ADHD- The most treatable Developmental Disorder

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Overview of Presentation

- What is ADHD? Epidemiology and Aetiology
- Identifying Children with ADHD
- Other Causes for ADHD Symptoms
- Treatment Options
- ADHD and Co morbidities
What is ADHD?

- Neuro-developmental Syndrome
- Broad Phenotype/ Spectrum Disorder with core symptoms
  - Inattention
  - Impulsivity
  - Hyperactivity
- Deficits in Executive Functioning
- Atypical reward responses
Neurobiology of ADHD

- Changes in the brain are well documented
  - Structural Changes (smaller brain volume)
  - Functional Changes (less activity in the Prefrontal Cortex)
  - Connectivity differences
  - Neurochemical Differences
    - Dopamine
    - Nor-adrenaline
The Epidemiology of ADHD

- Globally affects between 2% (Erskine et al., 2013) and 5% (Polanzcyk et al., 2007) of children
- Young Minds Matter Survey 7% of Australian primary school aged children had ADHD
- Persists into adulthood in at least 20%
- Associated with a increased risk of a broad range of adverse outcomes
Potential adverse outcomes of ADHD
Potential adverse outcomes of ADHD

- 101 studies across North America, Western Europe, and the Asia Pacific
- Sample sizes ranged from 71 to almost 2 million participants
- Years of follow up ranged from 2-40 yrs
- Attrition ranged from 60% to 0%
- Number of outcomes able to be meta-analysed = 52
## Substance use disorders

<table>
<thead>
<tr>
<th>Long-term outcome</th>
<th>Odds ratio</th>
<th>95% CIs</th>
<th>No. of data points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Substance use disorder</td>
<td>1.73</td>
<td>1.24-2.41</td>
<td>13</td>
</tr>
<tr>
<td>Illicit drug use</td>
<td>2.24</td>
<td>1.43-3.52</td>
<td>8</td>
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<tr>
<td>Illicit drug use disorder</td>
<td>2.57</td>
<td>2.06-3.20</td>
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<tr>
<td>Cannabis use</td>
<td>1.67</td>
<td>1.23-2.26</td>
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<tr>
<td>Cannabis use disorder</td>
<td>2.51</td>
<td>0.67-9.30</td>
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<tr>
<td>Alcohol use</td>
<td>1.00</td>
<td>0.70-1.44</td>
<td>7</td>
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<tr>
<td>Alcohol dependence</td>
<td>1.39</td>
<td>1.06-1.83</td>
<td>8</td>
</tr>
<tr>
<td>Regular smoking</td>
<td>2.16</td>
<td>1.77-2.63</td>
<td>13</td>
</tr>
<tr>
<td>Tobacco dependence</td>
<td>2.41</td>
<td>1.67-3.48</td>
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# Mental disorders and suicide

<table>
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<tr>
<th>Long-term outcome</th>
<th>Odds ratio</th>
<th>95% CIs</th>
<th>No. of data points</th>
</tr>
</thead>
<tbody>
<tr>
<td>ODD</td>
<td>7.05</td>
<td>2.63-18.85</td>
<td>6</td>
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<tr>
<td>CD</td>
<td>5.40</td>
<td>2.53-11.55</td>
<td>8</td>
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<tr>
<td>ASPD</td>
<td>3.17</td>
<td>1.98-5.08</td>
<td>8</td>
</tr>
<tr>
<td>Bipolar disorder</td>
<td>7.09</td>
<td>2.03-24.75</td>
<td>4</td>
</tr>
<tr>
<td>Depression</td>
<td>2.31</td>
<td>1.45-3.70</td>
<td>13</td>
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<tr>
<td>Anxiety disorders</td>
<td>1.48</td>
<td>0.89-2.46</td>
<td>9</td>
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<tr>
<td>Panic disorder</td>
<td>2.47</td>
<td>1.10-5.53</td>
<td>4</td>
</tr>
<tr>
<td>Suicide attempts</td>
<td>2.48</td>
<td>1.63-3.77</td>
<td>7</td>
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## Academics and employment

