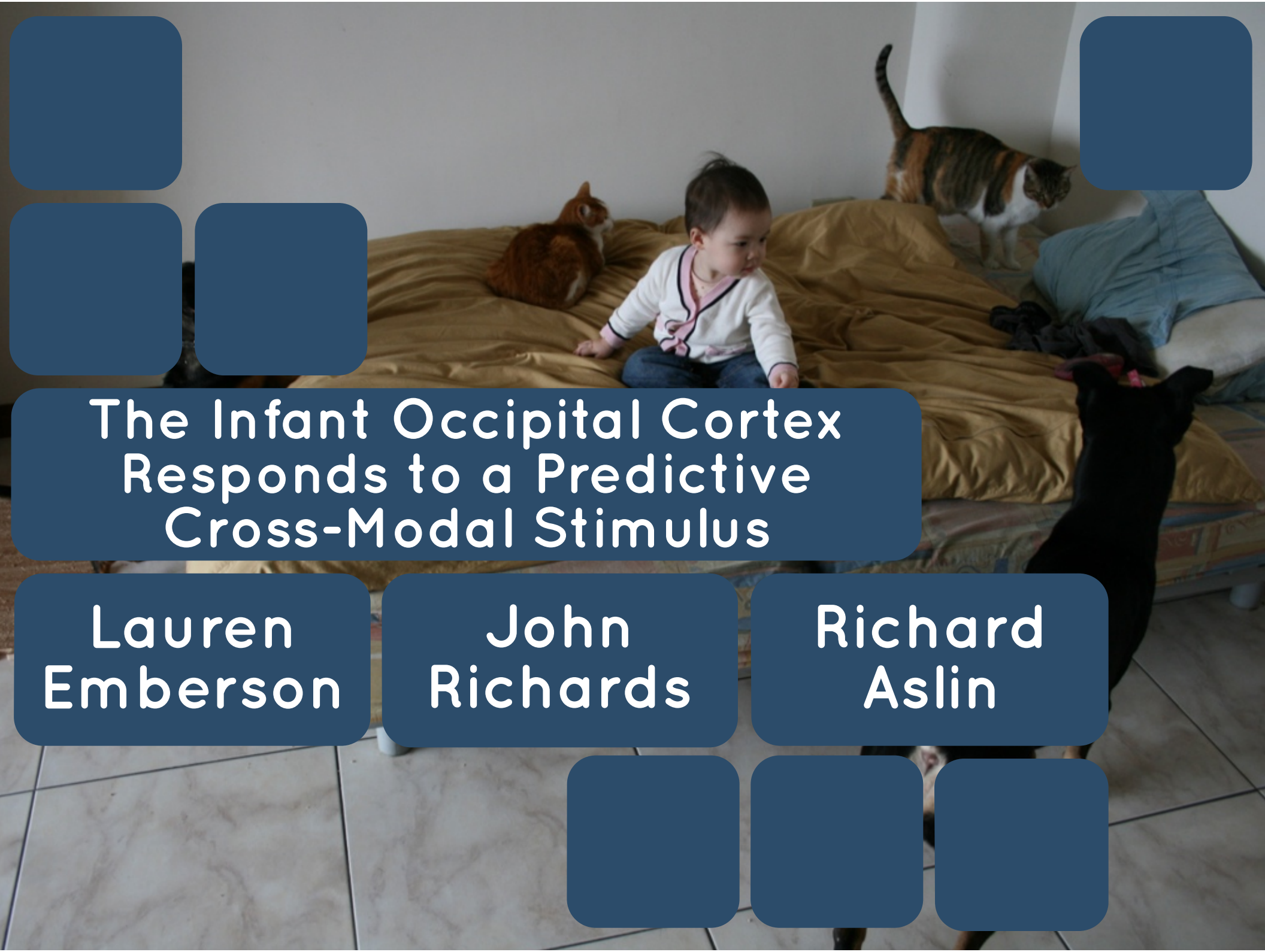


The Infant Occipital Cortex Responds to a Predictive Cross-Modal Stimulus

Lauren Emberson

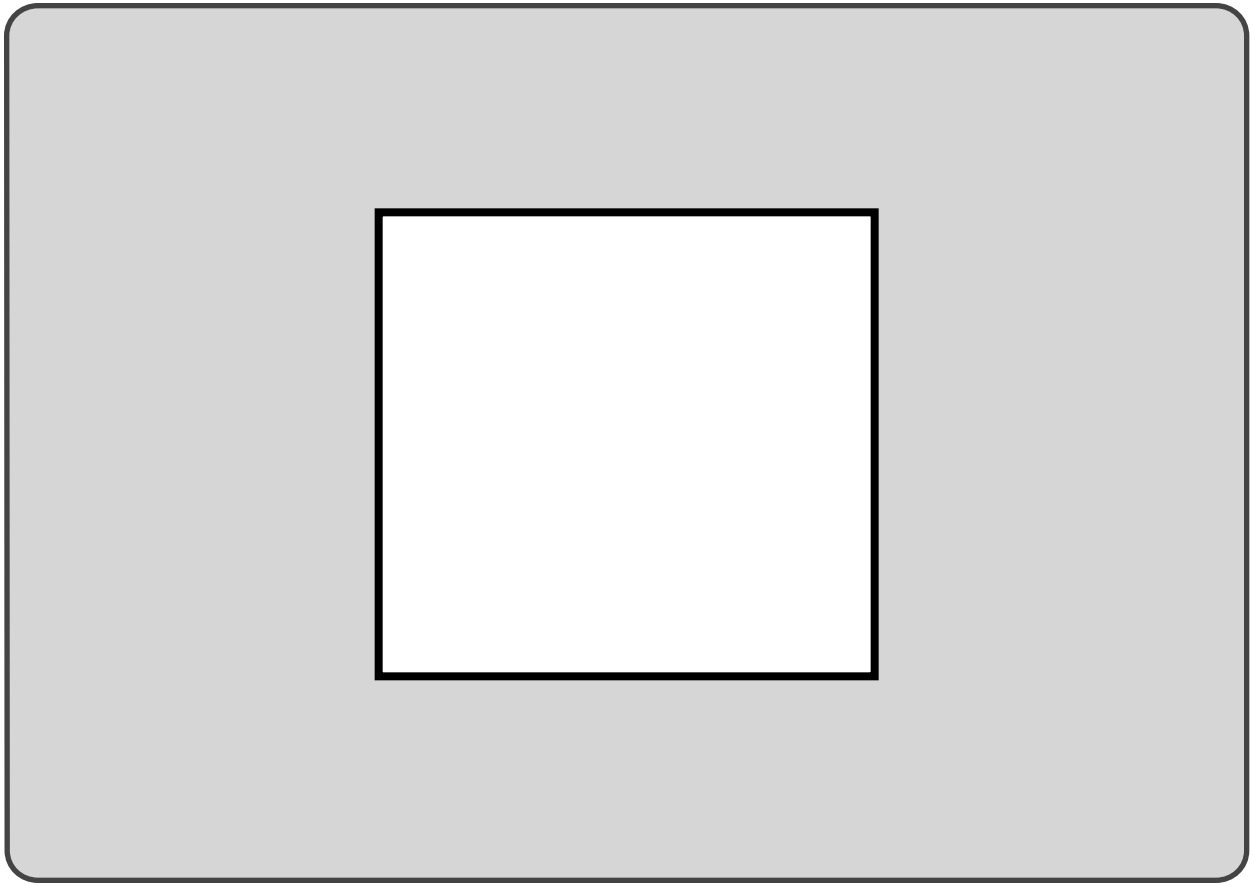
John Richards

Richard Aslin

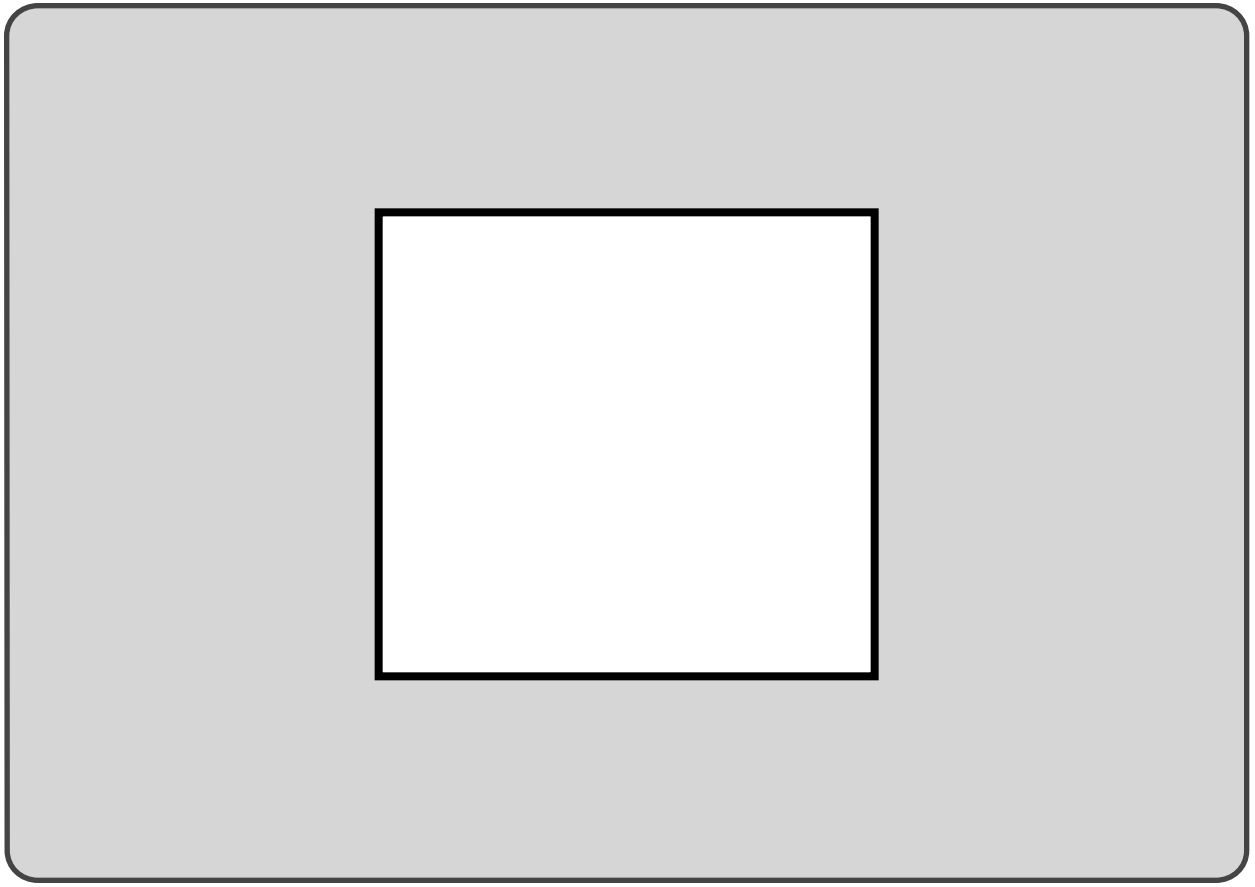

Do infant
perceptual cortices track
sensory expectations?

Do infant perceptual cortices track sensory expectations?

Does Experience With Cross-modal Structure Shape Occipital Cortex Function?



Does Experience With Cross-modal Structure Shape Occipital Cortex Function?



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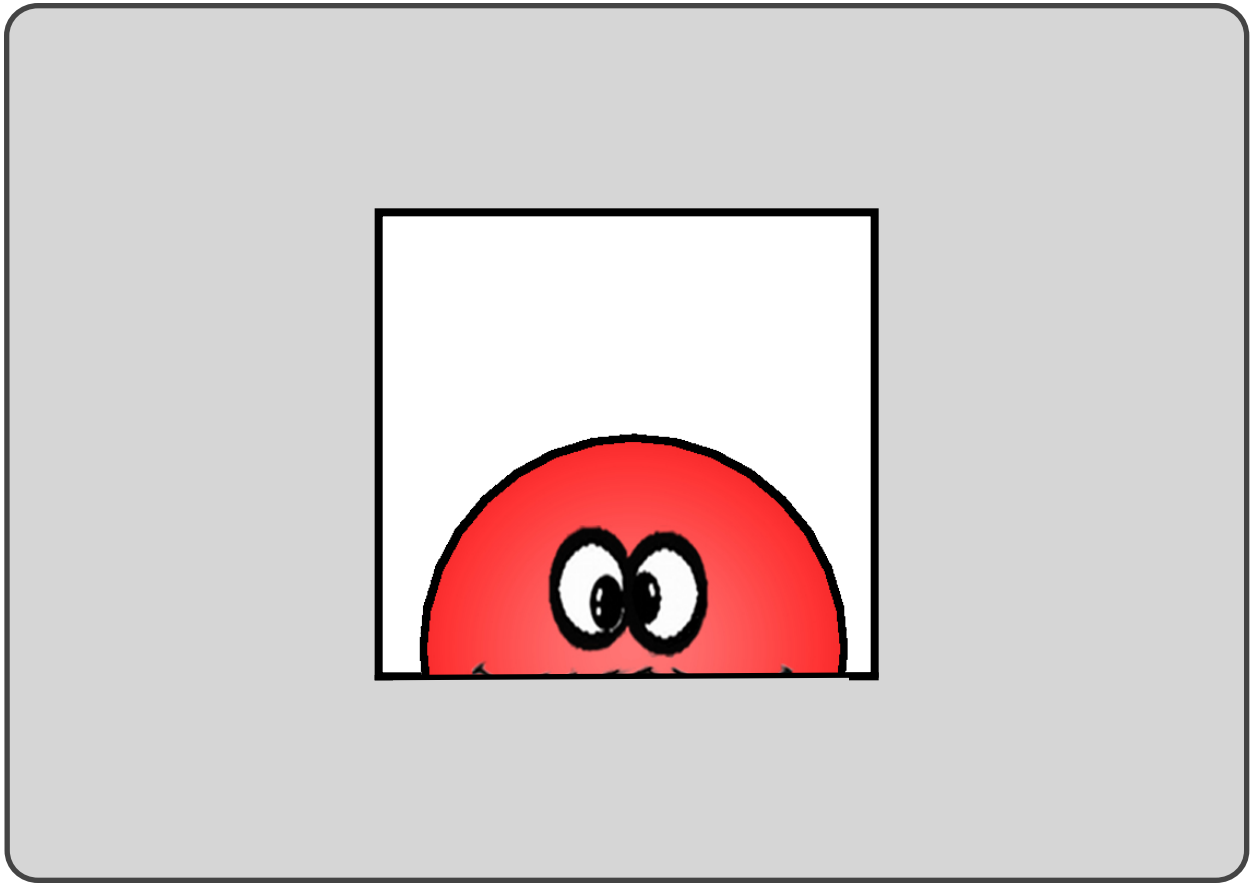
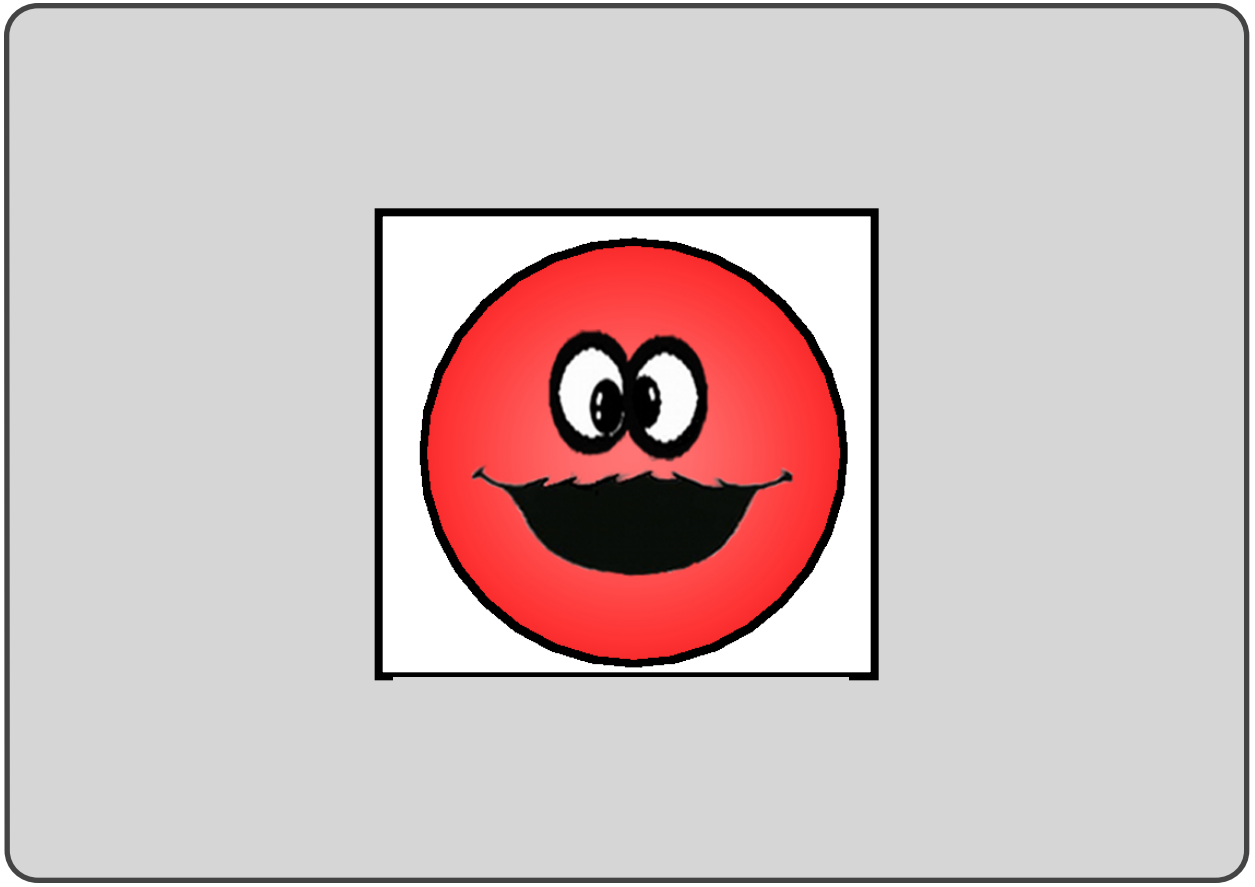
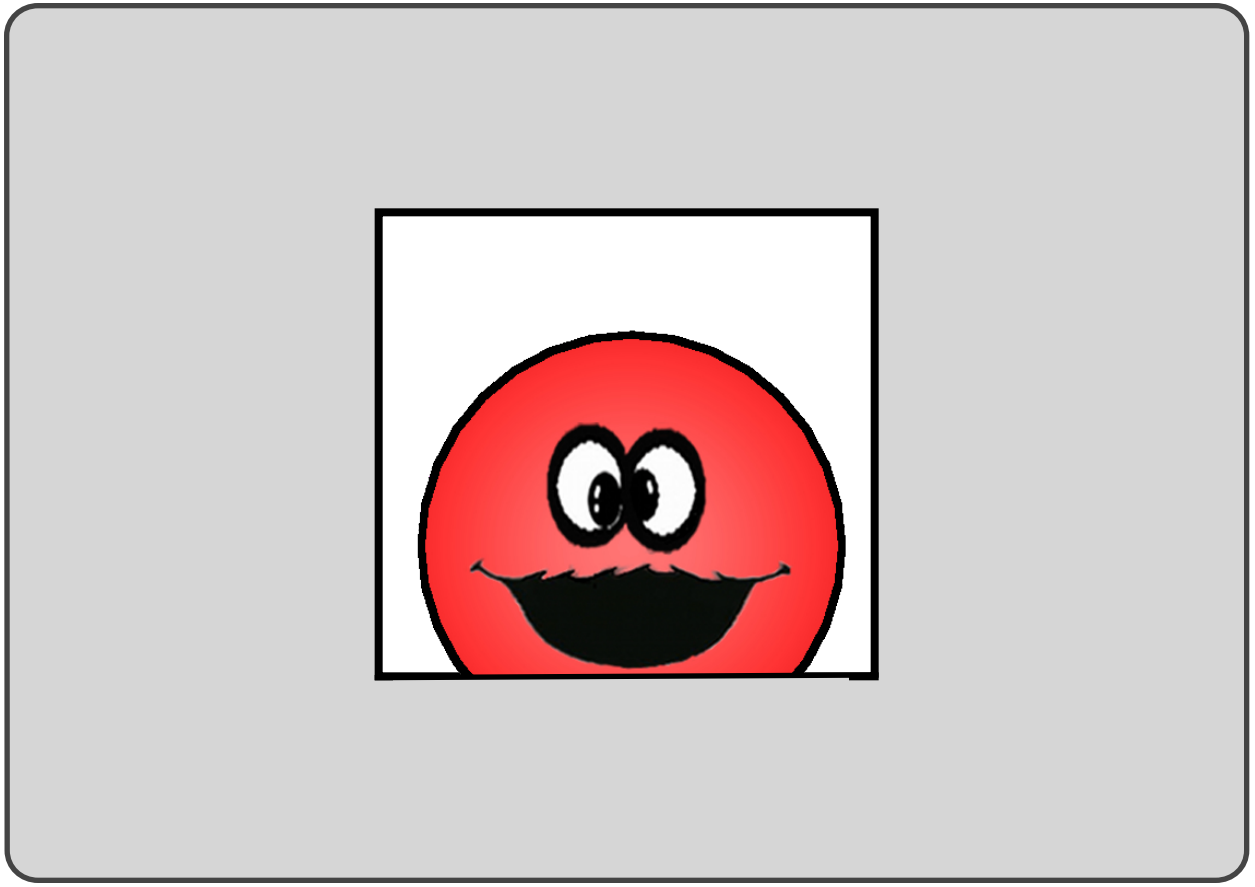


