

# Neural Circuits Of Empathy In The Perception Of Someone Else's Congruent And Incongruent Emotional Facial Response And Their Relationship With Emotional Awareness

Lepron, E., Démonet, J-F.

Inserm U825, Hôpital Purpan - Toulouse, France



## INTRODUCTION

### What is empathy ?

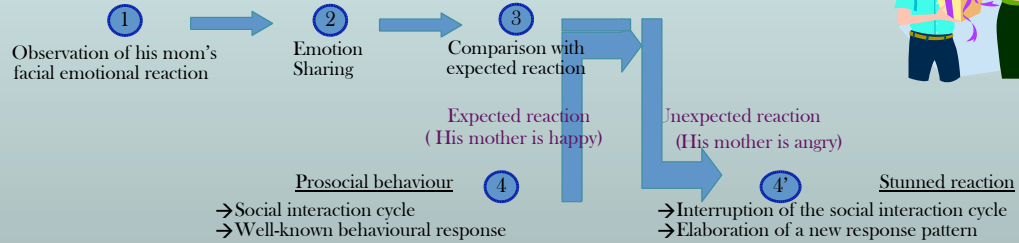
Empathy is the ability to:

“Experience and understand what others feel without confusion between oneself and others”

Decety, 2006

### What if I don't understand someone else's feelings ?

Example of a Face to Face social interaction: A boy is offering a present to his mother



## ISSUE

### What are the brain specificities in expected and unexpected emotional reaction ?

Our hypothesis: Expected: Basic empathy-related neural networks and «shared representation» regions: medial prefrontal cortex (mPFC), left anterior insula (AI)  
Unexpected: Meaning research and decision making regions, emotion feeling (surprise): frontal and sub-cortical regions

## METHODS

H<sub>2</sub>O<sup>15</sup> PET scan

The activation task consisted in Scenari depicting social interaction of the subject and another person, ending with the emotional facial response of the other person that was either congruent or incongruent with the situation.

25 healthy right-handed subjects - 13 female

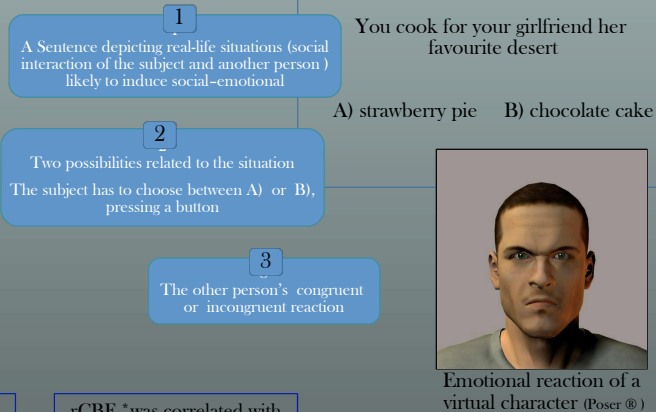
mean age: 50.5 ± 6.4

SPM5 analysis

Measurement of empathy level using LEAS test (Level Scale, Lane et al. (1990))



Example of the activation task used in PET scanner: the following steps appeared on the screen :



## RESULTS & DISCUSSION

Expected emotional reaction elicit more empathy-related and action-planning regions than unexpected reaction

Unexpected emotional reaction elicit activation in episodic memory, attention, working memory and in visual processing regions

rCBF \* was correlated with LEAS score in Precuneus and Associative cortex (angular and supramarginal gyrus)  
\*regional cerebral blood flow

## CONCLUSION

Observing others' inappropriate socio-emotional behaviour do not imply the same neural networks as empathic process

Several processes of a social interaction cycle may be interrupted, in particular the preparation of an appropriate behavioural response

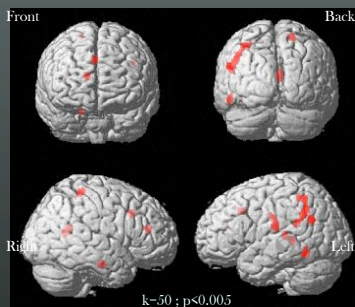
Unexpected emotional reaction elicit integration of distributed representations in the brain and metacognitive perception of the emotional reaction

The most empathetic persons have greater activation in brain areas relative to emotional awareness and representation of emotional response when someone else's response is unexpected

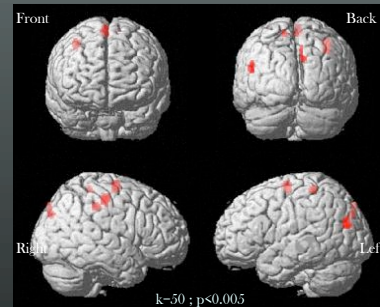
r=0.70  
P<0.001

r=0.70  
P<0.001

**Congruent** > **Incongruent**



**Incongruent** > **Congruent**



**mPFC**: « mind reading » (Singer, 2006)

**ACC**: role in coding the motivational-affective dimension of empathy, which is associated with the preparation of behavioral response (Morrison, 2004)

« social interaction cycle

**Left AI**: crucial role in social emotions related to others (Singer, 2006)

**Cuneus/precuneus**: self-reflection processes, mental imagery and episodic/autobiographical memory

retrieval (Cavanna, 2007)

**Fronto-parietal regions**: attention, working memory, episodic memory retrieval, and visual awareness (Singer, 2006)