Studies of Cognition in CP

Adapted Cognitive Assessment Laboratory Update

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"Neuropsychology of Cerebral Palsy"

- **Preterm Birth/ VLBW, with and without CP, entails risk for cognitive impairments**

  Motor, Memory, Attention and Executive dysfunction

- **Neuropathology, with or without CP, entails risk for impairments**

  PVL: Attention and executive dysfunction; visuospatial impairments

- **Epilepsy, with or without CP, entails risk for impairments**

  Attention and executive dysfunction; Memory impairments

- **Other comorbidities and conditions that affect cognitive development and status (e.g., sensory impairments, sleep disturbance, multiple birth)**

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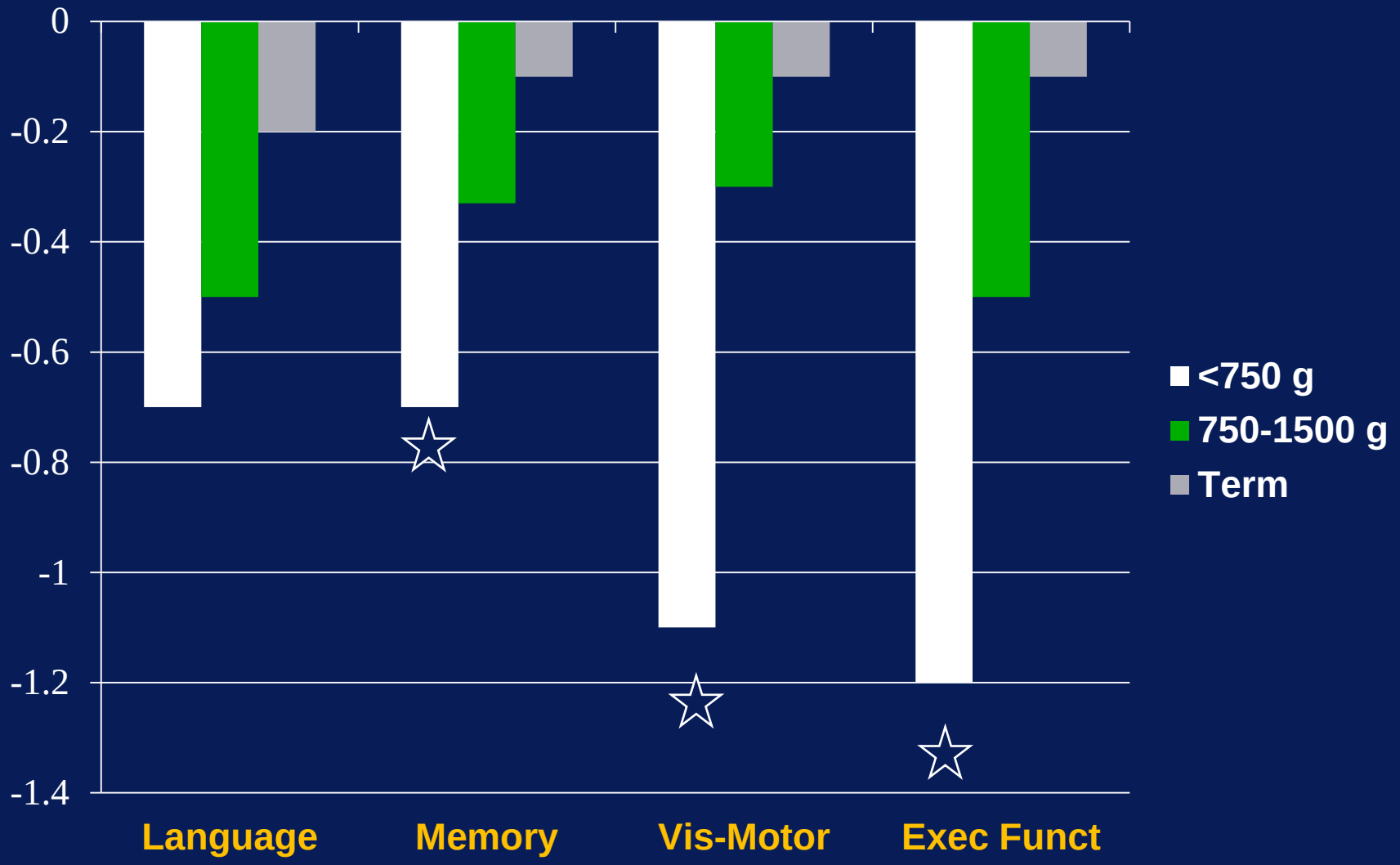
Neuropsychological Outcomes of VLBW at Age 16 (Taylor, 2009)



