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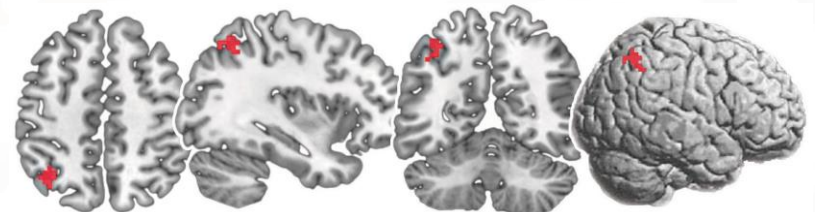
queensland brain institute

Racial bias in neural empathy to observed pain

A/Prof Ross Cunnington

Queensland Brain Institute and School of Psychology

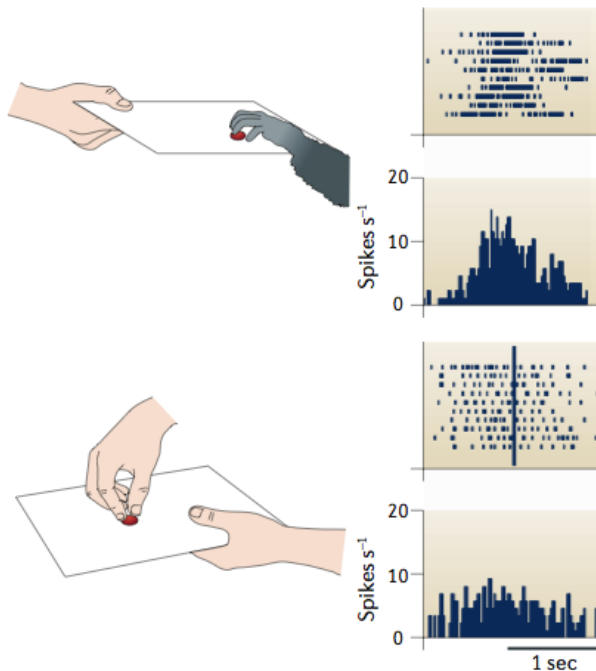
University of Queensland



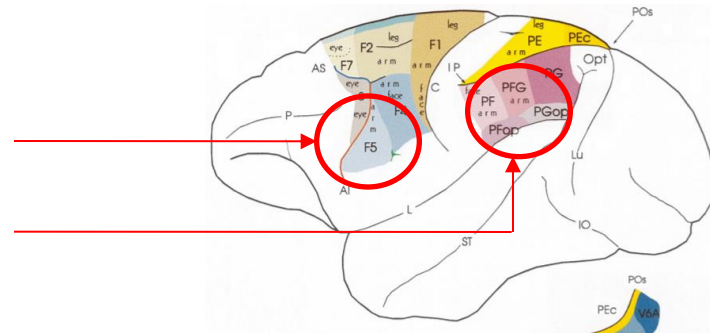
Mirror Neurons

Observation and Execution of Action

Prof Rizzolatti
University of Parma, Italy



Gallese et al, *Brain*, 1996



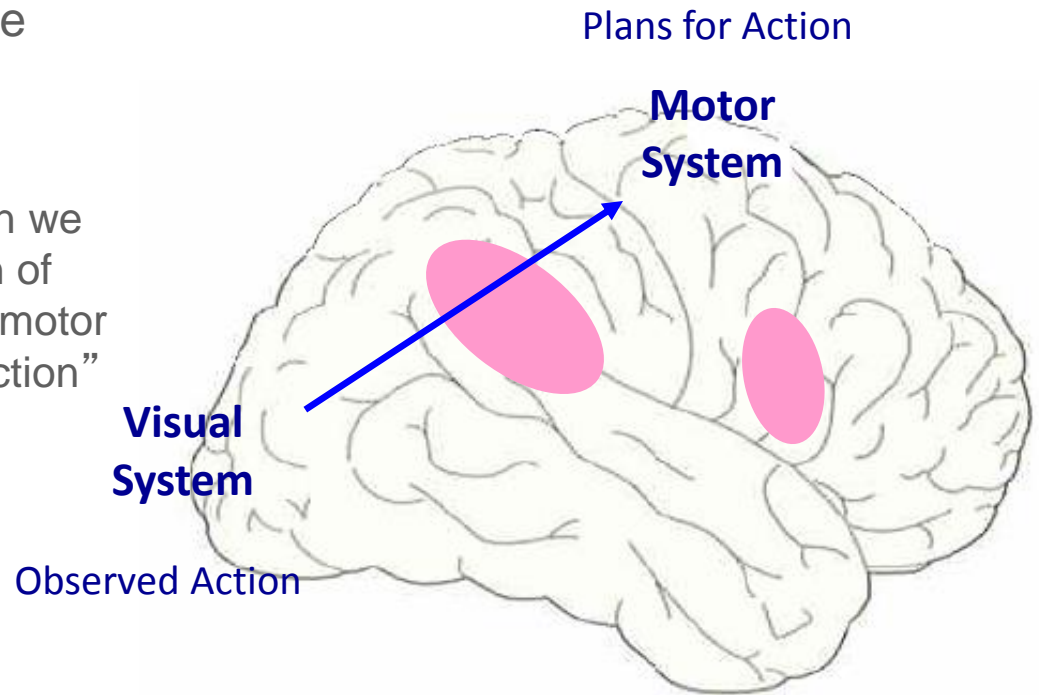
- Mirror Neurons fire when the monkey performs an action, and when it observes the same action being performed
- **“Mirrors” the observed state of the other in the monkey’s own brain**

Mirror Mechanisms

Understanding action by simulation or “mirroring”

- Mirror system:
 - ***Automatically*** maps observed actions to the motor system
- “We understand actions when we map the visual representation of the observed action onto our motor representation of the same action”

Rizzolatti et al, Nature Reviews Neuroscience 2001



Simulation Theory

Understanding others through *simulation*

We understand others' mental and emotional states and intentions by simulating their state in our own mind.

