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INTRODUCTION

Background:

• Previous studies have found large differences between adults and children in behavior and neural control networks during task switching performance [Church et al. 2016; Chevalier et al. 2010].

Objective:

• To test whether differences in eye gaze pattern may inform accuracy and response time differences in task switching performance for adults and children.
• To determine whether performance differences relate to individual differences in working memory and other neuropsychological measures.

METHODS

Approach:

• Eyelink 1000 Plus tracked eye fixations on interest areas during a task switching computer game under two working demand conditions (within subject).
• WISC/WAIS Digit Span, WASI Estimated IQ, D-KEFS Trail Making and Color-Word Interference

Participants:

• 51 Adults (24 m, 28 f; M=22.08 years, 18-27 y.o.)
• 48 Children (28 m, 21 f; M=11.78 years, 8-16 y.o.)

Exclusion Criteria:

• >60% task accuracy on first level (2B2F)
• >200ms response time
• <3+ blinks in a 4000ms trial

Task:

• Three Interest Areas: Features, Choices, and Target.
• Participants responded which response Choice matched the Target stimulus based on the indicated cued Feature.
• Three levels manipulating the number of possible cued features (2,4) and response choices presented (2,4).
• Each level was a mixture of task repetition/switch.

Analysis:

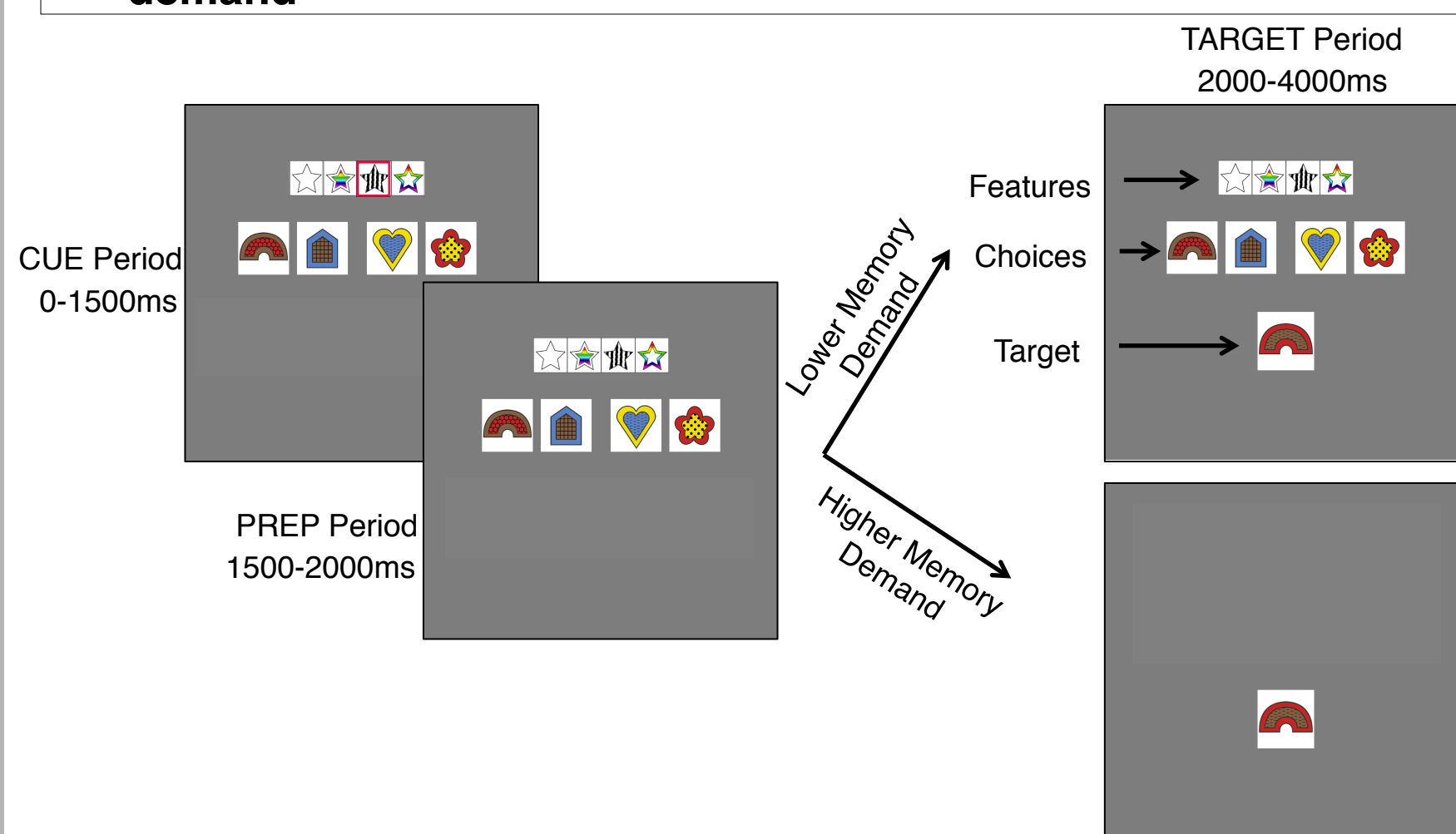
• Correlation between averaged accuracy/response time performance across three levels, neuropsychological assessments and averaged fixation duration across three levels on Interest Areas (Features, Choices and Target) during the Prep Period (1500-2000msec) before the Target for correct trials.

