

## Background & Objectives

Individuals with severe functional impairments, low cognitive abilities, or who are minimally verbal are underrepresented in research. The contribution of cognitive impairments in developmental disorders such as Autism Spectrum Disorder (ASD) is unclear in part due to the inability for some children to complete traditional cognitive and behavioral testing. Advances in techniques such as electroencephalography (EEG) that focus on reliable, biological signals may improve measurement success for challenging populations.

### Objectives:

- Evaluate EEG success among children with varying levels of cognitive impairment
- Describe and critically evaluate behavioral management strategies employed during EEG

## Method

### Participants

- 153 participants with ASD and/or ASD-associated disruptive genetic variants
- ASD diagnosis confirmed with ADOS-2, ADI-R, DSM-5
- Cognitive ability evaluated by DAS-II

### EEG

- Participants completed a passive auditory Oddball paradigm (Salmond et al., 2007) in which children heard auditory stimuli (tones, sounds) while watching silent zoo movies
- Proband behavior was monitored and redirected as necessary by a behavior assistant who used a personalized behavioral plan based on the child's needs

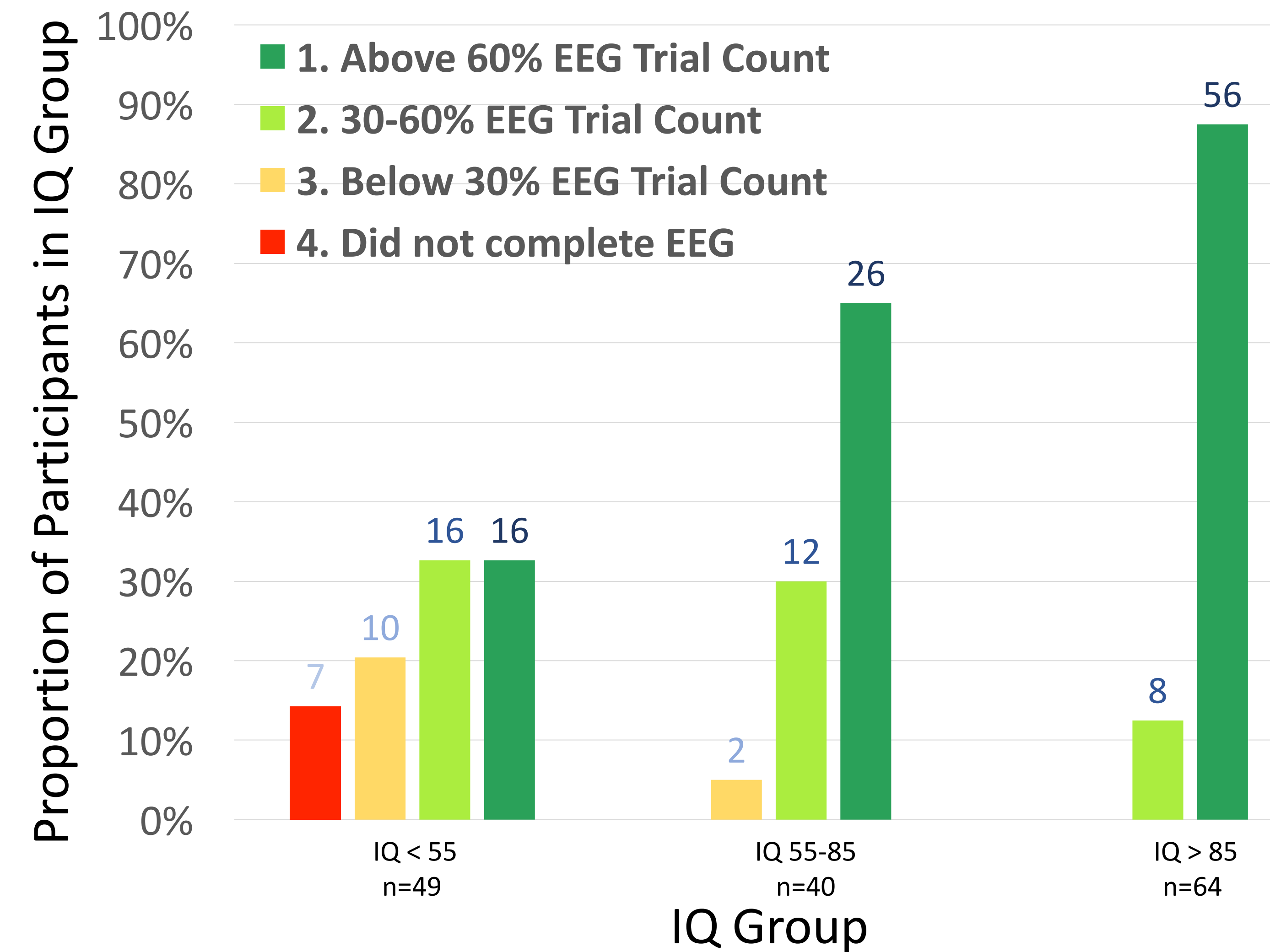
