

# Detecting and Indexing Emotion

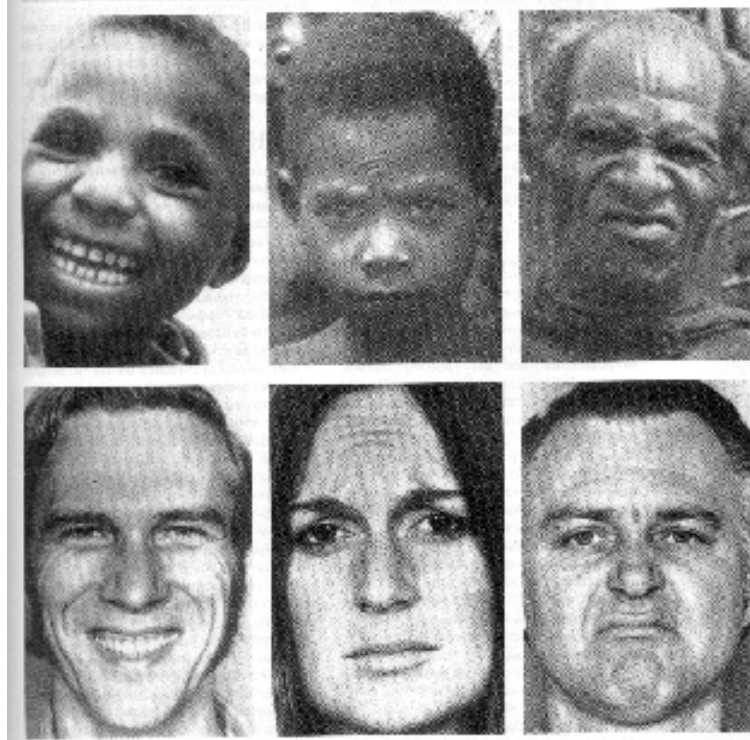
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# When Measuring Emotion It is Useful to have a Theory of Emotion

- Dimensional
  - Positive versus Negative
  - Approach versus Avoidance
- Discrete Emotions
  - Ekman...and beyond



# When Measuring Emotion It is Useful to have a Theory of Emotion

- Dimensional
  - Positive versus Negative
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- Discrete Emotions
  - Ekman...and beyond
- Quasi-Emotional Motivational States
  - Startle
  - Challenge and Threat
  - “Stress”
  - “Arousal”

# A Framework for Psychophysiological Indexing is Also Useful

- Example....skin conductance
  - Essentially a measure of sympathetic nervous system activation...
    - But often presented as a measure of something more specific (anger, fear, etc.)
- The Gold-Standard for thinking about this is Cacioppo...
  - Often ignored...but valuable

# Diverse Effects (and therefore Indices) of Affect and Motivation

- Central Nervous System responses
  - General right versus left hemisphere activation
  - Amygdala
  - Insula
  - Thalamus
  - And many more....some of which may index particular emotions
- Eyeblink
  - Startle response
- Musculature
  - Facial muscles indexing positive versus negative affect...and maybe specific emotions

# Diverse Effects (and therefore Indices) of Affect and Motivation

- Cardiovascular system
  - Cardiac activity
  - Vasculature (blood pressure)
- Skin sweat responses
  - Essentially under control of the sympathetic nervous system
- Hormonal responses
  - Cortisol (linked to “stress”)
  - Oxytocin (linked to “trust” and “intimacy”)

# Diverse Effects (and therefore Indices) of Affect and Motivation

- Immune Responses
  - Natural Killer Cells, T-Cells
  - Cytokines
  - The list goes on and on.....
- Given the diverse physiological effects linked to emotion and motivation, choices about what to measure are strategic....

