

# Developmental considerations

Dr. Caitlin Hudac  
University of Alabama

PY 630 – Affective Neuroscience  
Spring 2021



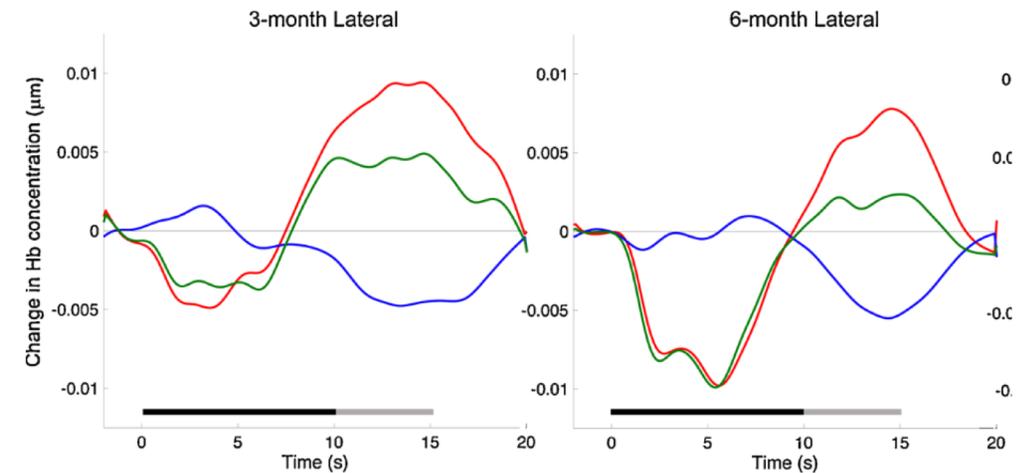
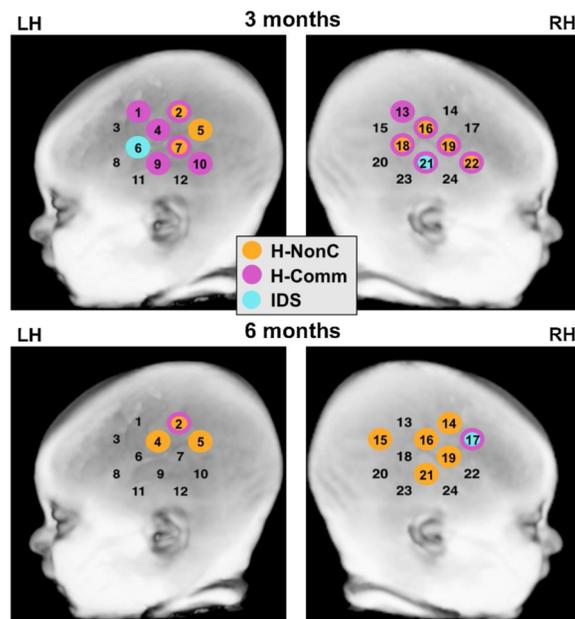
Don't forget to record!



# Vocal emotion processing in infants

(Zhao et al., 2020)

- **Premise:** Early sensitivity to mother's voice – in utero and within minutes/days of birth. Infants prefer happy intonations and natural speech