Study 1: Lower Working Memory (WM) Demand

• The feature bar and the response choices remained on the screen during target onset.

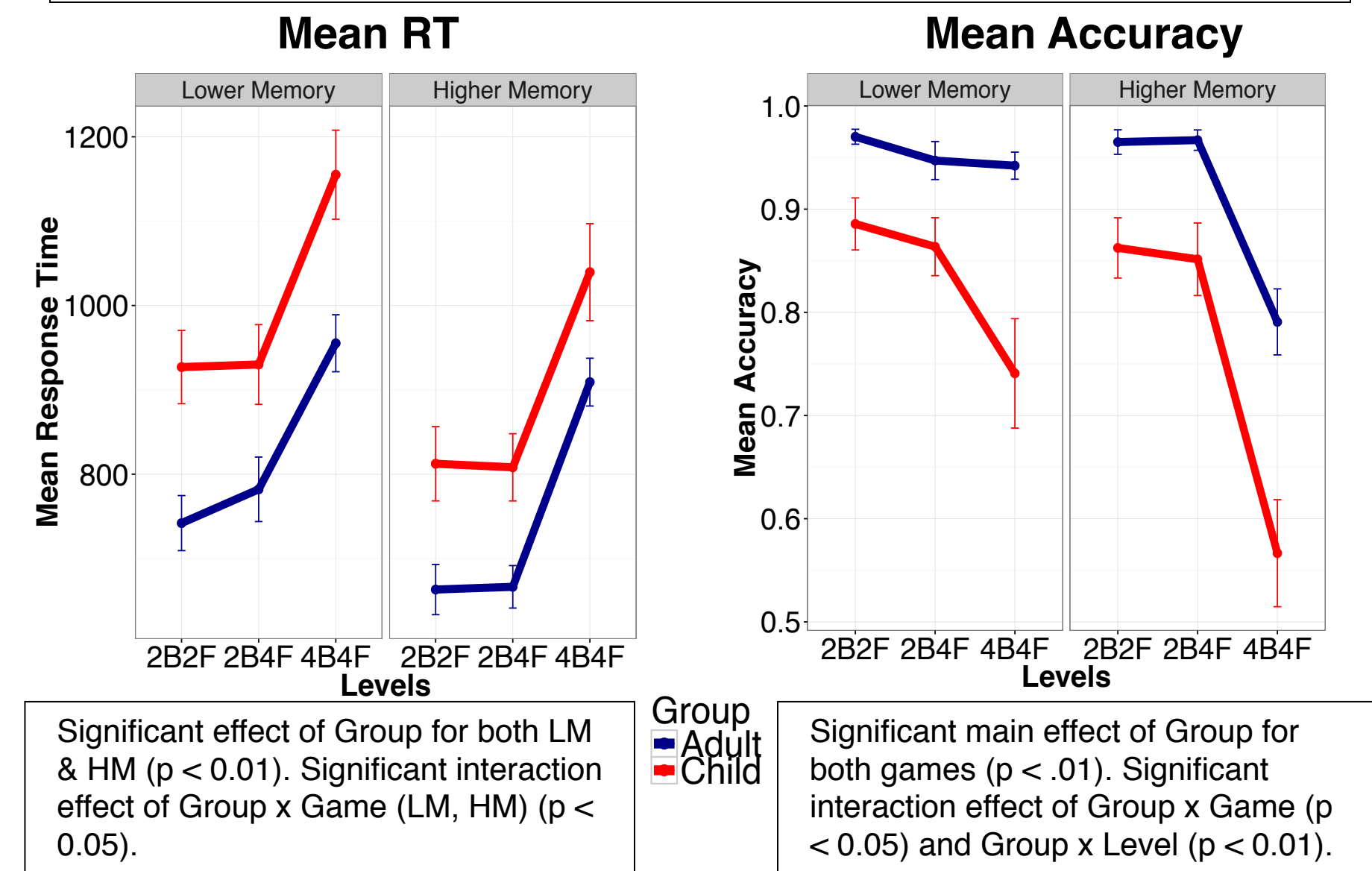
Study 2: Higher Working Memory (WM) Demand