Goldman 2006. *Simulating Minds*

Simulation and ***Theory Theory***
~ ***Mirroring*** and ***Mentalising***

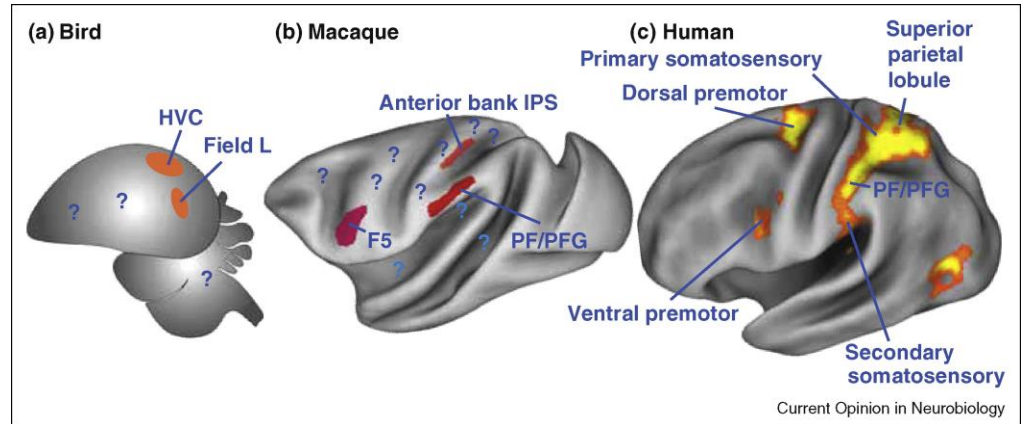


“Expanding the Mirror”

Keysers and Gazzola, 2009

“Vicarious activity for actions, emotions, and sensations”

Mirror neurons may also exist for
“mirroring” sensations and emotions
– not just actions