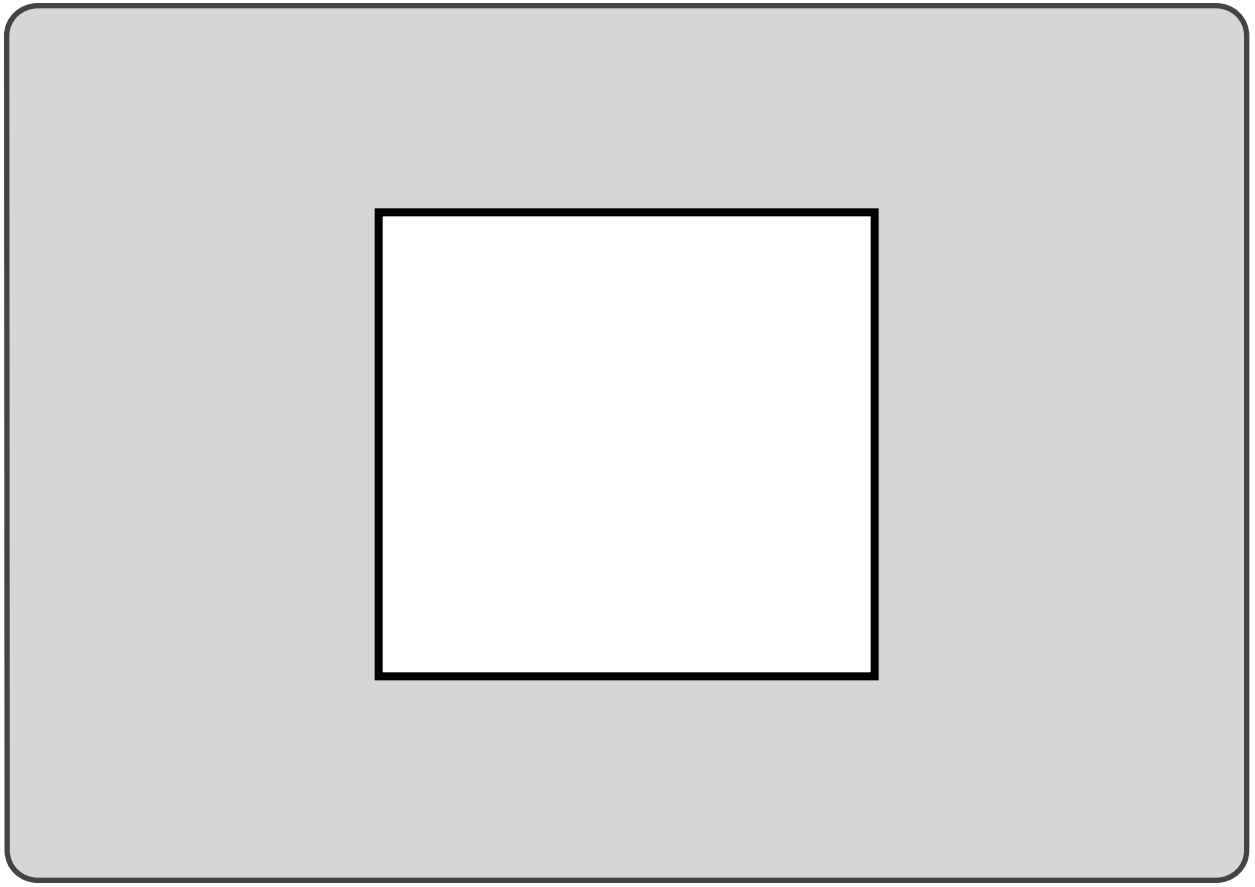
Does Experience With Cross-modal Structure Shape Occipital Cortex Function?



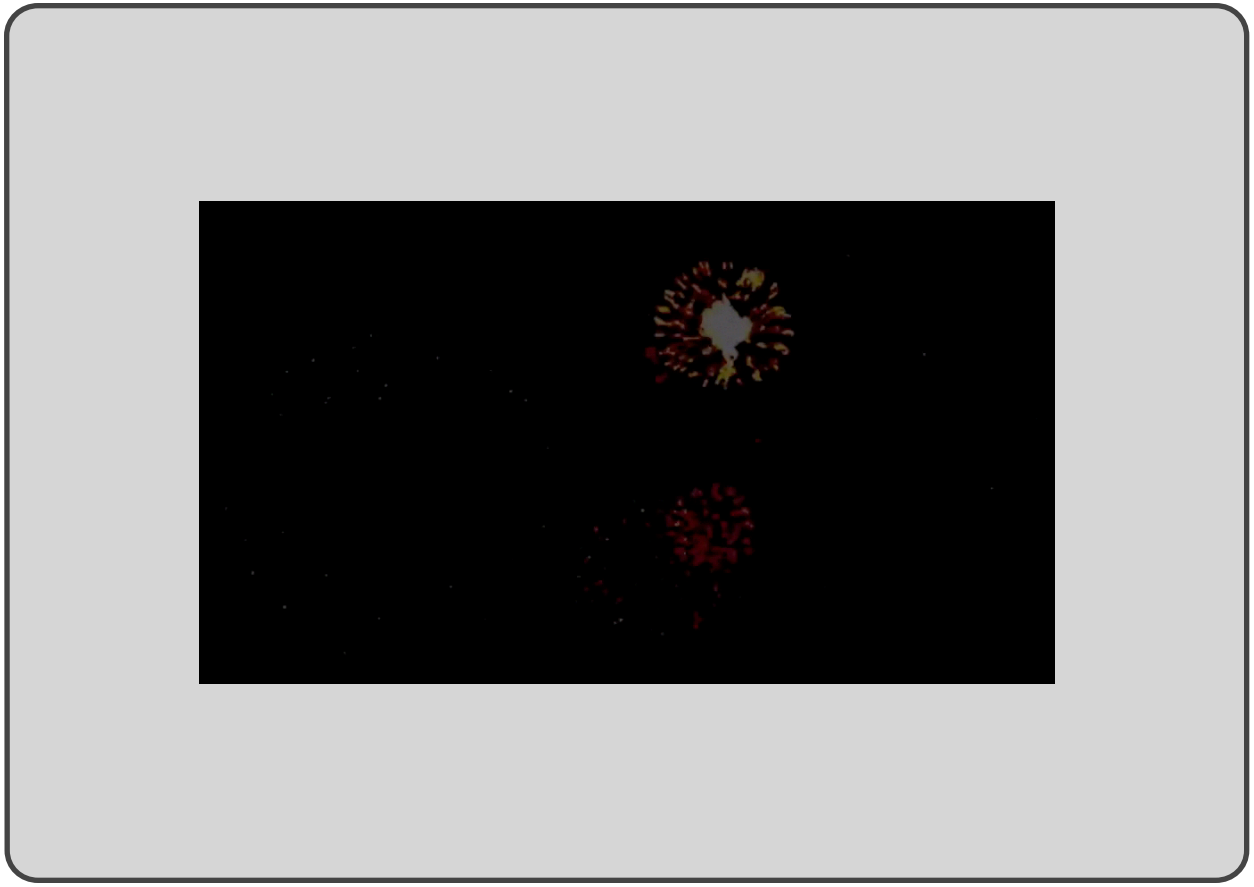
Does Experience With Cross-modal Structure Shape Occipital Cortex Function?



Does Experience With Cross-modal Structure Shape Occipital Cortex Function?



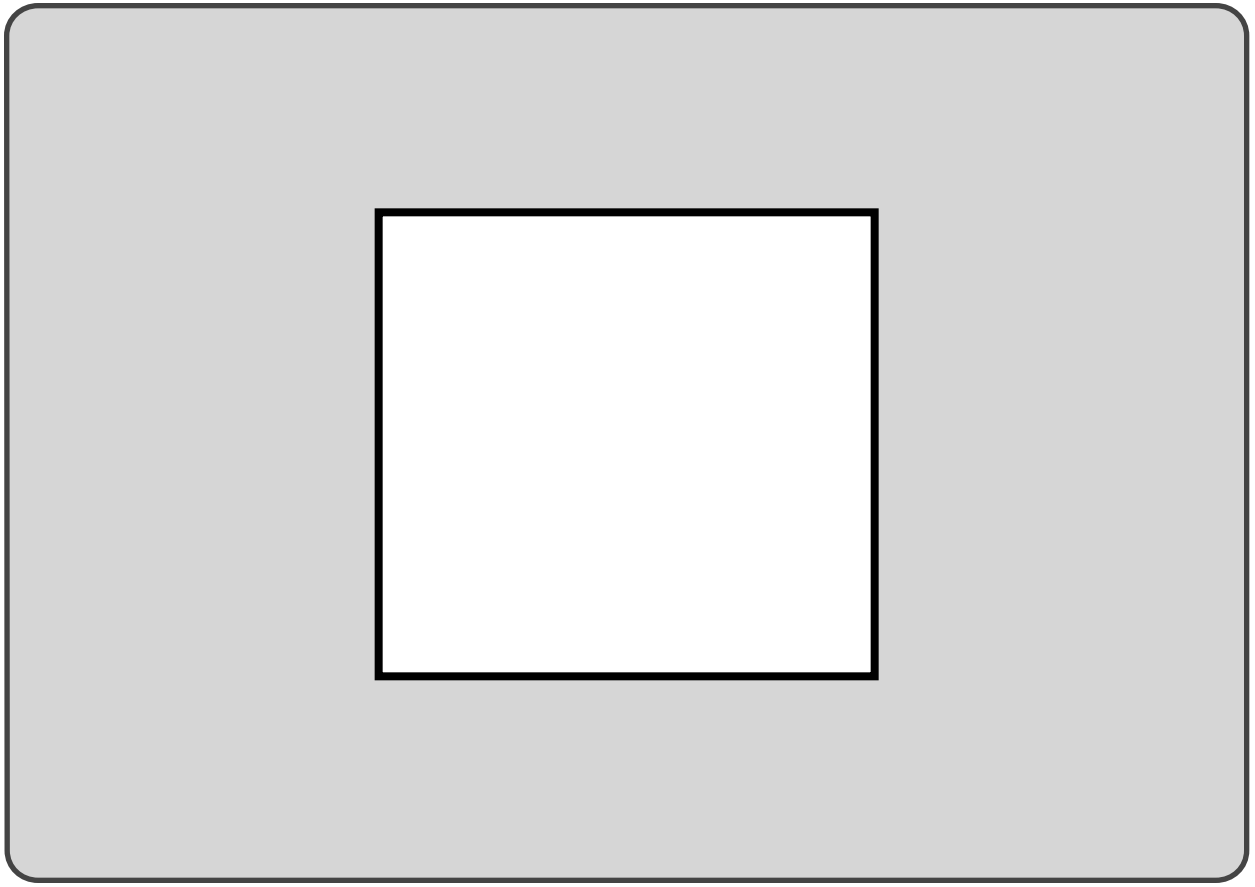
Does Experience With Cross-modal Structure Shape Occipital Cortex Function?



