Diagnosis and Intervention Strategies for Fetal Alcohol Syndrome Children and Adolescents: Perspectives from (Neuro)Psychology

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• Identification and Guidelines

• Intervention

• Neuropsychological Deficits

• The Future

National Organization on Fetal Alcohol Syndrome

• We believe that FASD ...

• is the leading known preventable cause of developmental disabilities and birth defects, and a leading known cause of learning disabilities.

• annual births are greater than the new cases of Down syndrome, cerebral palsy, cystic fibrosis, spina bifida, and sudden infant death syndrome – COMBINED. (FASD nearly the same rate as autism.)

• prevention is at least ten-times more cost effective than the $1.4 million lifetime cost to treat one person with Fetal Alcohol Syndrome.

• can affect anyone regardless of ethnicity, income, or educational level.

• is completely preventable.

• children and adults can succeed with access to services and appropriate intervention.

• birth mothers deserve therapeutic intervention and treatment.

• families and caregivers deserve a voice among researchers and policymakers.

A wealth of information on this web page:  http://www.nofas.org/
Fetal Alcohol Syndrome (FAS): Some Landmarks

- In France: 1968: Lemoine et al (described 127 offspring of chronic alcoholics)
- In the USA: 1973: Jones, Smith, Ulleland, and Streissguth; Jones and Smith: First to use the term fetal alcohol syndrome. Began a new research era. (Identified growth deficiency, intellectual handicap, and craniofacial abnormalities)
- The Pregnancy and Health Program 1978 in King County, Washington (AKA The Seattle Study)
  Before this program 1/3 of the county’s residents believed three or more drinks a day was safe during pregnancy: The public reaction? ANGER!!
- 1993: the Academy of Pediatrics stated ANY alcohol during the pregnancy was harmful.
- 1999 Fetal Alcohol Awareness. Alcohol awareness color is blue.
  - Every year on September 9, communities throughout the United States and the world observe FASD Awareness Day. Events are held at 9:09—the 9th minute of the 9th hour of the 9th day of the 9th month of the year. This date and time is used to remind women not to drink during the 9 months of pregnancy. The first Awareness Day was held on 9/9/99

How big of a problem?

- **Full FAS**
  - 0.2 to 1.5 cases per 1000 births (CDC, 2002; various parts of US)
  - 0.3 per 1000 (2009 data, multi-state study, ages 7 to 9, CDC, 2015)

- **FASD’s**
  - Estimate is 2-5% of US population (May et al., 2009, 2014)

- **FASD’s are considered both a birth defect and a developmental disability**
  - Incidence greater in Native Americans and dependent upon which nation: Navajo 1 in 690; Pueblo 1 in 495; Plains 1 in 102.
Fetal Alcohol Spectrum Disorder
- term adopted in 2006

- Amount/dose
- Timing
- Prenatal environment (care, nutrition)
- Genetics
- Subsequent postnatal environment
Terminology

- **FETAL ALCOHOL SPECTRUM DISORDER**
  - Fetal Alcohol Syndrome
  - Partial Fetal Alcohol Syndrome
  - Neurobehavioral Disorder associated with prenatal alcohol exposure (ND-PAE)
  - Alcohol Related Birth Defects ARBD

- **Other:**
  - Gestational Alcohol Exposure
  - Alcohol Encephalopathy

**DSM-5 recognition**

- **Neurobehavioral Disorders**
- **Onset age**
- **Severity scales**
- **Qualifiers**
  - Associated with a known medical or genetic condition or environmental factor
- **ND-PAE**
Proposed Criteria: ND-PAE
Neurobehavioral disorder associated with prenatal alcohol exposure

• Impaired neurocognitive functioning. At least one of the following:
  • global intellectual performance ≤ 70
  • Executive Function
  • Learning
  • Memory
  • Visual Spatial

• Impaired Self Regulation. At least one of the following:
  • Mood or behavioral
  • Attention
  • Impulse control

• Adaptive Function. Two or more of the following: (Vineland categories)
  • Communication
  • Social communication and interaction
  • Daily living skills
  • Motor skills

• More than minimal exposure. (> 13 drinks per month. Also no episode of ≥2 drinks)
• Evident in childhood; clinically significant distress; not explained by other.


