

“Leadership is the ability to articulate a vision and walk the path, such that it inspires people to rise above the banality and strife of their common-day existence and achieve a higher and common goal.”

Sanjiv Chopra, MD



Leadership Mnemonic: The 10 Tenets of Leadership

Sanjiv Chopra, MD

Listening
Empathy
Attitude
Dreaming Big
Effectiveness
Resilience
Sense of purpose and
Selflessness
Humility and Humor
Integrity
Purpose



Neurobiology of Leadership

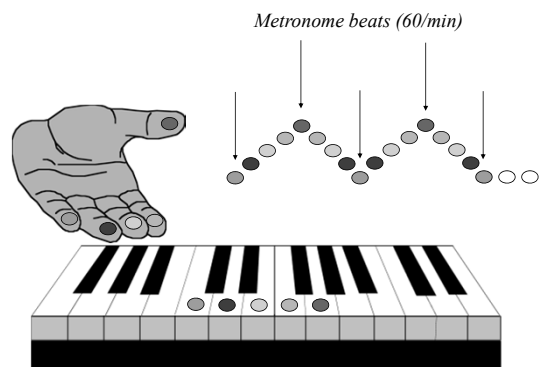
- We all Lead by Example
 - Embodied Cognition / Resonance
- We all have the capacity and the responsibility to become better leaders
 - Plastic Brain

Plasticity is an intrinsic property of the brain across the lifespan

Everything we do, experience, think, changes our brain

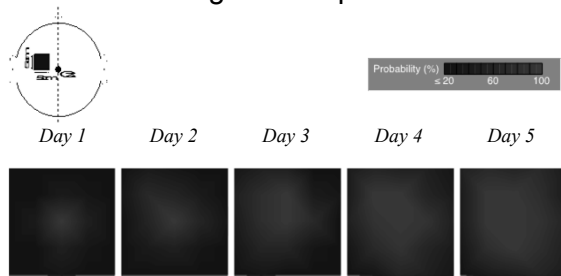
Plasticity:

Nature's invention to overcome the limitations of the genome and respond to the demands of a rapidly changing world



Pascual-Leone et al. *Science* 1994, *J Neurophysiol* 1995

Modulation of Motor Cortical Outputs During Skill Acquisition



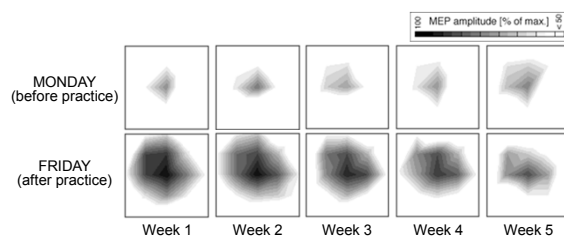
Pascual-Leone et al. *Science* 1994; *J Neurophysiol* 1995

Thinking is an Active Brain Process and Mental Practice Changes the Brain



Pascual-Leone et al. *J Neurophysiol* 1995

Continued Practice Over-learned Behavior



Pascual-Leone et al. 03

Two Steps of Plasticity

- Dynamic Changes in Existing Neural Networks
 - Activity across a neural network changes dynamically to preserve behavior
 - Shifts in connectivity
 - Dependent on existing connections
 - Influenced by genetic factors
- Establishment of New Connections
 - Dynamic changes across a neural network can be followed by longer-lasting, more stable plastic changes
 - Dendritic arborization
 - Establishment of new connections

Pascual-Leone et al. *Annu Rev Neurosci* 05

Given the Plastic Human Brain Leaders can be Made and Leading is a Huge Responsibility

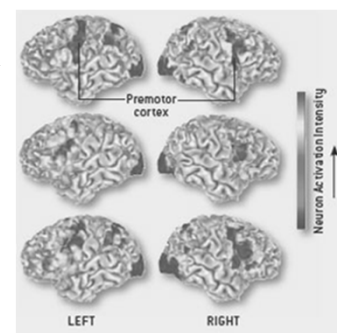
- Leaders change their brains and they change other people's brains
 - ... but people may not like it
 - ... and the outcome for humanity may not be desirable

What can neurobiology teach us about the tenets of leadership ?

Perform an Action

Observe an Action

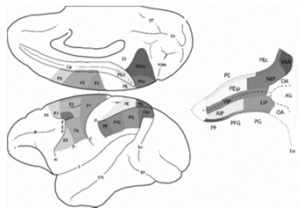
Imagine an Action



Marco Iacoboni (UCLA) et al

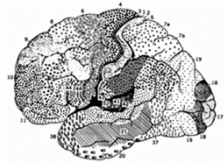
Mirror Neurons

Monkey



Human

BA 44 • Broca's Area
Human Language

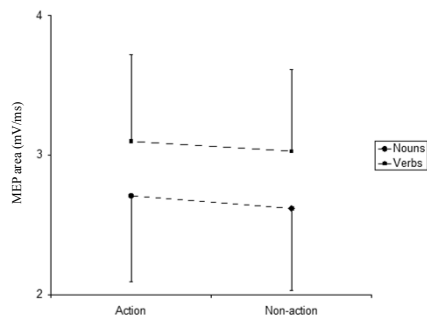


Mirror Neurons • Language



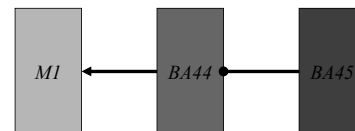
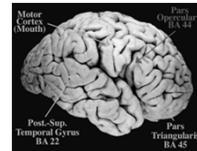
Arbib, Rizzolatti et al.