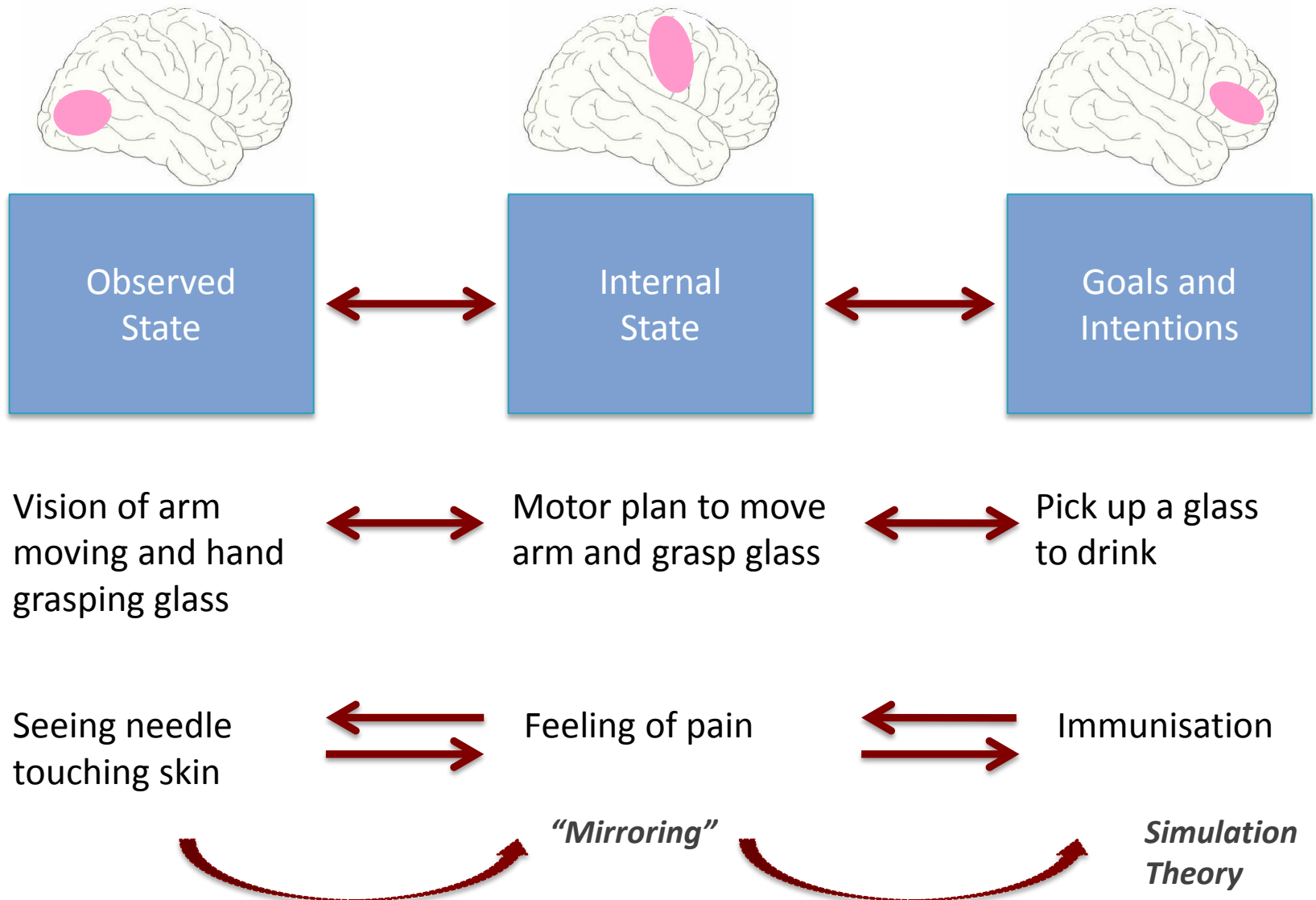


Theory of learning by association

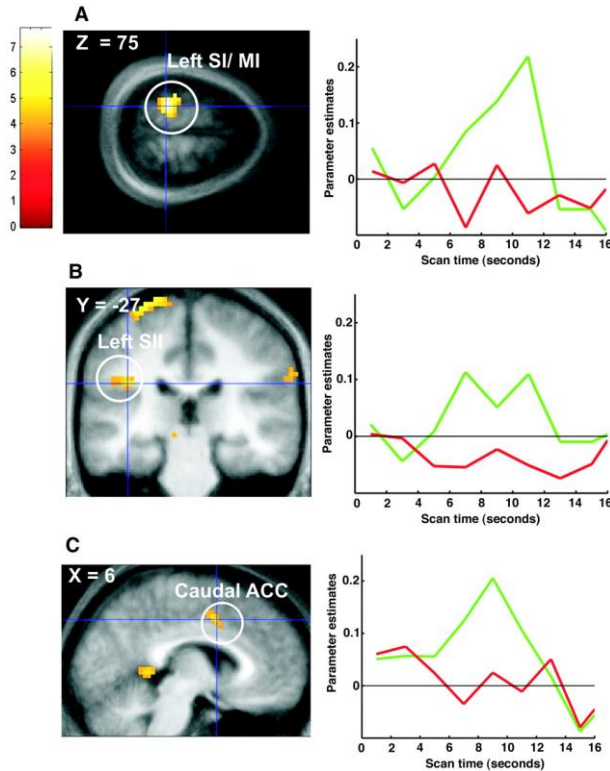
- Mirror neurons form associations between *observed* and *experienced* states
- Not only for action, but also for observing and experiencing touch or emotion

“Each time we see an object touch our skin, we feel a tactile sensation on our skin. This contingency could reinforce synapses between visual and somatosensory neurons and cause somatosensory neurons to start fire to the vision of an object approaching the corresponding body part of either the individual himself or others”

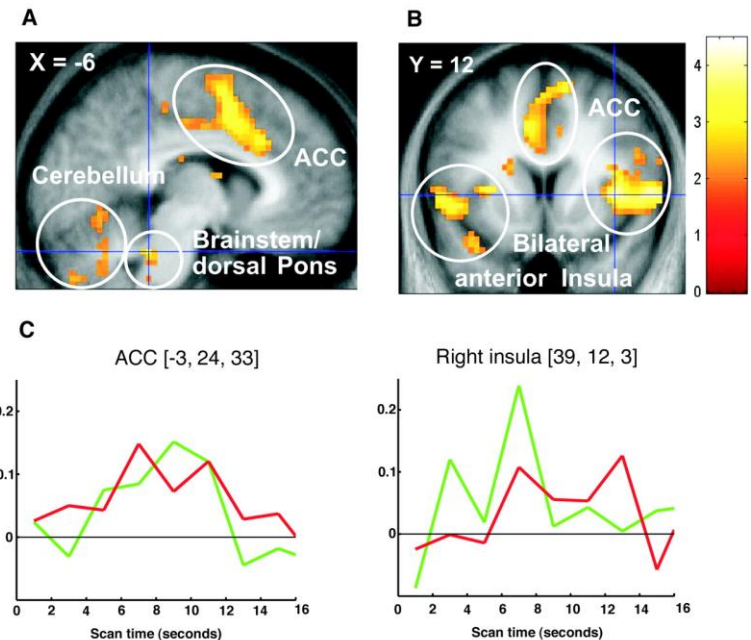
Mirror Neurons and Associative Learning



Neural “Empathy” for Pain



Affective / Emotional Areas
The “unpleasantness” of pain
•active during BOTH actual pain and observed pain