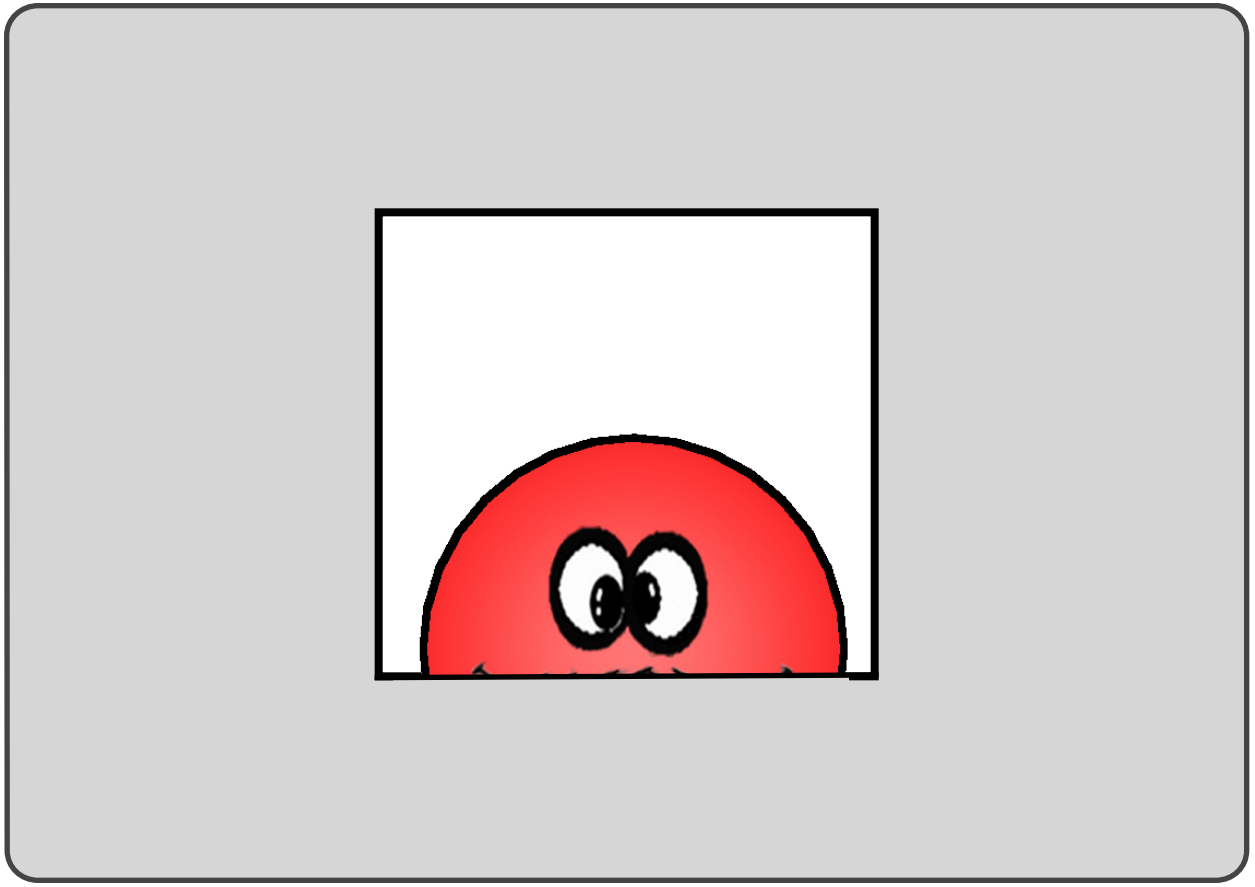
a la Watanabe, Homae, Nakano & Taga, 2008

jittered ISI: 4-9 secs; mean = 6.5 secs;
Plichta et al. 2007

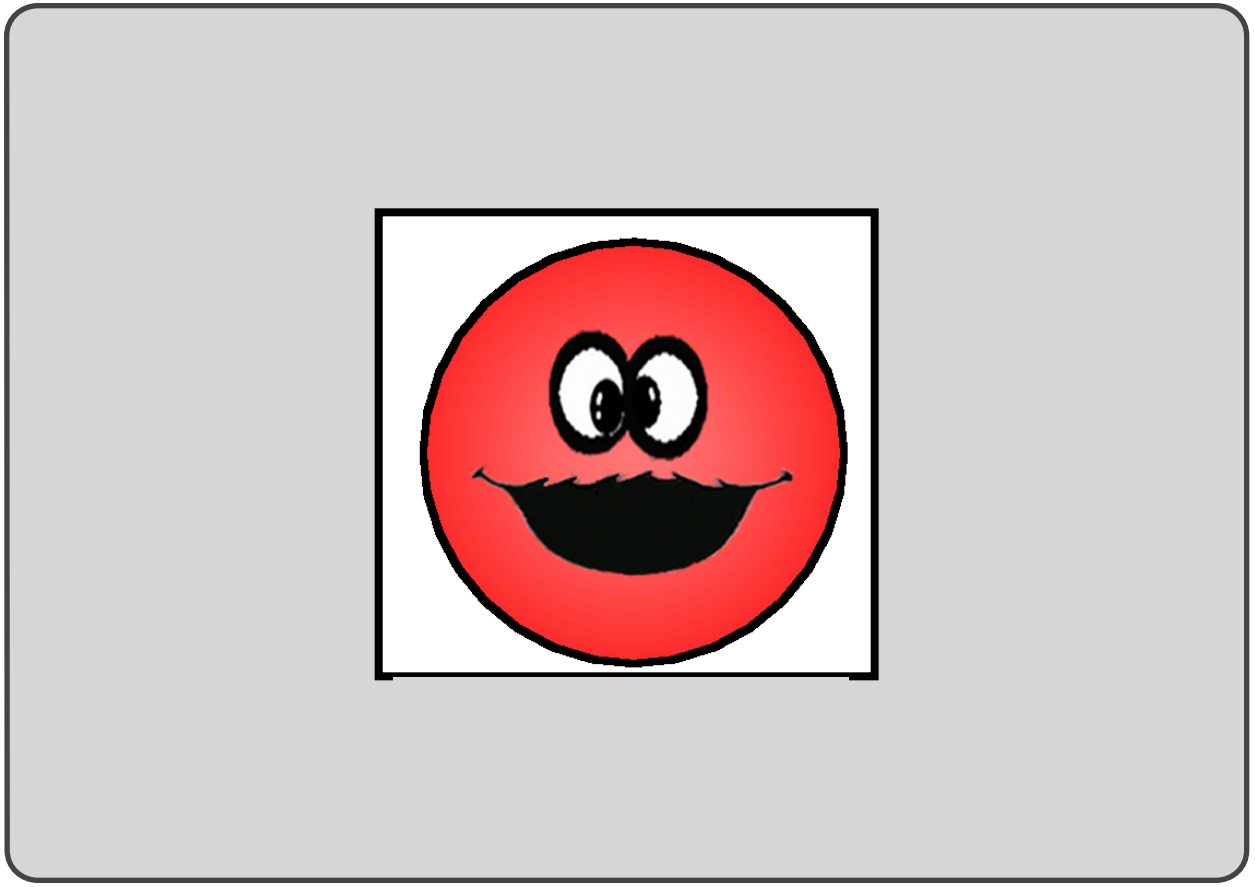
Does Experience With Cross-modal Structure Shape Occipital Cortex Function?



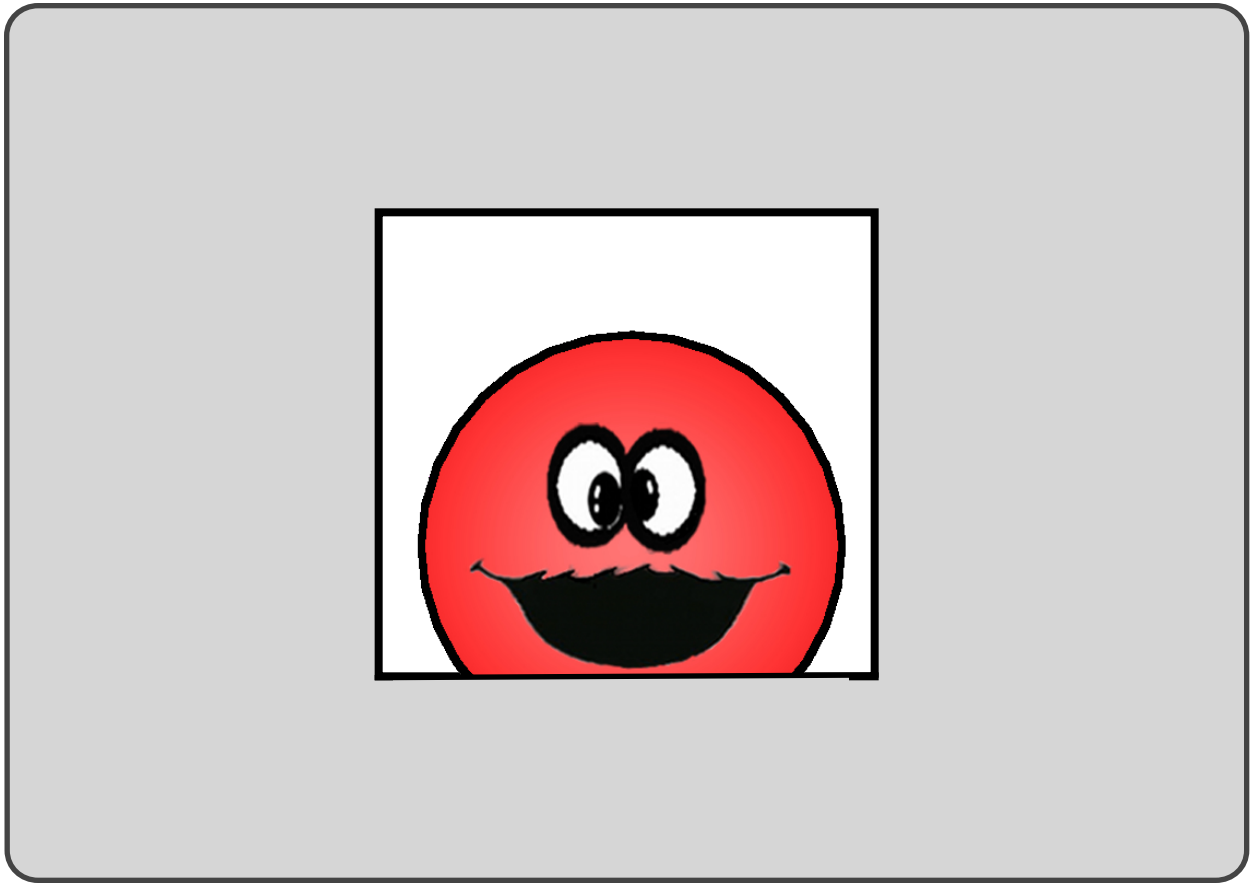
Does Experience With Cross-modal Structure Shape Occipital Cortex Function?



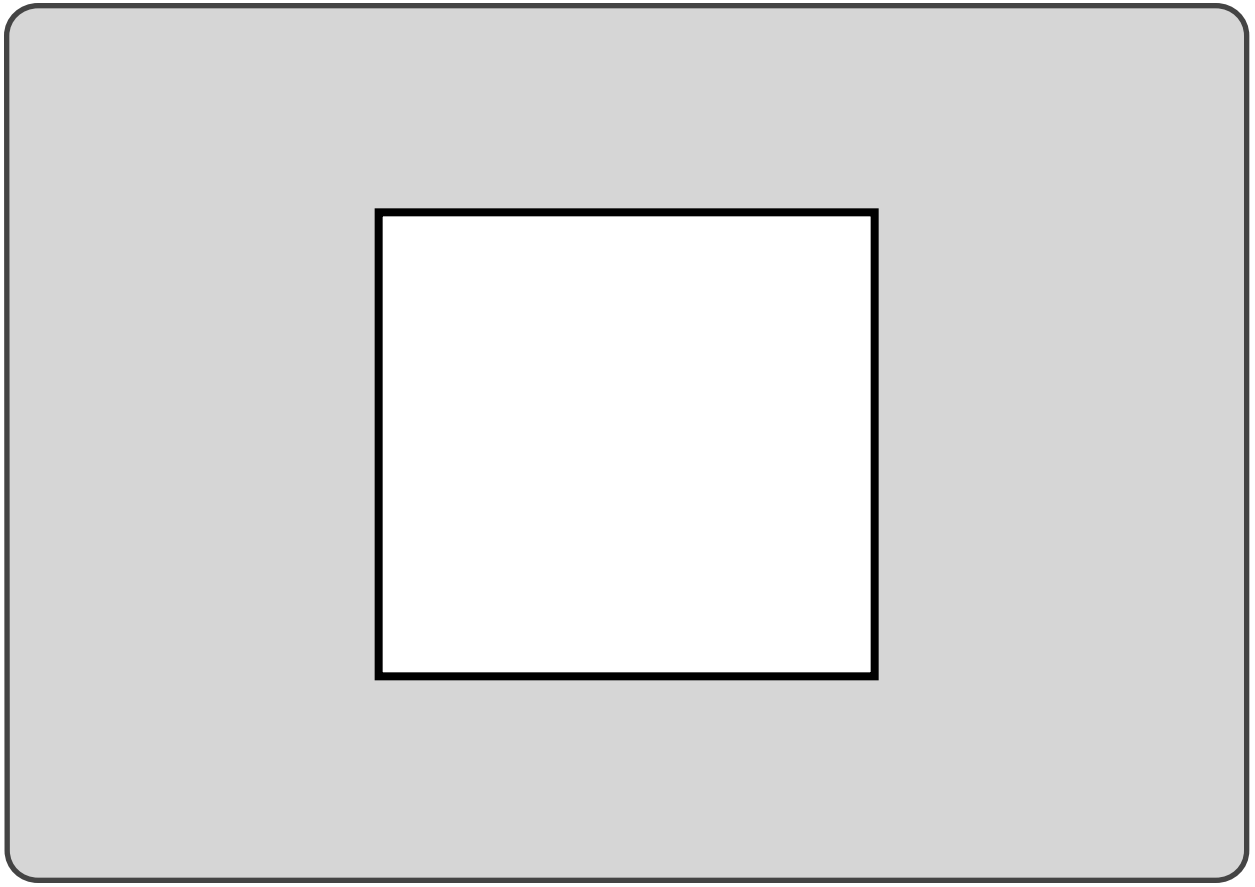
Does Experience With Cross-modal Structure Shape Occipital Cortex Function?



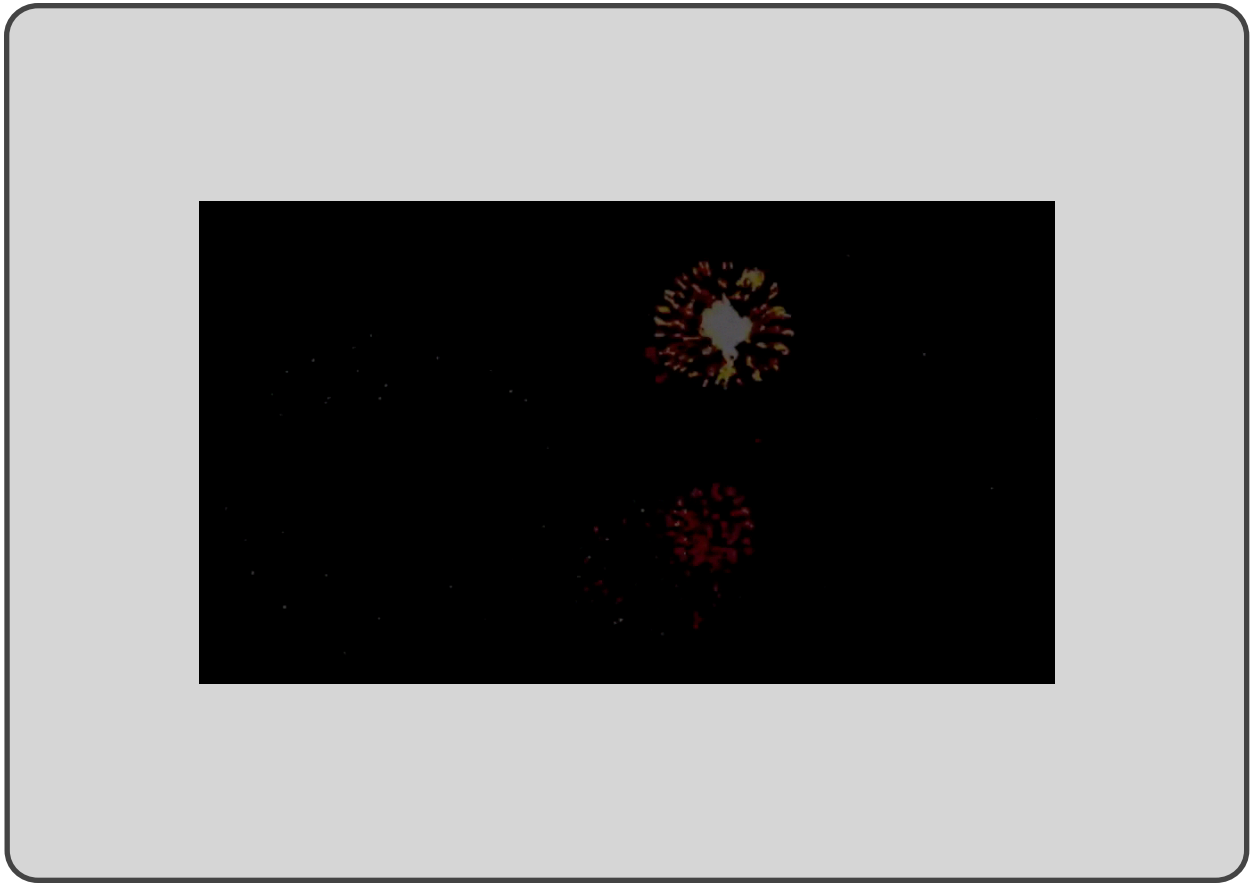
Does Experience With Cross-modal Structure Shape Occipital Cortex Function?