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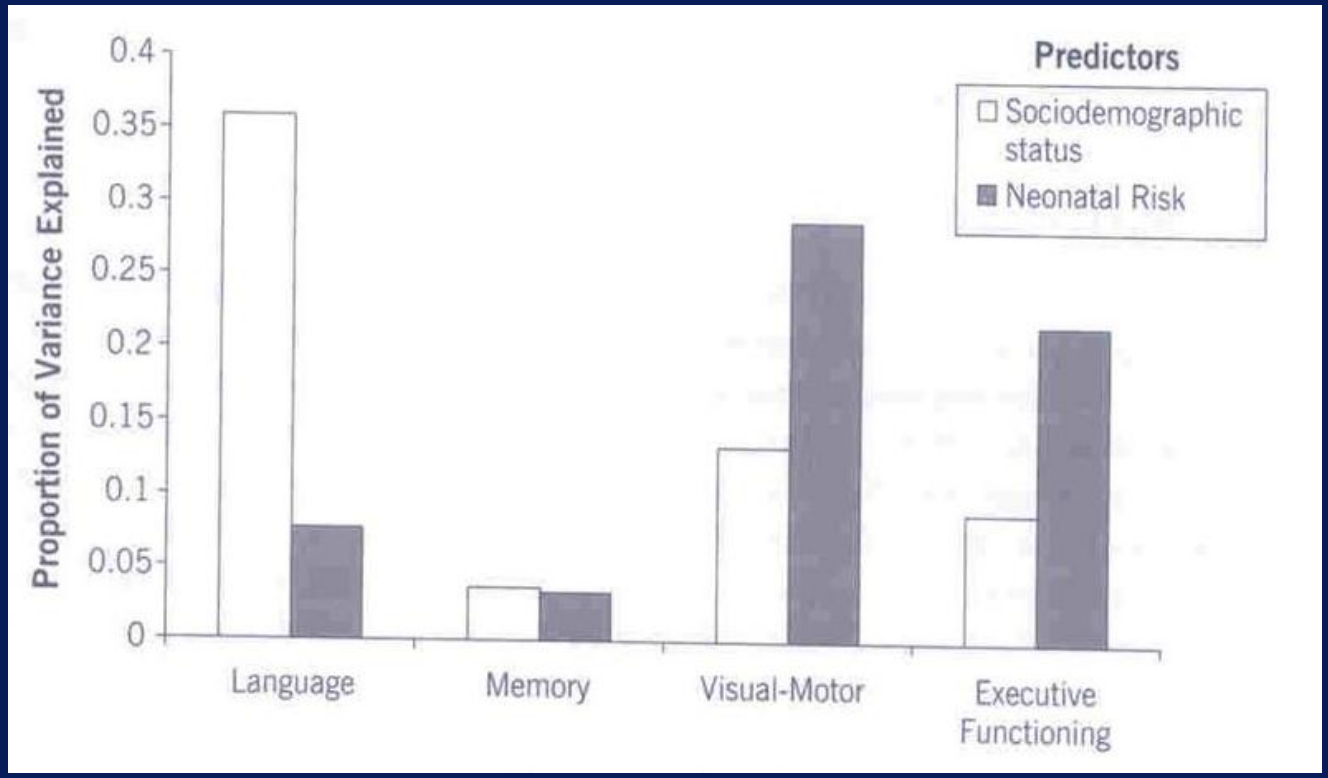
Biological versus Sociodemographic risk in VLBW sample (Taylor et. al., 2004; Taylor, 2009)