McDonald et al., 2019

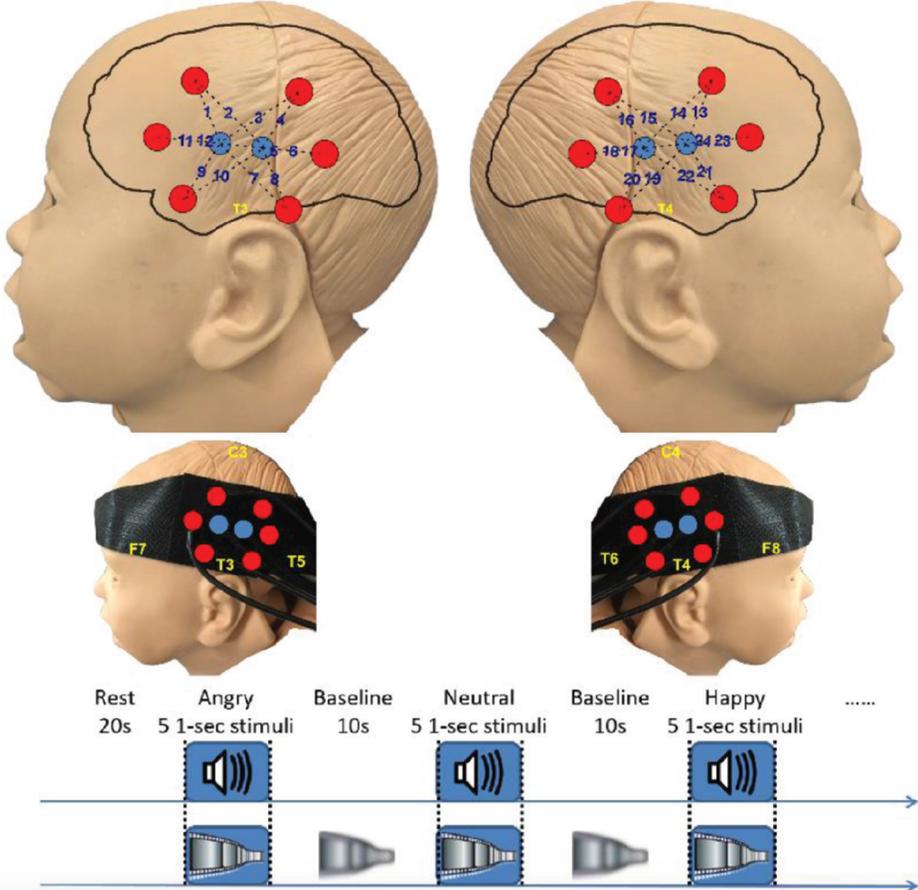
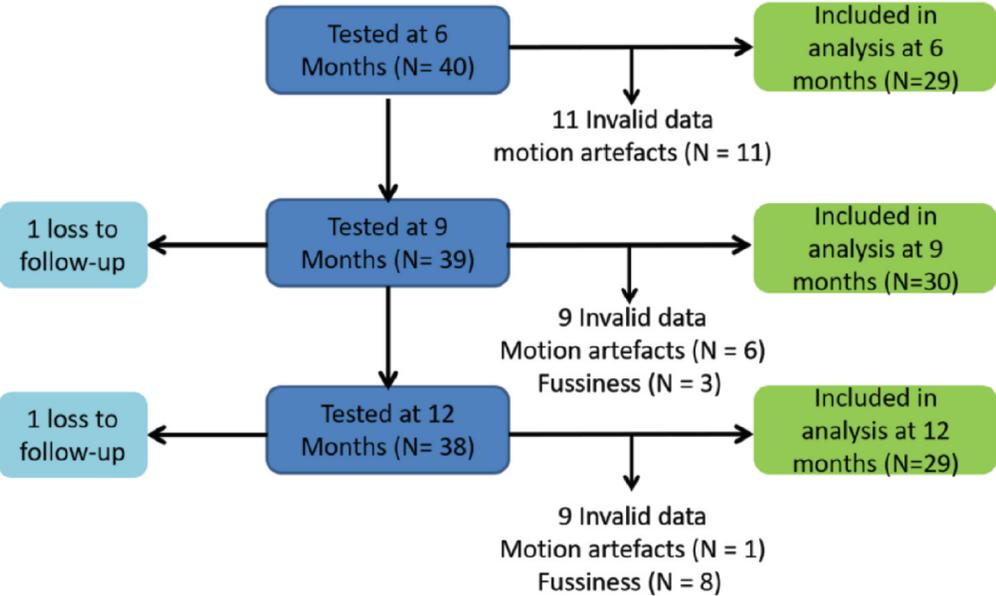
Human Noncommunicative sounds  
Human Communicative sounds  
Infant-directed speech

# Hypotheses

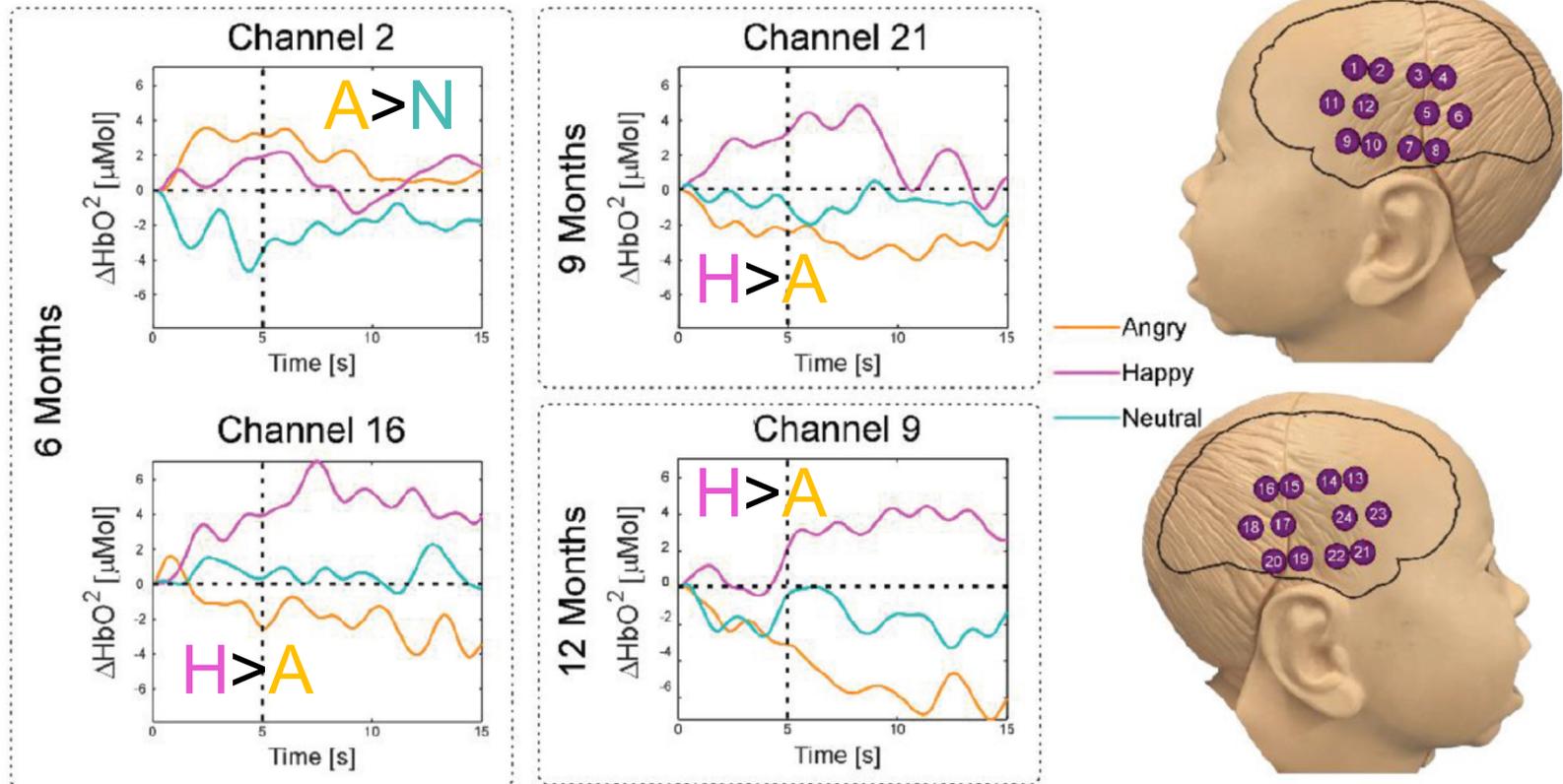
**Goal:** Trajectories of infant vocal emotion processing