• The target appeared alone to increase working memory demand



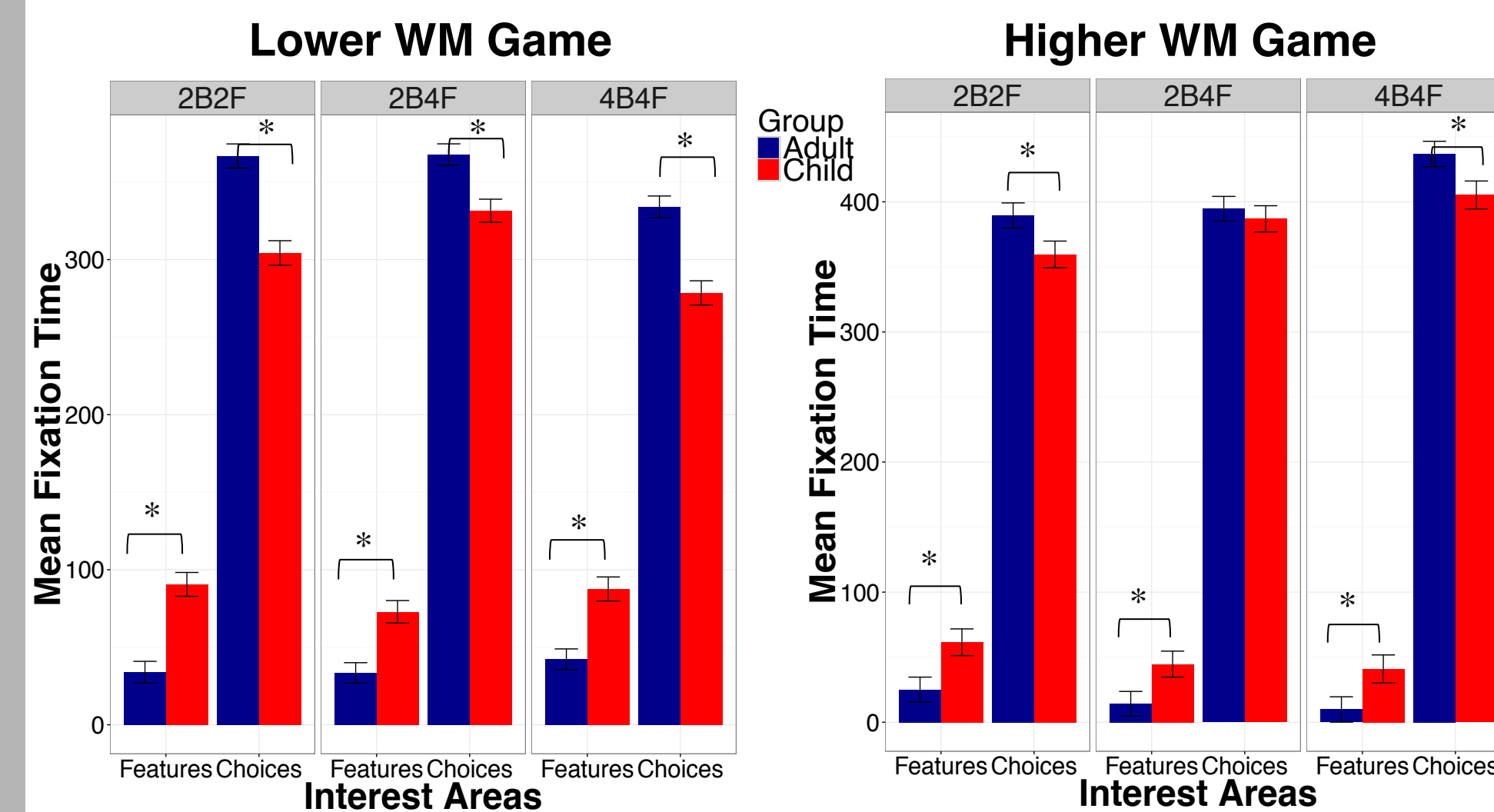
ACCURACY AND RESPONSE TIME

Children were slower than adults, and their accuracy was more affected by increasing response number and working memory demand



