**ABSTRACT**

Despite limited data demonstrating catastrophic effects of prenatal cannabis exposure, popular opinion and public policies still reflect the belief that cannabis is a uniquely dangerous teratogen. This article provides a critical review of results from longitudinal studies examining the impact of prenatal cannabis exposure on multiple domains of cognitive functioning. In addition, neuroimaging data on cannabis-exposed offspring are reviewed in order to better understand possible mechanisms of action. Statistically significant differences between prenatally exposed individuals and control participants have been observed on a minority of measures (8.2 percent). More importantly, however, the clinical significance of these findings is limited because cognitive functioning overwhelmingly falls within the normal range when compared against normative data. In short, there is no convincing evidence that prenatal cannabis exposure is associated with unique deleterious effects on cognitive functioning.

**RESULTS SUMMARY**

Any association between prenatal cannabis exposure and cognitive scores? Only a minority (10%) do.

Is clinical relevance determined? No individual scores reported.

Move on with group mean scores...

1. Only one study compares scores with normative data (Richardson et al., 1995).
2. Compare rest if possible (never normed, out of circulation or inaccessible)

**TOTAL FOR ENTIRE LITERATURE <1%**

**OTHER IMPORTANT FINDINGS**

- Overinterpretations in some (9/28) studies
- Language (such as deficit and impairment) when referring to findings—even though none compared against normative data
- Positive relationships minimized
  - Example (Leech et al., 1999): “Although finding fewer errors of omission may, at first, appear to be a positive effect of prenatal exposure...children may do less well over the long-term, particularly in time limited situations.”
- All funded by same institution (NIDA)

**TAKE-HOME MESSAGE**

- There is no convincing evidence that prenatal cannabis exposure produces clinically relevant effects in term of cognition
- Might change in future
  - Cognitive scores are compared against normative data
  - Address impact of disproportionate contribution of research groups & funders

**ACKNOWLEDGEMENTS**

Support contributed by NIDA's T32 in HIV and Substance Abuse in the Criminal Justice System (Dr. Nabila El-Bassel, primary investigator). We thank Drs. Jennifer Manly and Anthony Ahmed for providing access to normative data for cognitive tests.

**REFERENCES**


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**WHAT IS OUR GOAL?**

To examine the assumption that prenatal cannabis exposure is harmful to cognitive functioning.

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**DETERMINING CLINICAL RELEVANCE**

Of every day, real-world, practical or functional import.

- Clinical relevance can be determined by comparing individual scores or measurements with normative data obtained from a large, randomly selected representative sample of the wider population. It should also incorporate important variables such as age, education, and gender.
- Normative data establish a baseline distribution for a score or measurement, and against which the score or measurement in experimental studies can be compared.
- Such comparisons allow researchers to determine whether statistically significant findings are clinically of functionally meaningful.

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**WHAT WE FOUND: THE PRIMARY DATA**

<table>
<thead>
<tr>
<th>Infants &amp; toddlers (birth-3yrs)</th>
<th>10</th>
<th>28</th>
</tr>
</thead>
<tbody>
<tr>
<td>Young children (4-11yrs)</td>
<td>111</td>
<td>3 (16)</td>
</tr>
<tr>
<td>Older children (12-17yrs)</td>
<td>3</td>
<td>1 (1)</td>
</tr>
<tr>
<td>Adolescents &amp; young adults (18-24yrs)</td>
<td>3</td>
<td>1 (1)</td>
</tr>
</tbody>
</table>

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**WHAT WE DID: A CRITICAL REVIEW**

- Included studies on prenatal cannabis exposure and cognition
- Defined as processes of knowing, including attending, perceiving, imagining, remembering, reasoning and problem solving (APA, 2015)
- Identify cohorts
- Ottawa Prospective Prenatal Study (Fried at Ottawa, Canada)
- Mental Health Practices & Child Development Project (Day at Pittsburg, PA)
- Prenatal Cocaine Exposure Studies (Singer at Cleveland, OH & Frank at Boston, MA)
- Jamaican Study (Dreher at Saint Thomas, Jamaica)

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**THE ASSUMPTION OF HARM**

- Cannabis is the most frequently used illicit substance by women of reproductive age in the U.S. (NPDS, 1996; Van Gelder et al., 2010)
- The dominant popular view is that prenatal cannabis exposure causes a broad range of deleterious outcomes, especially on cognitive functioning (for a review, see Huzink and Mulder 2006; Jutras-Asadow et al. 2009)

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**REFERENCES**