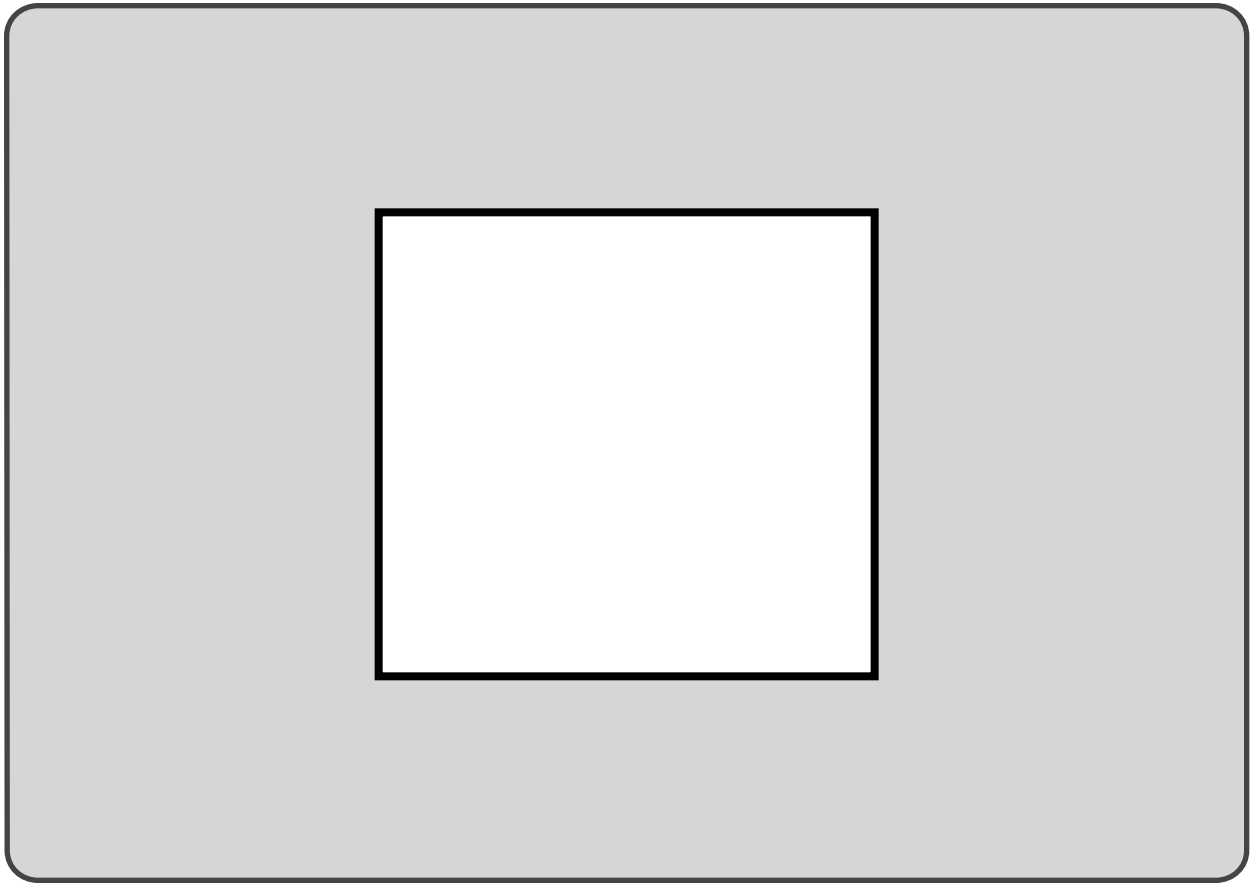
Does Experience With Cross-modal Structure Shape Occipital Cortex Function?

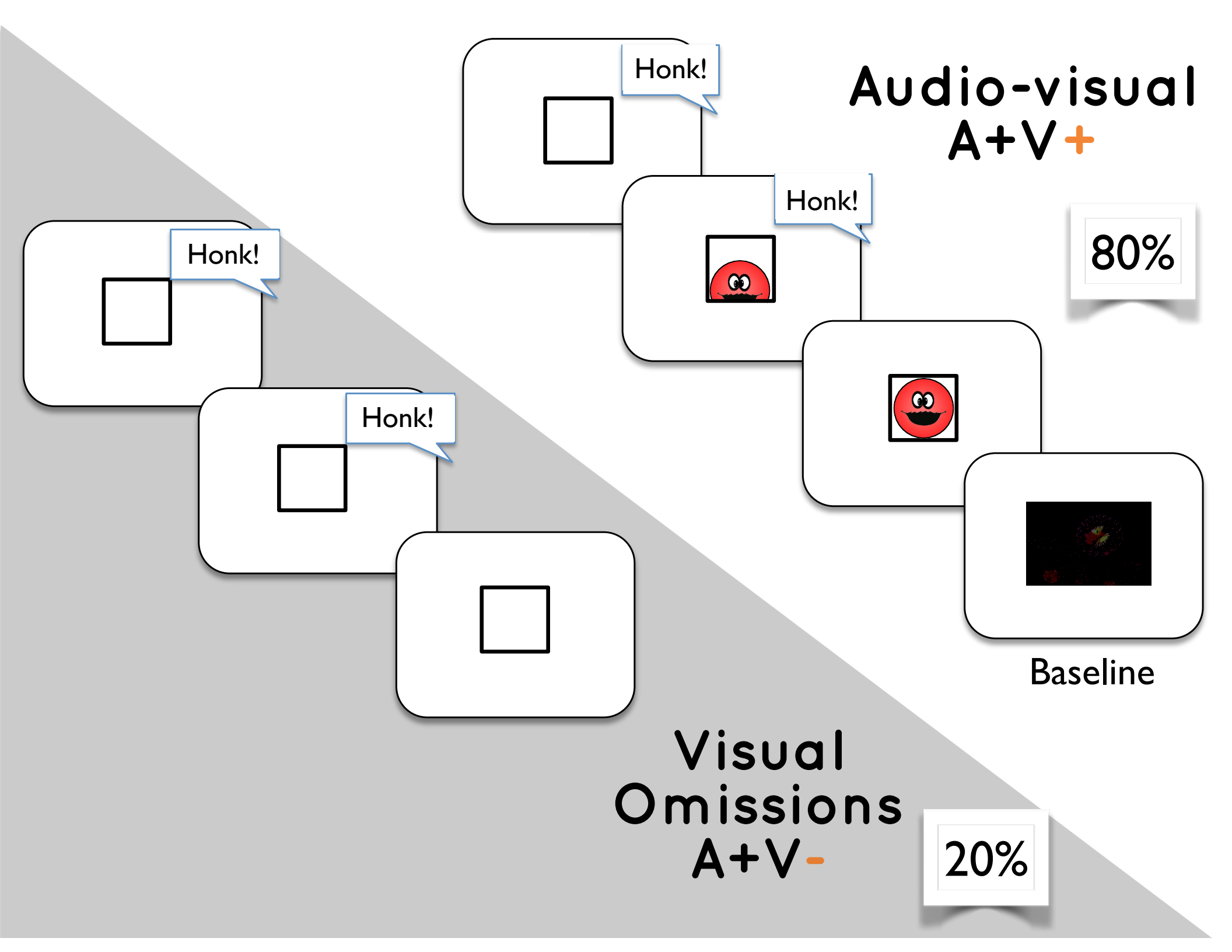


Does Experience With Cross-modal Structure Shape Occipital Cortex Function?

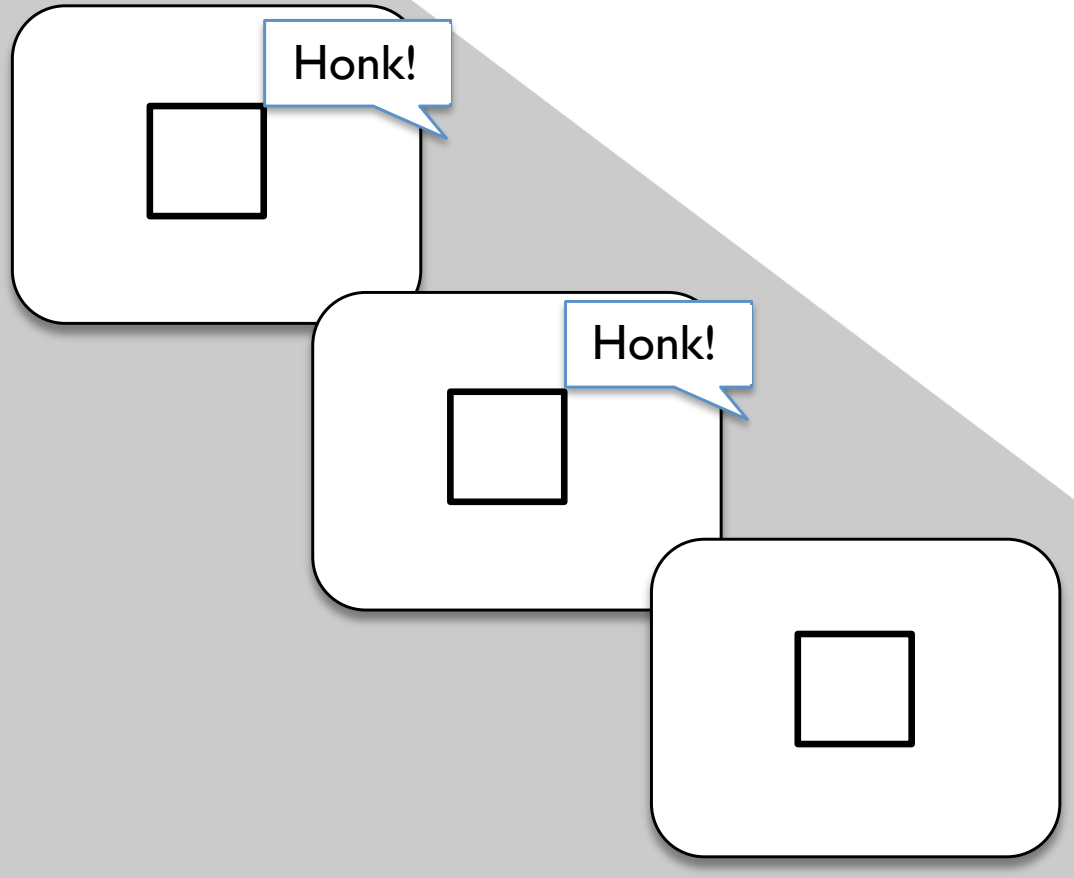


Does Experience With Cross-modal Structure Shape Occipital Cortex Function?




Honk!
Audio-visual
A+V+
Honk!
80%
Honk!
Honk!
Baseline
Visual
Omissions
A+V-
20%

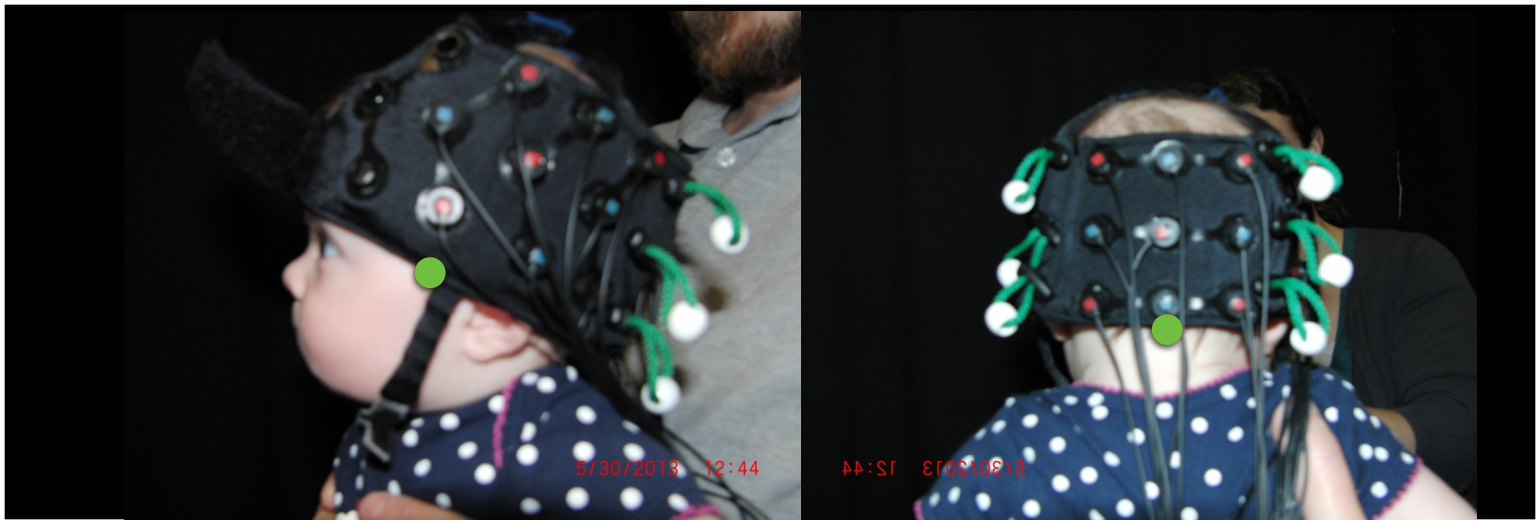
Is the occipital cortex sensitive to infant's visual expectations?