From regressions in which BW and Neonatal Risk Index are entered, followed by SES and Race



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A Comparison of Visual Inspection Time Measures in Children with Cerebral Palsy

Kaufman, Donders, & Warschausky (2013, in press)

- **Information Processing Speed (PS)**
  - Sensitive to change in neurological status
  - Contributes to higher level cognitive functions
  - Most robust sequela to brain injury
- **Standard measures of PS rely on rapid motor responses**
- **Inspection time is a measure of PS that is not dependent on response time**

Funding: US Department of Education, National Institute on Disability and Rehabilitation Research (H133G070044), National Institutes of Health (1 R21 HD0574344), Mildred S. Swanson Foundation

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Standard & Adapted IT tasks

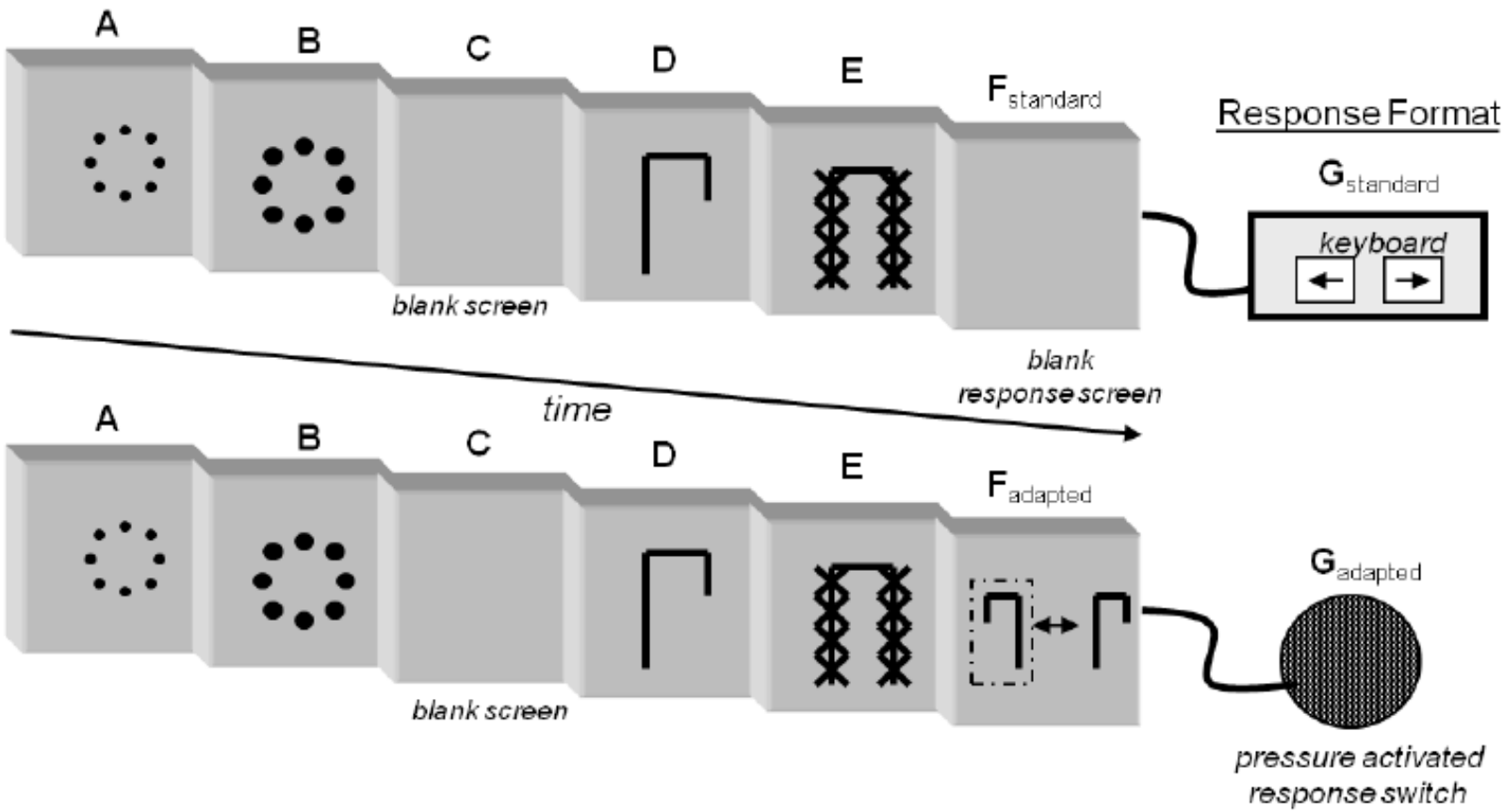

Figure 1

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Participants

	CP (n=66)	Control (n=119)
Age	11.33 (2.32)	11.34 (2.51)
Gender*	66.2% Male	50.0% Male
SES (Hollingshead)	3.59 (1.04)	3.59 (1.15)
Seizure History**	20.3%	0.9%
Birth Weight (grams)**	2061 (1153)	3223 (745)
PPVT-III**	100.34 (17.86)	108.21 (15.36)

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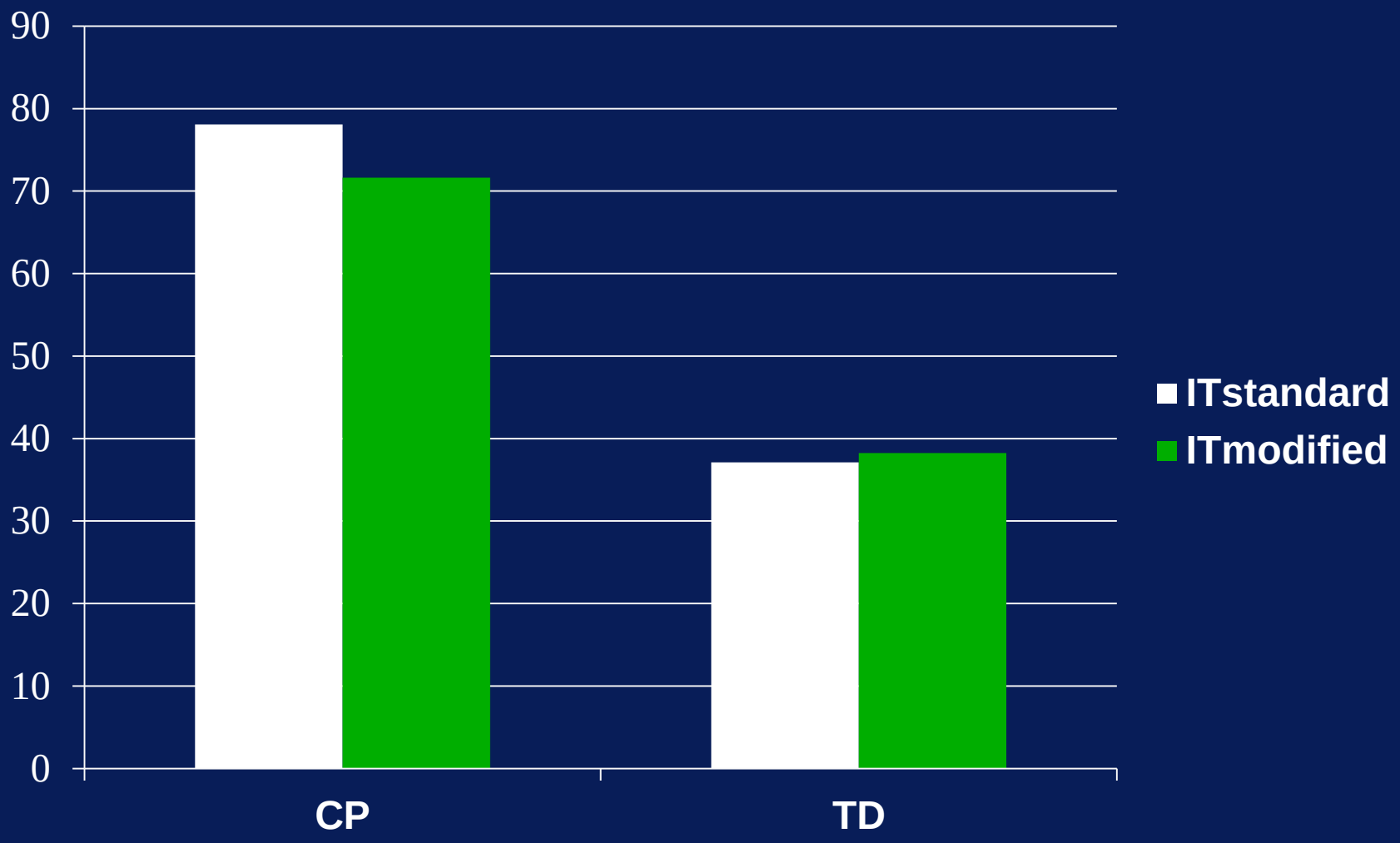
Standard and modified IT threshold by group



