



# Early Experience and Attention Development in Preschoolers: Effects of Moderate to Late Preterm Birth

Amanda S. Hodel<sup>1</sup>, Jane E. Brumbaugh<sup>2</sup>, Jennifer A. Wenner<sup>1</sup>, Kathleen M. Thomas<sup>1</sup>

<sup>1</sup>Institute of Child Development, University of Minnesota; <sup>2</sup>Department of Pediatrics, University of Minnesota

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## Introduction

Research in animal and human populations has demonstrated that early, postnatal experiences have a profound impact on later cognitive and brain development (e.g. Greenough et al., 1987). For example, studies examining attention development in adolescents and adults born very preterm (<32 weeks gestation) have suggested that the neural circuitry supporting inhibitory control may be particularly vulnerable to variations in early experience associated with preterm birth (Lawrence et al., 2009).

Interest has recently increased in monitoring neurodevelopmental outcomes of children born moderate to late preterm (32-36 weeks gestation). Although this population typically demonstrates good neonatal outcomes, it is unclear how 4-8 weeks of premature ex-utero experience may alter later brain and cognitive development.

The purpose of this project was to investigate whether moderate to late preterm birth impacts the development of inhibitory control and sustained attention at four years of age.

## Question

Does moderate to late preterm birth impact the development of inhibitory control and/or sustained attention in preschool-aged children?

## Participants

All children were screened for significant prenatal or birth complications, developmental or neurological disorders, and vision or hearing impairments.

	Full-Term Children (n=44)	Preterm Children (n=32)
<b>Age at Test</b>	M = 56.9 months Range = 53 - 59 months	M = 56.4 months Range = 54 - 59 months
<b>Gender</b>	22 f, 22 m	23 f, 9 m
<b>Gestational Age</b>	M = 39.7 weeks Range = 38.0 - 42.2 weeks	M = 34.33 weeks Range = 32.0 - 35.9 weeks
<b>Birth Weight</b>	M = 3580 grams Range = 2605 - 4761 grams	M = 2232 grams Range = 1340 - 2885 grams

**Demographics:** Children were predominantly Caucasian (87%), and lived in two-parent families (91%), with most households having at least one parent who had completed a college or graduate level degree (91%). Median household income for the sample was between \$76,000-\$100,000.

**Excluded Participants:** Four children (3 full-term) failed to complete the inhibitory control or sustained attention task blocks and were excluded from analyses. One full-term child was excluded from the sustained attention task as a statistical outlier.

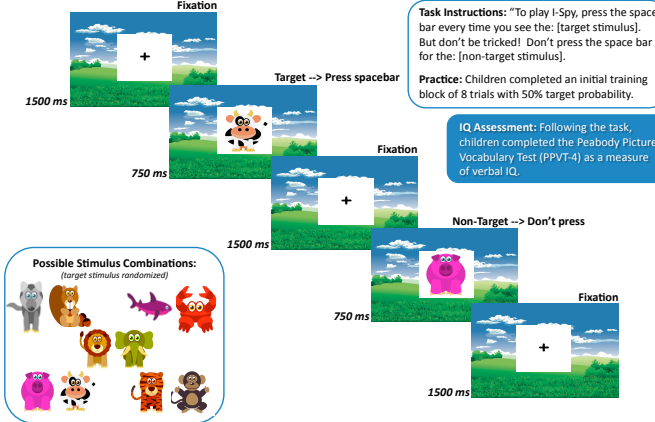
## Acknowledgments

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## Methods

### Combined Go/No-Go – Continuous Performance Task



**Task Design:** Children completed a practice block, followed by 4 blocks of 48 trials each with varying ratios of target : non-target stimuli.

### Go/No-Go Blocks

2 Targets: 1 Non-Target (EASY)  
5 Targets: 1 Non-Target (HARD)

*Inhibitory control* measured by accuracy on infrequent Non-Target (No-Go) trials

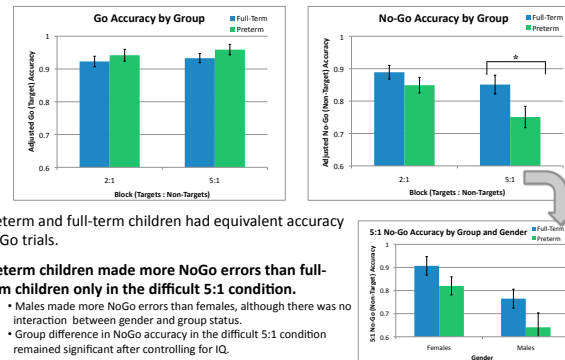
### CPT Blocks

1 Target: 2 Non-Targets (EASY)  
1 Target: 5 Non-Targets (HARD)

*Sustained attention* measured by accuracy on infrequent Target trials

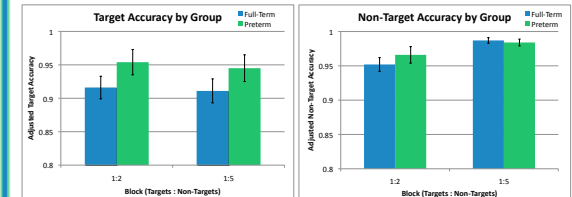
**Analyses:** Group differences in accuracy are reported as marginal means adjusted for gender. All analyses were conducted with and without IQ as an additional covariate.

## Inhibitory Control Results



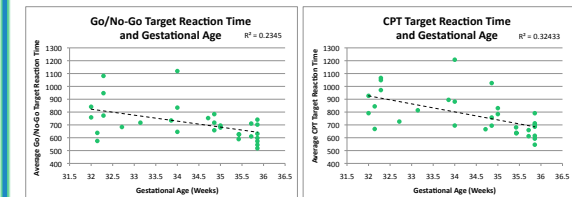
- Preterm and full-term children had equivalent accuracy on Go trials.
- Preterm children made more NoGo errors than full-term children only in the difficult 5:1 condition.
  - Males made more NoGo errors than females, although there was no interaction between gender and group status.
  - Group difference in NoGo accuracy in the difficult 5:1 condition remained significant after controlling for IQ.

## Sustained Attention Results



- Preterm and full-term children did not differ in performance on the sustained attention task.

## Reaction Time Results



- Within the preterm group, faster average reaction times for target stimuli were correlated with greater gestational age on both the Go/No-Go and CPT tasks.

## Discussion

In comparison to full-term children, preschoolers born moderate to late preterm committed more inhibitory control errors during the most difficult condition of a Go/No-Go task. Group differences in inhibitory control were:

- significant after controlling for individual differences in IQ.
- detected in a high SES, high IQ sample, suggesting that the effects may be greater for children in less enriched environmental contexts.
- possibly the result of atypical development rather than delayed maturation, given that adolescents born very preterm show disrupted inhibitory control (Lawrence et al., 2009).

Full-term and preterm children performed equivalently on measures of sustained attention, indicating that only specific aspects of cognitive development are disrupted in children born moderate to late preterm.

Future studies should investigate if moderate to late preterm children exhibit reductions in overall processing speed, given the association between reaction time and gestational age.

## Conclusion

Inhibitory control may be particularly vulnerable to variations in early life experience associated with moderate to late preterm birth.