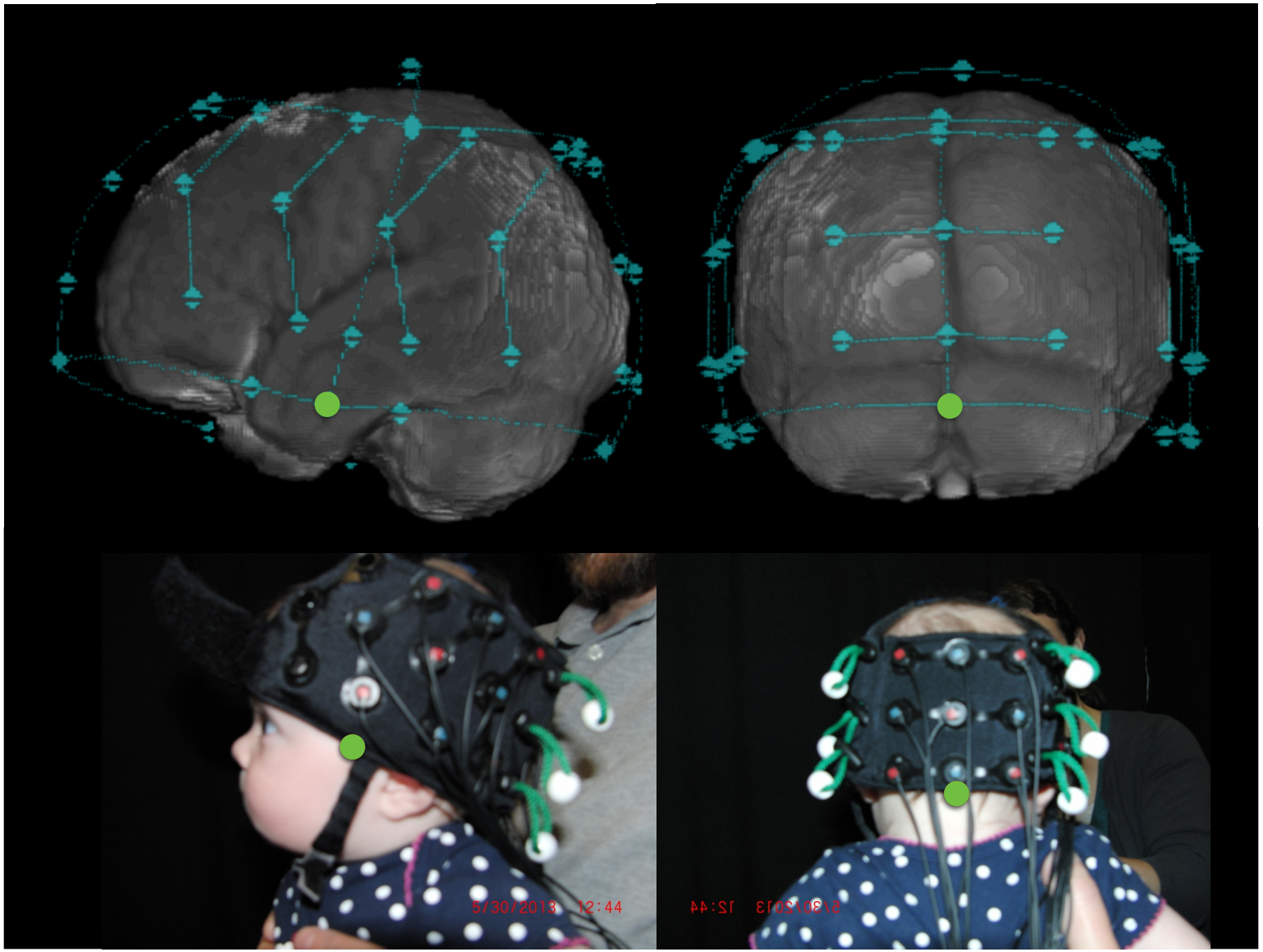
Visual Omissions A+V-

20%

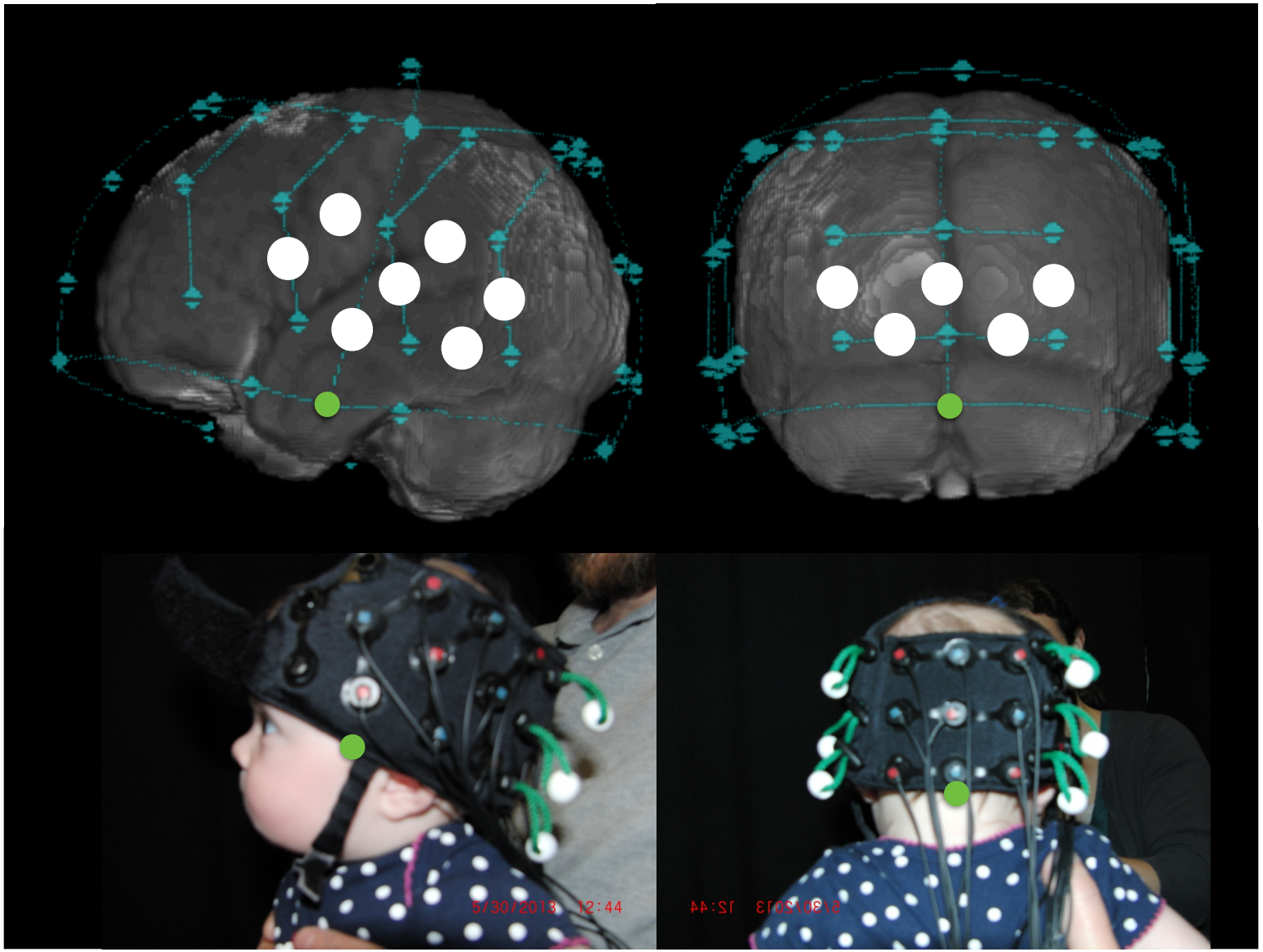
MR Co-registration of fNIRS Recordings



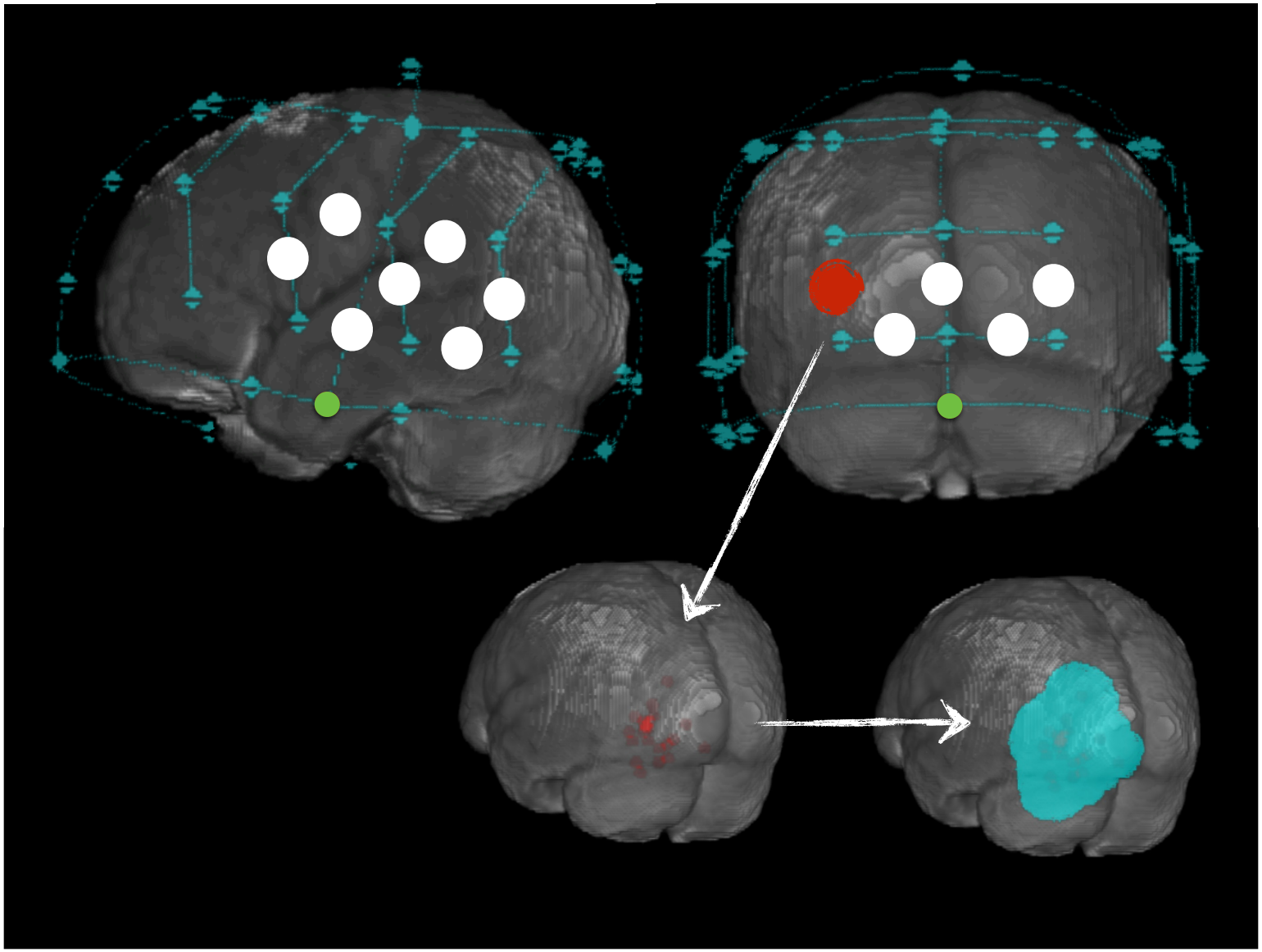
MR Co-registration of fNIRS Recordings



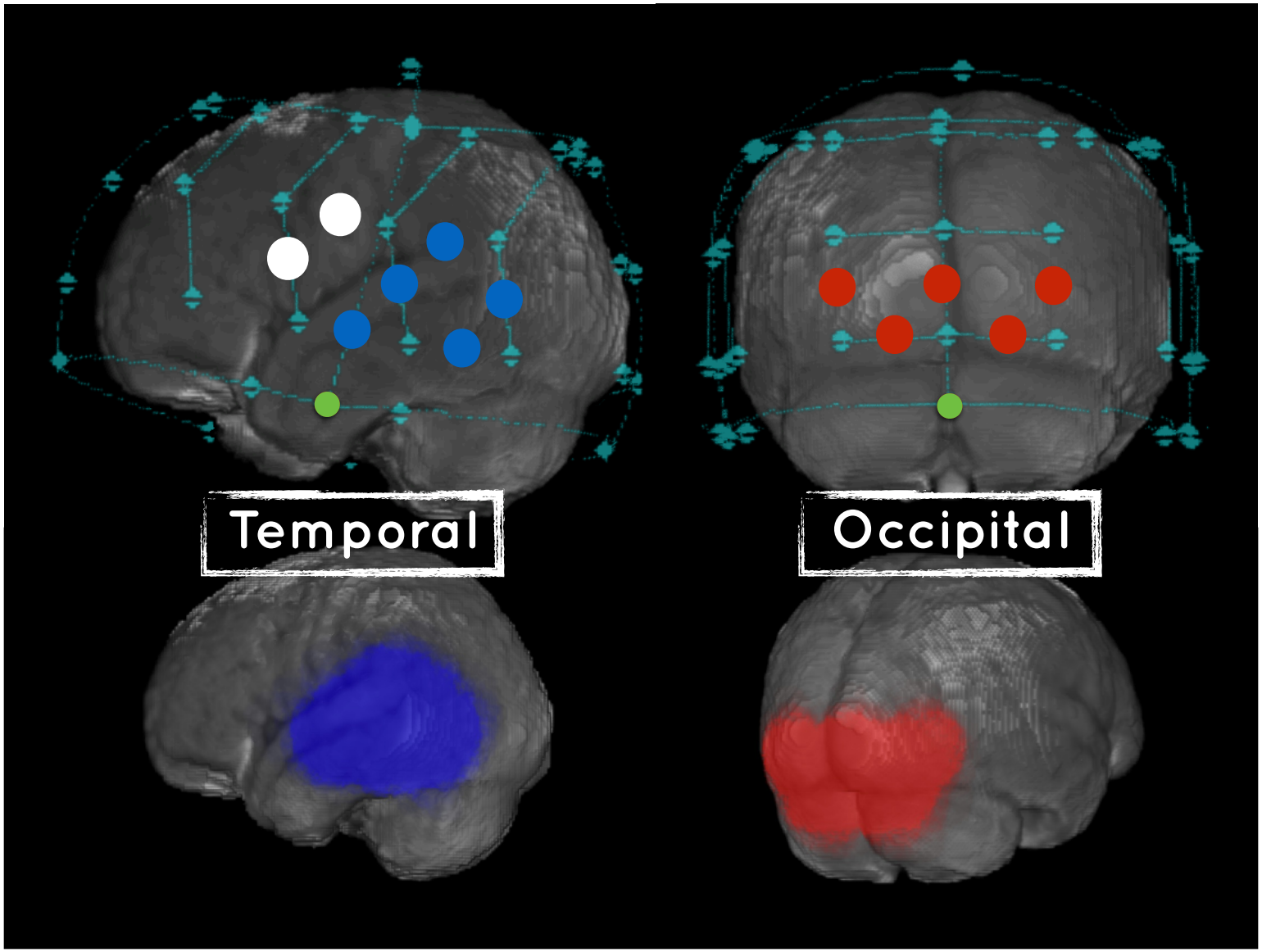
MR Co-registration of fNIRS Recordings

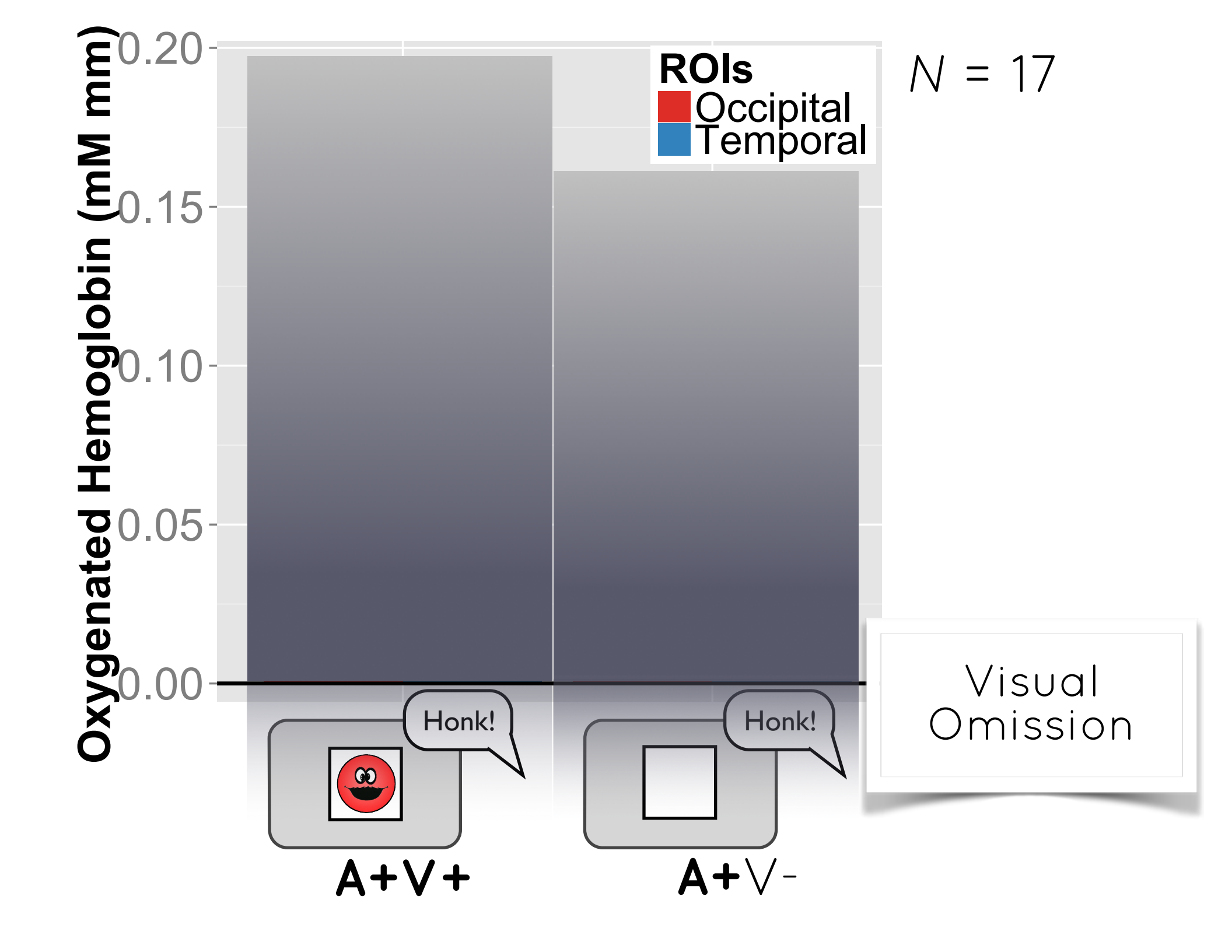


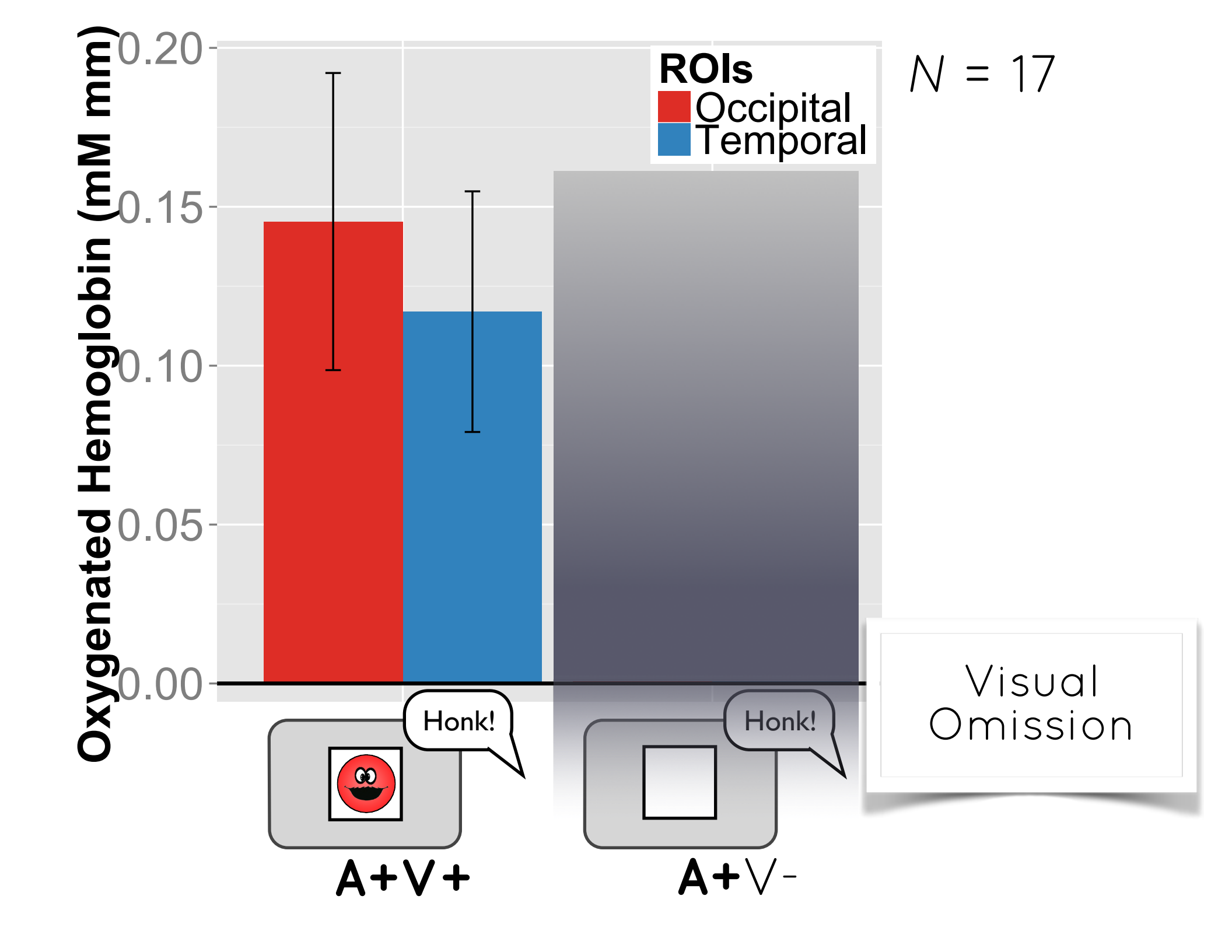