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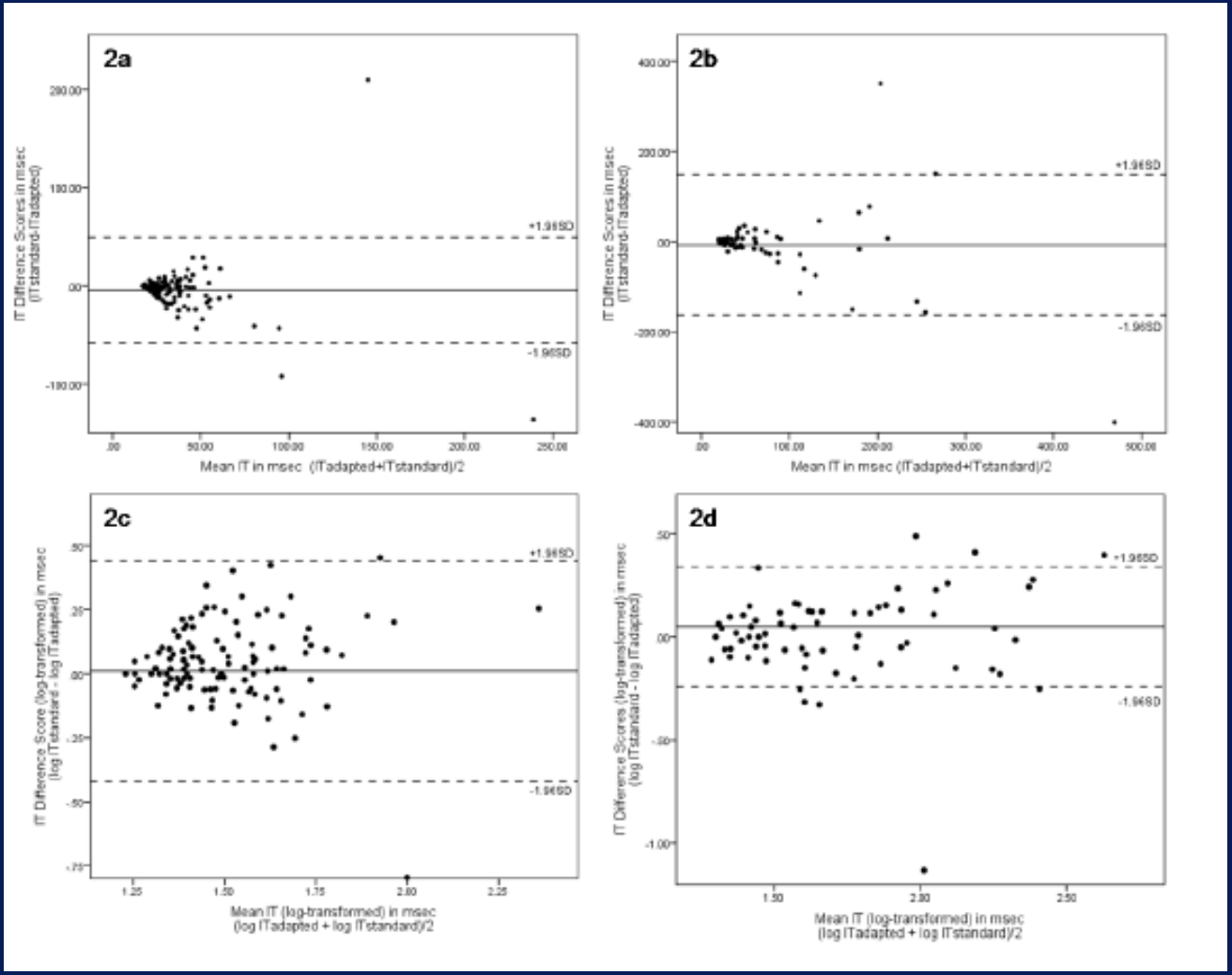
Bland Altman plots showing value of log transformed scores in sample with CP

