

INTRODUCTION & OBJECTIVES

Event Related Potentials (ERPs) can increase our understanding of the neuronal deficits underlying many speech and language disorders; however, this technology is problematic when used with children who cannot sustain visual attention. The goal of this project was to link ERPs with eye-tracking technology to allow a wider range of populations to benefit from the scientific gains currently possible with visual ERP research.

Data retention is vital when using EEG. Two common problems in developmental studies are 1) lack of sustained attention in children, and 2) loss of data by relying on stimulus onset for epoching data. Traditional approaches to these problems are often subjective and can lead to poor quality and/or lost data.

The current study investigated whether using linked eye-tracking and EEG technology leads to better data retention in adults and children.

RESEARCH QUESTIONS

Clean
Developmental
EEG

Problem: No objective way to track visual attention or consistently regain lost attention

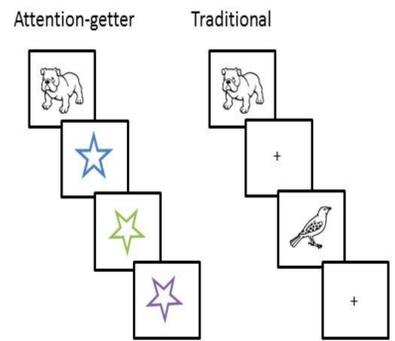
Problem: Low signal-to-noise ratio in data

Current best practice: Experimenter monitors participant behaviors

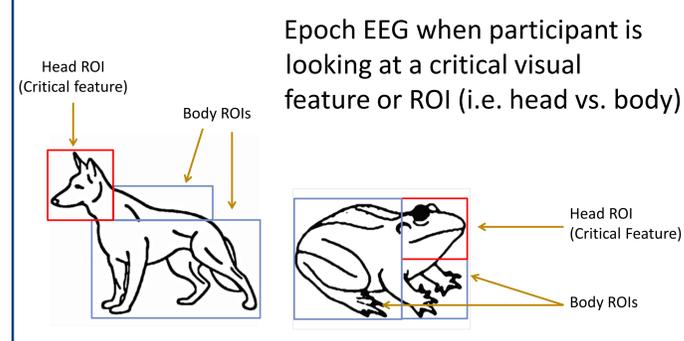
Current best practice: Epoch according to stimulus onset

Using eye-tracking as an attention enhancer

- Display stimulus
- Subject looks away
- Stop stimulus
- Flash an exciting picture
- Regain attention
- Subject reorients to stimulus



Defining Regions of Interest (ROI) for epoching



Research Question 1: Do we retain more data per subject using the Attention-getter Method?

Research Question 2: Can we increase the proportion of usable data by epoching based on the participant's attention to the critical feature of the image?

METHODS

Participants.

Sample	Attention-getter Critical feature	Traditional method
Adults ($N = 23$)	$n = 13$	$n = 10$
Children ($N = 18$)	$n = 10$	$n = 8$

Study Design. Participants saw pictures and identified dogs versus other animals.

Data Collection. Data were collected using 62 electrode cap, referenced at FCz (re-referenced to a spline-average for analysis).

DATA ANALYSIS

Epoching

Attention-Getter method:

- * Presentation onset of the picture

Critical Feature method:

- * Participants' first look to the head of the animal

Traditional method:

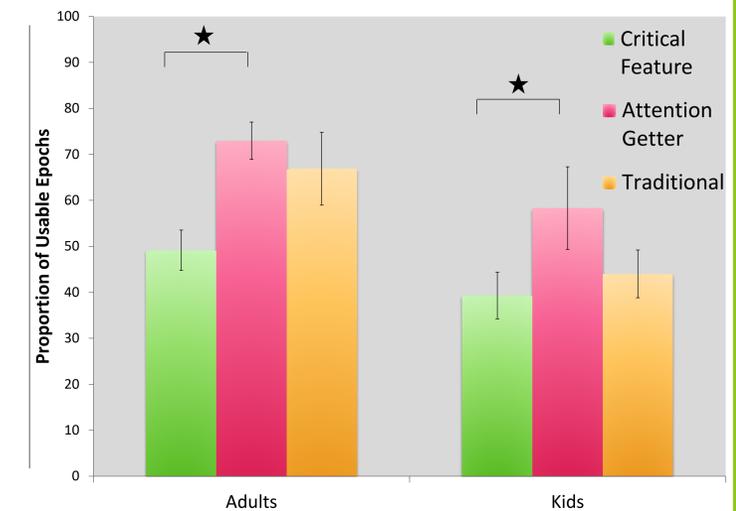
- * Presentation onset of the picture

Analysis

- Proportion of usable epochs per subject calculated after correcting for errors
- Group means compared using a series of paired- and independent-samples t -tests
- Alpha adjusted for familywise error, $p < 0.017$

RESULTS

	Critical Feature	Attention Getter	Traditional
ADULTS			
% Retained	49.16	72.97	66.90
Variance	798.24	713.76	2601.88
Range	30-147	87-180	45-188
CHILDREN			
% Retained	39.31	58.31	44.03
Variance	635.11	2406.62	1040.5
Range	19-106	17-162	41-130



CONCLUSIONS

Research Question 1

- The best data retention occurred from the Attention-Getter method. This was significantly better than critical feature ($t(22) = 6.88, p < .001$), but only slightly better than the traditional method. The benefit was larger for children than adults.
- Within group variance is greater for traditional methods than the attention-getter method for adults. The opposite pattern is true for children.
- Thus, using the eye-tracker as an Attention Getter method helps maintain a higher proportion of usable data for both children and adults, while also reducing variance in the adult group.

Research Question 2

- Using eye-gaze data to measure critical feature analysis does not increase the proportion of usable data.

SELECTED REFERENCES

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ACKNOWLEDGEMENTS

This poster was possible with support from NIH/NIDCD R03HD064629-01 to MM. We are grateful for the help of research assistants and the participation of families and children.