### Analysis

- EEG data hand-edited to remove trials with artifact
- Participant subgroups defined by IQ and percent of successful EEG trials (i.e. "Trial Count")
- ANOVA to test for between-groups differences
- Pearson's correlation to test for relationship between IQ and EEG performance

	Very Low IQ (<55)	Below Average IQ (55-85)	Average IQ (>85)	Total
n	49	40	64	153
Female	18 (37%)	4 (10%)	15 (23%)	37 (24%)
Age (years)	10.7	11.8	12.3	11.7
FSIQ (SD)	35.96 (11.37)	71.83 (9.23)	106.03 (14.05)	75.42 (32.12)

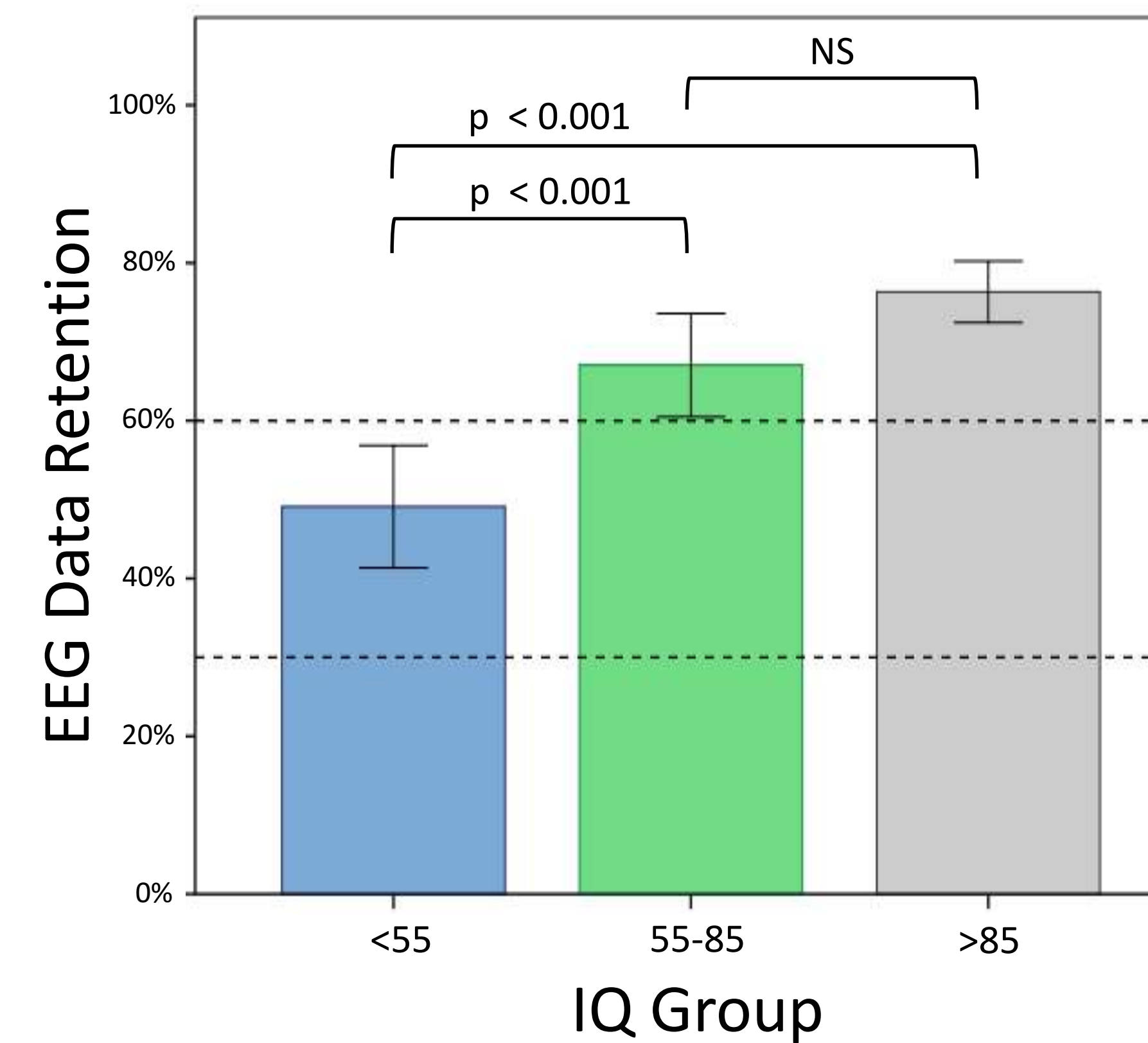
**References:** 1. Salmond, C.H., Vargha-Khadem, F., Gadian, D.G., de Haan, M., & Baldeweg, T. (2007). Heterogeneity in the patterns of neural abnormality in autistic spectrum disorders: Evidence from ERP and MRI. *Cortex*, 43(6), 686-699. 2. Tager-Flusberg, H., & Kasari, C. (2013). Minimally verbal school-age children with Autism Spectrum Disorder: The neglected end of the spectrum. *Autism Research: Official Journal of the International Society for Autism Research*, 6(6), 468-78. 3. Webb, S.J., Bernier, R., Henderson, H.A., Johnson, M.H., Jones, E.J.H., Lerner, M.D., McPartland, J.C., Nelson, C.A., Rojas, D.C., Townsend, J., & Westerfield, M. (2015). *Journal of Autism and Developmental Disorders* 45(2), 425-443.