1. Increased responses to affective (vs neutral) vocalizations
2. The extent of condition differences will increase with age
3. Exploratory: Do trajectories vary for different emotions?

# Methods



# Hypotheses & findings



Effects surviving correction for multiple comparisons

# Hypotheses

**Goal:** Trajectories of infant vocal emotion processing

1. Increased responses to affective (vs neutral) vocalizations

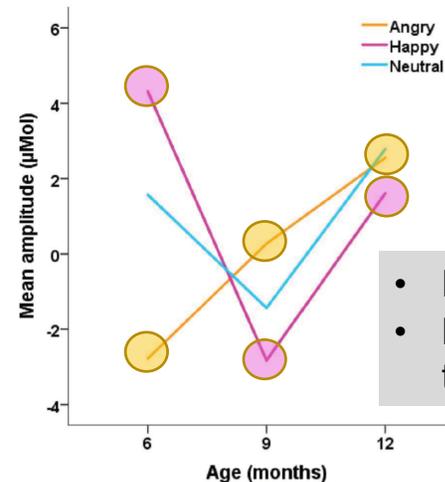


H > A at all time points



2. The extent of condition differences will increase with age

3. Exploratory: Do trajectories vary for different emotions?



- Effect is decreasing over time?
- Non-linear – so emotion trajectories do differ

# Discussion questions

## Study improvements

- Clarity re: hearing health
  - Tubes/current cold (Candice)
  - Deaf or hearing impairments (Giana)
  - Hearing health of the parents (Kelly)
  - How would this change neural correlates (Kaleigh)

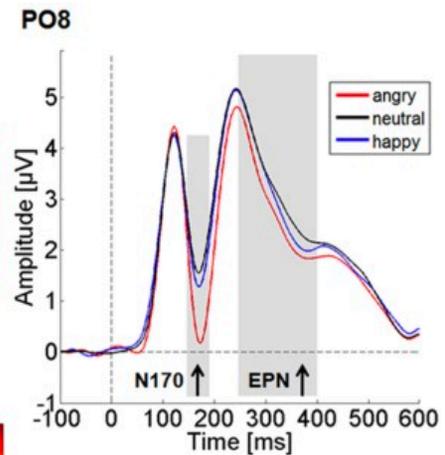
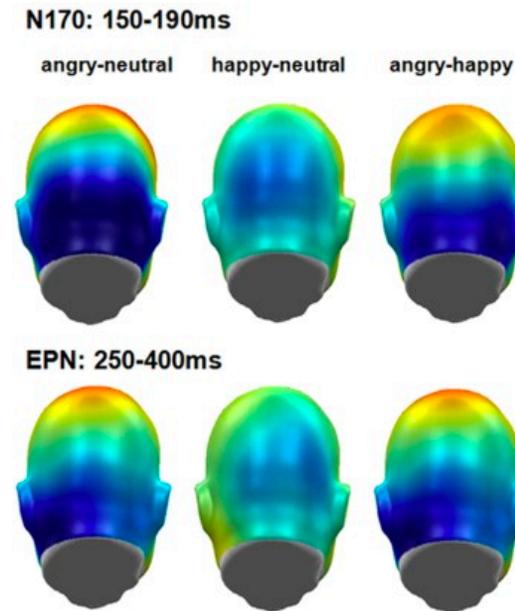
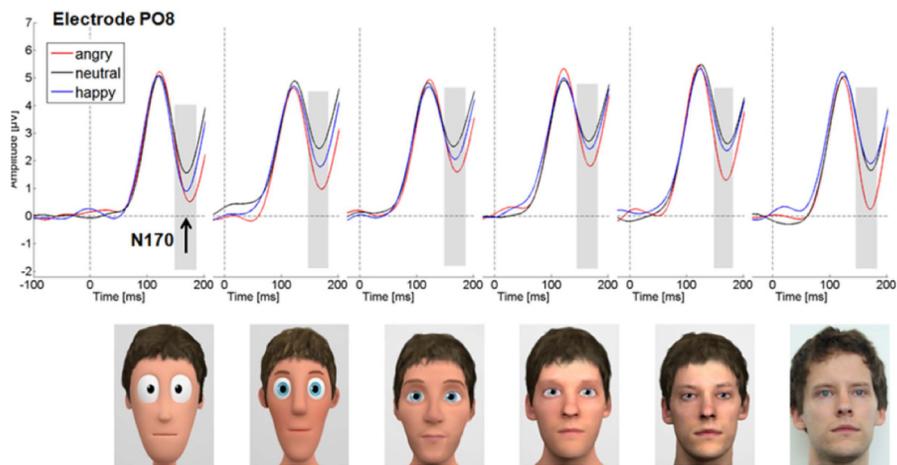
## “Big” questions and problems