- Facial dysmorphia
  - Smooth philtrum, thin vermilion border, small palpebral fissures

- Growth Problem
  - Height and or weight ≤ 10th %ile documented at any point in time

- Central nervous system abnormalities
  - Structural
    - Head circumference ≤ 10th %ile
    - Neuroimaging abnormalities
  - Neurological.
    - Deficits not due to other.
  - Functional
    - Cognitive or intellectual ≥ 2 standard deviations below mean
    - Functional deficits (≥ 1 standard deviation below average) in at least three of the following
      - Cognitive, developmental or discrepancies
      - Executive function
      - Motor functioning
      - Attention or hyperactivity
      - Social skills
      - Other, including sensory, pragmatic language, memory, etc

- Maternal alcohol exposure
  - Confirmed
  - Unknown

- Diagnosis of FAS requires facial dysmorphia, growth, CNS

Frontal lobe volume by diagnosis

But, don’t judge a book by it’s cover!!
Partial FAS (pFAS)

- Characteristic facial abnormalities as well as growth retardation, CNS abnormalities, or cognitive abnormalities characteristic of full blown FAS. The facial abnormalities must include 2 of the 3 cardinal facial features.

- Also requires
  - pre- or post-natal growth retardation in height or weight; or small head circumference.
  - OR, evidence of complex pattern of behavioral or cognitive abnormalities inconsistent with developmental level and unexplainable by genetic composition, family background or environment.

- Confirmed use of gestational alcohol required though not required.
Alcohol-related birth defects (ARBD)

- Rarely used diagnosis
- Congenital anomalies, malformations, and dysplasias
- Two of three dysmorphic facial features
Binge Exposure

• Binge-like alcohol exposure during the brain growth spurt may be as devastating as chronic exposure through the pregnancy.

• Binge:
  • double the usual amount ingested
  • >3 ounces of absolute alcohol (≈ to 3 shots of 80-proof whiskey)
  • Current standard (CDC): four or more drinks at one time.

Alcohol Mechanism of Damage

• Fetal hypoxia: Collapse of umbilical vessels within 10–15 minutes and recovery about 30 minutes later (animal model: monkey).
  • Reduced number of hippocampal neurons
  • Lower dendritic spine density
  • Decreased Plasticity

Primary Disabilities
(CNS mediated neurocognitive abilities and neuromaturation)

Interventions

Secondary Disabilities
(AKA: Day to Day Life)
INTERVENTION: DIATHESIS STRESS

- This model suggests individuals who are vulnerable (have PRIMARY DISABILITIES).
- And are exposed to stress, will develop problems (SECONDARY DISABILITIES).
- Thus the intervention is to protect the individual, by providing intervention to their primary disabilities.

- PROTECTIVE FACTORS
  - Stable, nurturant, good quality home during critical / important parts of life (experience-dependent/expectant) or majority of life
  - Relationship / Bonding
  - Remain safe from violence
  - Apply for and have appropriate aide (social services)
  - Early identification
Secondary Disabilities

- School disruption
- Trouble with the Law
- Confinement experience
- Inappropriate sexual behaviors
- Drug/alcohol problems
- Mental Health diagnoses affecting adaptive function
- Dysfunctional family interactions
No specific treatments exist that are specific to FAS, but the similarity to other diagnoses such as ADHD allows the development of a treatment framework.

• For example, it has been estimated that 50 – 90% of individuals with FASD have ADHD.

• Stimulants? Differential outcomes.
  • May reduce activity, but not improve attention
  • Results may be unpredictable, and even lead to poorer outcomes.
  • May increase spontaneous motor behavior later in life.
  • Clinical trial for Strattera underway.
  • In general, not a great response to methylphenidate

• Impact of nutrition during pregnancy (increasingly studied; for example mitigating effect of iron or other vitamins)
ADHD in FAS. It may not be the same.

• ADHD affects up to 11% in the population.