<table>
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<tr>
<th>Long-term outcome</th>
<th>Odds ratio</th>
<th>95% CIs</th>
<th>No. of data points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Failure to complete high school</td>
<td>3.70</td>
<td>1.96-6.99</td>
<td>11</td>
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<tr>
<td>Grade retention</td>
<td>3.64</td>
<td>2.39-5.56</td>
<td>9</td>
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<tr>
<td>Suspension</td>
<td>6.31</td>
<td>2.53-15.73</td>
<td>5</td>
</tr>
<tr>
<td>Expulsion</td>
<td>3.19</td>
<td>2.15-4.74</td>
<td>4</td>
</tr>
<tr>
<td>No tertiary education</td>
<td>6.47</td>
<td>4.58-9.14</td>
<td>9</td>
</tr>
<tr>
<td>Fired</td>
<td>3.92</td>
<td>2.68-5.74</td>
<td>4</td>
</tr>
<tr>
<td>Unemployment</td>
<td>1.97</td>
<td>1.01-3.85</td>
<td>4</td>
</tr>
<tr>
<td>Long-term outcome</td>
<td>Odds ratio</td>
<td>95% CIs</td>
<td>No. of data points</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>------------</td>
<td>-------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>Criminal acts</td>
<td>1.81</td>
<td>0.94-3.50</td>
<td>7</td>
</tr>
<tr>
<td>Arrest</td>
<td>2.43</td>
<td>1.62-3.65</td>
<td>10</td>
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<tr>
<td>Drug-related arrest</td>
<td>1.69</td>
<td>0.75-3.77</td>
<td>4</td>
</tr>
<tr>
<td>Violence-related arrest</td>
<td>3.63</td>
<td>2.31-5.70</td>
<td>5</td>
</tr>
<tr>
<td>Convictions</td>
<td>2.01</td>
<td>1.25-3.24</td>
<td>6</td>
</tr>
<tr>
<td>Incarceration</td>
<td>2.53</td>
<td>1.38-4.63</td>
<td>4</td>
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## Other outcomes

<table>
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<tr>
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<th>Odds ratio</th>
<th>95% CIs</th>
<th>No. of data points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early pregnancy (&lt; 23 years)</td>
<td>2.77</td>
<td>0.67-11.37</td>
<td>5</td>
</tr>
<tr>
<td>Vehicular accidents</td>
<td>1.15</td>
<td>0.67-1.99</td>
<td>6</td>
</tr>
<tr>
<td>At-fault vehicular accidents</td>
<td>1.98</td>
<td>1.03-3.81</td>
<td>4</td>
</tr>
<tr>
<td>Vehicular accidents with injury</td>
<td>2.75</td>
<td>1.47-5.15</td>
<td>4</td>
</tr>
<tr>
<td>Driving citations</td>
<td>2.13</td>
<td>1.09-4.19</td>
<td>5</td>
</tr>
<tr>
<td>DUI driving citations</td>
<td>1.60</td>
<td>1.00-2.57</td>
<td>5</td>
</tr>
<tr>
<td>License revoked/suspended</td>
<td>1.95</td>
<td>1.30-2.92</td>
<td>5</td>
</tr>
<tr>
<td>Service use – education</td>
<td>6.37</td>
<td>2.58-15.73</td>
<td>8</td>
</tr>
</tbody>
</table>
Increased Mortality

- Females 3.60 (2.24-5.44)
- Males 2.27 (1.82-2.79)
- Excess mortality due to suicide and accidents

(Dalsgaard et al., 2014)
The Aetiology of ADHD

- Genetics
  - Multiple Genes with small effects

- Environmental Factors
  - Maternal Smoking
  - Pregnancy Complications
  - Prematurity
  - Parental Neglect
  - Acquired Brain Injury
Identifying Children with ADHD

- Hyperactivity is very non-specific and unreliable.
- Children with ADHD maintain attention 1 on 1 or in activities in which they are absorbed (e.g., computer games).
- Impulsivity is helpful but not always present.
- Inattention during non-stimulating activities and disorganization are the most reliable indicators.
Identifying Children with ADHD

- Problems primarily due to the ADHD symptoms
  - Don’t finish their work
  - Forgetful (books/ pens/ lessons etc)
  - Appear not to listen/ Day Dream
  - Appear Bored/ Not making an effort
- Secondary Problems
  - Disruptive (boys)
  - Quiet, withdrawn and anxious (girls)
Josephine

- 16 year old year 11 student
- Presents with depression, cannabis and alcohol abuse
- Distressed because she is failing at school
- Thinks she is ‘dumb’
- Taking longer than others to learn things
- Describes frequently making mistakes
- Feels like she is always in trouble
Josephine

- On careful assessment
  - Often forgets and loses things
  - Takes longer than others to be organised e.g. leaving the house in the morning.
  - Feels constantly anxious and worried she’ll make mistakes
  - Does and says ‘stupid things’ with out thinking
Josephine: Developmental History

- Always found school difficult
- Not disruptive - worked very hard but underachieved
- Had lots of conflict with peers throughout late primary school and high school
- By grade 9, was failing many of her subjects
- Started to use substances, essentially gave up on learning
- Continues at school because parents make her
- Has been in a number of intimate relationships with older males who have treated her badly
Mother confirms Josephine always had difficulties at school