## Results



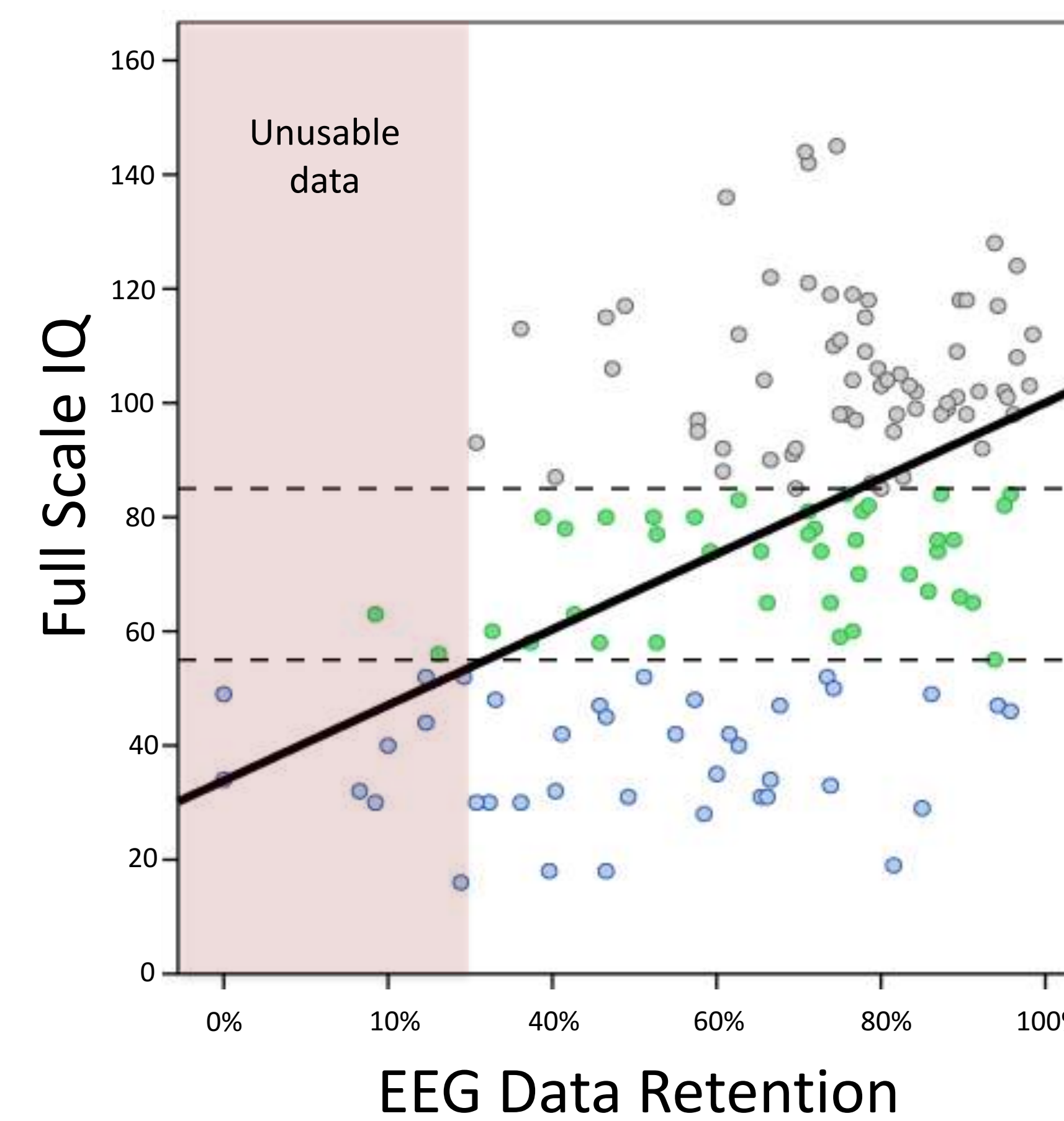
A one-way ANOVA indicated a significant effect of IQ Group on EEG performance,  $F(2, 143) = 23.66$ ,  $p < .0001$ .