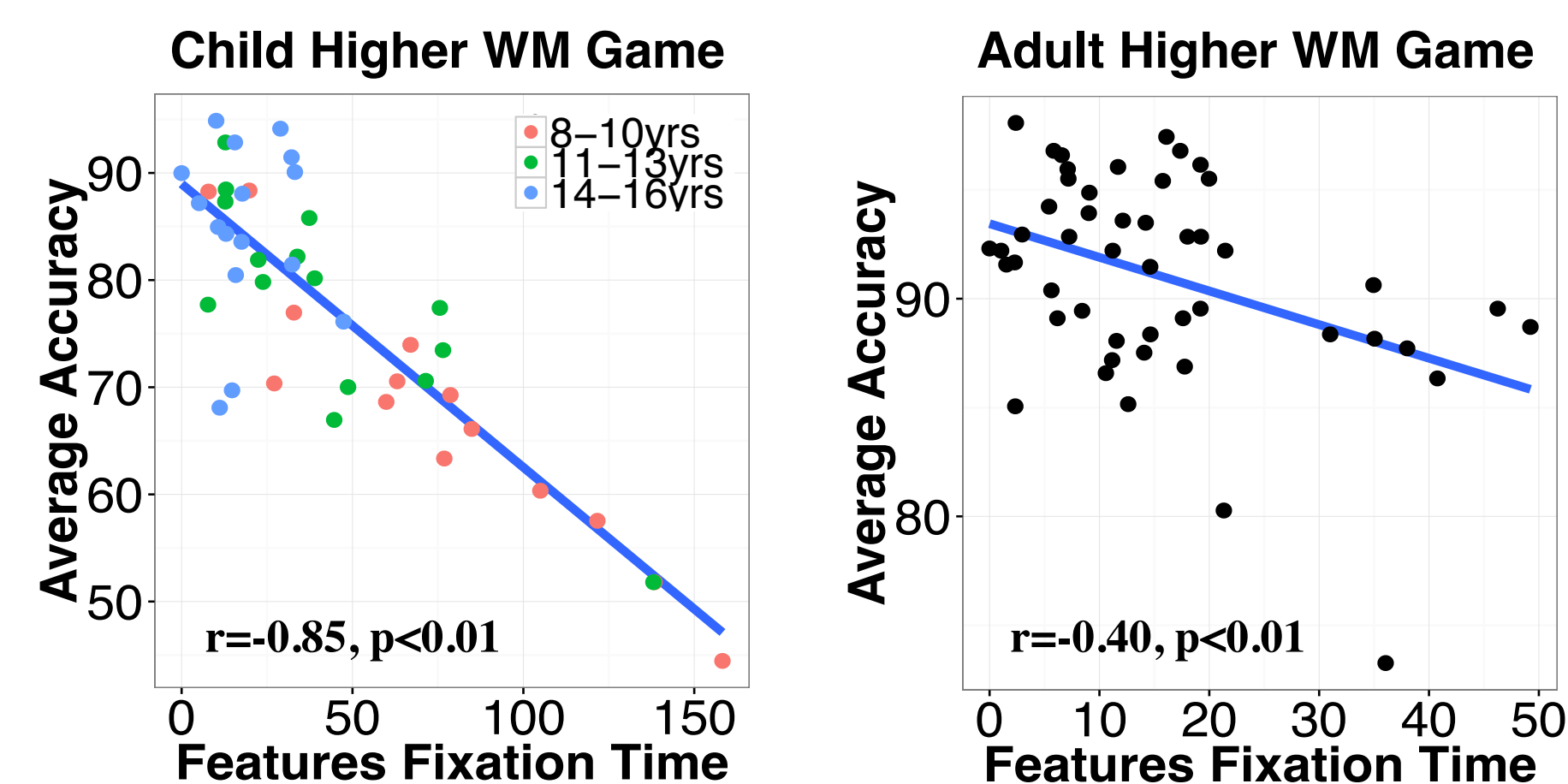
PREP PERIOD FIXATION TIMES

Children fixated longer on the cued features compared to Adults for both Lower and Higher WM Games