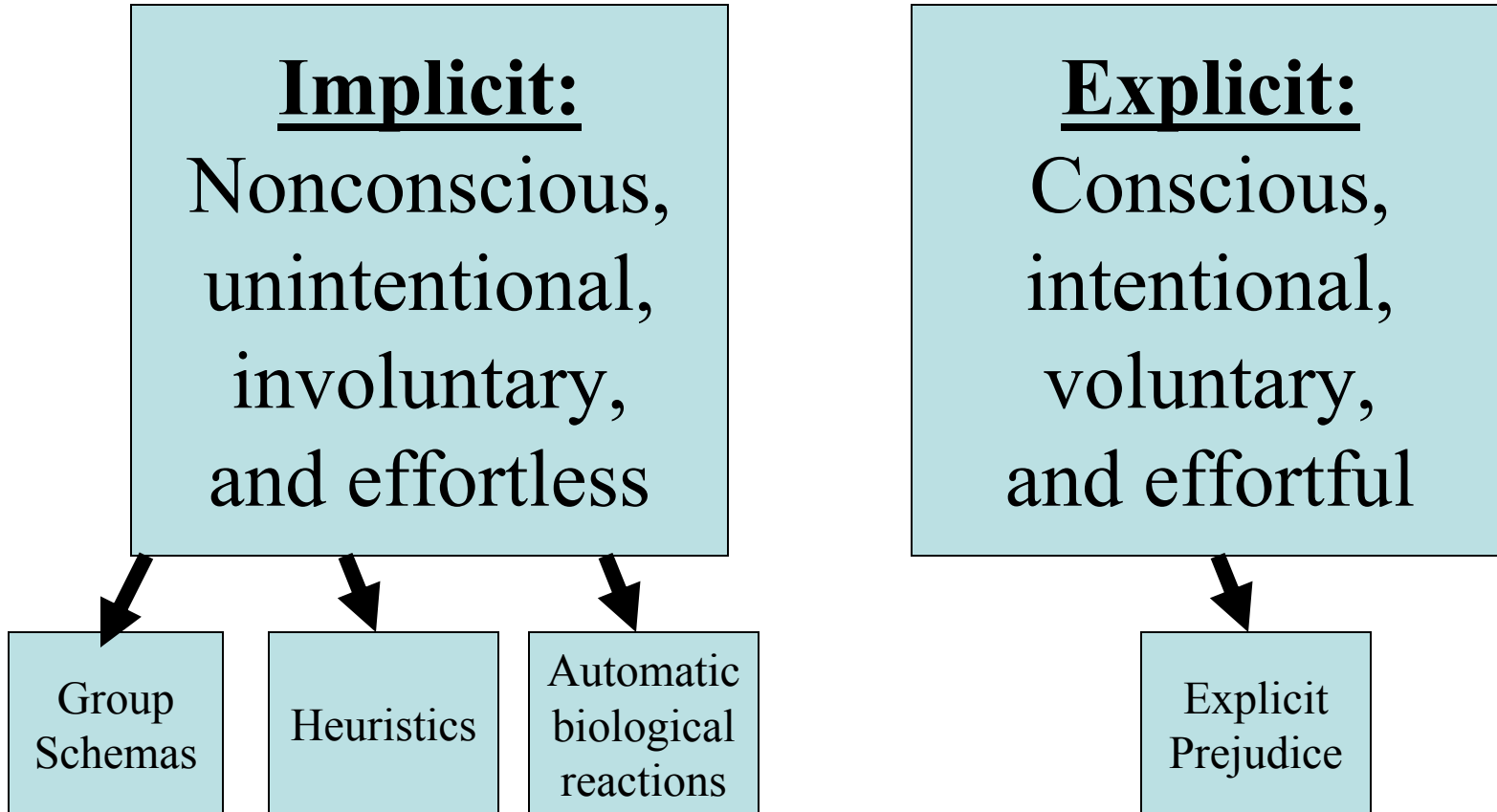


# Inter-Ethnic Interaction: An Example

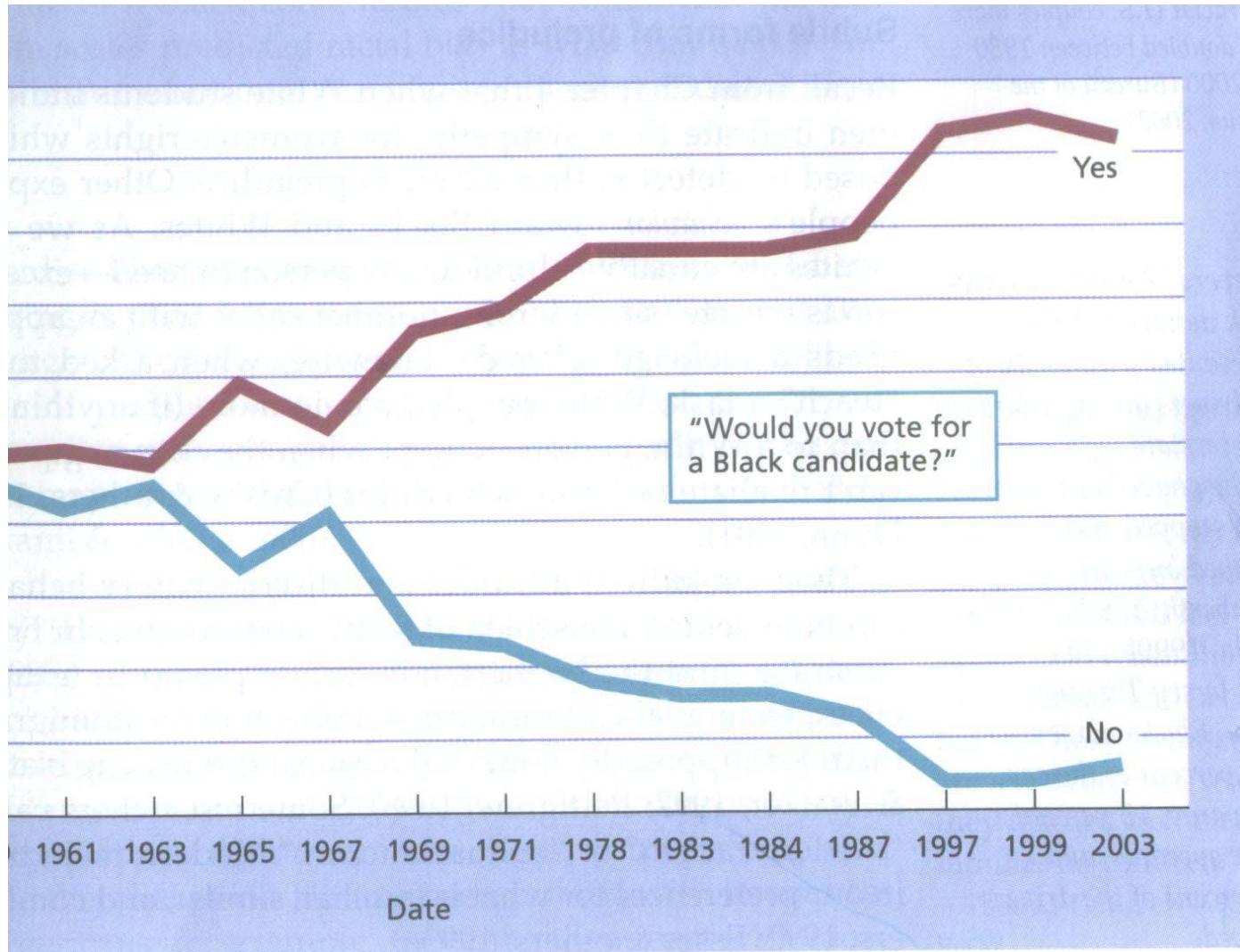
- Behavioral inclination (discrimination)
- Cognition (stereotypes)
- Affect (negative feelings)
  - The exact nature of these responses is still debated....but all agree that in general, it is negative....