- Environmental factors
  - Home environment, abuse, neglect (Giana)
- Language spoken and (cultural?) intonation patterns (Kelly)
- Vocal emotion processing in COVID-19
  - Lack of vocal diversity? (Kelly)
  - Interference from masks (Caitlin)

# Attentional bias to threat

(O'Toole et al., 2013)

- **Premise:** Respond more rapidly, accurately, “bigger” to threat vs. neutral
  - Attentional bias helps threat detection
  - Increased attention TO threat in anxiety



Schindler et al. 2017

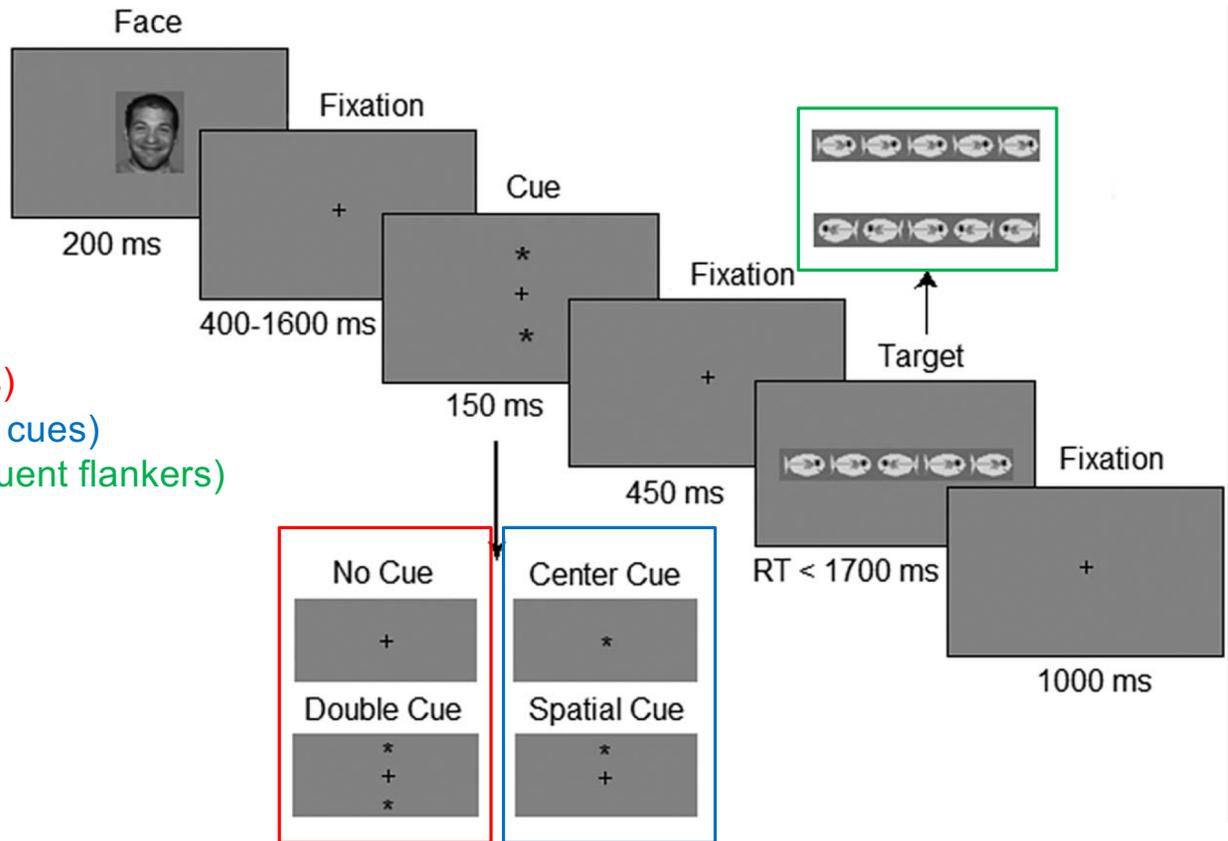
# Hypotheses

## **Goal: Utility of “threat” N170 as a biomarker of anxiety**

1. Attentional bias to threat: Indicated by differential N170 response to angry vs. neutral, happy
  - Should relate to behavioral performance
2. Attentional bias to threat will relate to maternal reports of anxiety (CBCL)
3. T1 high attentional bias to threat in (maternal ratings, increased N170 @ T1) → ABT @ T2