• A recent (2015) meta-analysis looking at executive functions

• In FASD: planning, fluency, set shifting, working memory

• In ADHD without FAS: Working memory

• (These groups could not be differentiated on the basis of inhibitory deficits.)
• In comparison to children with ADHD, neuropsychological evaluation can provide information about areas of information processing deficit such as
  • Visual spatial
  • Encoding of information
  • Flexibility in problem solving
  • Math problem solving
  • General intellectual
  • Etc.

• The above do not tend to be problem areas in individuals with ADHD only.
Early and family oriented interventions

• In 2001, in response to the Healthy Children Act of 2000, the CDC provided funding to five grantees to develop systematic, specific and scientifically evaluated children with FASDs and their families.

• Project Bruin Buddies
• Math Interactive Learning Experience
• Neurocognitive Habilitation
• Parent-Child Interaction Therapy
Bruin Buddies:

96 children 6 – 12 years completed the study. Vineland Social Composite $z < 1.0$; verbal IQ $> 70$

- Parent assisted children’s friendship training
  - Target areas: understanding social cues, indiscriminant social behavior, communicating in social contexts
  - Skills taught: a) social network formation with the aid of b) informational interchange with peers leading to a common ground activity, c) entry into a group of children already in play, d) in home play dates, and conflict avoidance and negotiation.
  - Results was improvement at home as a result of treatment, though not in the classroom. More work was suggested.

Objective: to improve behavioral and mathematic functioning of alcohol affected children.

- 6 weeks of math tutoring
  - Active learning approach using “plan-do-review” methodology
- Caregivers received instruction in supporting math learning and weekly home assignments to compliment individualized tutoring sessions
- Education to the teachers about alcohol related neurodevelopmental problems

Participants did make gains in math and behavior as assessed via pre- and post-testing with CBCL.
Neurocognitive habilitation for children with FASDs (Children’s Research Triangle)

78 children, 40 received the intervention. Specific ages not given.

• Recipients: Children with FASDs who had been adopted or who were in foster care.
  • These children do not have the protective factors of
    • Being raised in a stable nurturing home
    • Diagnosis before age 6; receiving early intervention
    • No sexual or physical abuse history
    • Not changing households every few years

• Core components: education and support to family
  • Also executive function
    • Alert program (car engine as a metaphor): 12 weekly 75-min sessions
    • Tools for memory, cause and effect reasoning, sequencing, planning, problem solving

• Results were promising.
Parent-Child Interaction Therapy (OK)

• Objective: reduce behavior and parenting stress.

• PCIT provides a live coached practice of behavioral parenting skills
  • Enhance parent-child relationship; increase appropriate social skills; reduce inappropriate behaviors; promote positive discipline.
  • 14 weeks 90-min sessions

• Approx 50% attrition rate

• There was improvement, but no significant difference between PCIT and Parent Support and Management group.

46 children 3 – 7 years of age.
Behavior Consultation Intervention (WA)

52 children 5 – 11 years of age.

• Objective: To develop a program, Families Moving Forward, for families with children with FASDs
  • Positive behavior support techniques
    • (In WA state, 82% of FASD children had disruptive behaviors)
    • That the families tend to be highly stressed is not helpful.
  • Quality of caregiving a specific target
    • Parents of FASDs very diverse group of birth, kinship, foster and adoptive

• The program: 9 – 11 months, with at least 16 every-other weekend 90 min sessions. Program was designed with flexibility in mind.

- Children assessed at ages 6 to 7 years of age.
- Almost one fourth of the women denied alcohol use during pregnancy.
- Low levels of alcohol use were reported in 63.8% and moderate/heavy use in 13% of pregnancies.
  - Increasing prenatal alcohol exposure was associated with lower birth weight and gestational age, higher lead levels, higher maternal age, and lower education level, prenatal exposure to cocaine and smoking, custody changes, lower socioeconomic status, and paternal drinking and drug use at the time of pregnancy.
- Sood et al 2001