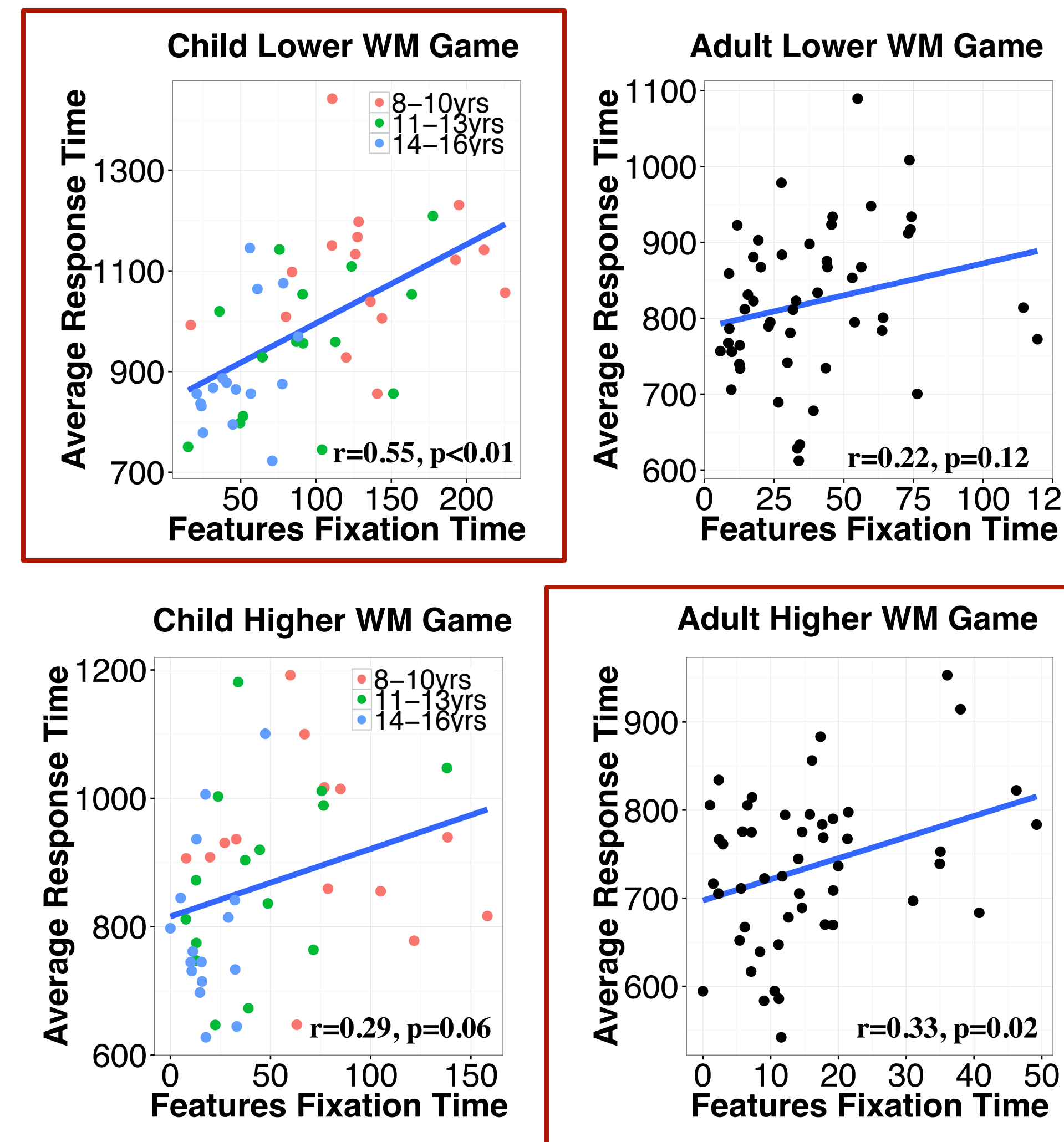
PERFORMANCE & PREP PERIOD FIXATION TIMES

Longer fixation on the cued feature for a trial related to lower accuracy for children for both WM games, and adults for the Higher WM Game