The Power of Talk



J Cognitive Neurosci 2004

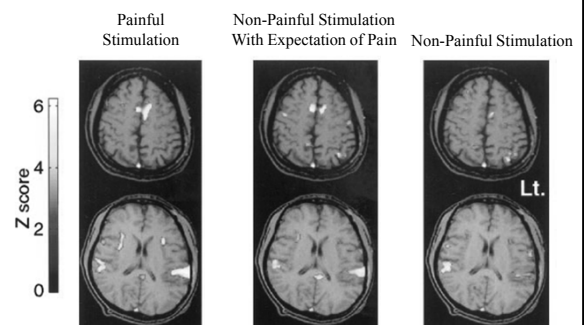
“Regulation” of mirror cell function



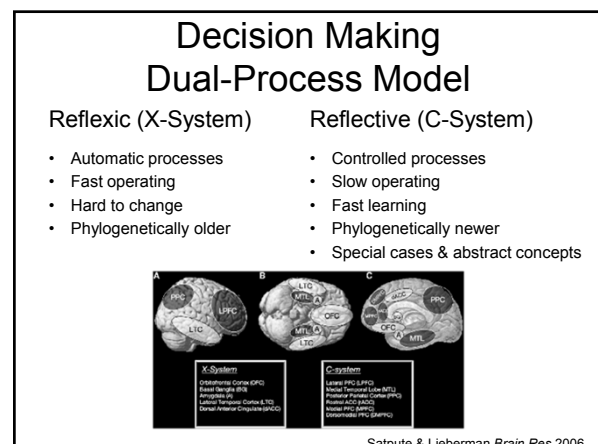
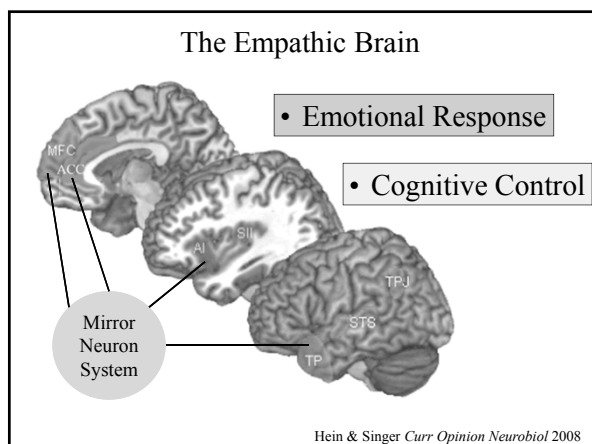
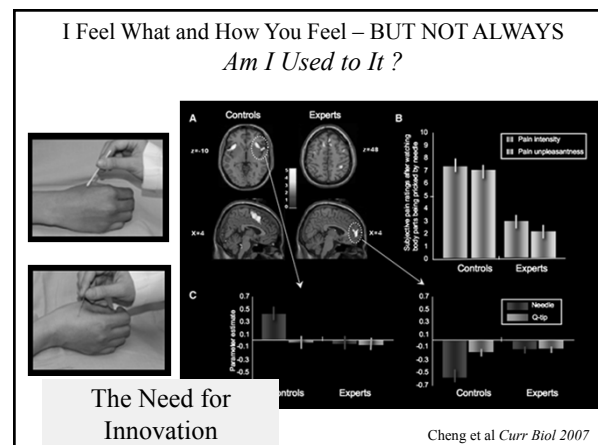
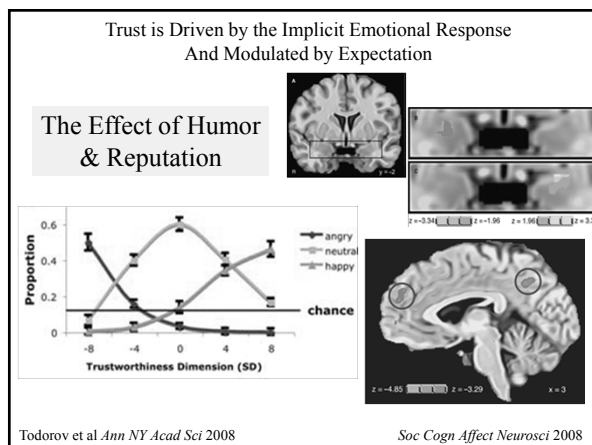
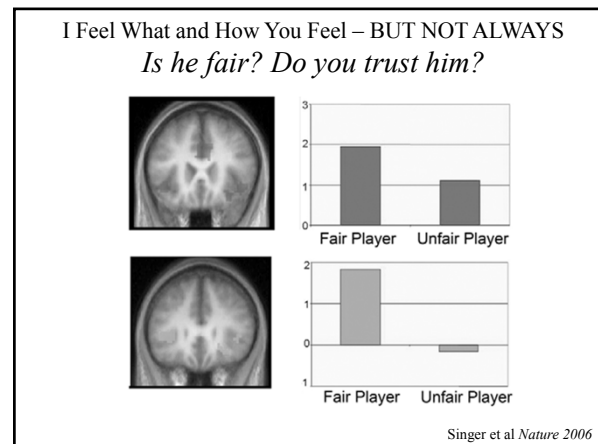
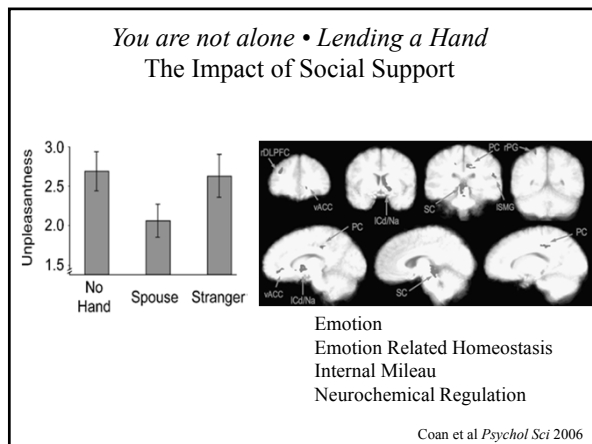
Mirror cell system (resonant system; embodied cognition)