Sensory Areas : Sensation of Pain
•NOT active during observed pain

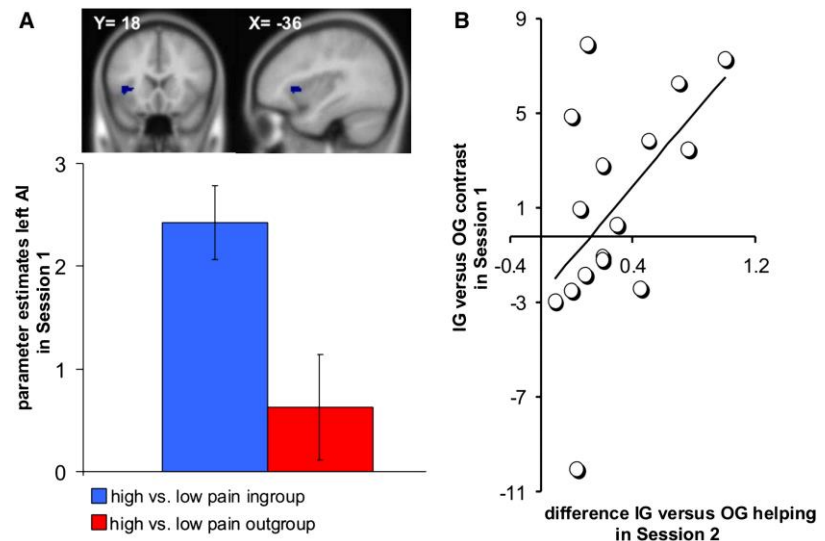
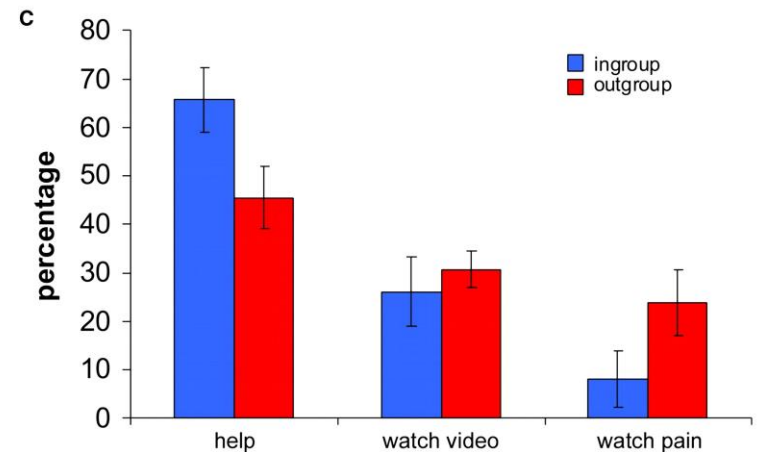
Empathy and *Group Association*

- Group Association
 - We form associations with people we perceive as like-us
 - ***in-group*** vs. ***out-group*** (Social Identity Theory)
- Group Behaviour
 - **In-group:** favouritism, conformity, helping
 - **Out-group:** prejudice, discrimination, conflict



“In-Group” versus “Out-Group” Empathy

- Fans of rival football teams
 - Observed Pain to **In-Group** and **Out-Group** members
- On each trial, could decide:
 - Help** – Take half pain
 - Watch** a football **video**
 - Watch** the other receive **pain**
- More “mirroring” empathy brain activity for pain in **In-Group**
 - Correlated with helping behaviour

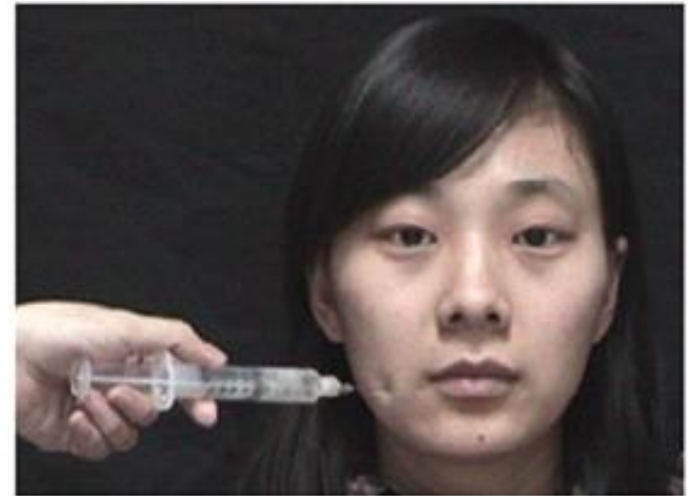


Race and Empathy

- “Mirroring” of pain for own-race versus other-race?