Is prejudice going away?

# It depends.



# For explicit prejudice...yes!



# The Biology of Automatic Prejudice

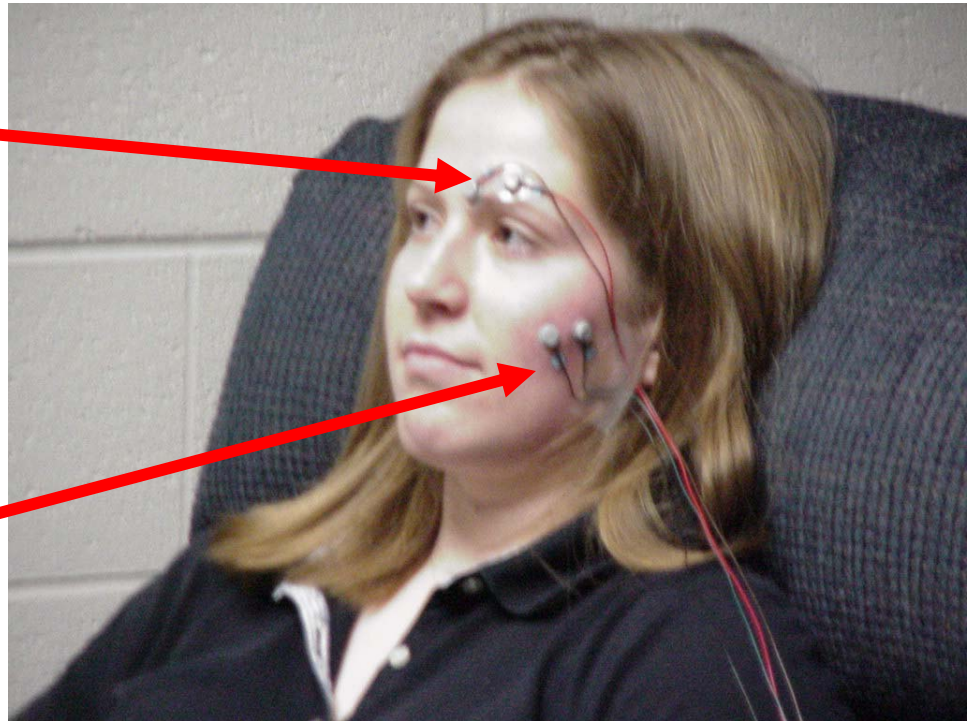
- Vanman et al. (1997)
- White subjects
- IV
  - work with an Black USC student
  - work with a White USC student