MR Co-registration of fNIRS Recordings

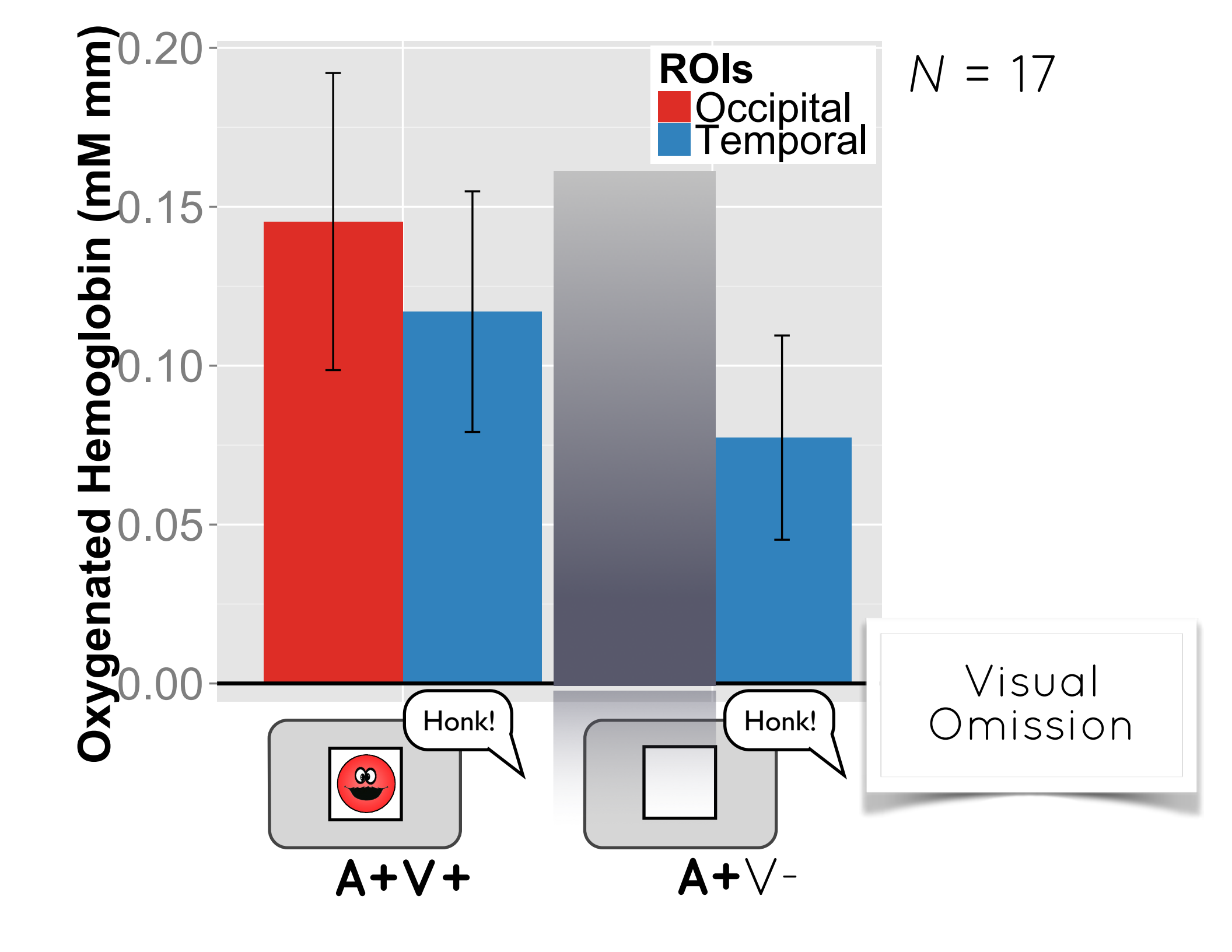


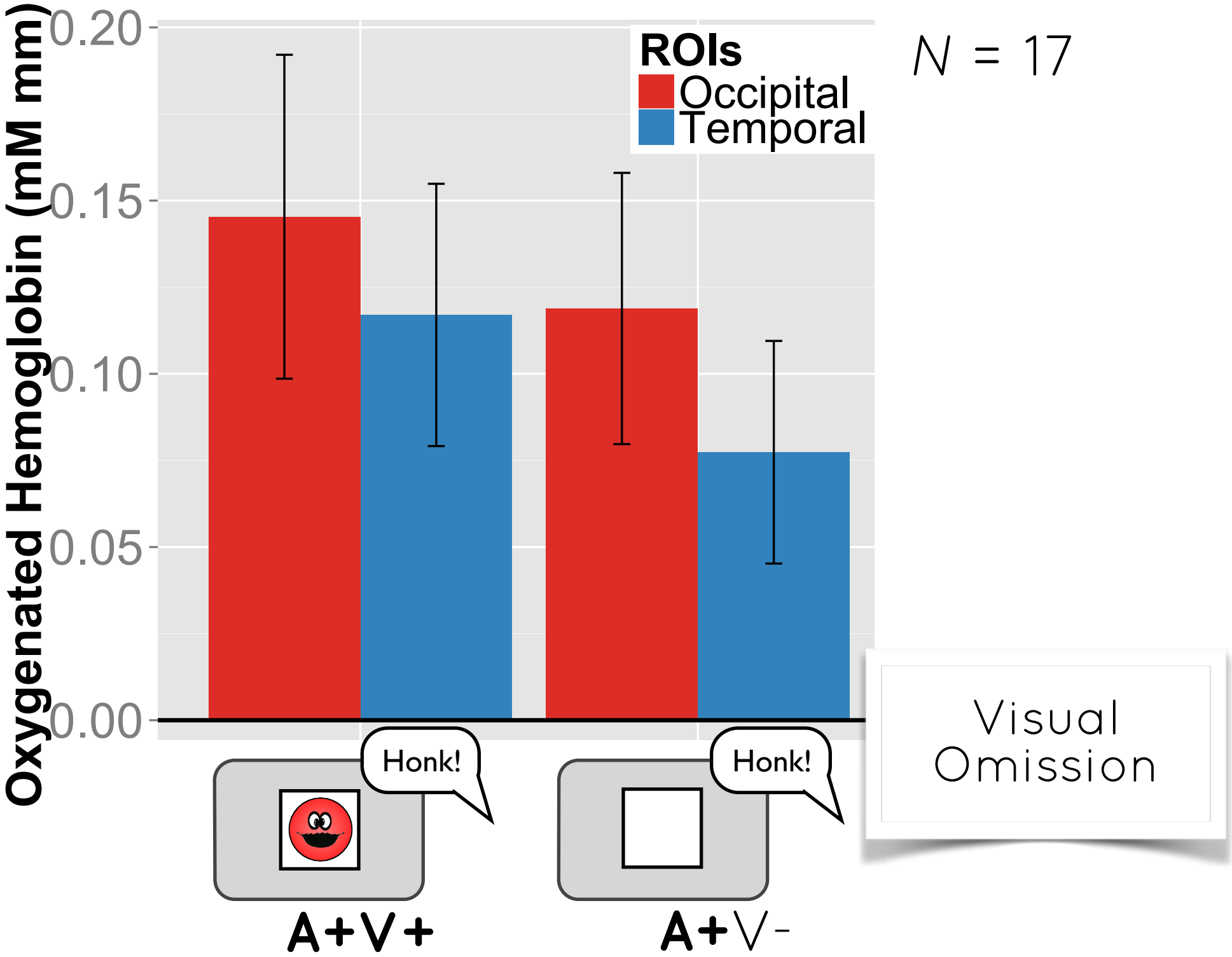
Temporal and Occipital ROIs: Neuroanatomically Defined, 5 channels each

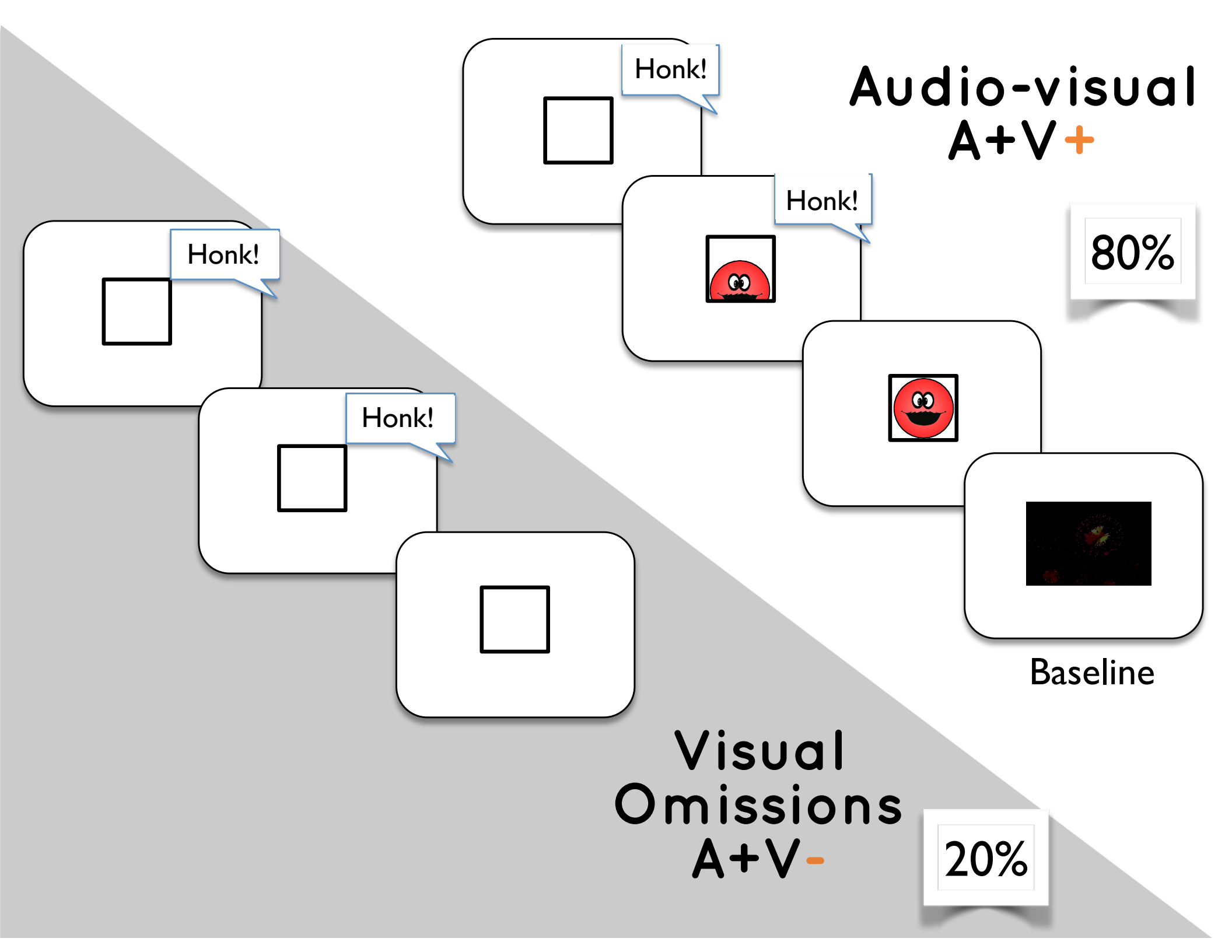


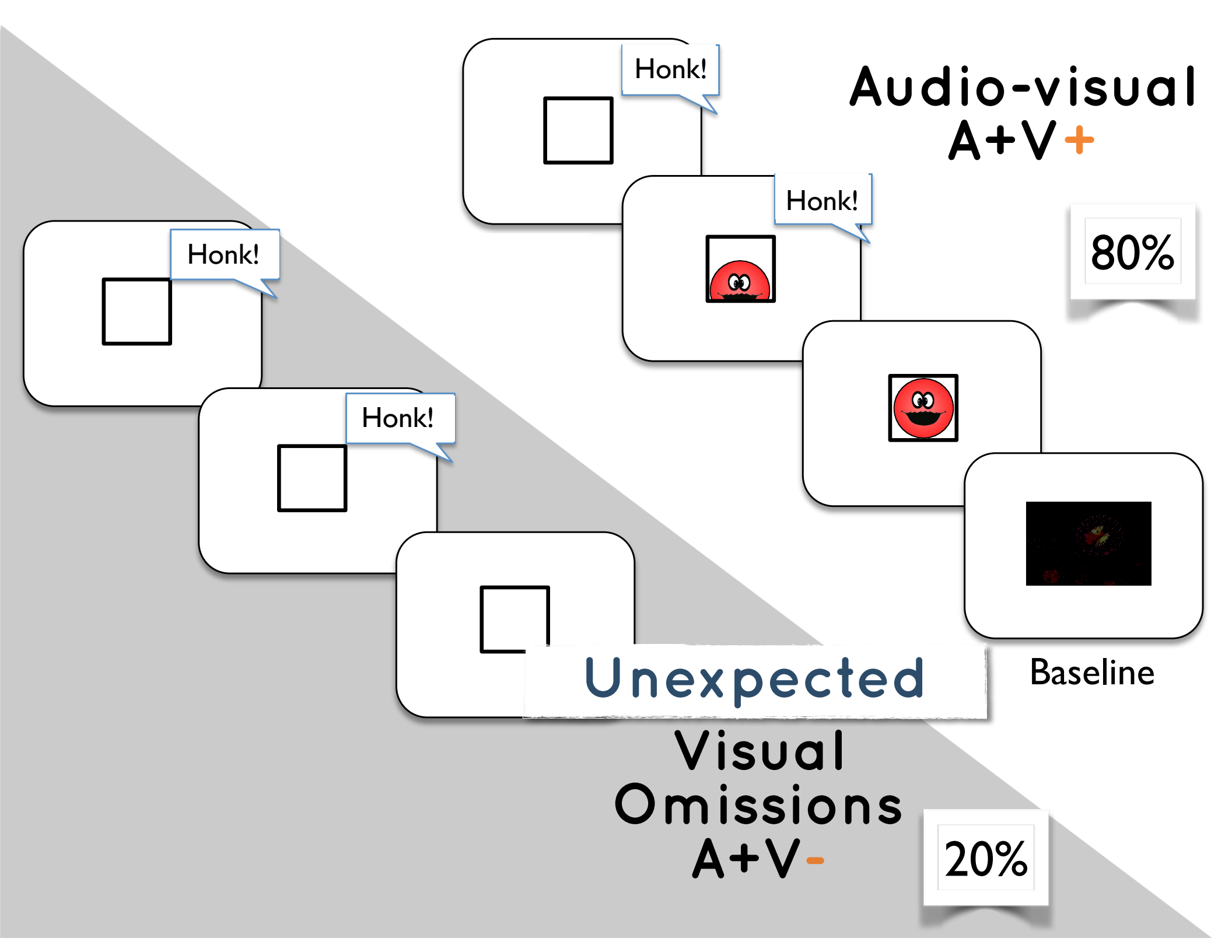

Oxygenated Hemoglobin (mM mm)
0.20
0.15
0.10
0.05
0.00
ROIs
Occipital
Temporal
N = 17
Honk!
Honk!
A+V+
A+V-
Visual Omission