(Bonferroni-correction for pairwise comparisons).



A Pearson's correlation indicated a strong positive correlation between IQ and EEG performance,  $r = 0.482$ ,  $n = 143$ ,  $p < 0.001$


- IQ < 55
- IQ 55-85
- IQ >85



## Behavioral Strategies

### Before the visit...

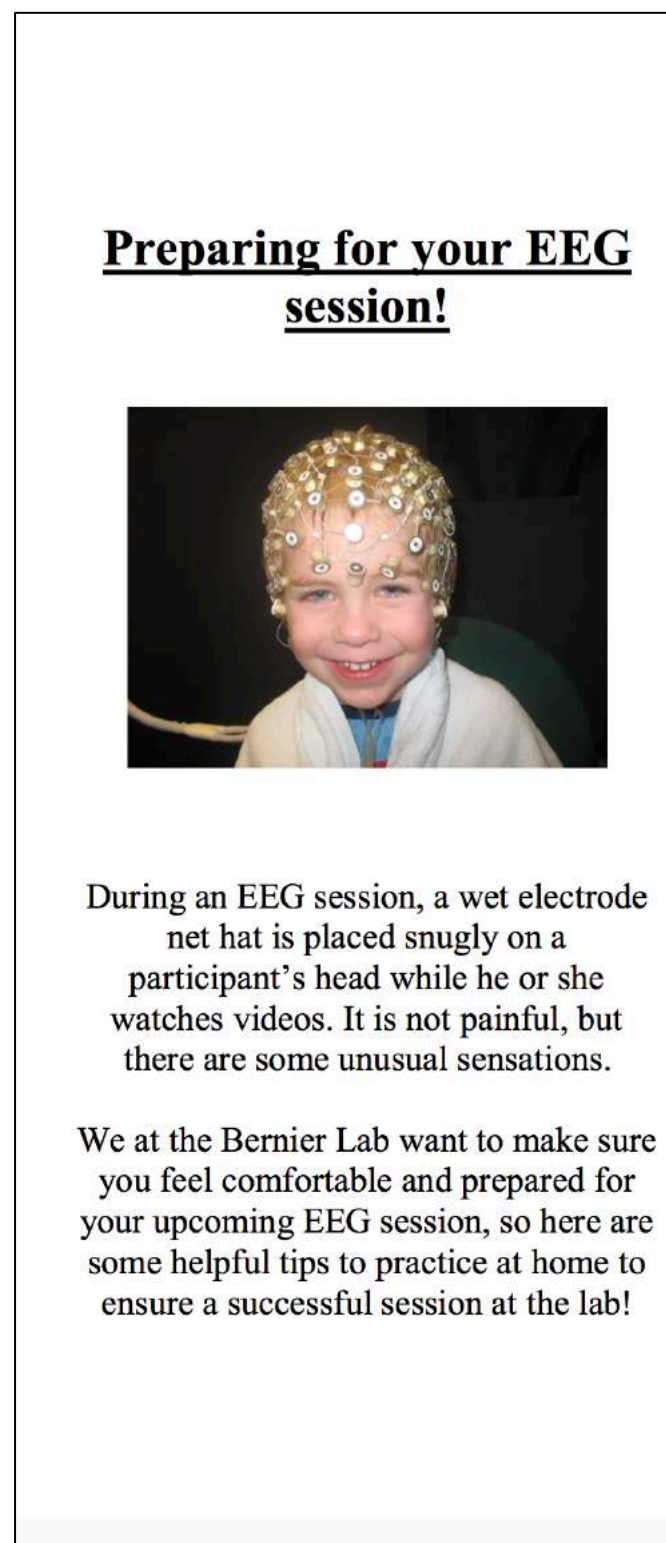
Send participating family training materials:

- Email link to video "What is it Like to Have an EEG?"  Scan QR for link to video
- Send "Preparing for Your EEG Session" brochure and EEG tolerance training plan and practice netcap

If possible, pre-session visit to meet EEG staff and explore EEG room

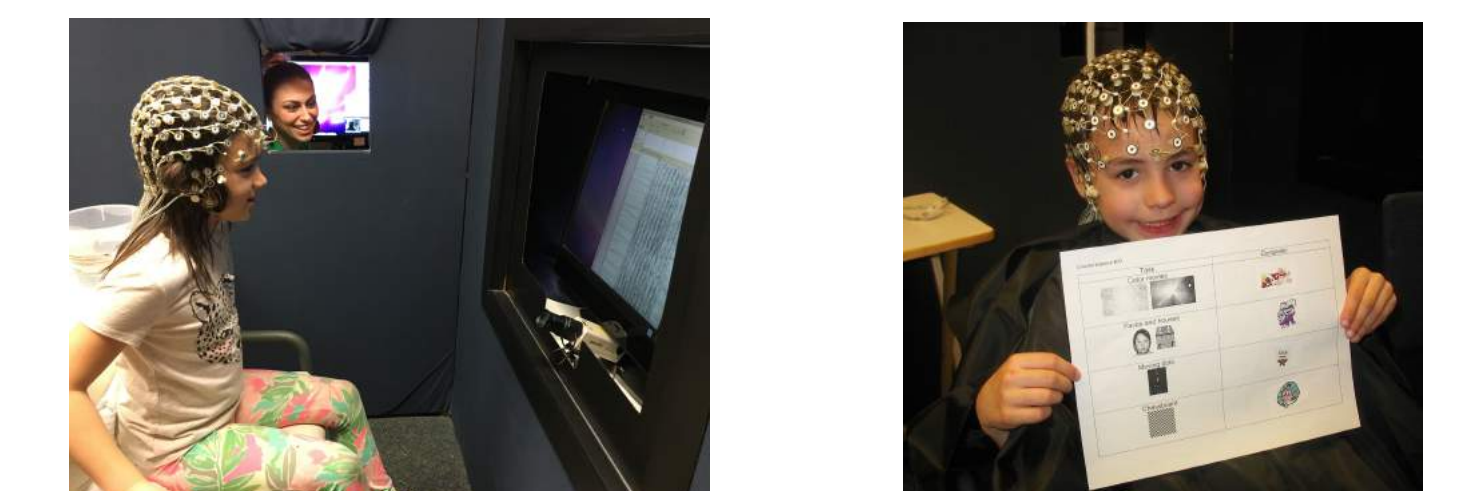
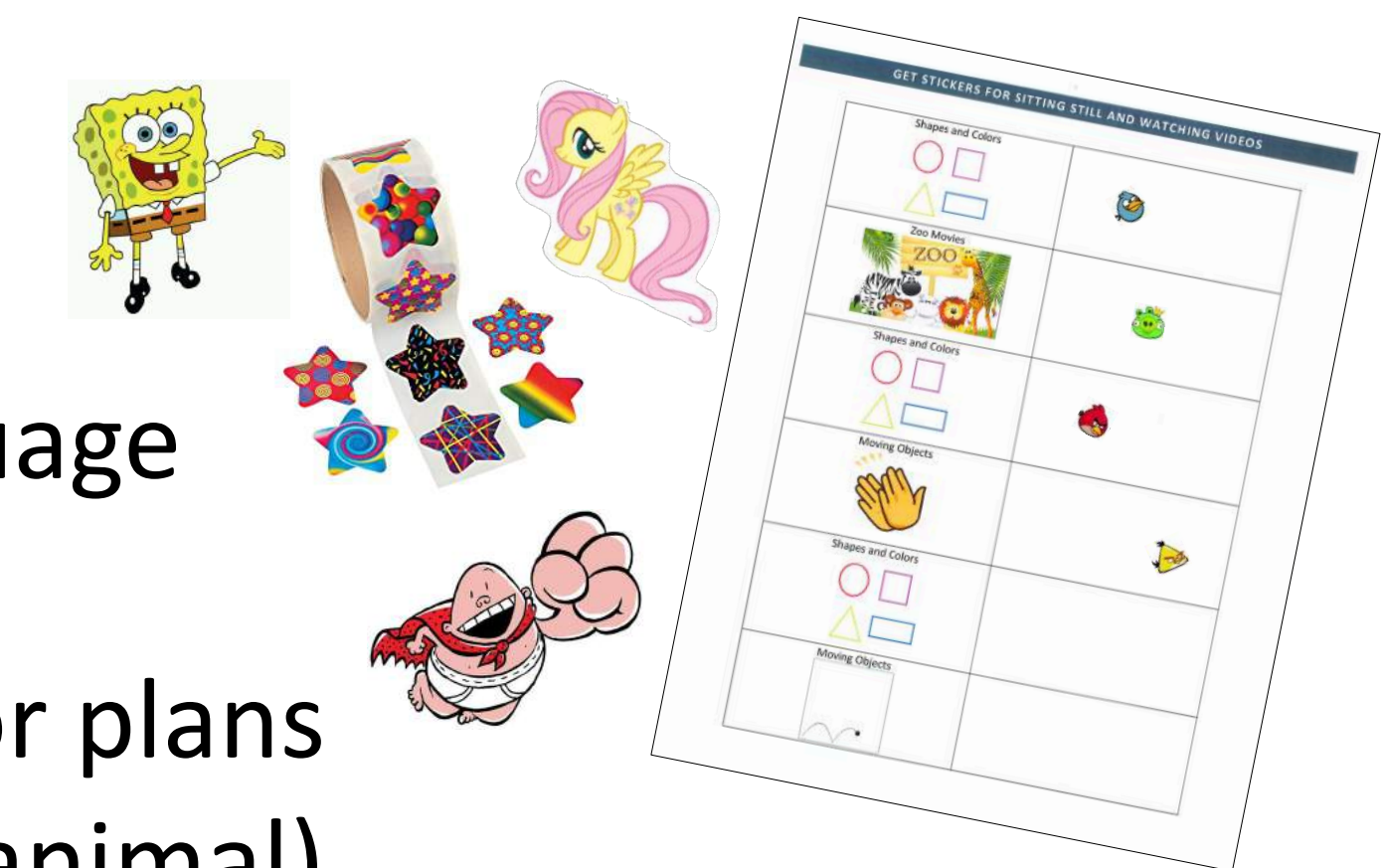
### Before the EEG...

- Acclimate to room
- Look at/touch netcap
- Hold netcap against head
- Mental-age-appropriate explanations and expectations
- Watch "Fun Movies" or favorite show on iPad during impedances



### During the EEG...

- Mental-age-appropriate language (e.g. 'First-Then' statements)
- Flexible, personalized behavior plans
- Comfort objects (e.g. stuffed animal)
- Positive reinforcement
- Sticker chart
- Breaks
- Snacks



## Discussion

146 of our 153 participants (95%) were successful in completing EEG. Correlational data suggest that higher IQ predicts stronger performance on a passive, auditory EEG task. However, even individuals with an IQ of 55 or lower still successfully complete EEG. Notably, over 65% of our participants in this low IQ group retained a desirable number of usable trials. A variety of flexible behavioral management strategies, personalized to each unique participant, contributed to EEG success. EEG may be a helpful alternative for understanding cognitive processes among individuals with intellectual disabilities and other neurodevelopmental disorders for whom standardized testing is difficult.