# The Biology of Automatic Prejudice

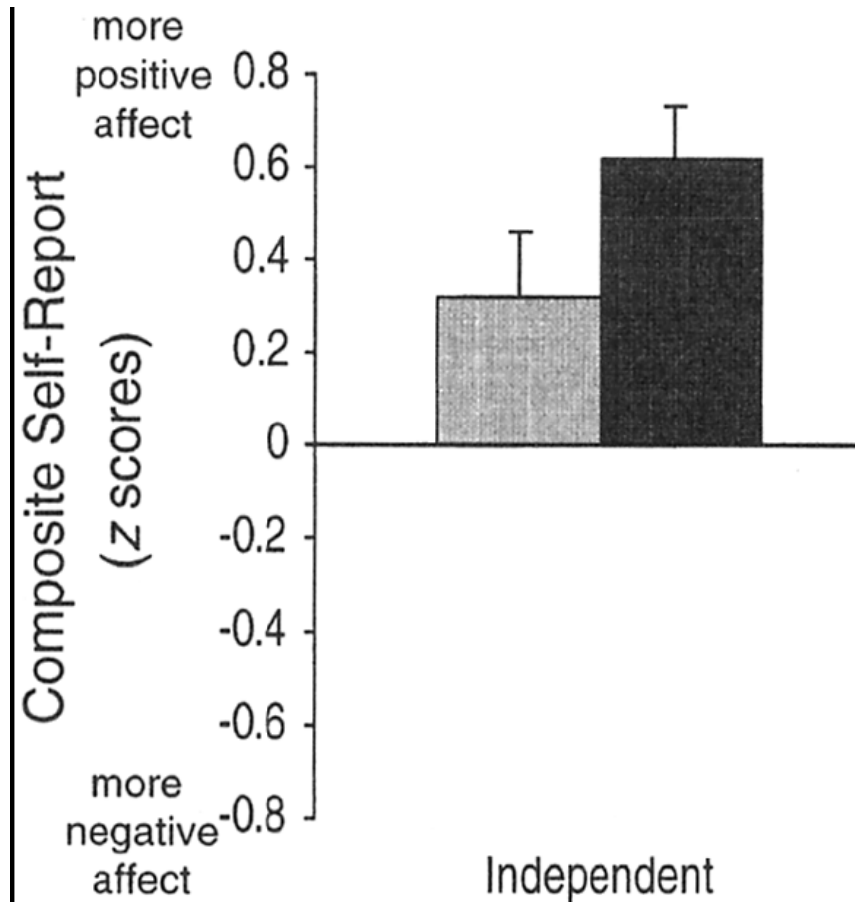
- DV = facial muscle activity

**corrugator muscle:**  
“frowning” negative  
mood

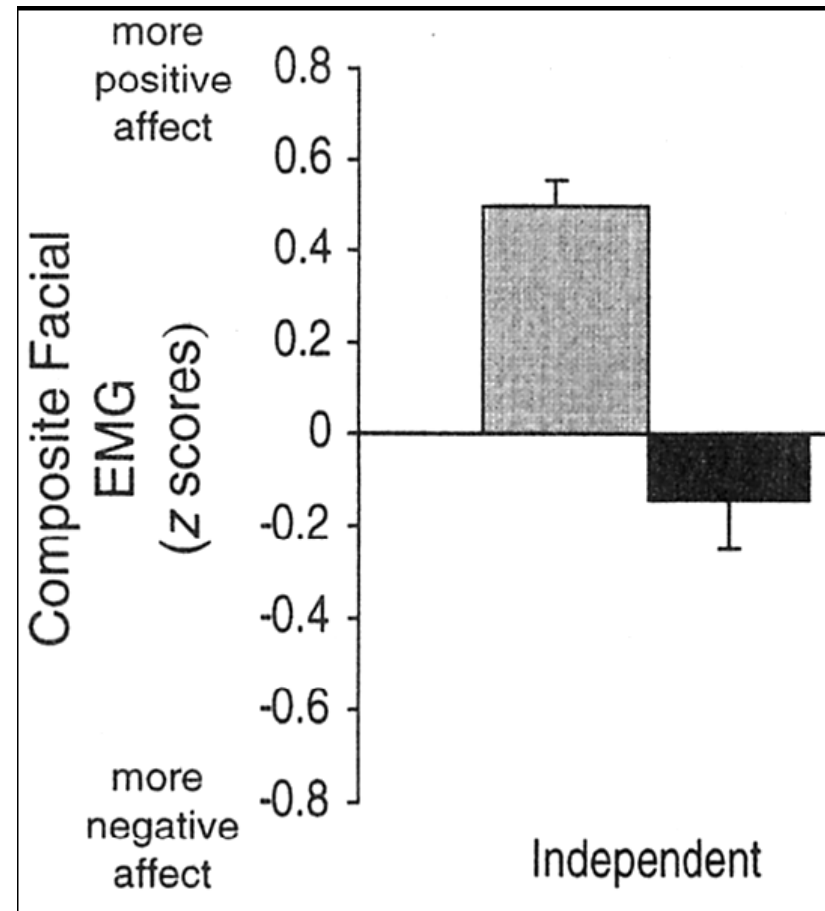
**zygomaticus muscle:**  
“smiling” positive  
mood