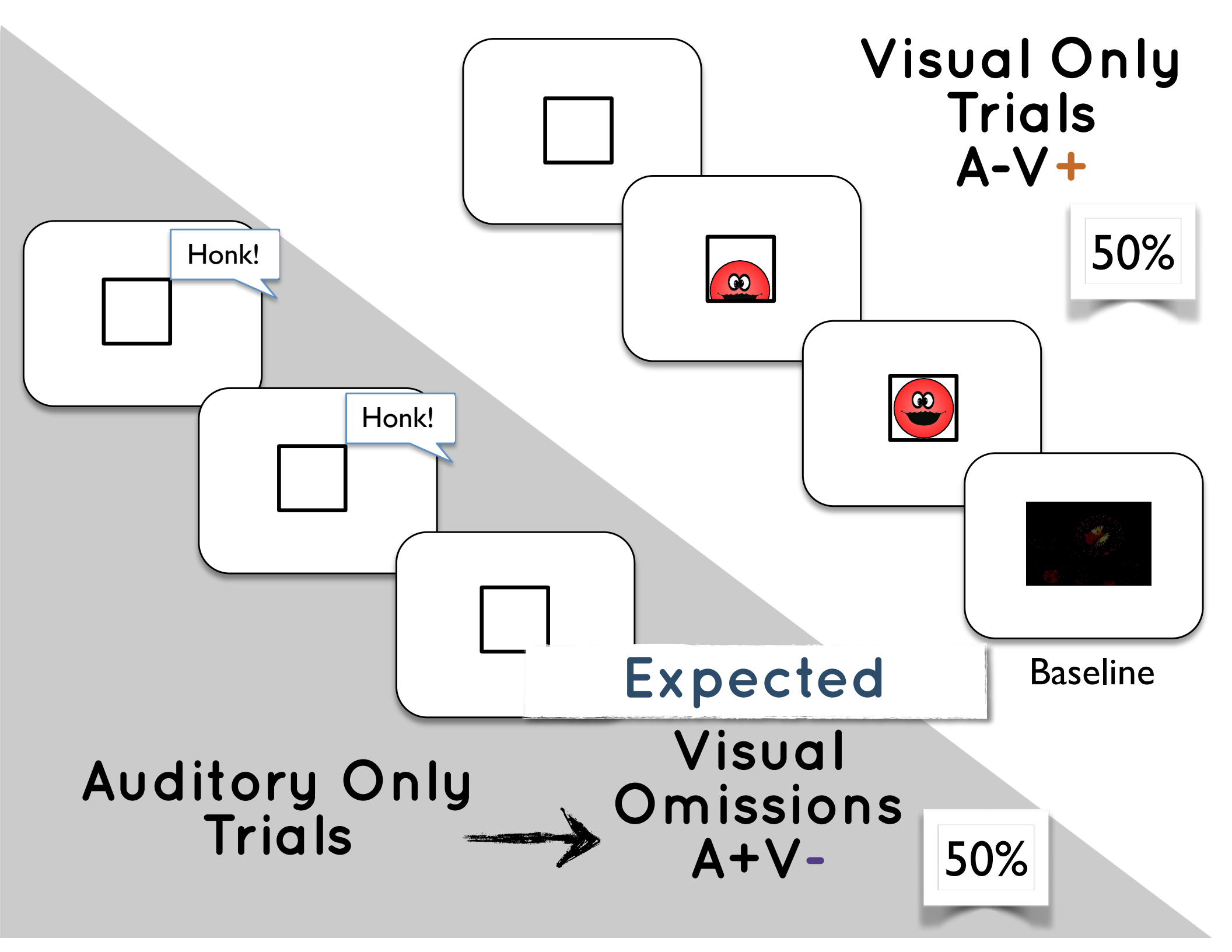

Oxygenated Hemoglobin (mM mm)
0.20
0.15
0.10
0.05
0.00
ROIs
Occipital
Temporal
N = 17
Honk!
Honk!
A+V+
A+V-
Visual Omission

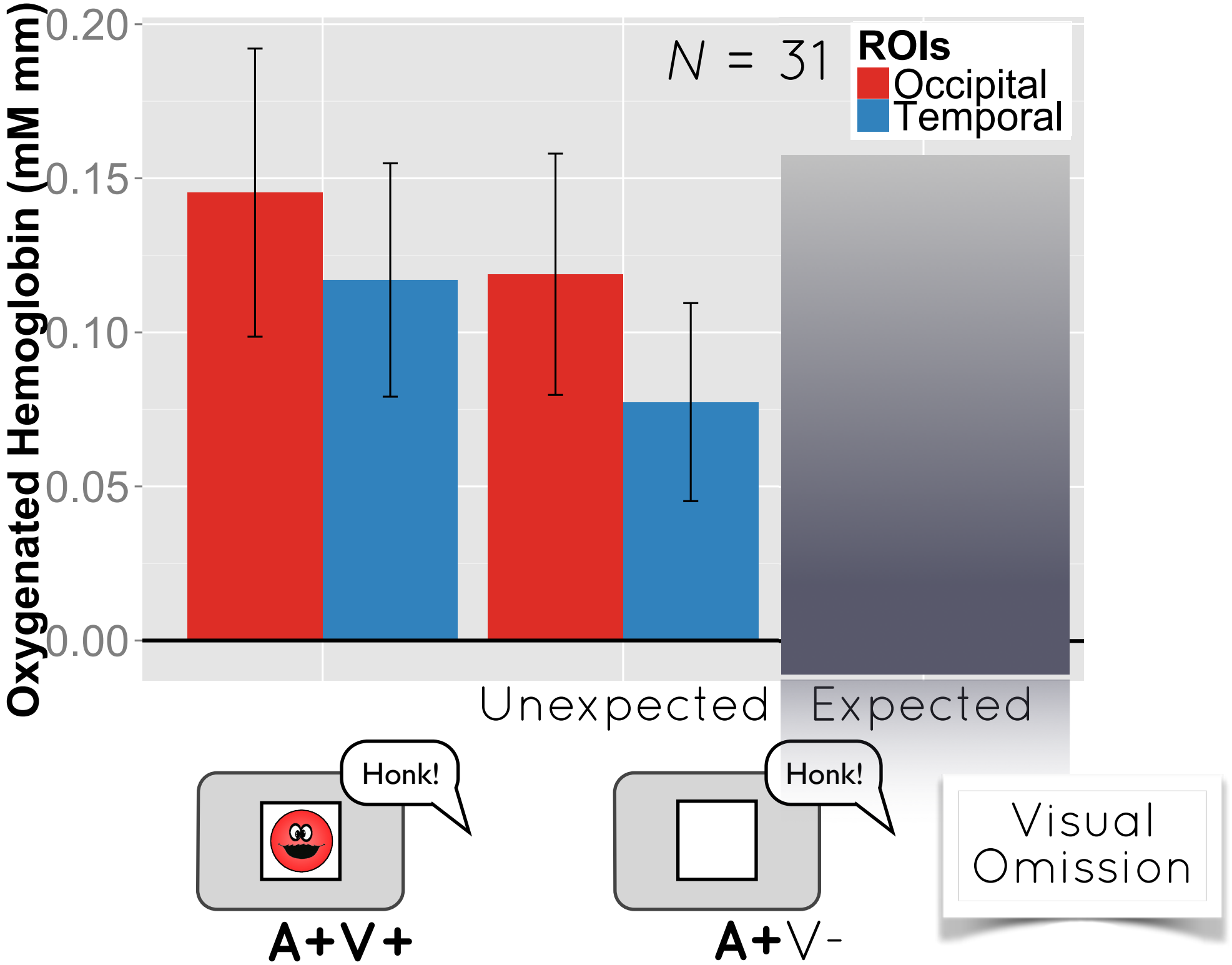

Oxygenated Hemoglobin (mM mm)
0.20
0.15
0.10
0.05
0.00
ROIs
Occipital
Temporal
N = 17
Honk!
Honk!
A+V+
A+V-
Visual Omission

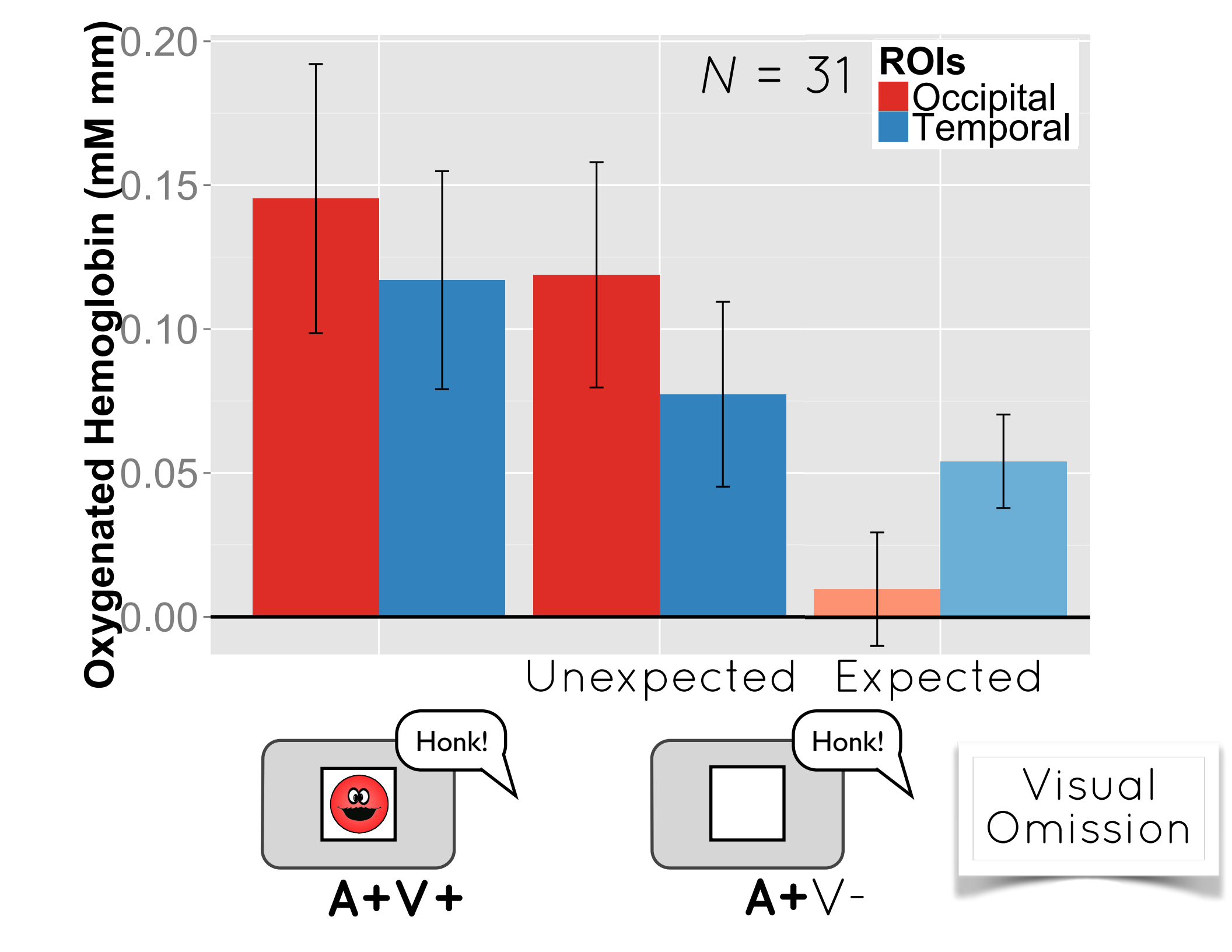

Oxygenated Hemoglobin (mM mm)
0.20
0.15
0.10
0.05
0.00
ROIs
Occipital
Temporal
N = 17
Honk!
Honk!
A+V+
A+V-
Visual Omission


Honk!
Audio-visual
A+V+
Honk!
80%
Honk!
Honk!
Baseline
Visual
Omissions
A+V-
20%

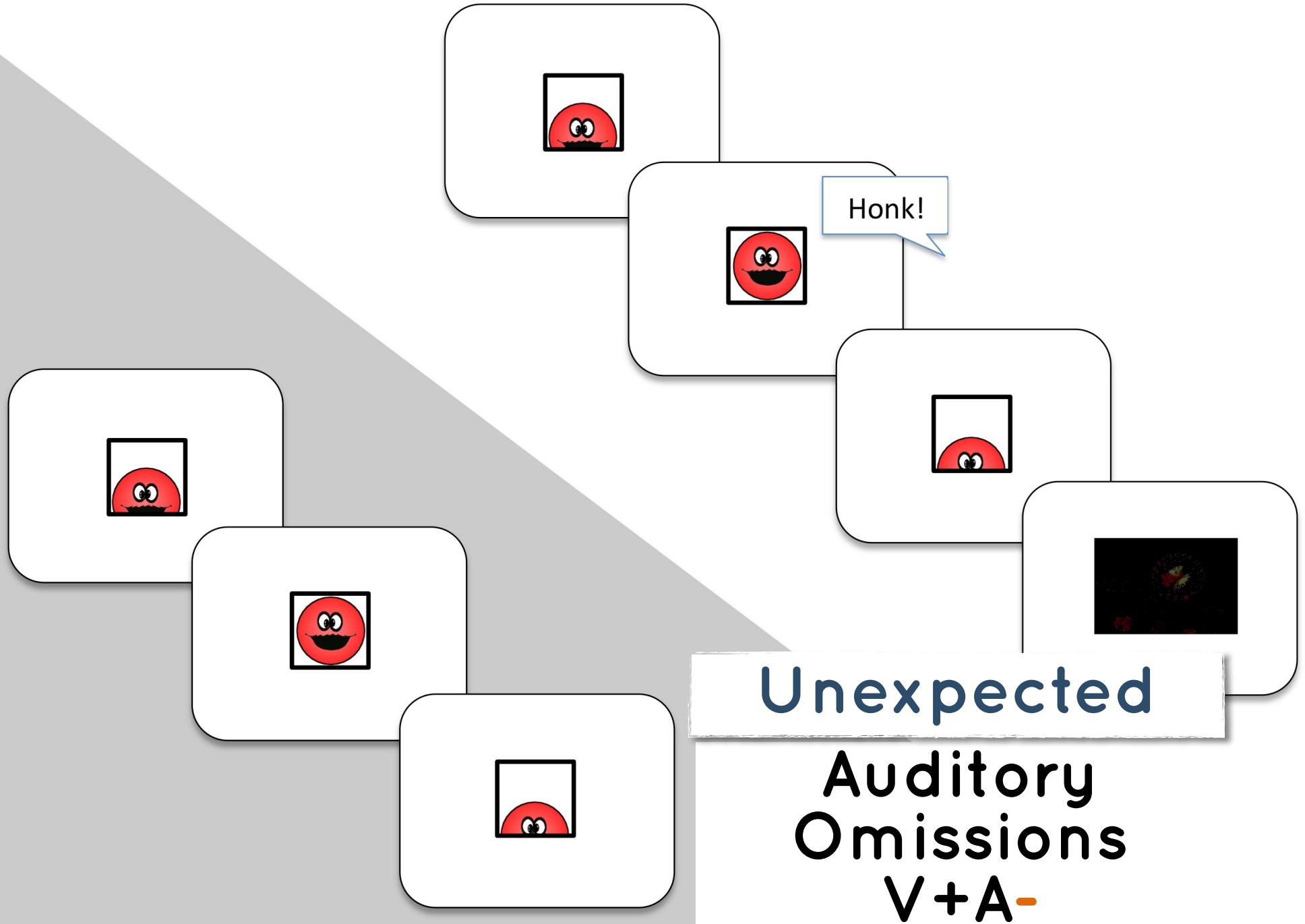

Honk!
Audio-visual
A+V+
Honk!
80%
Honk!
Honk!
Baseline
Unexpected
Visual
Omissions
A+V-
20%


Visual Only Trials
A-V+
50%
Honk!
Honk!
Expected
Baseline
Auditory Only Trials
Visual Omissions
A+V-
50%


Oxygenated Hemoglobin (mM mm)
0.20
0.15
0.10
0.05
0.00
N = 31
ROIs
Occipital
Temporal
Unexpected
Expected
Honk!
Honk!
A+V+
A+V-
Visual Omission


Oxygenated Hemoglobin (mM mm)
0.20
0.15
0.10
0.05
0.00
N = 31
ROIs
Occipital
Temporal
Unexpected
Expected
Honk!
Honk!
A+V+
A+V-
Visual Omission

How general is this phenomenon?



If unexpected *omissions* drive infant perceptual cortices, does an infant's expanding expectations about the world drive their **perceptual** development?

Coming Fall 2015...

Princeton Baby Lab

ACKNOWLEDGMENTS

Everyone in the **Rochester Baby Lab**

> **Eric Partridge** and **Ashley Rizzieri**
for heroic MR coreg/preprocessing help
> **Holly Palmeri** for heroic everything!

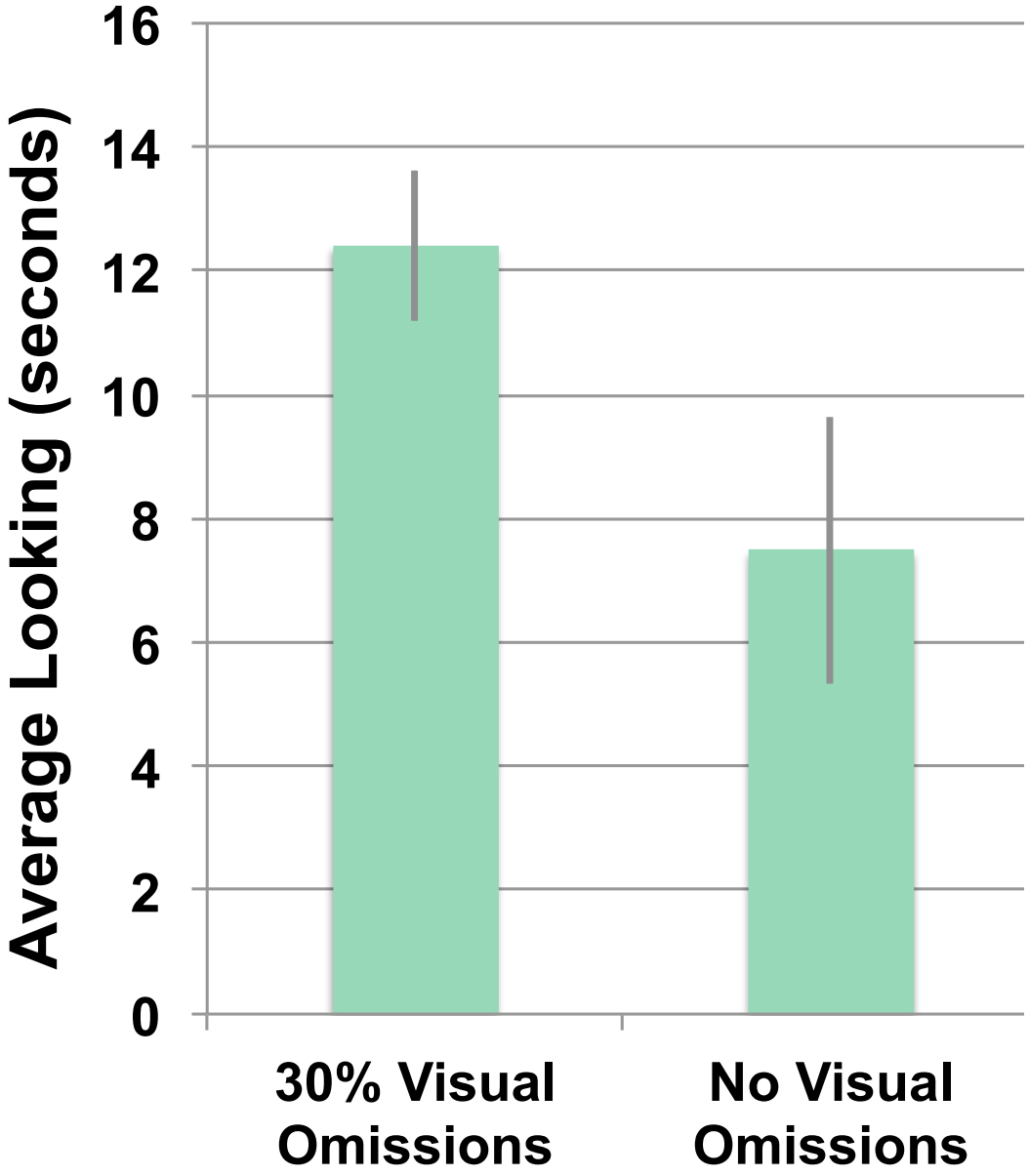
Infants and Caregivers
who volunteered their time!