### Table 1: Demographic Characteristics by Alcohol Exposure Group

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>No (n = 117)</th>
<th>Low (n = 325)</th>
<th>Moderate/Heavy (n = 66)</th>
<th>P Value</th>
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</thead>
<tbody>
<tr>
<td>Child</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>6.9</td>
<td>6.9</td>
<td>6.9</td>
<td>NS</td>
</tr>
<tr>
<td>Gender (% M)</td>
<td>49.6</td>
<td>51.7</td>
<td>53.0</td>
<td>NS</td>
</tr>
<tr>
<td>Birth weight</td>
<td>3124.0</td>
<td>3024.5</td>
<td>2690.8</td>
<td>.000</td>
</tr>
<tr>
<td>Gestational age</td>
<td>38.6</td>
<td>38.9</td>
<td>37.7</td>
<td>.002</td>
</tr>
<tr>
<td>Current lead (µg/dL)</td>
<td>4.8</td>
<td>4.7</td>
<td>6.0</td>
<td>.007</td>
</tr>
<tr>
<td>Performance IQ</td>
<td>85.5</td>
<td>85.2</td>
<td>85.0</td>
<td>NS</td>
</tr>
<tr>
<td>Mother</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>23.2</td>
<td>26.0</td>
<td>28.1</td>
<td>.000</td>
</tr>
<tr>
<td>Education</td>
<td>11.4</td>
<td>11.7</td>
<td>11.2</td>
<td>.030</td>
</tr>
<tr>
<td>Married (%)</td>
<td>32.8</td>
<td>27.0</td>
<td>21.5</td>
<td>NS</td>
</tr>
<tr>
<td>Cigarettes (number/d)</td>
<td>4.0</td>
<td>8.9</td>
<td>14.0</td>
<td>.000</td>
</tr>
<tr>
<td>Cocaine use (%)</td>
<td>18.8</td>
<td>45.2</td>
<td>69.7</td>
<td>NS</td>
</tr>
<tr>
<td>Current alcohol (oz AA/d)</td>
<td>0.04</td>
<td>0.4</td>
<td>0.5</td>
<td>.061</td>
</tr>
<tr>
<td>Current drugs (% use)</td>
<td>0.0</td>
<td>1.5</td>
<td>4.5</td>
<td>NS</td>
</tr>
<tr>
<td>Family</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Custody (biological mother)</td>
<td>87.2</td>
<td>85.4</td>
<td>62.1</td>
<td>.000</td>
</tr>
<tr>
<td>Custody changes (% yes)</td>
<td>16.5</td>
<td>21.1</td>
<td>35.4</td>
<td>.011</td>
</tr>
<tr>
<td>Father lives with child (%)</td>
<td>28.4</td>
<td>21.5</td>
<td>15.4</td>
<td>.108</td>
</tr>
<tr>
<td>Father drinks (%)</td>
<td>45.2</td>
<td>80.3</td>
<td>89.2</td>
<td>.000</td>
</tr>
<tr>
<td>Father uses drugs (%)</td>
<td>21.7</td>
<td>37.7</td>
<td>44.6</td>
<td>.002</td>
</tr>
<tr>
<td>SES</td>
<td>30.7</td>
<td>29.9</td>
<td>25.1</td>
<td>.001</td>
</tr>
<tr>
<td>HOME inventory</td>
<td>32.8</td>
<td>31.8</td>
<td>28.9</td>
<td>.012</td>
</tr>
<tr>
<td>Violence exposure</td>
<td>14.1</td>
<td>13.7</td>
<td>13.7</td>
<td>NS</td>
</tr>
<tr>
<td>Maternal depression</td>
<td>16.1</td>
<td>17.2</td>
<td>17.2</td>
<td>NS</td>
</tr>
<tr>
<td>SCL-GSI</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>NS</td>
</tr>
</tbody>
</table>

P values from corresponding t or χ² analyses. NS indicates not significant; AA, absolute alcohol; SCL-GSI, Symptom Checklist-Global Severity Index.
The effect was observed at average levels of exposure of as low as 1 drink per week. Although effects on mean scores for Externalizing and Aggressive behaviors were observed at low levels of prenatal alcohol exposure, effects on Delinquent behavior and Total Problem Scores were observed at moderate/heavy levels of exposure.

Children with any prenatal alcohol exposure were 3.2 times as likely to have Delinquent behavior scores in the clinical range compared with non-exposed children.

Prenatal alcohol exposure remained a significant predictor of behavior after adjusting for covariates. Although maternal psychopathology was the most important predictor of behavior.