# Explicit



# Automatic

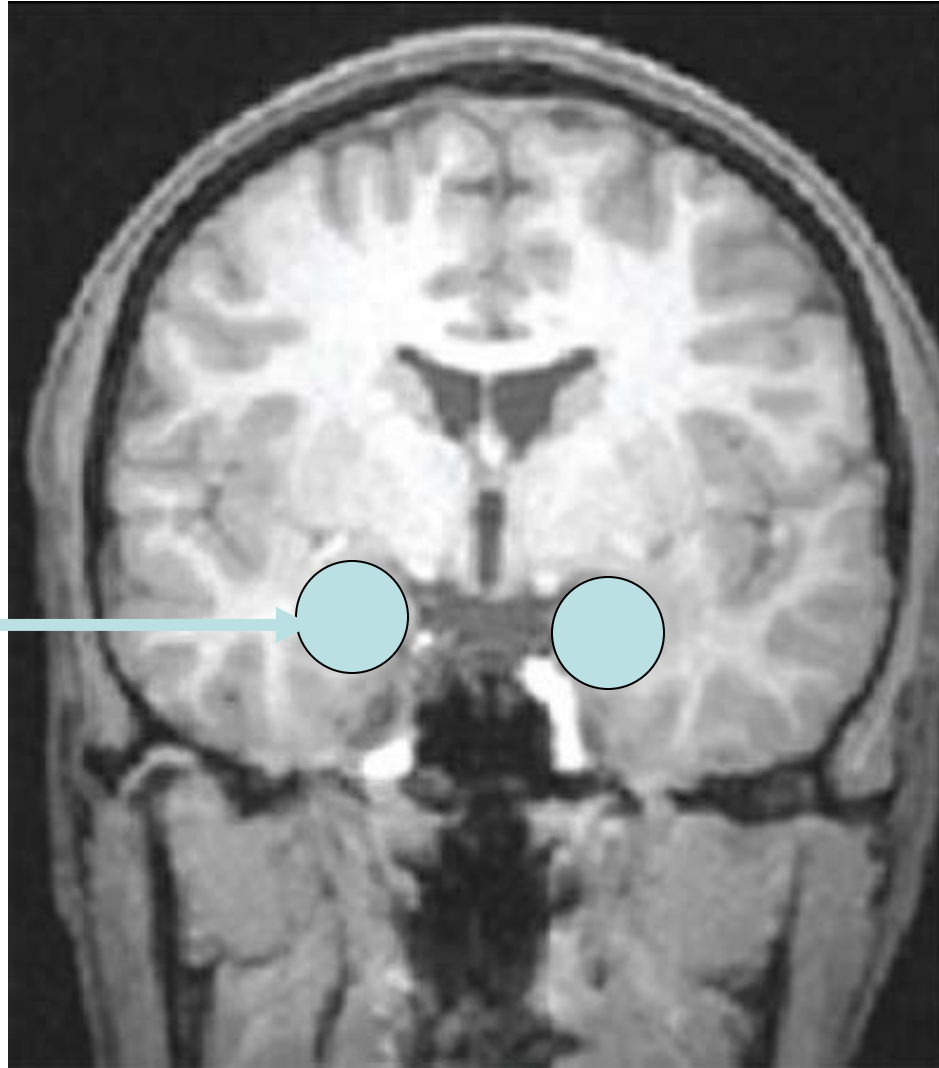


# The Biology of Automatic Prejudice: The Amygdala

- What is the amygdala?
- **Black faces increase amygdala activity**  
(Phelps, O'Connor, Cunningham, Funayama, Gatenby, Gore, and Banaji, 2000; Hart, Whalen, Shin, McInerney, Fischer, & Rauch, 2000; Cunningham, Johnson, Gatenby, Gore, & Banaji, 2003; Cunningham, Johnson, Raye, Gatenby, Gore, & Banaji, 2004; Lieberman, Hariri, Jarcho, Eisenberger, & Bookheimer, 2005; Ronquillo, Denson, Lickel, Lu, Nandy, & Maddox, 2007; for a review, see Eberhardt, 2005).
- True for White and Black people
- Supraliminal and Subliminal effects