TD **CP**



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Summary

- **The Group with CP had slower IT than the Control Group independent of test version.**
- **Bland-Altman plots showed that at higher mean IT thresholds, greater discrepancies between test version scores were observed. Log transformations were successful in the Group with CP.**
- **Findings support the feasibility of developing accessible PS tests that reduce speeded motor response demands.**
- **Future test development should incorporate increased gradations of difficulty at the extremes of neuropsychological functioning to more accurately assess the performance of individuals whose conditions are associated with atypical performance levels.**

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Visual Inspection Time as an Accessible Measure of Processing Speed: A Validation Study in Children with Cerebral Palsy

Kaufman, Van Tubbergen, Donders & Warschausky

Variable	1	2	3
1. Standard Inspection Time	—	0.83**	–0.49*
2. Adapted Inspection Time	0.69**	—	–0.57**
3. WISC–III Processing Speed	–0.19	–0.21	—

CP Group correlations above the diagonal.

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Event-related brain potentials as alternative cognitive test access for children with CP

Blain-Moraes, Connelly, Huggins, Young & Warschausky (2013; INS)

In this pilot study, we investigate the potential clinical utility of an innovative assessment technique developed by Connolly et al. (1995) that uses EEG to record ERPs as test item responses, thereby bypassing the need for motor and oral responses.

ERP PPVT-4

- **Participants were presented with matching or mismatching picture-word pairs at a range of vocabulary levels.**
- **During the computerized test, EEG of the participants were recorded using eight Ag/AgCl electrodes, affixed to Fpz, F3, Fz, F4, Cz, P3, Pz and P4 (International 10-20 electrode system), with a ground and reference on the left and right ear, respectively.**

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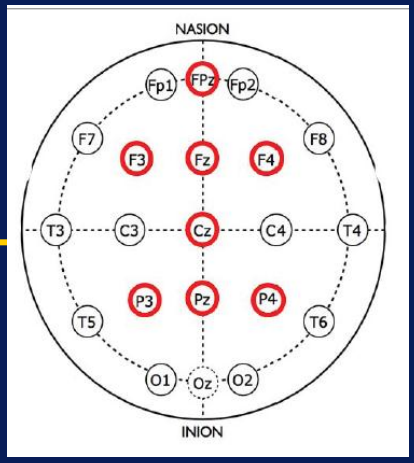
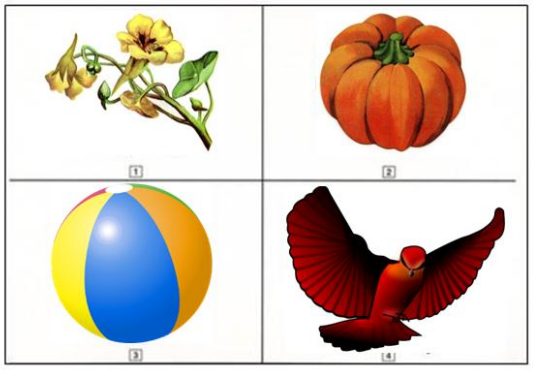
ERP PPVT-IV Administration



a)