Sood et al, 2001
Children who are exposed to alcohol have significantly greater odds of having delinquent behavior.

Sood et al., 2001

Burd et al 2003

>70% Native American; Chance for ADHD, developmental, learning, and social problems increased by 37 to 82%
For anger 38%

<table>
<thead>
<tr>
<th>Comorbid mental disorder</th>
<th>FAS n (%)</th>
<th>Partial FAS n (%)</th>
<th>No FAS n (%)</th>
<th>FAS to partial FAS RR</th>
<th>P</th>
<th>FAS to no FAS RR</th>
<th>P</th>
<th>Partial FAS to no FAS RR</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADHD</td>
<td>111 (73.0)</td>
<td>108 (71.5)</td>
<td>32 (36.8)</td>
<td>1.03</td>
<td>0.870</td>
<td>1.76</td>
<td>&lt;0.001</td>
<td>1.82</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Learning disability</td>
<td>54 (35.5)</td>
<td>52 (34.4)</td>
<td>12 (13.8)</td>
<td>1.02</td>
<td>0.938</td>
<td>1.43</td>
<td>&lt;0.001</td>
<td>1.44</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Mood disorder</td>
<td>12 (7.89)</td>
<td>17 (11.26)</td>
<td>6 (6.9)</td>
<td>0.81</td>
<td>0.424</td>
<td>1.19</td>
<td>0.385</td>
<td>1.05</td>
<td>0.979</td>
</tr>
<tr>
<td>ODD</td>
<td>25 (16.4)</td>
<td>28 (18.5)</td>
<td>10 (11.5)</td>
<td>0.93</td>
<td>0.742</td>
<td>1.20</td>
<td>0.213</td>
<td>1.15</td>
<td>0.394</td>
</tr>
<tr>
<td>Developmental disorder</td>
<td>47 (30.9)</td>
<td>31 (20.5)</td>
<td>2 (2.3)</td>
<td>1.29</td>
<td>0.053</td>
<td>1.60</td>
<td>&lt;0.001</td>
<td>1.74</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Other medical problems</td>
<td>9 (5.9)</td>
<td>17 (11.3)</td>
<td>2 (2.3)</td>
<td>0.67</td>
<td>0.146</td>
<td>1.46</td>
<td>0.027</td>
<td>1.30</td>
<td>0.334</td>
</tr>
<tr>
<td>Sleep problem</td>
<td>19 (12.5)</td>
<td>31 (20.5)</td>
<td>11 (12.6)</td>
<td>0.72</td>
<td>0.084</td>
<td>1.21</td>
<td>0.174</td>
<td>1.00</td>
<td>0.999</td>
</tr>
<tr>
<td>Anger problem</td>
<td>24 (15.8)</td>
<td>50 (33.1)</td>
<td>13 (14.9)</td>
<td>0.58</td>
<td>&lt;0.001</td>
<td>1.38</td>
<td>0.004</td>
<td>1.02</td>
<td>0.999</td>
</tr>
<tr>
<td>Other psychiatric symptoms</td>
<td>4 (2.6)</td>
<td>11 (7.3)</td>
<td>5 (5.7)</td>
<td>0.52</td>
<td>0.109</td>
<td>1.09</td>
<td>0.851</td>
<td>0.69</td>
<td>0.387</td>
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<tr>
<td>Self-injury</td>
<td>16 (10.5)</td>
<td>18 (11.9)</td>
<td>6 (6.9)</td>
<td>0.93</td>
<td>0.840</td>
<td>1.21</td>
<td>0.310</td>
<td>1.16</td>
<td>0.483</td>
</tr>
<tr>
<td>Social skills</td>
<td>53 (31.9)</td>
<td>63 (41.7)</td>
<td>14 (16.1)</td>
<td>0.86</td>
<td>0.267</td>
<td>1.50</td>
<td>&lt;0.001</td>
<td>1.37</td>
<td>0.003</td>
</tr>
<tr>
<td>Alcohol</td>
<td>11 (7.2)</td>
<td>9 (6.0)</td>
<td>2 (2.3)</td>
<td>1.10</td>
<td>0.829</td>
<td>1.31</td>
<td>0.340</td>
<td>1.36</td>
<td>0.186</td>
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<tr>
<td>Heart problem</td>
<td>18 (11.8)</td>
<td>10 (6.6)</td>
<td>7 (8.1)</td>
<td>1.32</td>
<td>0.171</td>
<td>0.92</td>
<td>0.881</td>
<td>1.15</td>
<td>0.482</td>
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<tr>
<td>Seizures</td>
<td>16 (10.5)</td>
<td>6 (4.0)</td>
<td>4 (4.6)</td>
<td>1.50</td>
<td>0.048</td>
<td>0.94</td>
<td>0.999</td>
<td>1.29</td>
<td>0.177</td>
</tr>
</tbody>
</table>
Take home is the increased risk for mental disorders.

