Maltreatment, brain development and the law: Towards an informed developmental framework

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In England the age of criminal responsibility is 10.

The implication is that a child of 10 is of sufficient maturity both to stand trial and be responsible in the same way as an adult for their behaviour.
“What is the magic of the age of 10? Why not 12, 14 or 16? Of course any age must be arbitrary”

Professor Glanville Williams, Textbook of Criminal Law, 1978
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Proposition 1

Across neurocognitive domains, a child of 10 is neurocognitively immature.
Cognitive Development
<table>
<thead>
<tr>
<th>Task</th>
<th>Skill</th>
<th>Study</th>
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<tbody>
<tr>
<td>Delay Discounting</td>
<td>• Future orientation</td>
<td>e.g. Steinberg et al., 2009</td>
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<td>Risk Taking</td>
<td>• Moderating influence of peer pressure</td>
<td>e.g. Gardner &amp; Steinberg, 2005</td>
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<tr>
<td>Emotion Recognition</td>
<td>• Face processing</td>
<td>e.g. Thomas et al., 2007</td>
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<tr>
<td>Planning</td>
<td>• Self regulation</td>
<td>e.g. Steinberg et al., 2008</td>
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Peers increase adolescent risk taking by enhancing activity in the brain’s reward circuitry

Jason Chein, Dustin Albert, Lia O’Brien, Kaitlyn Uckert and Laurence Steinberg
More risky decisions and crashes in adolescents when with a peer than when alone

Chein et al Dev Sci 2010
More risky decisions and crashes in adolescents when with a peer than when alone

Chein et al Dev Sci 2010
Functional Changes
In PEER condition greater activation of the Ventral Striatum in adolescents

Chein et al. *Dev Sci* 2010
<table>
<thead>
<tr>
<th>Task</th>
<th>Brain Regions</th>
<th>Study</th>
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</table>
| Inhibitory Control        | - Anterior cingulate  
                         | - Frontoparietal cortex      | e.g. Velanova et al., 2008 |
| Learning from feedback    | - Dorsolateral prefrontal cortex     | e.g. Crone et al., 2008    |
|                           | - Anterior cingulate                |                            |
| Reward Evaluation         | - Nucleus accumbens  
                         | - Orbitofrontal cortex      | e.g. Galvan et al., 2006   |
| Emotion Processing        | - Amygdala                           | e.g. Hare et al., 2008     |
| Social emotion processing | - Medial prefrontal cortex           | e.g. Burnett et al., 2009  |
Structural Changes
There is converging evidence that typical adolescence is characterised by marked neurocognitive development.
Proposition 2

Early adversity alters the trajectory and balance of adolescent brain development amplifying vulnerability during this period.
Children in Custody *

76% Absent father

51% Deprived households

39% Maltreatment / neglect documented

28% Witnessed domestic violence

* Prison Reform Trust, 2010
• **Structural differences** in regions implicated in social emotional processing
• Structural differences in regions implicated in social emotional processing

• **Functional differences** in regions implicated in emotional processing and reward sensitivity
Maltreatment may sensitize children to certain environmental cues (specifically threat cues) that may be adaptive in abusive contexts but in the longer term lead to heightened risk of mental health problems.
Heightened neural reactivity to threat in child victims of family violence

Eamon J. McCrory¹,²,*, Stéphane A. De Brito¹,²,*, Catherine L. Sebastian¹, Andrea Mechelli³, Geoffrey Bird⁴,⁵, Phillip A. Kelly¹,², and Essi Viding¹
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Maltreatment

Amygdala

Anterior insula

McCrory et al., (2011)

Combat

Wingen et al., (2011)
There is emerging evidence that childhood maltreatment is associated with **atypical** neural development.

Childhood maltreatment may serve to **exacerbate** neurocognitive vulnerabilities that characterise typical adolescent development.
Conclusions

1. An emerging explanatory model, based on neurobiological and cognitive research, means that we are able to characterise with increasing objectivity the developmental maturity of children and adolescents.

2. This research has the potential to \textit{at least inform} how we treat children within the criminal justice system.

3. There is \textit{preliminary} evidence that younger children who have experienced early adversity may be doubly disadvantaged – by virtue of their developmental immaturity \textit{and} heightened neurocognitive risk.

4. This raises a wider question whether, in the cases of very young children, criminalising them is ethically or indeed rationally justified.