# Attention Network Task (ANT)

- Alerting (RT no cues – RT double cues)
- Orienting (RT center cues – RT spatial cues)
- Executive (RT incongruent – RT congruent flankers)



# Methods

- **44 neurotypical children (final) @ T1**
  - 5-7 years old (M = 74.30, SD = 6.34, in months)
  - Additional 7 removed for EEG artifacts
- **27 neurotypical children @ T2**
  - 7-9 years old (M = 97.70, SD = 5.61, in months)
- **Procedures**
  - ANT task with emotional faces
    - Behavior
    - EEG (N170)
  - CBCL → DSM Anxiety scales



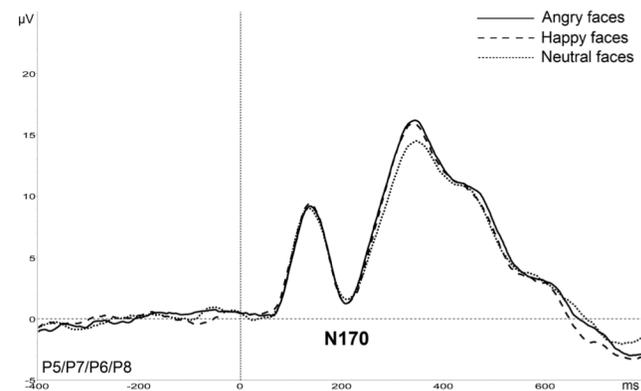
TABLE 1: Descriptive Statistics for CBCL Anxiety *t*-Scores at Time 1 and Time 2

	<i>M</i>	<i>SD</i>	<i>Range</i>
Time 1	55.79	5.92	50.00–72.00
Time 2	53.82	6.04	50.00– 70.00

# Hypotheses & Findings

## Goal: Utility of “threat” N170 as a biomarker of anxiety

1. Attentional bias to threat: Indicated by differential N170 response to angry vs. neutral, happy
  - Should relate to behavioral performance
2. Attentional bias to threat will relate to maternal reports of anxiety (CBCL)



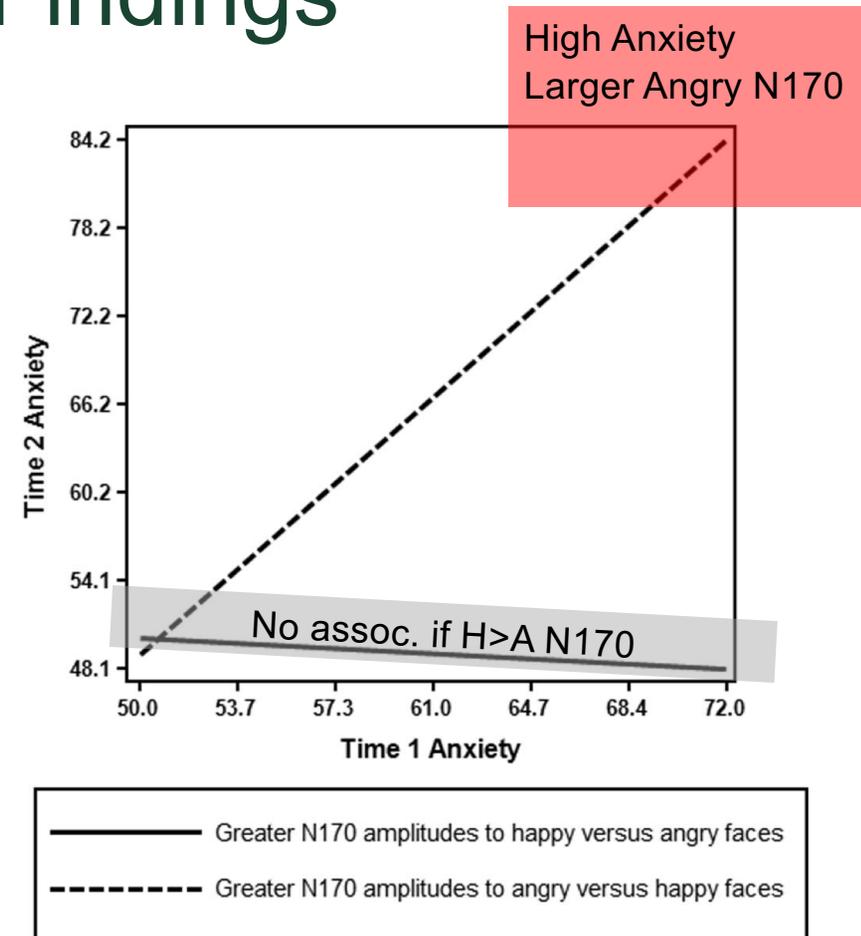
- No N170 condition differences
- N170 NOT related to behavior