Funding: **NIH K99 HD076166-01A1 to LLE**
CIHR postdoctoral fellowship to LLE
NIH R37 HD18942 to JER
NIH R01 HD-37082 to RNA

UNIVERSITY of ROCHESTER

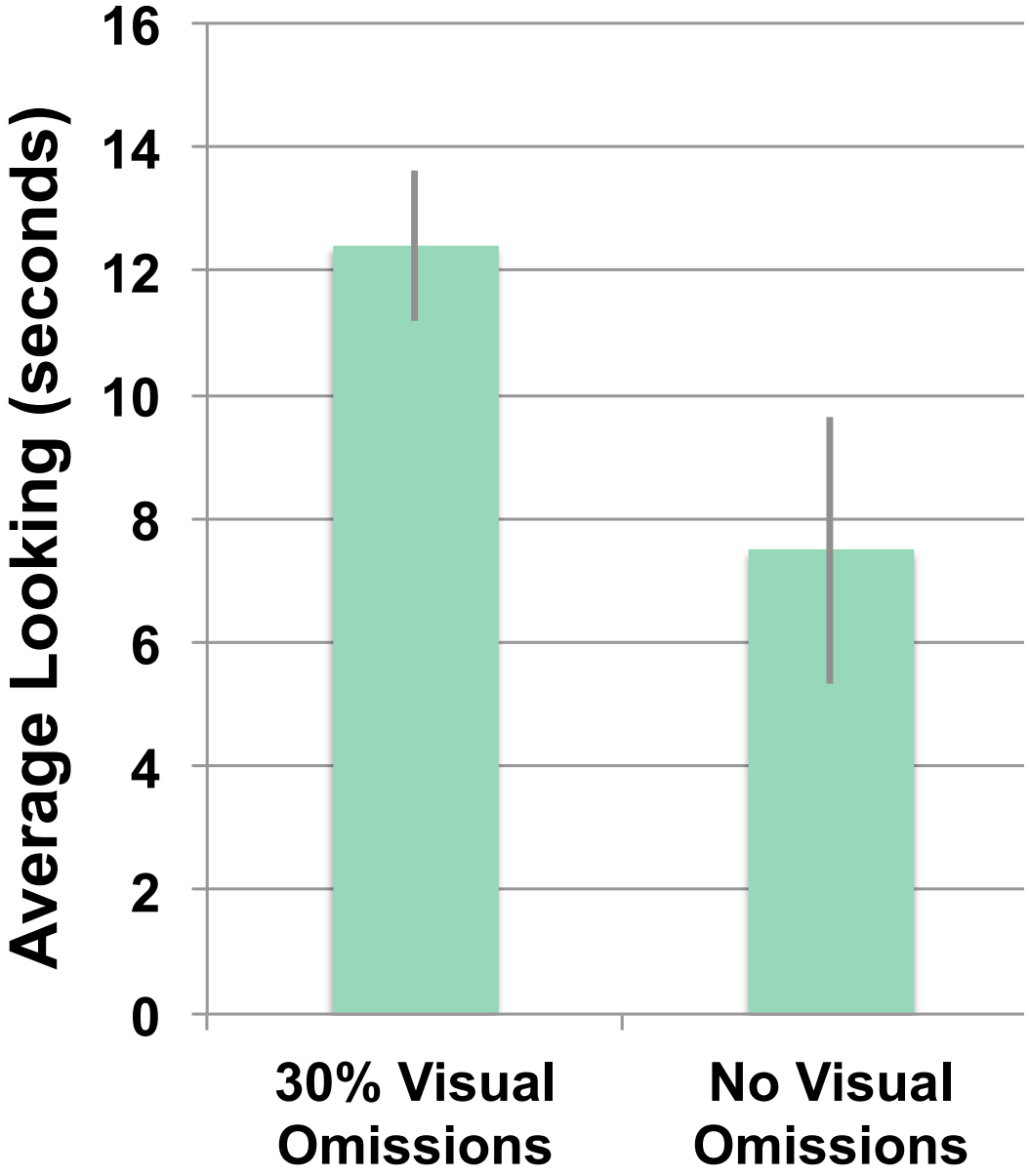
UNIVERSITY OF SOUTH CAROLINA

An Unexpected Visual Omission Influences Infant Behavior

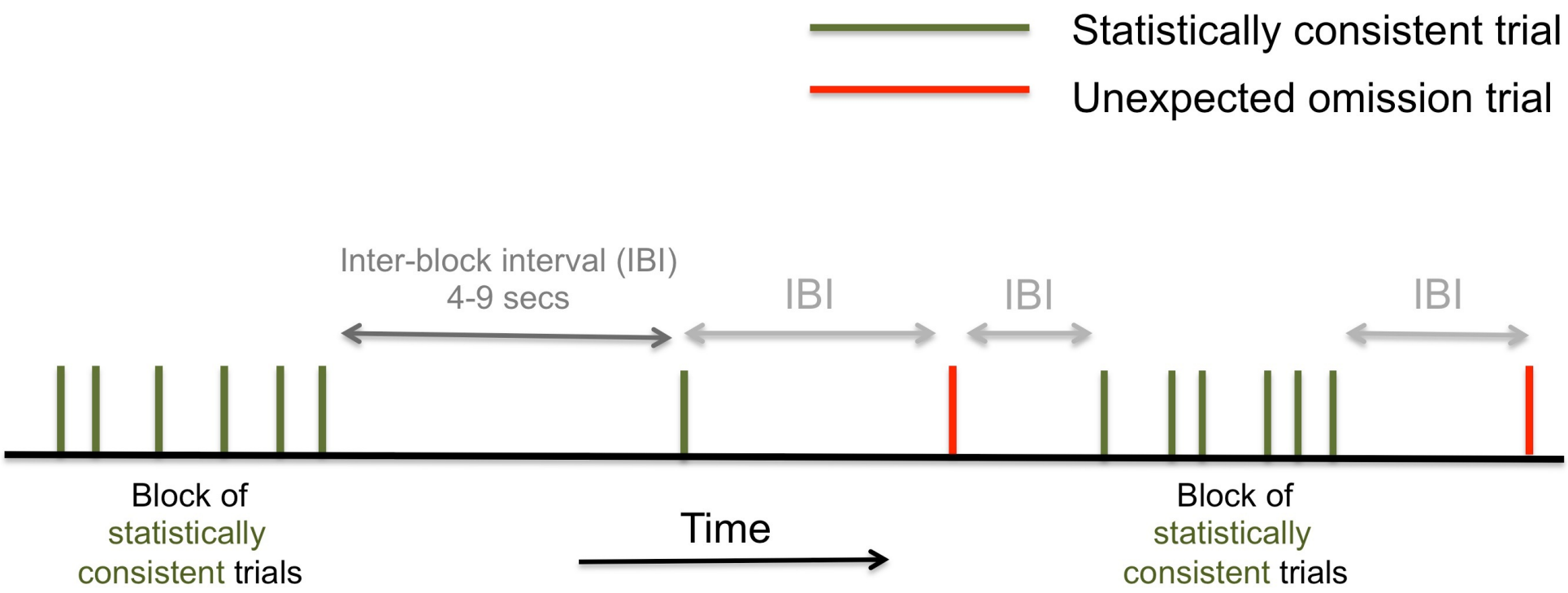


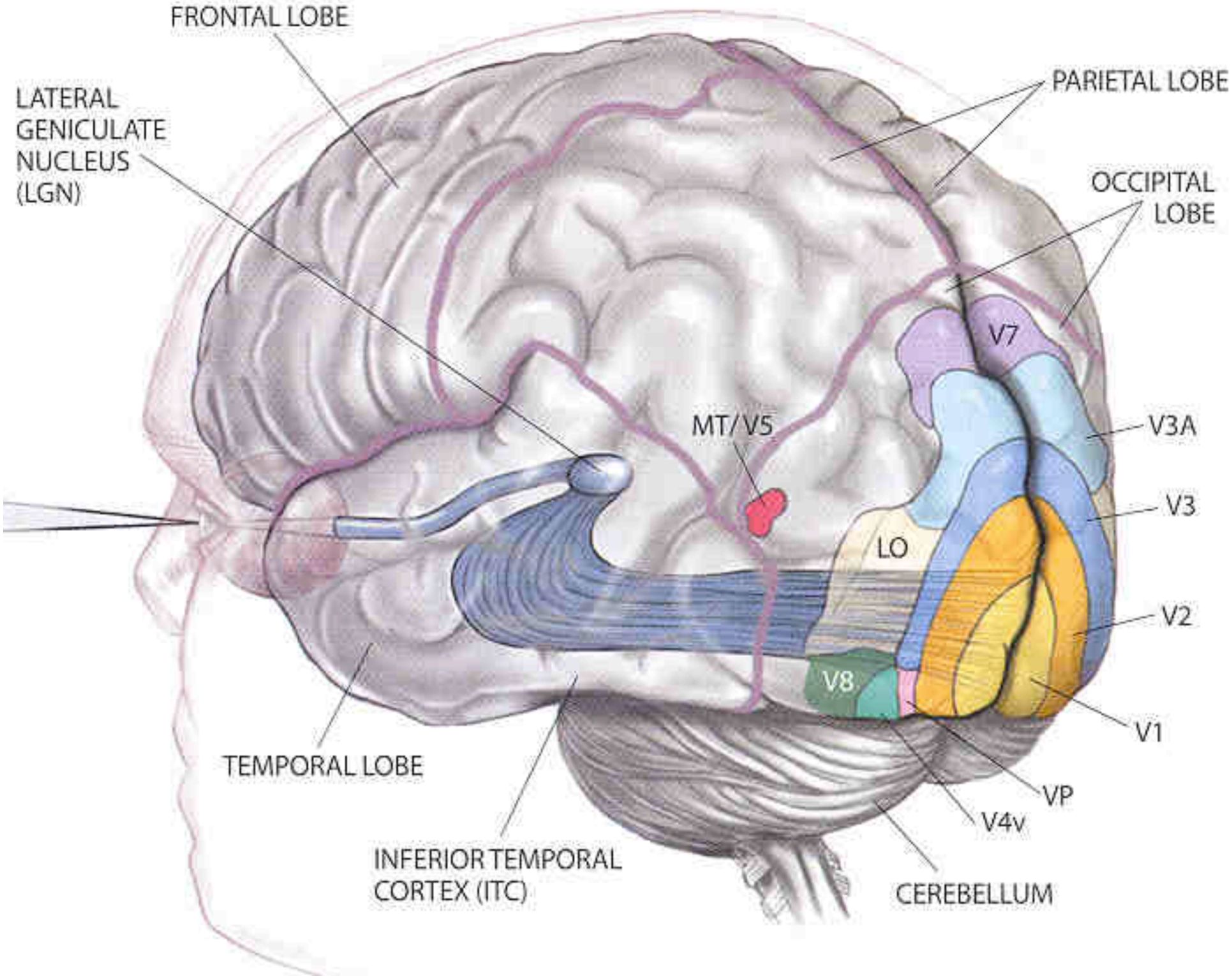
N = 13

An Unexpected Visual Omission Influences Infant Behavior

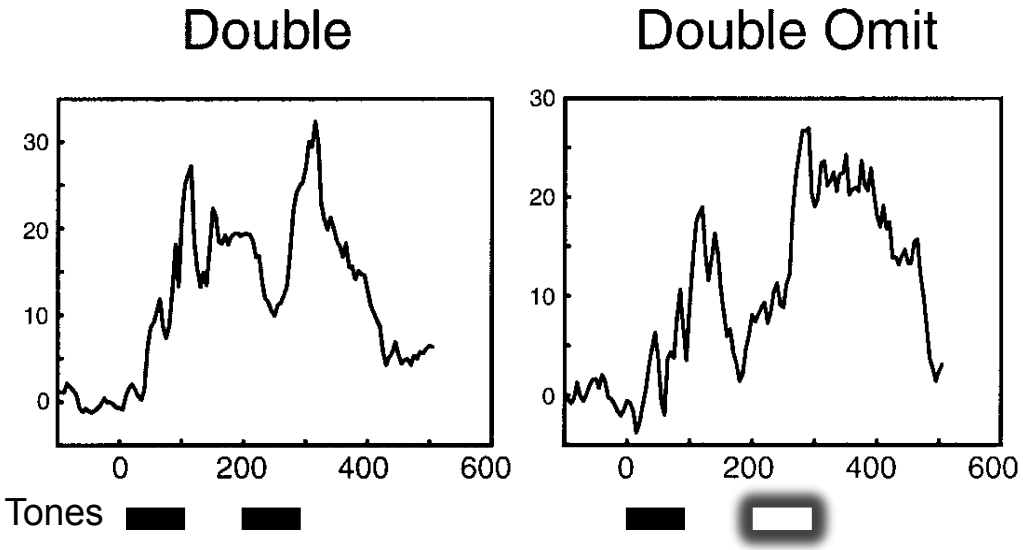


N = 13

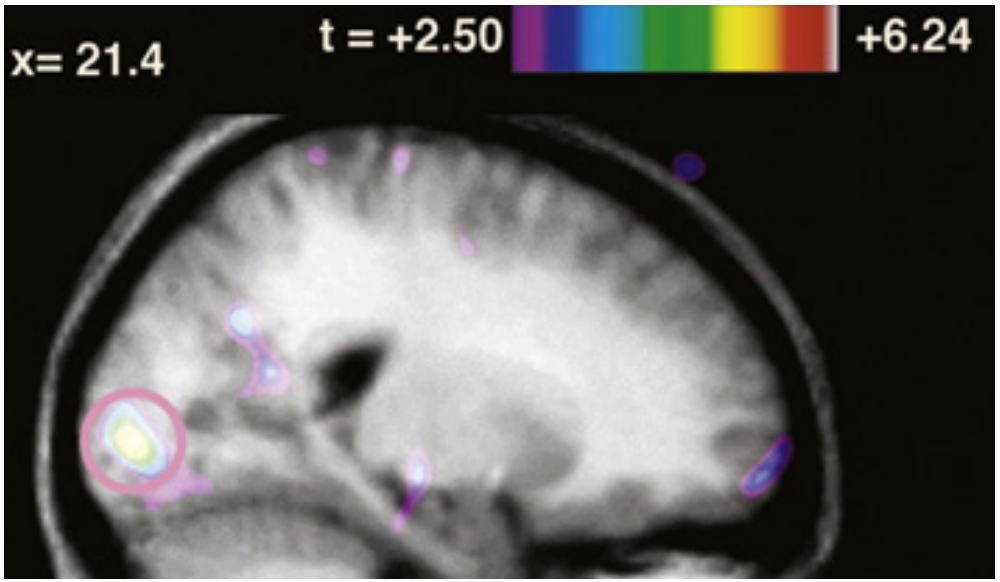

Statistically consistent trial
Unexpected omission trial
Inter-block interval (IBI)
4-9 secs
IBI
IBI
IBI
Block of
statistically
consistent trials
Time
Block of
statistically
consistent trials


FRONTAL LOBE
LATERAL GENICULATE NUCLEUS (LGN)
PARIETAL LOBE
OCCIPITAL LOBE
V7
MT/ V5
V3A
V3
LO
V2
V8
V1
TEMPORAL LOBE
VP
V4v
INFERIOR TEMPORAL CORTEX (ITC)
CEREBELLUM

Previous Research on Unexpected Sensory Omissions



Hughes et al., (2001)



Zangenehpour & Zatorre (2010)

den Ouden et al. (2009)