**Burd’s conclusions:**

• Clinicians may wish to speculate on why we continue to view dysmorphia as the essential features of FAS and pFAS when the primary problem is dysfunction manifesting as disorders of development and mental illness.

• We may need to consider dysmorphia as a marker that correlates with severity.

• Burd and colleagues advocates that the primary phenotype of prenatal alcohol exposure is neurodevelopmental.
• **FAS/PFAS**: severe cognitive/behavioral dysfunction and FAS phenotype.

• **SA/AE**: severe cognitive/behavioral dysfunction though without facial dysmorphology.

• **ND/AE**: prenatal alcohol exposure comparable to groups 1 and 2, though in comparison to these groups only mild to moderate cognitive/behavioral dysfunction and also no facial dysmorphology.

• **Normal CNS/AE**: had prenatal alcohol exposure, though no CNS abnormalities, may have had growth deficiency and/or FAS facial/features.
TABLE 7  Child Behavior Check List (CBCL/ 6-18) outcomes (see Figure 2) among the 516 patients administered a CBCL when they were between 6 and 18 years of age.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>FASD Diagnostic Subgroups</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>Overall</th>
<th>Post Hoc</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N = 154</td>
<td>N = 394</td>
<td>N = 722</td>
<td>N = 130</td>
<td>N = 1400</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Problems: T-score&lt;sup&gt;c&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internalizing</td>
<td>51</td>
<td>63.4(10.1)</td>
<td>154</td>
<td>64.5(10.9)</td>
<td>270</td>
<td>65.6(10.9)</td>
<td>25</td>
</tr>
<tr>
<td>Externalizing</td>
<td>51</td>
<td>69.1(9.9)</td>
<td>154</td>
<td>69.6(10.9)</td>
<td>270</td>
<td>70.8(10.3)</td>
<td>25</td>
</tr>
<tr>
<td>Total</td>
<td>51</td>
<td>71.4(8.9)</td>
<td>154</td>
<td>71.3(9.3)</td>
<td>270</td>
<td>72.1(9.0)</td>
<td>25</td>
</tr>
<tr>
<td>Syndrome Scales: T-score&lt;sup&gt;d&lt;/sup&gt;</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anxious/Depressed</td>
<td>51</td>
<td>63.0(11.3)</td>
<td>153</td>
<td>64.0(9.9)</td>
<td>269</td>
<td>64.9(10.9)</td>
<td>25</td>
</tr>
<tr>
<td>Withdrawn/Depressed</td>
<td>50</td>
<td>62.4(8.6)</td>
<td>153</td>
<td>64.6(11.2)</td>
<td>269</td>
<td>65.0(11.1)</td>
<td>25</td>
</tr>
<tr>
<td>Somatic Complaints</td>
<td>51</td>
<td>60.0(9.3)</td>
<td>153</td>
<td>60.8(10.8)</td>
<td>269</td>
<td>61.8(10.0)</td>
<td>25</td>
</tr>
<tr>
<td>Social Problems</td>
<td>50</td>
<td>72.0(12.0)</td>
<td>153</td>
<td>69.7(10.2)</td>
<td>269</td>
<td>68.5(10.2)</td>
<td>25</td>
</tr>
<tr>
<td>Thought Problems</td>
<td>50</td>
<td>70.7(10.7)</td>
<td>153</td>
<td>69.1(10.6)</td>
<td>270</td>
<td>68.4(10.2)</td>
<td>25</td>
</tr>
<tr>
<td>Attention Problems</td>
<td>51</td>
<td>75.5(11.9)</td>
<td>153</td>