- Engaged for early learning in childhood
- Controlled later in life
 - Maturation of Prefrontal Cortex
- Implicit mimicking of facial expressions - Obligatory jawing
- Dementia: “Imitation behavior”
Lhermitte et al. Ann. Neurol. 1986
- EMPATHY • HUMOR
- TRUST • PROXIMITY
- DECISION MAKING / ALTRUISM

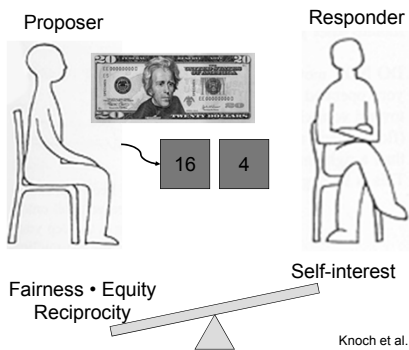
The Effect of Expectation



Sawamoto et al *J Neurosci* 2000



Ultimatum Game

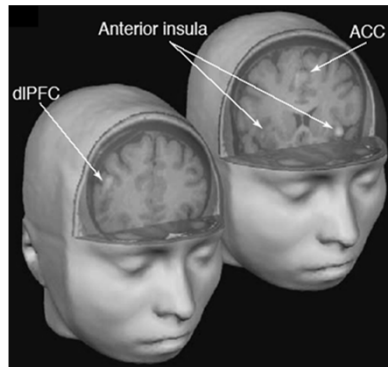


Knoch et al. *Science* 2006

Altruistic Punishment

- People reject low offers even if stake levels are as high as three months' income
- Rejection rates up to 80% for offers below 25% of the available money

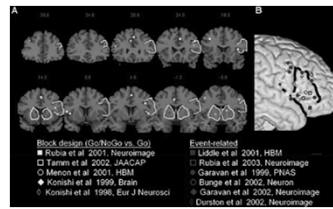
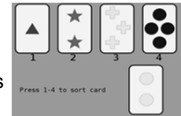
Responder



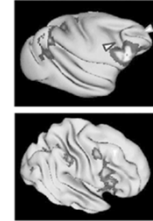
Sanfey et al. *Science* 2003; Knoch et al. *Science* 2006

Right Lateral Prefrontal Cortex & Inhibition

- Wisconsin Card Sorting Test
- Go/No-Go & Stop Signal Paradigms
- Task-set switching



Aron & Poldrack, 2005



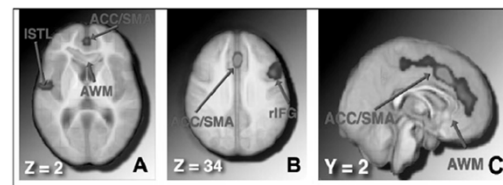
Nakahara et al. 2002

(Right Lateral) Prefrontal Cortex

Cognitive control can be trained ?

Self-centered behavior

- Hedonic desires
- Impulses
- Risk taking



Journal of Gerontology: Medical Sciences
2006

The Neurobiology of Leadership

- The brain is plastic – leadership is a responsibility but it can also be learned
- Mirror neurons or resonant system – lead by example
- Remember the power of expectation, humor, trust, proximity/touch, language
- Promote your capacity to control impulses