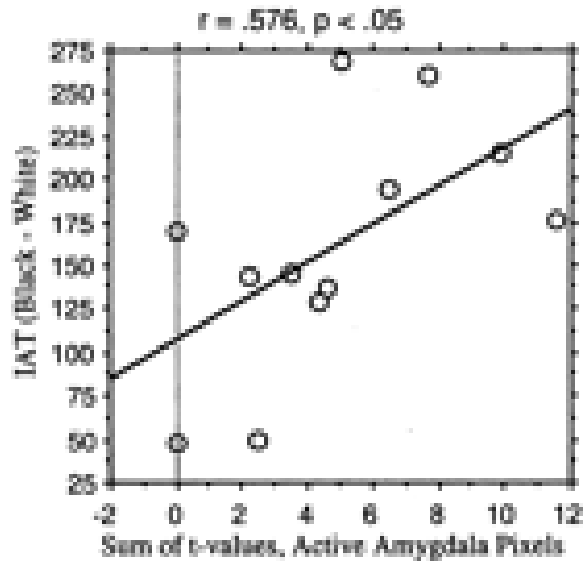


# The Amygdala

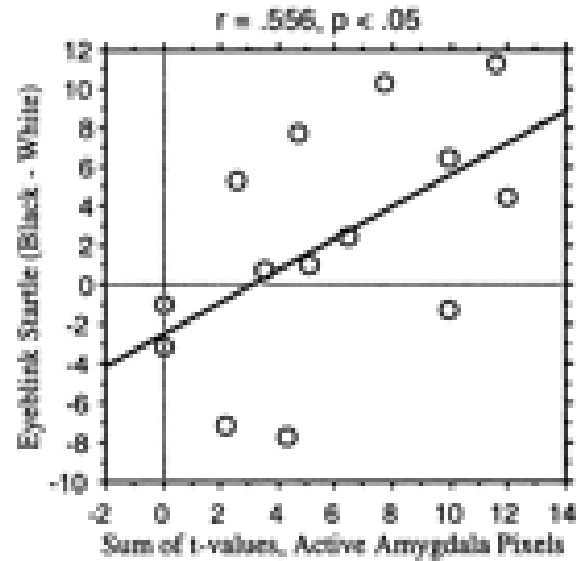


the  
amygdala

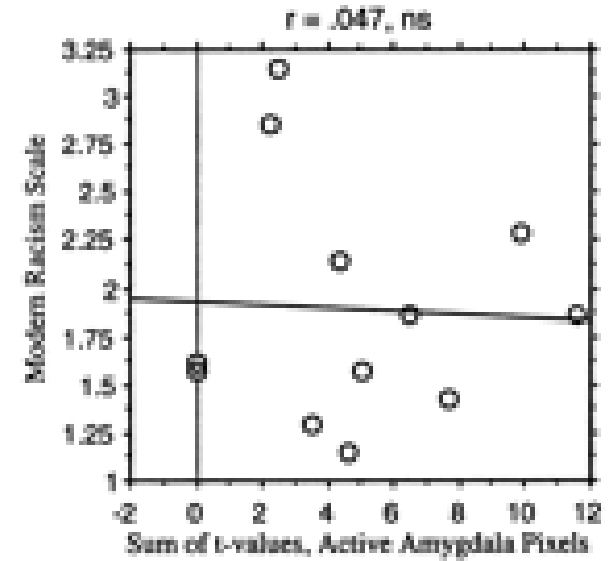
# Does amygdala activity = implicit prejudice?



a.

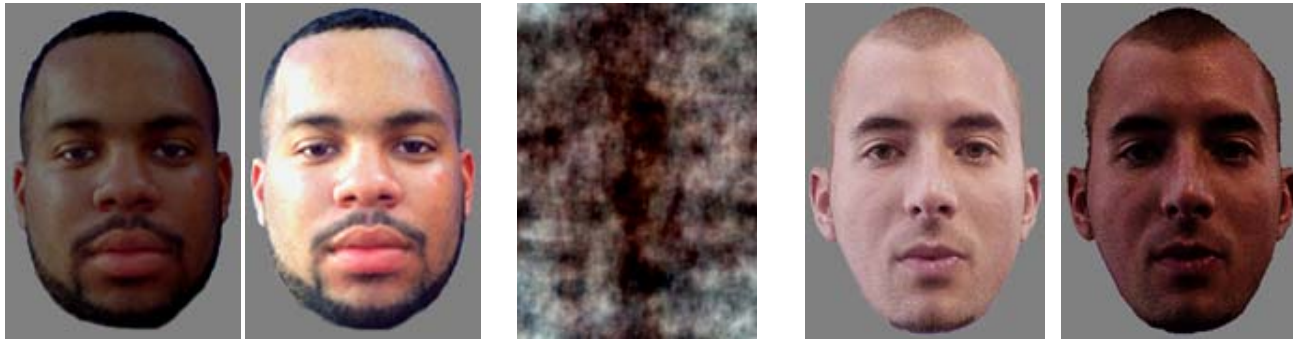


b.



