

The processing of internally generated interoceptive sensation

Human Brain Mapping, 2009

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Relevance

- Interoception is understudied
- The development of interoception is understudied
- The dysfunction of interoception is understudied
- Insular function is not well understood

On Mind and Body



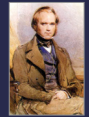
Aristotle



René Descartes



Baruch Spinoza



Charles Darwin



William James



Walter Cannon

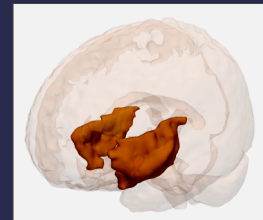
Interoception and the Insula

Interoception: the current homeostatic condition of the entire body and the ability for this information to reach conscious awareness

Sherrington, 1906; Craig, 2003

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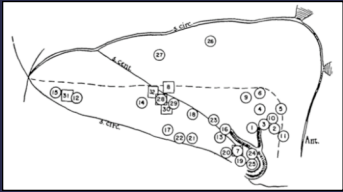
The Insula



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The Insula

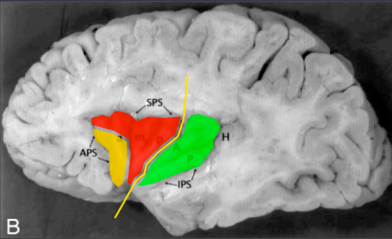


Penfield, 1955

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The Insula

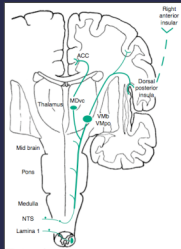
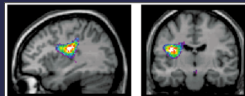
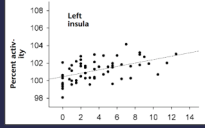


Naidich et al., 2004

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Posterior Insula

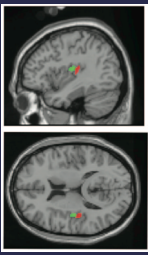
Craig, 2004

Craig, 2000

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Posterior Insula

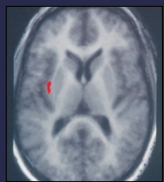
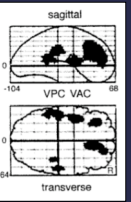
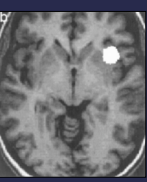


Hua et al., 2005

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Mid Insula

Hadjikhani et al., 1998

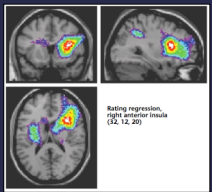
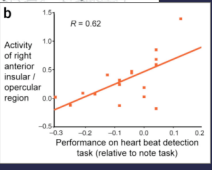
Banati et al., 2000

Bushara et al., 2001

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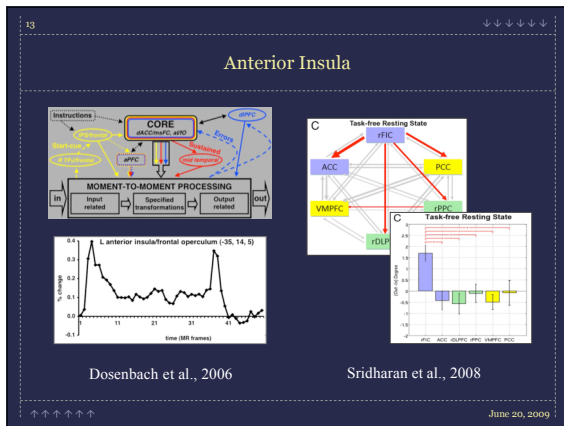
Anterior Insula

Craig, 2000

Critchley et al., 2004

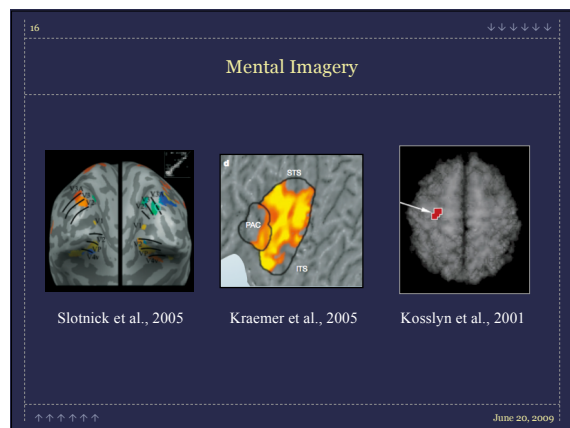
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Our Experiment