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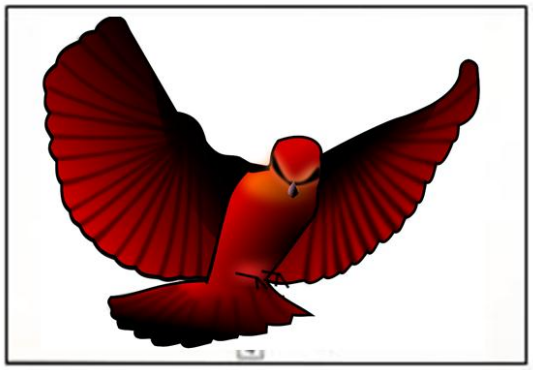
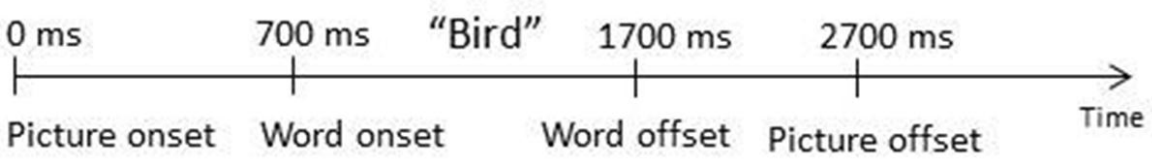
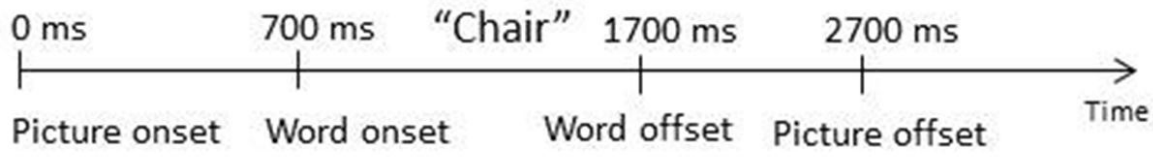