<td>75.7(11.0)</td>
<td>270</td>
<td>74.3(11.4)</td>
<td>25</td>
</tr>
<tr>
<td>Rule-Breaking Behavior</td>
<td>51</td>
<td>67.9(8.9)</td>
<td>153</td>
<td>67.5(10.2)</td>
<td>269</td>
<td>69.7(10.0)</td>
<td>25</td>
</tr>
<tr>
<td>Aggressive Behavior</td>
<td>50</td>
<td>70.2(13.1)</td>
<td>153</td>
<td>71.7(12.1)</td>
<td>269</td>
<td>72.0(12.2)</td>
<td>25</td>
</tr>
</tbody>
</table>
FIG. 2 Child Behavior Check List<sup>24</sup> (CBCL/ 6-18) Syndrome Scales (see Table 7) among the 516 patients administered a CBCL when they were between 6 and 18 years of age. All abbreviations are defined in Table 7.
### TABLE 11: Mental health disorders reported in the medical records of the 1,064 patients 5 or more years of age at the time of the FASD diagnostic evaluation across the four study groups.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>FASD Diagnostic Subgroups</th>
<th>Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N = 154</td>
<td>N = 394</td>
</tr>
<tr>
<td>Mental Health Disorders: N (valid%)</td>
<td>73 (47.3%)</td>
<td>71.6 (18.1%)</td>
</tr>
<tr>
<td>ADD/ADHD</td>
<td>53 (34.5%)</td>
<td>59.6 (15.2%)</td>
</tr>
<tr>
<td>Adjustment Disorder</td>
<td>4 (2.6%)</td>
<td>2.6 (0.6%)</td>
</tr>
<tr>
<td>Antipersonality Disorder</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Anxiety Disorder</td>
<td>2 (1.3%)</td>
<td>1.3 (0.3%)</td>
</tr>
<tr>
<td>Reactive Attachment Disorder</td>
<td>6 (3.9%)</td>
<td>3.9 (1.0%)</td>
</tr>
<tr>
<td>Bipolar/Manic Depression</td>
<td>4 (2.6%)</td>
<td>2.6 (0.7%)</td>
</tr>
<tr>
<td>Conduct Disorder</td>
<td>2 (1.3%)</td>
<td>1.3 (0.3%)</td>
</tr>
<tr>
<td>Depression</td>
<td>7 (4.5%)</td>
<td>4.5 (1.2%)</td>
</tr>
<tr>
<td>Dysthmic Disorder</td>
<td>3 (1.9%)</td>
<td>1.9 (0.5%)</td>
</tr>
<tr>
<td>Obsessive Compulsive Disorder</td>
<td>1 (0.6%)</td>
<td>0.6 (0.0%)</td>
</tr>
<tr>
<td>Oppositional Defiant Disorder</td>
<td>8 (5.2%)</td>
<td>5.2 (1.4%)</td>
</tr>
<tr>
<td>Post Traumatic Stress Disorder</td>
<td>10 (6.5%)</td>
<td>6.5 (1.7%)</td>
</tr>
<tr>
<td>Suicidal</td>
<td>2 (1.3%)</td>
<td>1.3 (0.3%)</td>
</tr>
</tbody>
</table>

Neurocognitive (The Holy Grail)

- Executive Function
  - Abstraction/judgment problems
  - Lack of control over emotions
  - Impulsivity
  - Inappropriate/immature social behaviors
  - Difficulty learning from consequences
- Attention (hallmark)
- Visual Spatial/Visual Motor
- Learning and Memory (verbal list learning)
- Motor
- Achievement (Arithmetic/Inability to manage money)
- Adaptive (Greater than expected day to day deficits given their IQ)
- Greater risk of psychiatric difficulties
- Compromises the ability of the neuropil to increase its complexity in response to environmental enrichment

Some of the neuropsychological data from Astley 2010
Alcohol and Pregnancy. No safe amount. No safe time. No safe alcohol.