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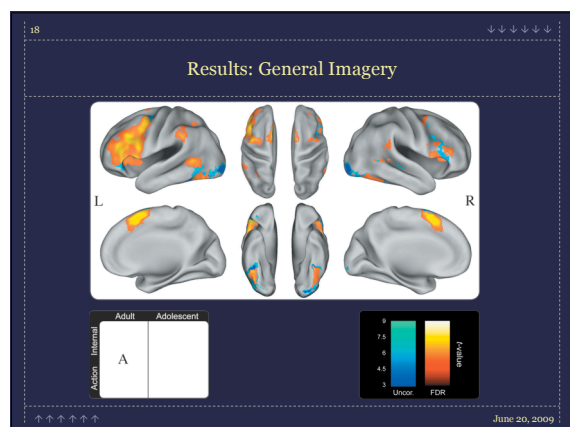
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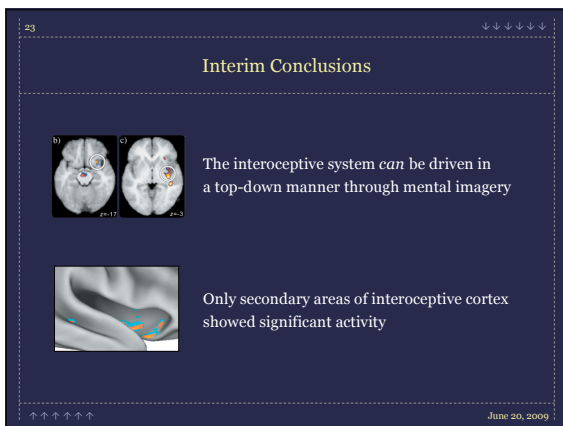
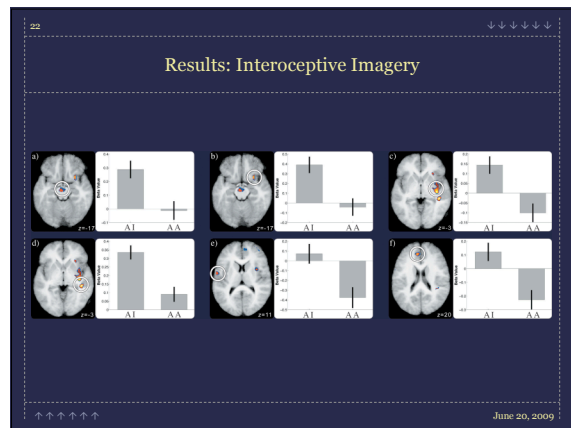
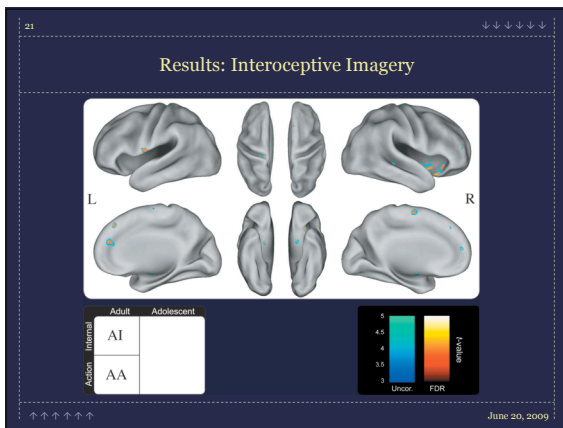
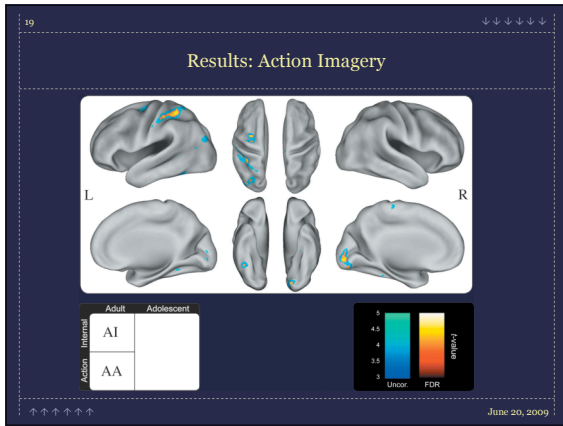
Example Phrases