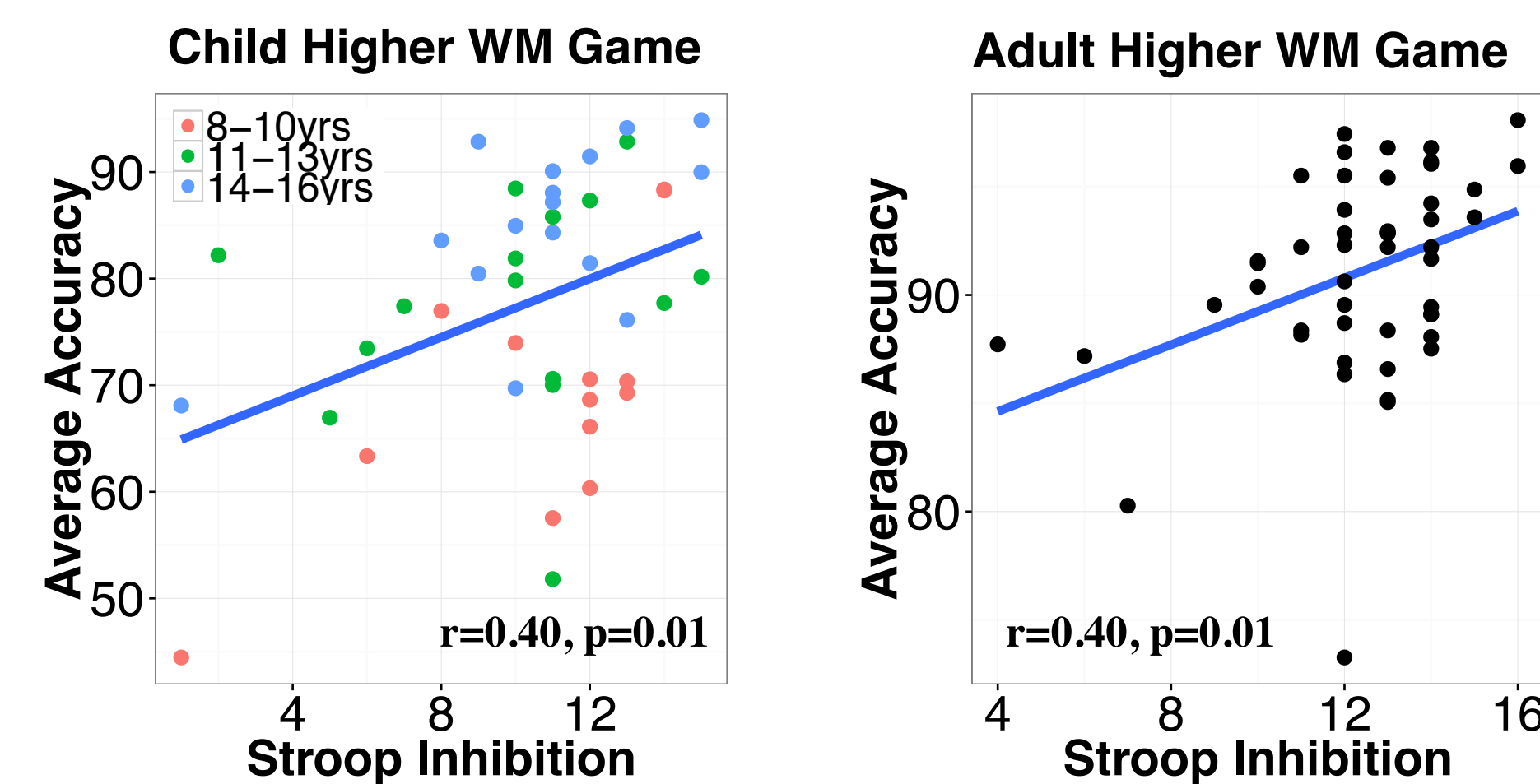
PERFORMANCE & PREP PERIOD FIXATION TIMES

Fixation duration on features was related to response time for children in lower WM Game and adults in Higher WM Game



