
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<td>10.9</td>
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<td>Mean</td>
<td>SD</td>
<td>NA</td>
<td>NS</td>
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<td>6.4</td>
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<td>Autistic Mannerisms</td>
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<td><strong>&lt;0.001</strong></td>
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<td>7.0</td>
<td>20.8</td>
<td>6.8</td>
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Conclusions

• This study suggests:
  ▪ Girls with milder forms of ASD (Asperger’s, PDD-NOS) are identified later than boys.
  ▪ There is no gender difference in age of identification in those with Autism Disorder.
  ▪ Boys have more difficulties in social mannerisms, and girls in social cognition, which may contribute to the earlier diagnosis in boys and later diagnosis in girls.
Implications

• Many factors may lead to a delay in ASD diagnosis in girls, such as differing natural history, or delayed recognition of symptom differences in young girls.
• Gender-specific risk factors should be further investigated and taken into account for early identification of ASD.
• Continue research on the differences in natural history and symptoms of autism in boys and girls, particularly on affected females.
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