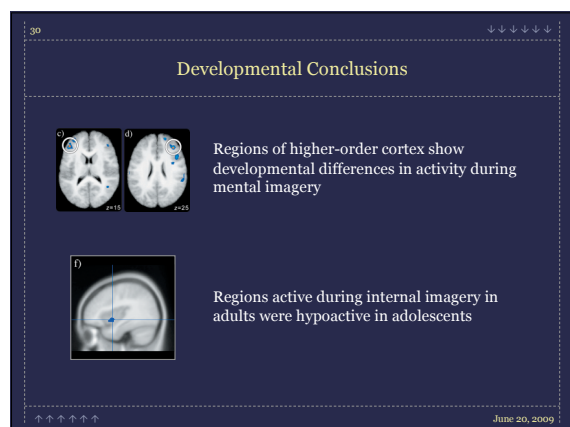
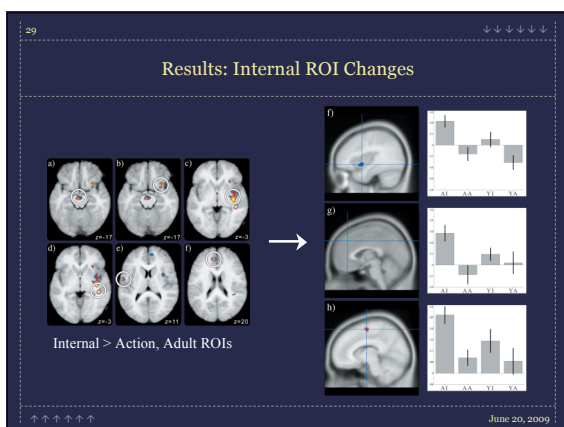
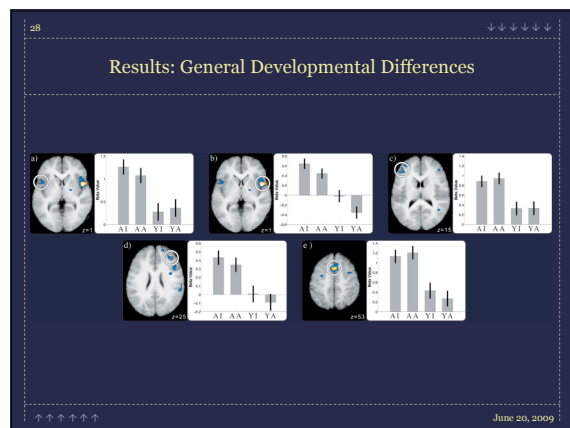
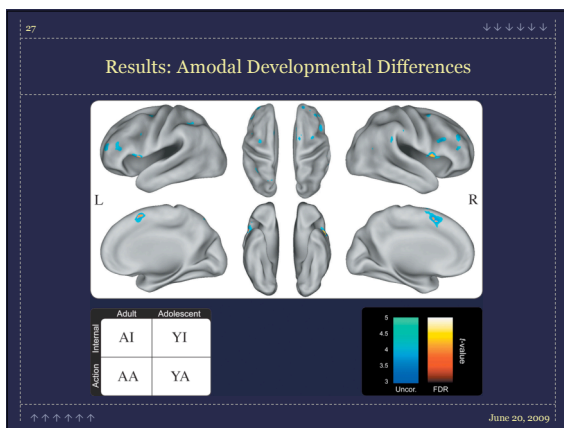
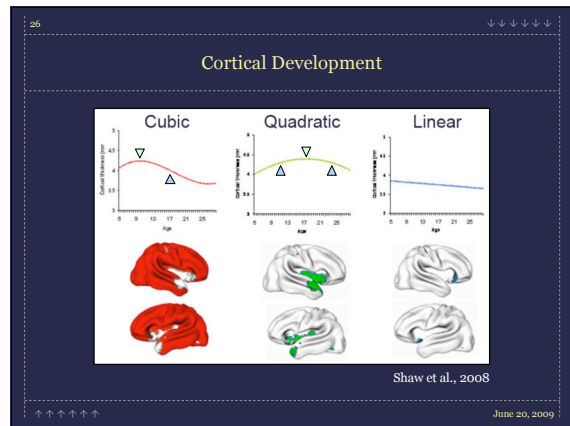
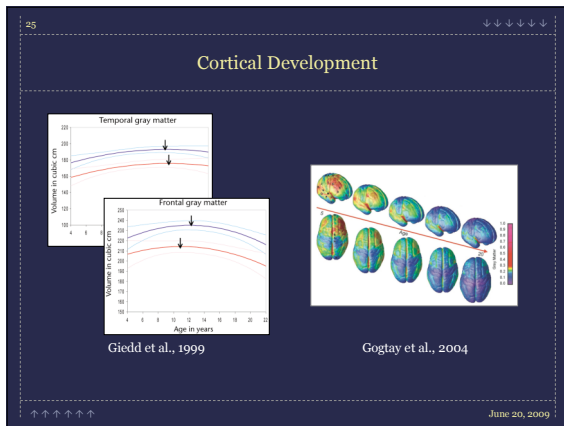
Freezing Cold	Tie Shoes
Sweltering Hot	Pour Water
Starving Hunger	Wash Hands
Nauseous	Lock Door
Itchy Rash	Answer Phone

Internal States	Everyday Actions
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








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Final Conclusions

- 
 Interoceptive sensory processing is separable, unique
- 
 Mental imagery can be used to explore interoception
- 
 Areas supporting this processing are still developing
- 
 There is still much to investigate and explore

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Thank You

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<http://prefrontal.org>

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