non-painful



painful

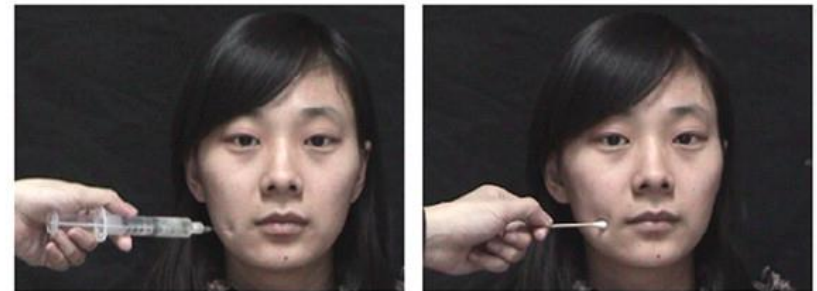
Caucasian faces



painful

non-painful

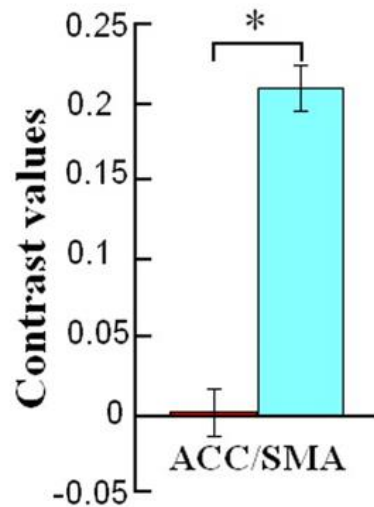
Chinese faces



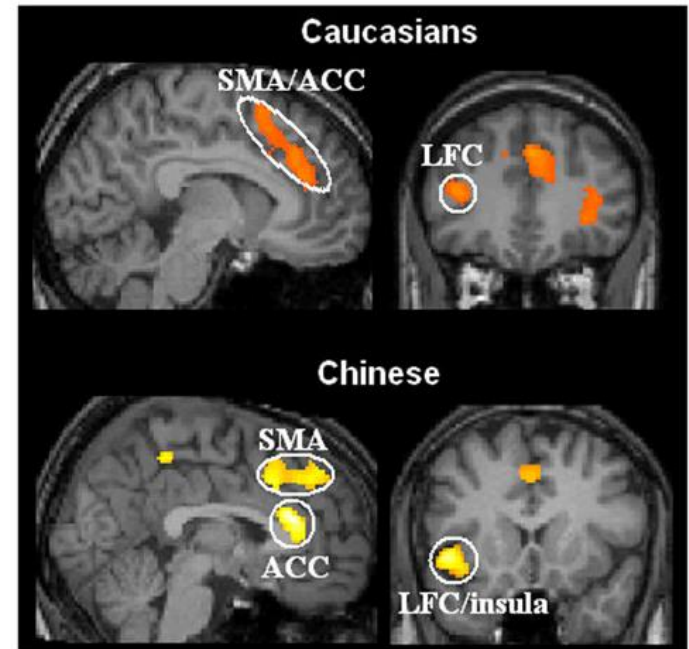
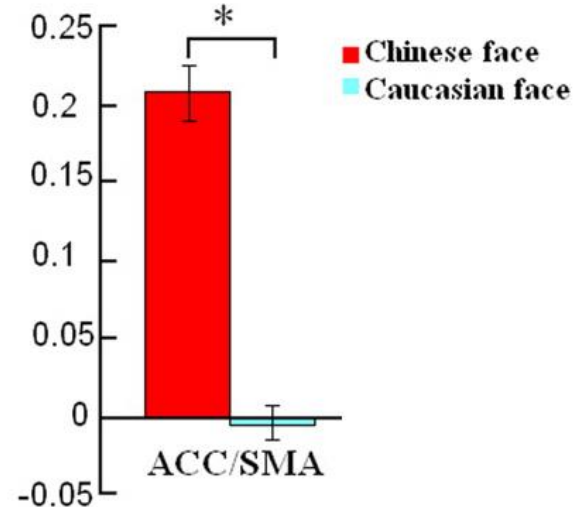
painful