# Hypotheses & Findings

## Goal: Utility of “threat” N170 as a biomarker of anxiety

3. T1 high attentional bias to threat in (maternal ratings, increased N170 @ T1) → ABT @ T2

- **Model 1 (Angry vs Happy):** T1 Anx & N170 → T2 Anx
- **Model 2 (Angry vs Happy):** w/Interaction
  - An additional 11% variance
- Model 1 (Angry vs Neutral): T1 Anx & N170 → T2 Anx
- Model 2 (Angry vs Neutral): w/Interaction



# Discussion questions

## Study improvements

- Repeat EEG @T2 (Brandon)
- Clarity re: ambiguity of faces
  - Justification for the use of neutral faces (Giana)
  - Benefit for leaning in to ambiguity, such as smirking/judgmental faces (Haley)
- Would we see similar patterns in clinical youth? (Betty, Rebecca)
  - Callousness-unemotional traits (RR)
- Preregister (Caitlin) 🍒

## “Big” questions and problems

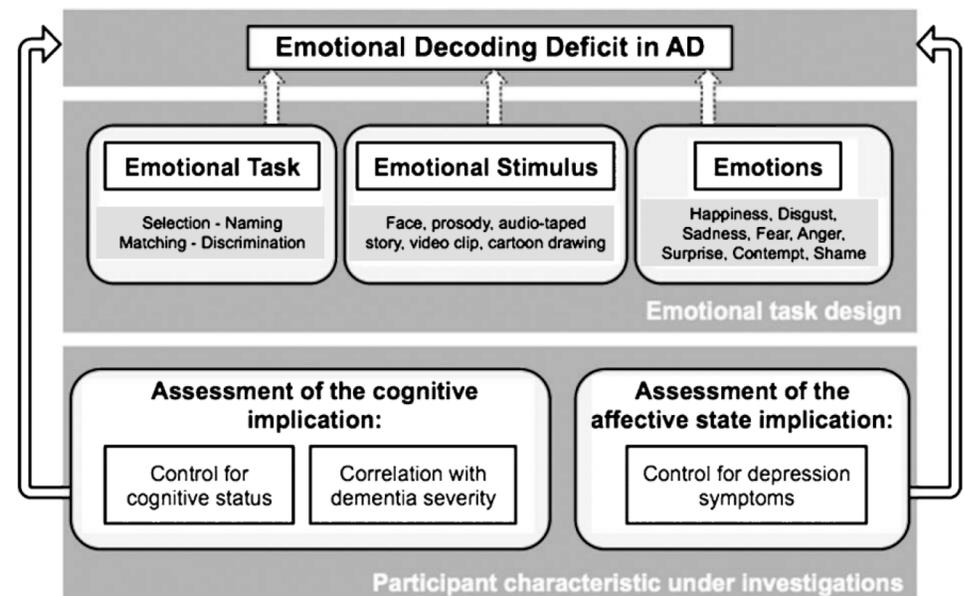
- Environmental factors (Brandon, Kaleigh): Increased exposure to anger
- Clarity re: trajectories
  - Is this a biomarker? (Betty)
  - Would there be an advantage for real-time testing? (Liz)
- Terminology: social inhibition & social anxiety (Haley)

# Emotional face recognition in Alzheimer's

(Fide et al., 2019)

- **Premise:** Alzheimer's disease is a progressive neurodegenerative disorder
  - Episodic memory impairment → Social cognitive deficits
  - AMY, PFC implicated in emotion processing and are affected in Alzheimer's disease

*Y. Klein-Koerkamp et al. / Emotional Decoding and Alzheimer's Disease*



- ERP components: P100, N170, VPP (“+N170”) and N230

# Hypotheses

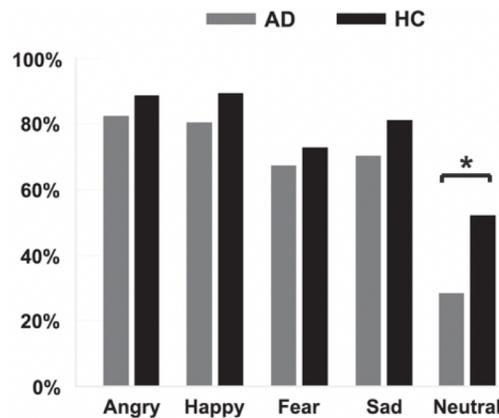
**Goal:** Examine modulation of ERP components by emotional expression in Alzheimer's disease

1. Decreased N170, Increased P100, Increased VPP in AD
2. Increased N230 amplitudes (in AD)

# Methods

- Exclusion of AD participants with MMSE >24, severe dementia, antipsychotic meds, broad health issues

## Behavioral results: Accuracy



Only worse in AD on Neutral faces

**Table 1**

Demographic, clinical and neuropsychological characteristics of participants.