- Parietal region
- Corpus Callosum
- Cerebellum
- Basal Ganglia
- Hippocampus
- Frontal Lobe Areas (increased thickness)

Brain areas variable between individuals.

Figure from: http://people.uwec.edu/piercech/fas/fas...htm

Drawing (VMI) data
Why does space matter?

- Motor + space = Visual Motor Integration
- Visual Motor Integration + Environmental Input = Behavioral Organization
- Behavioral Organization = Executive Function
- Executive Function = Good Decision Making
- Good decision making = Good Adaptive Skills
- Good Adaptive Skills = Successful Life Experiences

16 Object Spatial Localization/Distortion

Children with FASD demonstrate a new capacity to learn skills, though do so through explicit instruction rather than through observation and abstracting rules, skills an ongoing knowledge as we typically expect.
Higher Level Organization

• Applies to information
  • Unrelated or contextual?
  • Making the abstract more concrete. Applying structure. Identify categories.

• Social
  • Friendship group rules
  • Family rules
  • Community

• Writing
  • Outlines
  • Webbing
  • Paragraph Construction
  • Writing Prompts
The Future

• Neuroplastic Interventions
  • Exercise
    • Shown to impact brain structure involved in learning and memory
    • Has been used as an intervention for ADHD, anxiety, PTSD, depression and other conditions
  • Passive exercise techniques
    • Such as yoga beginning to also be shown increased attention to self and impulsivity
• Mindfulness/Meditation
  • Attention
  • Impulse Control
  • Awareness of Emotions
  • Social Compassion

**Intervention (Handout)**

- **Behavior and Education Therapy**
  - According to the CDC (2011), behavior and education therapy perform important functions as part of treating children with ND-PAE. There are substantial venues of support for persons with ND-PAE developmental disabilities; however, research supports the effectiveness of only a few specific to children with ND-PAE. The DSM-5 lists the following behavior and education therapies that have been proven to be effective according to research:
    - Friendship training—For many children with ND-PAE, making and keeping friends and socializing with others in general is difficult. Friendship training instructs children with ND-PAE how to interact appropriately with friends, how to enter a group of children already at play, how to coordinate and handle in-home play dates, and how to avoid and work through conflicts.
    - Specialized math tutoring—This treatment method offers specialized teaching strategies and tools to help the child with ND-PEA be more successful at math.
    - Executive functioning training—Executive functioning teaches behavioral awareness and self-control, and it improves executive functioning skills, including memory, cause and effect, reasoning, planning, and problem solving.
    - Parent-child interaction therapy—Parent-child interaction therapy strives to improve the parent-child relationship create a positive discipline program and reduce behavior problems in children with ND-PAE. Parents acquire new skills from a coach.
    - Parenting and behavior management training—This behavioral and learning management therapy provides comfort to caregivers, helps to meet the family's needs, and develops strategies that reduce problem behaviors of the child.
(Handout)

- Motor activities/enrichment
  - Promotes organization of nervous system
- A typically developing toddler may need to try a food 12-15 times before “liking” it. A child with FAS may need more exposures.
- Good sleep patterns
  - Routine, visual schedule, safe environment
- Relationship / attachment building
- Structure. Provide it, teach it.
Traditional parenting practices might not be effective for children with ND-PAE. Parent training therapy teaches parents about their child’s disability and gives them various ways to work efficiently with their child. This therapy exists in both group situations or with individual families. Programs offering Parent Training specialize in the following:

- Concentrate on the child's strengths and talents
- Accept the child's limitations/Positive Parenting/Differential reinforcement of positive behavior
- Be consistent with everything (discipline, school, behaviors)
- Use concrete language and examples
- Use stable routines that do not change daily
- Keep it simple
- Be specific—say exactly what one intends (and follow through)
- Structure your child’s world to provide a foundation for daily living
- Use positive reinforcement often (praise, incentives)
- Supervise: friends, visits, and routines
- Repeat, repeat, repeat

Web Resources (Handout)

• FAS Community Resource Center:  http://www.come-over.to/FASCRC/
• National Organization on Fetal Alcohol Syndrome: http://www.nofas.org/
References (selected)


- Competency-Based Curriculum Development Guide for Medical and Allied Health Education and Practice