non-painful

Caucasian subjects



Chinese subjects



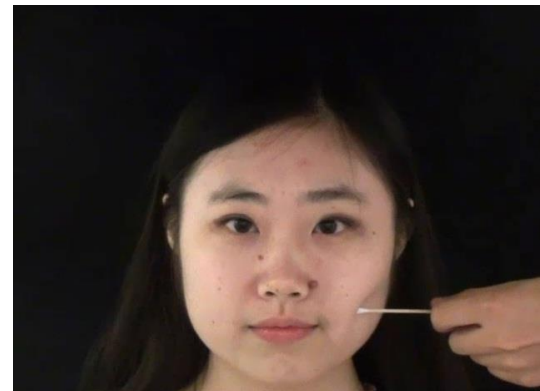
“Mirroring” Emotion

Race versus Minimal-Group bias in empathy for pain

Your Group

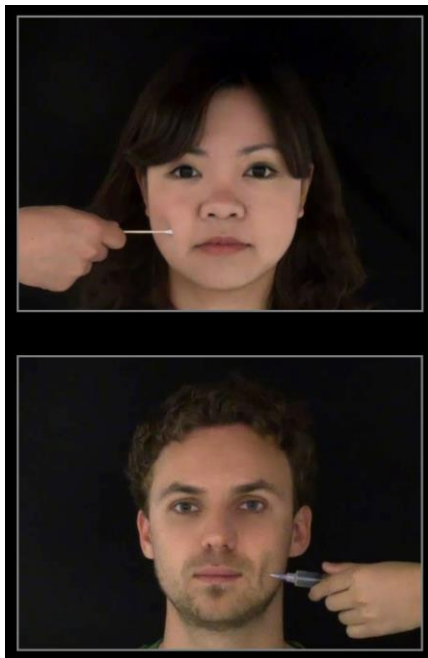


Other Group

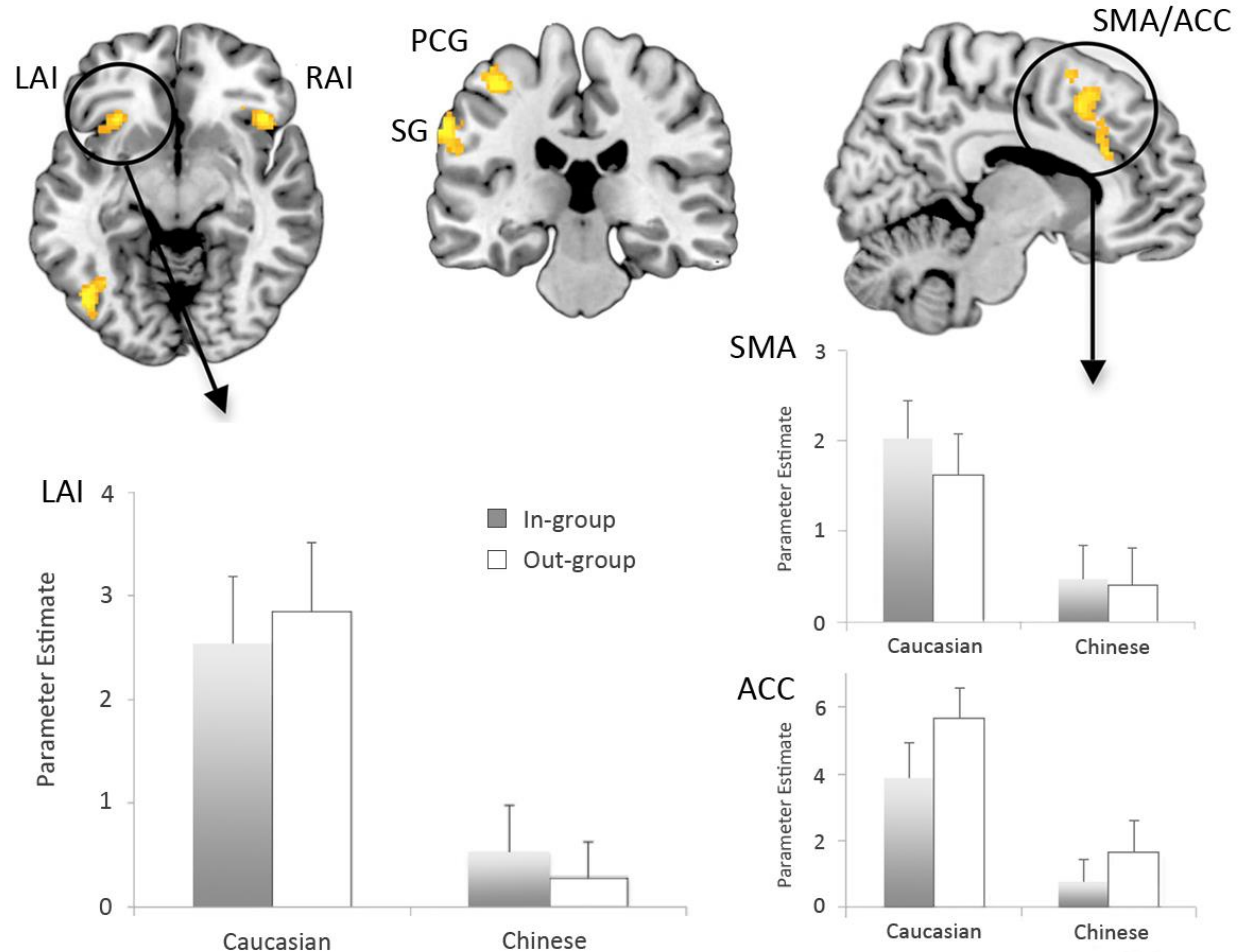


Racial but not group bias in neural empathy to pain

Caucasian participants only

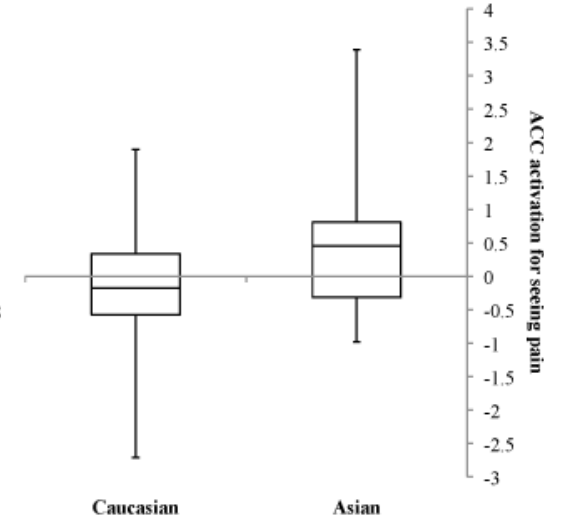
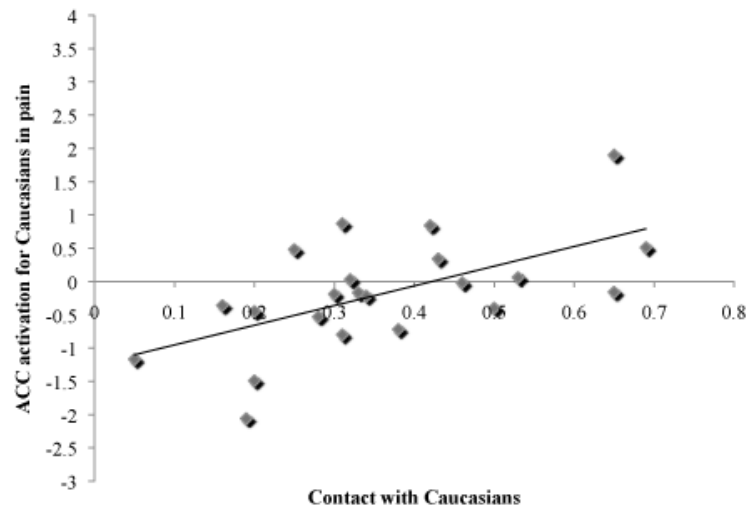
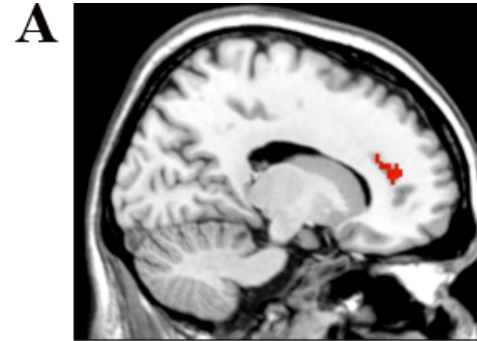
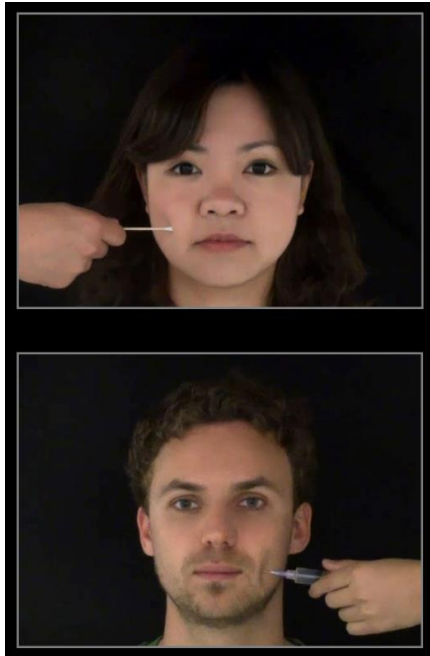