	Healthy Controls (n = 24)	Individuals with AD (n = 23)	<i>p</i>
Age	71.71 ± 8.52	72.96 ± 4.73	.54 <sup>a</sup>
Gender (M/F)	13/11	13/10	.87 <sup>b</sup>
Education	11.83 ± 4.56	9.52 ± 3.46	.06 <sup>a</sup>
Handedness (Right/Left/Both)	21/2/1	20/1/2	.67 <sup>b</sup>
MMSE	29.00 ± 1.47	21.48 ± 3.45	<b>.00<sup>a</sup></b>
GDS	5.25 ± 6.46	5.43 ± 4.27	.91 <sup>a</sup>
BFRT	46.92 ± 3.77	43.56 ± 3.50	<b>&lt;.01<sup>a</sup></b>
Episodic Memory	0.77	-0.81	<b>.00<sup>a</sup></b>
Attention	0.38	-0.37	<b>&lt;.01<sup>a</sup></b>
Executive Functions	0.45	-0.35	<b>&lt;.01<sup>a</sup></b>
Visuospatial Skills	0.48	-0.54	<b>.00<sup>a</sup></b>
Language	0.00	0.00	1.00 <sup>a</sup>

# Hypotheses & findings

**Goal:** Examine modulation of ERP components by emotional expression in Alzheimer's disease

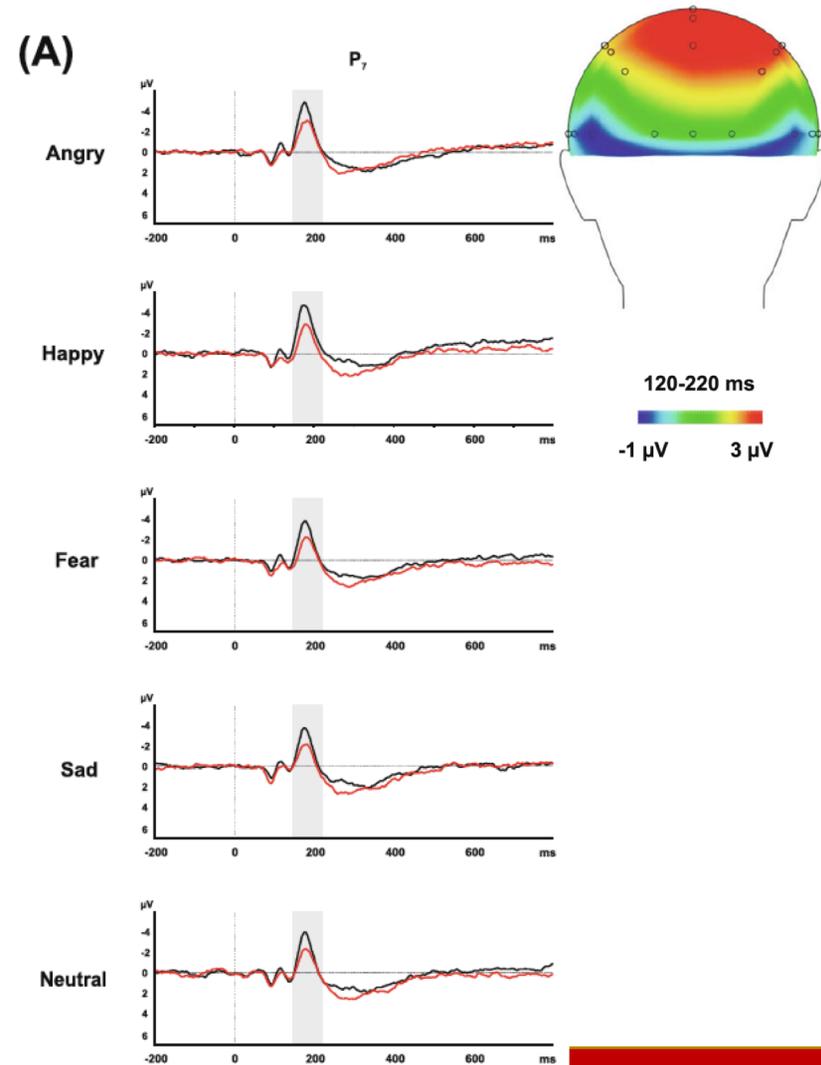
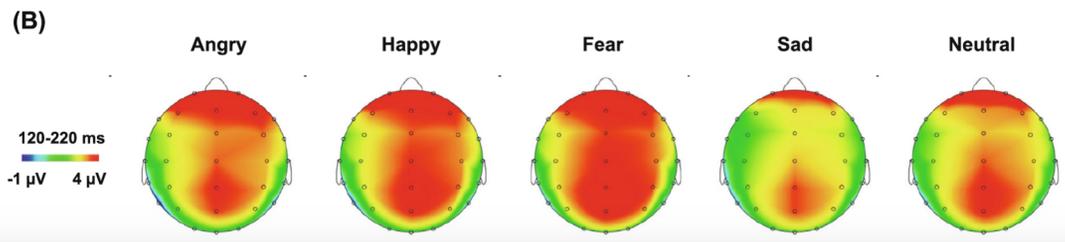
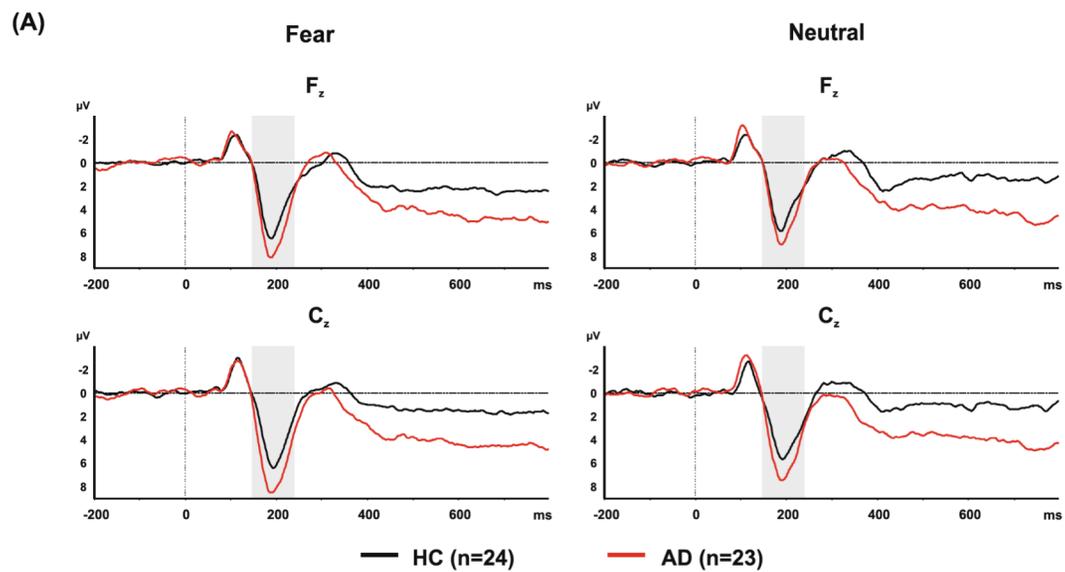
1. Increased P100, Decreased N170, Increased VPP in AD
2. Increased N230 amplitudes (in AD?)