“good girl” throughout primary school who tried very hard

In high school, became increasingly disruptive and oppositional

Was being bullied by peers

Started to spend time with older males, engaged in substance use
Consistently achieved Cs throughout primary school

Early Primary School Comments
- ‘Needs to listen carefully’
- ‘Needs to develop organisational skills’

Early High School Comments
- ‘Should work harder’
- ‘Homework is often not completed’
- ‘Disruptive to others’

NAPLAN
- Underperforming and deteriorating each test
Identifying Children with ADHD

- Psychometric Tests
  - Not essential but helpful for diagnosis and informing parents
- SNAP IV/ Connors Scale
- WISC and WIAT
  - Low working memory
  - Low academic performance in spite of average IQ scores
Sample SNAP-IV Teacher and Parent Rating Scale # 6160
James M. Swanson, Ph.D.

Name: ____________________ Gender: ________ Age: _____ Grade: _____ Date: ___________

Ethnicity (check one) ___African-American ___Asian ___Caucasian ___Hispanic ___Other ____________

For teacher: Completed by: ___________ Type of Class: ___________________ Class Size: ____________

Telephone # at school: ____________________ Recommended times for follow-up call: ______________

For parents: Completed by: _______________ # Parents Living in Home: ______ Family Size: ___________

Period of Time Covered by Rating: ___Past Week ___Past Month ___Past Year ___Lifetime ___Other __________

For each item, select the box that best describes this child. Put only one check per item.

<table>
<thead>
<tr>
<th></th>
<th>Not at all (0)</th>
<th>Just a Little (1)</th>
<th>Quite A Bit (2)</th>
<th>Very Much (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Often fails to give close attention to details or makes careless mistakes in schoolwork, work, or other activities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Often has difficulty sustaining attention in tasks or play activities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Often does not seem to listen when spoken to directly</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Often does not follow through on instructions and fails to finish schoolwork, chores, or duties</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Asks for behaviour over the past week

- “Often has difficulty sustaining attention in tasks or play activities”

Responses
- Not at all 0
- Just a little 1
- Quite a bit 2
- Very much 3
Other Causes for ADHD Symptoms

- Anxiety
- Poor parenting skills
- Attachment Disorders
- Abuse
- Other developmental problems (Language delays, intellectual disability)
- Foetal Alcohol Spectrum Disorder
- Rarely is there urgency to make a diagnosis
- Best practice is working together to ensure the child is comprehensively assessed
Treatment Options

- Behavioural and Learning Support
- Dietary Changes
- Cognitive Remediation
- Omega 3 PUFAs (Fish Oil)
- Pharmacotherapy
  - Stimulant medication- Methylphenidate, Dexamphetamine
  - Non Stimulant Medication- Atomoxetine
Medications in ADHD - MTA

- The Multimodal Treatment Study of Children with ADHD—"MTA"
  - Almost 600 7-9 year old children - Multi-site
  - (1) Methylphenidate (Ritalin) alone
  - (2) Gold Standard Psychosocial/Behavioral treatment alone
  - (3) a combination of both
  - (4) routine community care.
- Study lasted 14 months
MTA- Results

- Superior outcomes for treatment of ADHD symptoms for Ritalin only and Combination of therapy and medication.
- Superior outcome for combination group for anxiety, social skills, parent child relationships and academic performance.
- Families and teachers more satisfied with combination treatment.
- In each group, some children did well.
A meta-analysis of treatments

- Methylphenidate and combined treatments: Large mean weighted effect-sizes for
  - ADHD symptoms
  - oppositional and conduct behaviour symptoms

- Psychosocial interventions: Moderate effect sizes
  - ADHD symptoms
  - oppositional and conduct behaviour symptoms

(Van der ord et al 2009)
ADHD Medication: Adverse Effects

- Loss of appetite
- Stunting of Growth
- Depression
- Emotional Flattening
- Sleep disturbance
ADHD and Co Morbidities

- Neurodevelopmental Problems Cluster Together
  - Intellectual Disability
  - Speech and Language Delays
  - Reading Disorder (Dyslexia)
  - ASD
  - Tourettes Syndrome

- Other Mental Disorders
  - Anxiety
  - Depression
  - Substance use disorders
Conclusion

- Common and Treatable
- Can be very impairing if undiagnosed and untreated
- No Urgency to Treat Developmental Problems
- Assessment requires time and support so parents accept that intervention is needed
- Mild- mod ADHD can be managed in earlier years with behavioural and learning support
- Mod- Severe ADHD usually requires medication
Role of Schools

- Identify children who need further assessment
- Encourage parents to listen to clinical advice.
- Provide Educational Support needed
- Creative ways to support these children
Thank you

Questions?