Picture displayed on computer screen





Examples of items on the:
a) standard and
b) computerized PPVT-4

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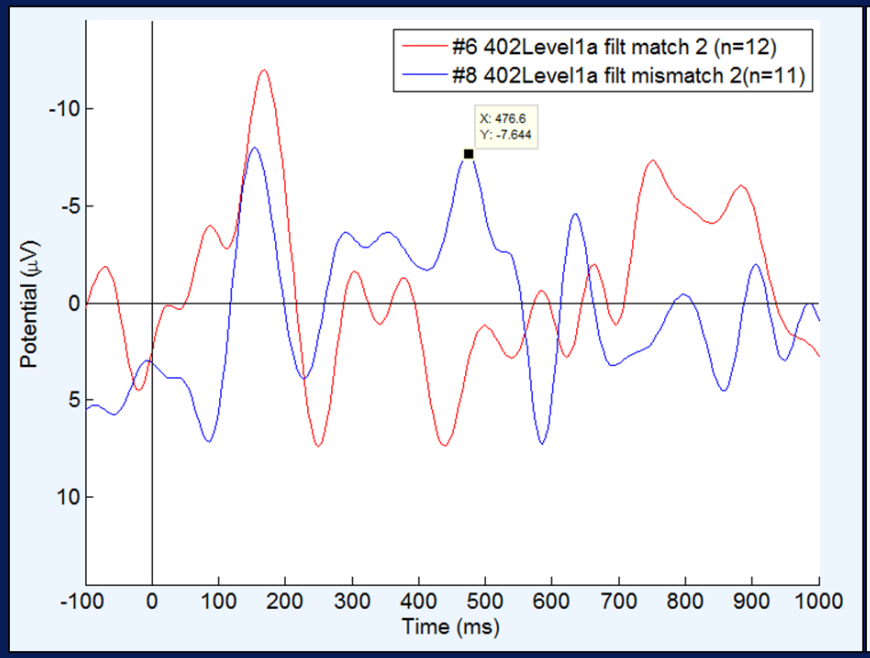
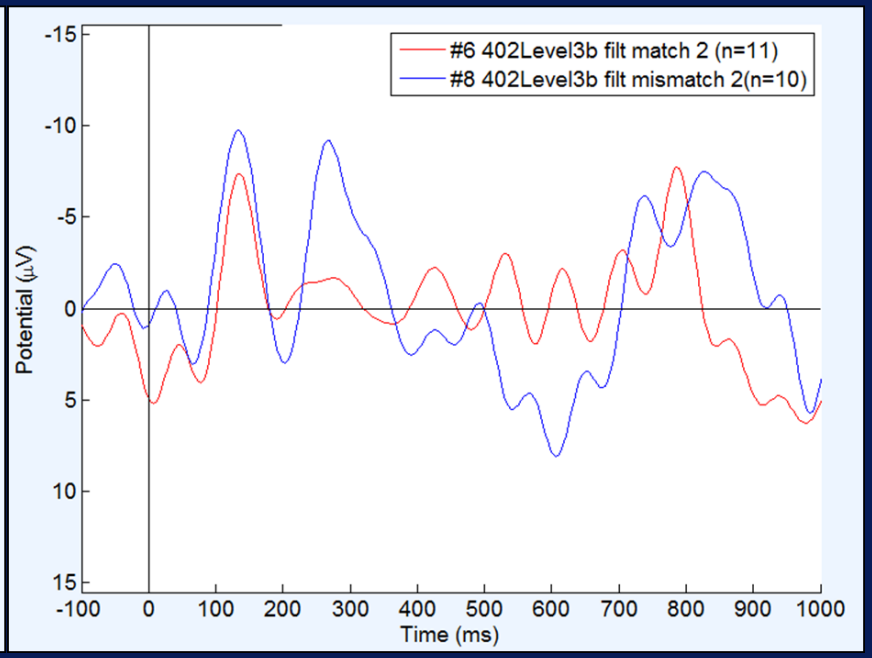
ERP N400 Mismatch by Vocabulary level

Level 1a: N400 Present

Level 3b: N400 absent





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Pilot Data illustrating predicted and observed performance

- **Within each level, standard PPVT-IV results were used to predict the presence or absence of an N400 in mismatch trials. For each participant, predictions were strongly correlated to observed changes in EEG.**

Table 2: Presence of predicted and observed N400 ERP. Shaded cells indicate the presence of an N400.

Participant	N400 Response	Level						
		1a	1b	2a	2b	2c	3a	3b
1	Predicted	■	■	■	■	■	■	
	Observed	■	■	■	■	■	■	
2	Predicted	■	■	■	■	■		
	Observed	■	■		■			
3	Predicted							
	Observed							
4	Predicted	■	■	■	■	■	■	
	Observed	■	■	■		■	■	

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The Future

- **ACAL projects continue to develop and refine accessible instruments, most notably Jacqueline Kaufman's current NIDRR-funded Working Memory study**
- **Medical and socio-demographic predictors of neuropsychological profiles**
- **Treatment effects on cognition**
- **Studies of the cognitive loads inherent in use of assistive technologies**

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ACAL Research Team

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  - Laura Shank, Ph.D. (2008-2010)
  - Stacie Leffard, Ph.D. (2008-2010)
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- Shana Asbell, Ph.D.

The ACAL Project Website

http://www.med.umich.edu/pmr/acal/index.htm

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