## Group effects

- ✓ **P100**: AD > C (“increased”)
- ✗ **N170**: AD < C (“increased”)
- ✓ **VPP**: AD > C (“increased”)
  - Only Group x Condition effect: group effects only for fear, neut
- **N230**: No group differences

## Condition effects

...



# Discussion questions

## Study improvements

- Physical constraints about testing
  - Fatigue (Liz)
- Valence ratings – reversed approach
  - Such that - scored positively, lower arousal scored higher. Does this make it even more difficult in AD? (Liz)

## “Big” questions and problems

- Clarity about cortical network – how does this translate to real-world scenarios? (Candice)
- Predictions about emotion regulation? (Andrea)

# Extra credit option open (up to 20 points)

- Open until 3/22
- This extra credit assignment is designed to help you prepare your research proposal (intro/methods).
  - Enter your title
  - Describe your topic
  - State your anticipated methodological approach (fMRI/fNIRS, physiological, eye tracking, EEG/ERP, MEG).
  - Lastly, there is a space for you to ask Caitlin specific questions
- Informal discussion board style writing is perfectly acceptable.



# Upcoming schedule

Sun	Mon	Tues	Wed	Thurs	Fri	Sat
3/21 W11	<b>3/22: Role of cognition/attention &amp; AffNeuro as treatment</b>	3/23	3/24	3/25	3/26	3/27
	Extra credit due	DB due	Discussion led by Hannah & Nicole			
3/28 W12	<b>3/29: Clinical and environmental considerations</b>	3/30	3/31	4/1	4/2	4/3
	Week 14 paper draft due* <i>Giana, Josh, Shayne, Betty</i>	DB due	Discussion led by Haley & Brandon Week 14 paper draft due* <i>Kelly, Andrea, Alex, Nicole, Rebecca</i>			
4/4 W13	<b>4/5: Love &amp; cultural considerations</b>	4/6	4/7	4/8	4/9	4/10
	Special guest: Dr. Mengya Xia Week 15 paper draft due* <i>Candice, Hannah, Haley, Sarah</i>	DB due	Discussion led by Bobby & Caitlin Week 15 paper draft due* <i>Brandon, Bobby, Liz, Kaleigh</i>			

\* Pre-review/pre-grading is optional but encouraged.

# Upcoming schedule

Sun	Mon	Tues	Wed	Thurs	Fri	Sat
4/11	4/12	4/13	4/14	4/15	4/16	4/17
W14	<b>4 presenters:</b> Giana, Josh, Shayne, Betty		<b>4 presenters:</b> Kelly, Andrea, Alex, Nicole, Rebecca			
4/18	4/19	4/20	4/21	4/22	4/23	4/24
W15	<b>4 presenters:</b> Candice, Hannah, Haley, Sarah		<b>4 presenters:</b> Brandon, Bobby, Liz, Kaleigh			
4/25 FINAL	4/26 <b>Due Monday: Final edits of paper due @ 11:59 pm</b>					