c.

# What about skin tone?

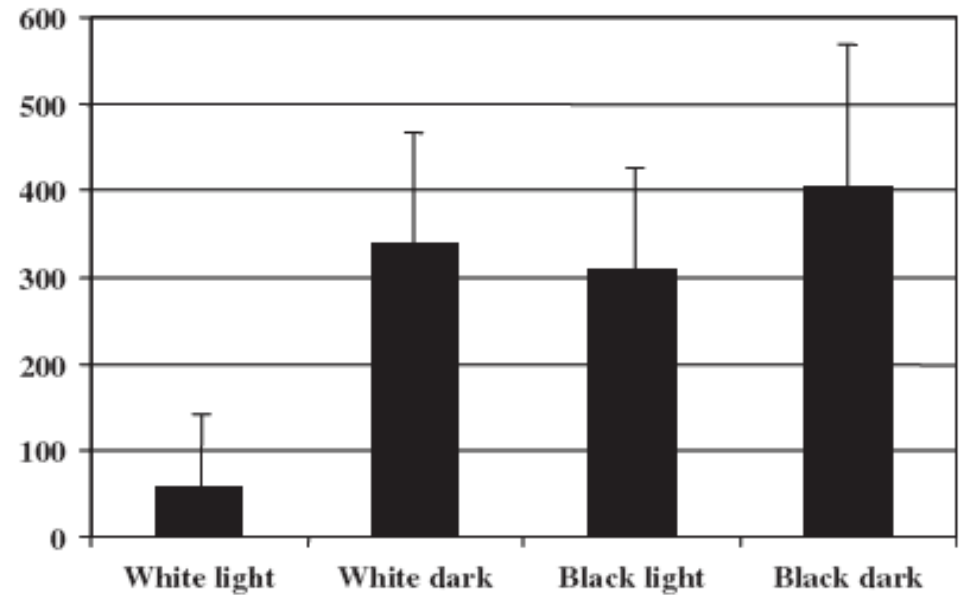
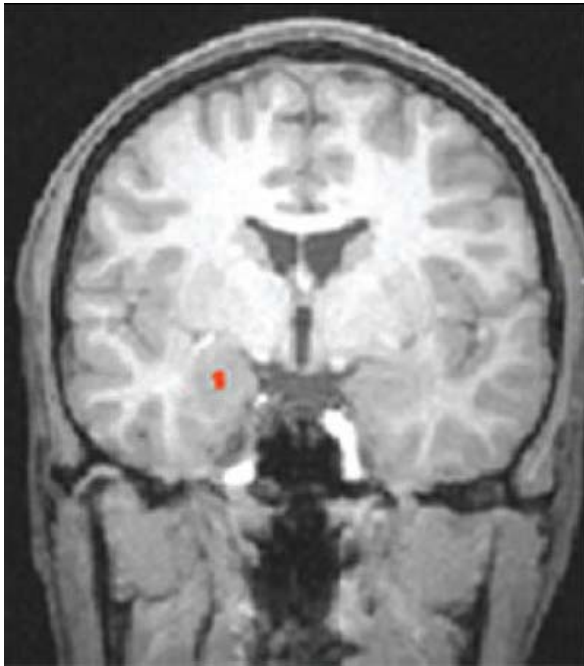


11 White male participants.

Are they over 24 or under? (categorization)

Do you see a face in the scrambled image?

