Moderate to Late Preterm Infants Demonstrate Verbal Working Memory and Verbal Inhibitory Control Deficits at Preschool Age

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Background
Children born at very preterm have deficits in executive function. The impact of moderate to late preterm birth on executive function remains incompletely defined. Over 10% of births in the United States occur at 32-36 weeks gestation. With a significant proportion of brain growth occurring after 34 weeks gestation and neonatal disease processes affecting the developing brain, moderate to late preterm birth has the potential to impact cognitive outcomes.

Hypothesis
Moderate to late preterm children (32-36 weeks) demonstrate deficits in executive function compared with full term (37-42 weeks) peers at 4½ years of age.

Methods
Recruitment was by telephone from a database of families. Children with neurologic or cysticotic heart disease were excluded. Full term children admitted to an intensive care unit were also excluded.

Children completed a battery of executive function tasks and a measure of verbal intelligence quotient (IQ).

Sample Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Preterm (n=52)</th>
<th>Full Term (n=52)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (months), mean (SD)</td>
<td>57.02 (1.72)</td>
<td>56.67 (2.05)</td>
</tr>
<tr>
<td>Male, n (%)</td>
<td>29 (56.9%)</td>
<td>29 (54.9%)</td>
</tr>
<tr>
<td>Caucasian, n (%)</td>
<td>31 (60.8%)</td>
<td>31 (58.1%)</td>
</tr>
<tr>
<td>Birth History</td>
<td></td>
<td></td>
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<tr>
<td>Gestational age (weeks), mean (SD)</td>
<td>34.95 (1.63)</td>
<td>39.41 (1.29)</td>
</tr>
<tr>
<td>Birth weight (grams)</td>
<td>2408.61 (523.98)</td>
<td>2534.35 (458.59)</td>
</tr>
<tr>
<td>Age at 5 minutes, mean (SD)</td>
<td>8.81 (0.55)</td>
<td>8.94 (0.25)</td>
</tr>
<tr>
<td>Household Characteristics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married, n (%)</td>
<td>24 (46.2%)</td>
<td>24 (45.3%)</td>
</tr>
<tr>
<td>Bachelor's degree or higher, n (%)</td>
<td>42 (80.8%)</td>
<td>49 (49.4%)</td>
</tr>
<tr>
<td>&lt;p=0.01 Annual Income ≤ $50,000, n (%)</td>
<td>2 (3.8%)</td>
<td>3 (5.8%)</td>
</tr>
</tbody>
</table>

References

5Joo ES, Yeon JS, Luna B, Feldman HM. Specific language and reading skills in school-aged children and adolescents are associated with prematurity after controlling for IQ. Neuropsychologia 2010. [Epub ahead of print].

Acknowledgments

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Conclusion

Children born moderate to late preterm demonstrated verbal short term memory and verbal inhibitory control deficits at 4½ years of age compared to their full term peers.

Discussion

• Whether group differences reflected a delay in development or a permanent deficit in moderate to late preterm children was unknown as the study was not longitudinal. However, adolescents born very preterm demonstrate executive function deficits.
• Discrepant language development in children born preterm may explain in part the group performance differences on verbal executive function tasks.
• Children were raised in well-educated, two-parent households with a high socioeconomic status. The group differences for children raised in less enriched environments may be greater.
• Executive dysfunction has the potential to impact success in the classroom setting and may not be picked up on routine kindergarten screening.

Short Term Memory Tasks

For verbal memory, children repeated a sequence of numbers after Count von Count with a maximum length of 5 digits (3 trials per load, 15 trials).

For spatial memory, children recalled a sequence of locations where paw prints appeared with a maximum length of 6 locations (3 trials per load, up to 18 trials).

Inhibitory Control Tasks

For the verbal task, children were instructed to say “day” for the moon and stars and “night” for the sun (16 trials).

For the non-verbal task, children were instructed to point to green in response to the word “snow” and to white in response to the word “grass” (16 trials).

Verbal Intelligence Results

• Children completed the Peabody Picture Vocabulary Test-4 (PPVT).
• The mean PPVT score was 118.17 (10.04) for the preterm group and 123.12 (12.96) for the full term group.
• The correlation between gestational age and verbal IQ approached significance (r=0.19, p=0.06).

Conclusion

Children born moderate to late preterm demonstrated verbal short term memory and verbal inhibitory control deficits at 4½ years of age compared to their full term peers.