Contreras et al, 2013
PLoS ONE



Race bias reduces with other-race contact

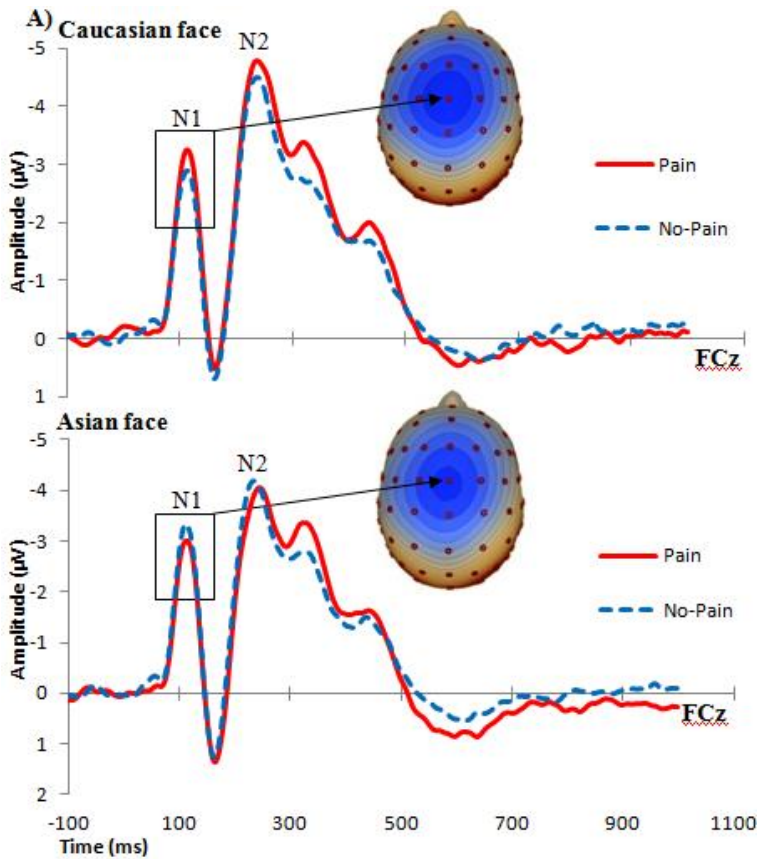
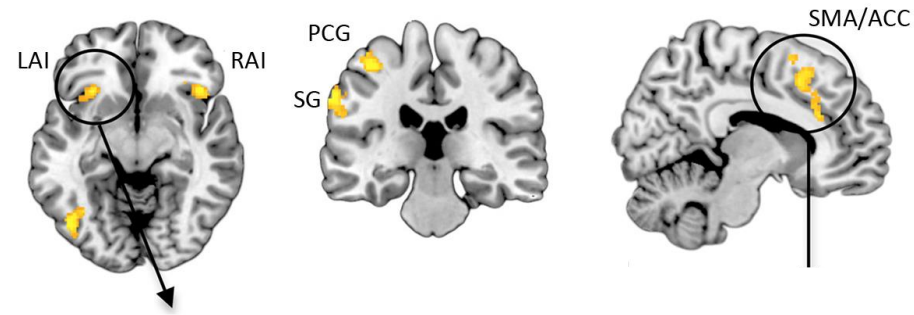
Chinese participants



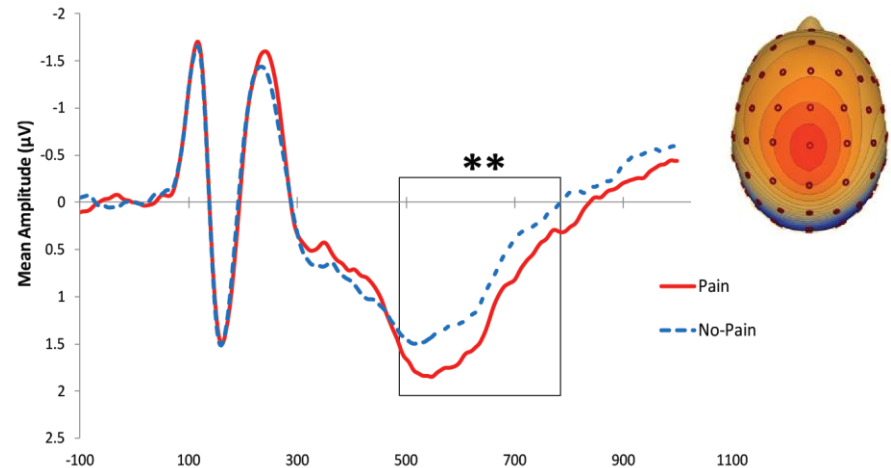
Chinese participants with longer duration in Australia (reporting more exposure to Caucasian faces) show greater neural empathic activity to Caucasians in pain.