NEUROPSYCH ASSESSMENTS & PERFORMANCE

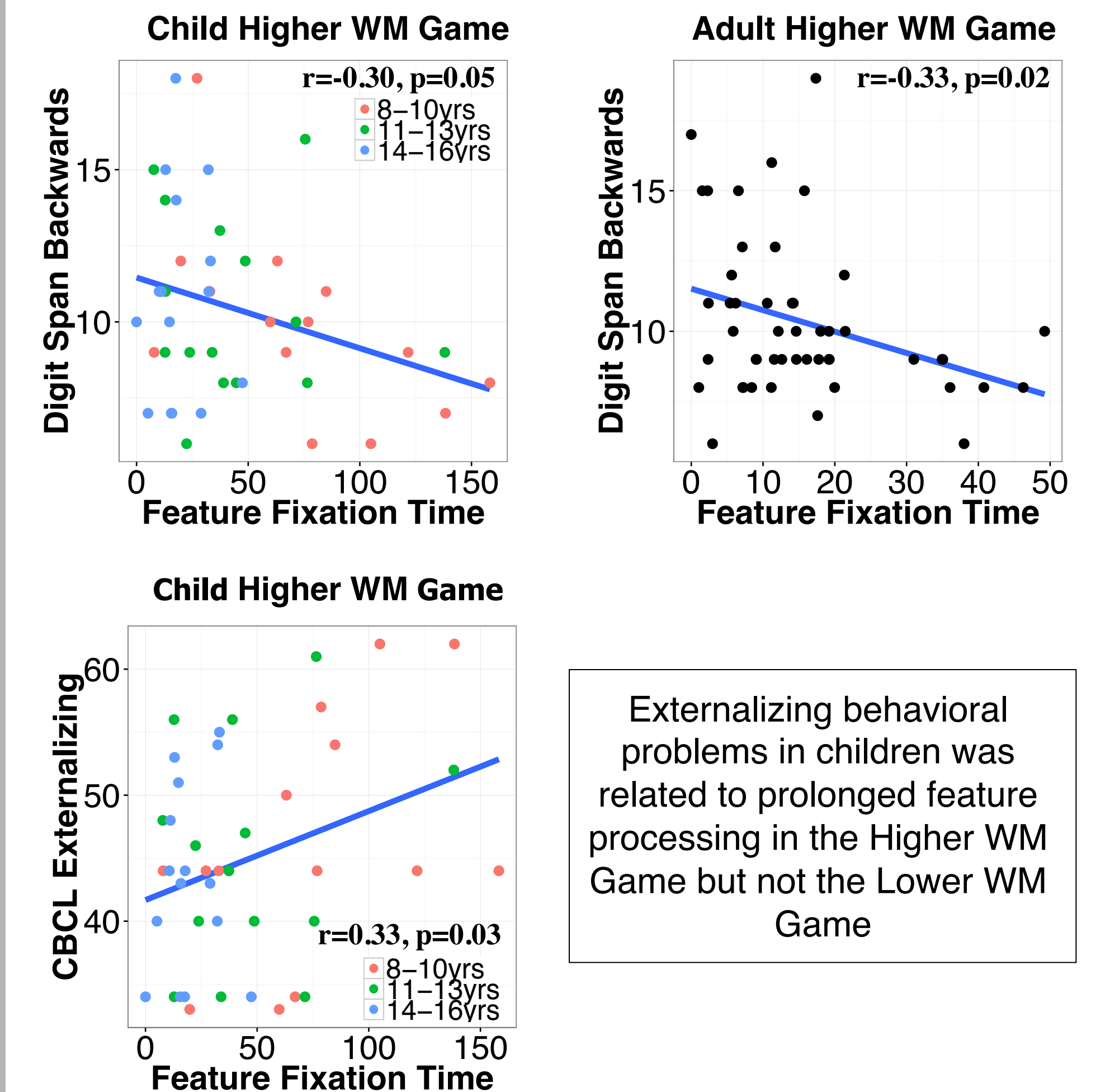
Stroop Inhibition performance was associated with better task switching accuracy in both age groups for the Higher WM Game, but only for adults in the Lower WM Game



Behavioral problems in children was related to decreased accuracy. Increased working memory abilities in adults, but not children, was related to better accuracy.

NEUROPSYCH & PREP PERIOD FIXATION TIMES

Increased working memory abilities was related to decreased fixation on the cued feature for children and adults in both Lower and Higher WM Games



Externalizing behavioral problems in children was related to prolonged feature processing in the Higher WM Game but not the Lower WM Game

CONCLUSIONS

- Longer fixation time on cued features rather than possible response choices was related with worse task switching accuracy and response time.
- Task switching accuracy was related to greater performance on the Stroop inhibition condition for both children and adults, fewer externalizing behavioral problems in children and increased working memory abilities for adults.
- Prolonged feature processing was related to decreased working memory ability for both children and adults and externalizing behavioral problems in children.

References

Church JA, Bunge SA, Petersen SE, Schlaggar BL. Preparatory engagement of cognitive control networks increases late in childhood. *Cerebral Cortex*. 2016. doi:10.1093/cercor/bhw046.

Chevalier N, Blaye A, Dufau S, Lucenet J. What visual information do children and adults consider while switching between tasks? Eye-tracking investigation of cognitive flexibility development. *Developmental Psychology*. 2010;46(4):955-72. doi: 10.1037/a0019674.

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