# Results: Amygdala activity



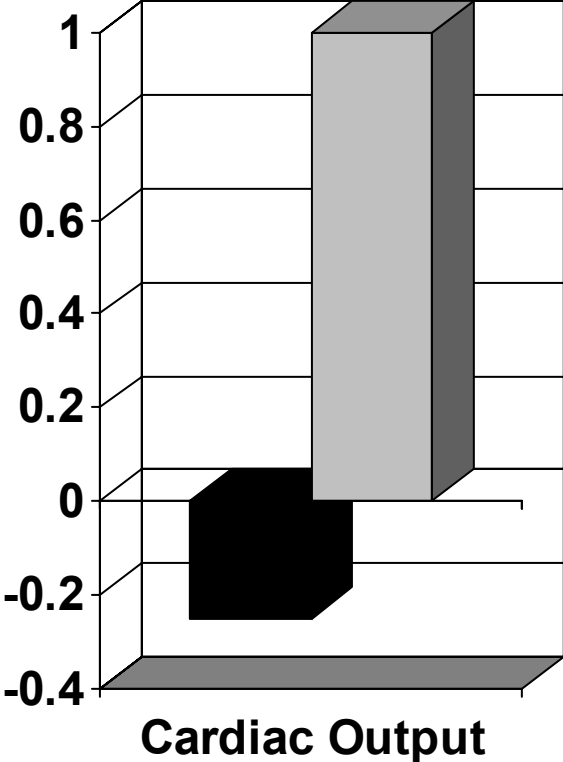
# Cardiovascular Responses

## Can Also Be Used to Index Threat

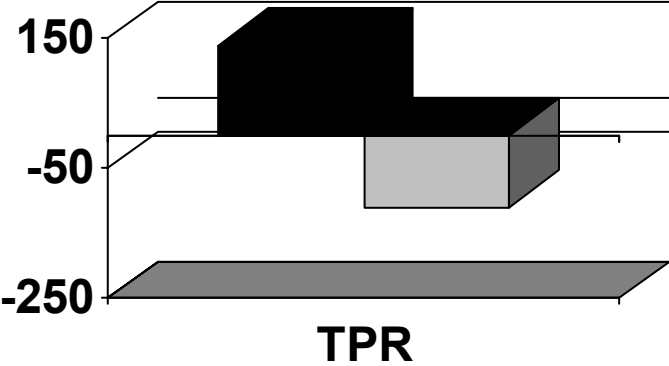
(Under certain Conditions)

- Mendes et al. 2003
- Examined social interactions between whites and white versus black confederates
- Measured cardiovascular responses during team tasks
  - Looking at markers of “challenge” and “threat”
    - See work by Blascovich and colleagues for more on these states

# Cardiovascular Responses



■ Black  
■ White



# Convergence, but just loose convergence....

- There is no evidence that the specific psychological states that are being indexed in these three studies are the same...
- As (almost) always...we are drawing rough connections between different lines of research rather than clear connections...

# Choice of Physiological Measures Driven By Three Concerns

- Fit – choose appropriate measures.
  - For example, if you are interested in the startle response you are pushed towards certain measures (i.e. startle eye-blink).
  - Recall the discussion of indexing
    - Know the nature of the link between your measure and the psychological claims you are making...
    - Don't wing it



# Choice of Physiological Measures Driven By Three Concerns

- Goals – If there are multiple measures, choose those that meet your research questions
  - Measures differ in their temporal resolution.
  - Brain imaging techniques differ in spatial resolution
  - Measures differ in what physical processes they assess...
    - (e.g. if building a process model, use fMRI; if interested in health implications, use cardiovascular or immune/endocrine measure)

# Choice of Physiological Measures Driven By Three Concerns

- Expediency – choose the most “cost-effective” measure.
  - fMRI is expensive and laborious
  - EMG cheap and (relatively) easy
- At all points, keep in mind the extent to which your measures are one-to-one matches to the psychological states you are assessing
  - Make inferences appropriate to your measures...

# Psychophysiology is easier than ever...but still not easy or cheap

- Off the shelf acquisition and scoring hardware/software for EKG; Blood-Pressure, EMG, skin conductance is fairly inexpensive (10-40k) and easy to use.
  - Hiring a consultant/collaborator is still recommended.
- EEG is still technically difficult.
  - Cost is decreasing
  - Good scoring/analysis software is available (a few k for the best scoring/analysis package)
  - Do Not Attempt to Build a System from Scratch using used Medical EEG equipment.
    - Go Turnkey

# Psychophysiology is easier than ever...but still not easy or cheap

- fMRI is expensive and requires skill
  - \$400 per hour at USC-DNI
  - Intensive training absolutely required for running subjects and analyzing data
    - Analysis is extremely labor-intensive
  - Good news...USC has great training and facilities
- Endocrine/Immune measures are growing in importance.
  - Requires some care in acquisition and storage
  - Analysis is almost always outsourced
  - Spit-Blood dichotomy the big one (spit easy, blood hard)

# Classes and Resources at USC

- Mike Dawson
  - Skin conductance
  - Startle eye blink
  - Classes in psychophysiology
- Bosco Tjan, Zhong-Lin Liu
  - fMRI classes
- Antonio and Hanna Damasio; Antoine Bechara
  - Neurology underlying emotion