“Mirroring” Emotion

Racial bias in empathy for pain

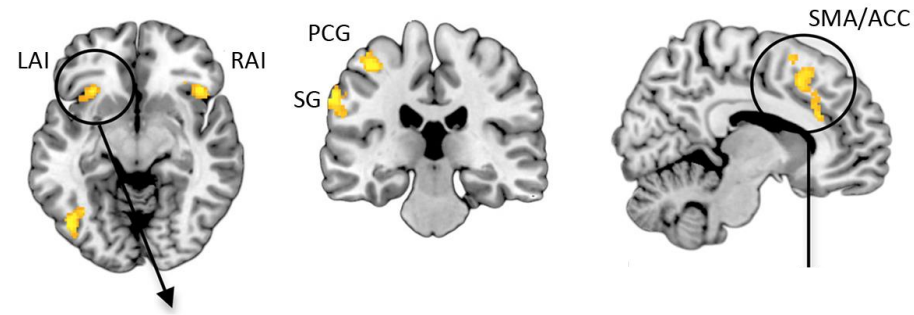


- **Early N1** – Empathy for pain to *own race faces* only
- **Later P3** – Empathy for pain but with no race or group bias

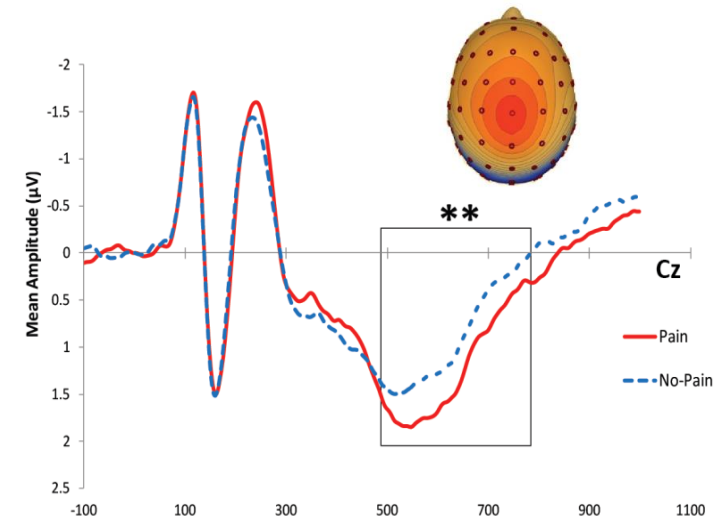
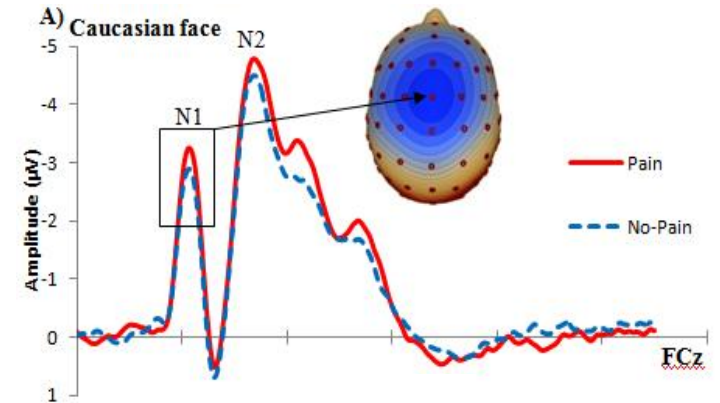


“Mirroring” Emotion

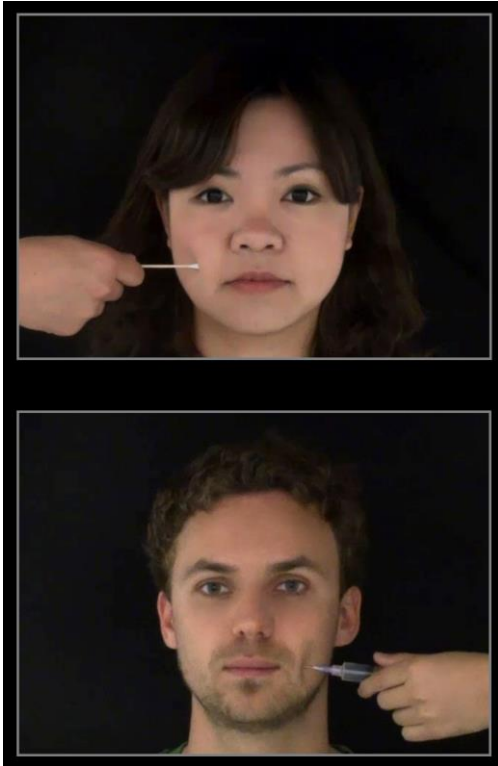
Early and Late processes



- Early and automatic brain response to observed pain in others
 - Modulated by Race
 - Not influenced by arbitrary or meaningless group association
- No racial bias in behavioural measures
 - Affective Priming: **In-Group** associated with pleasant and **Out-Group** with unpleasant
 - No effect of Race
- *Early racial bias can be suppressed or controlled by later top-down cognitive control processes*



Not the end of the story ... ongoing research



- “*Mirroring*” brain activity biased toward own-race
- Early automatic brain response to seeing others in pain
- Too early for higher-order social factors – prejudice, semantic or emotional associations with race
- More “mirroring” for the types of people we see around us every day – ***evolutionary origin?***
- Influence of early, automatic, bottom-up brain processes can (usually) be *suppressed and controlled*
- *End behaviour and attitudes combination of early, automatic brain processes and top-down cognitive regulation and control*



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