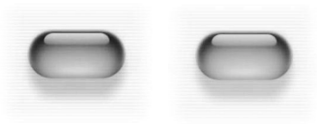
The Brain and Reality

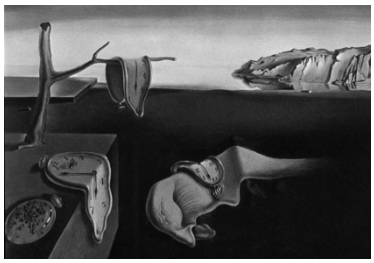


Expectations, Beliefs
and the origins of the Placebo effect

The Brain and Reality

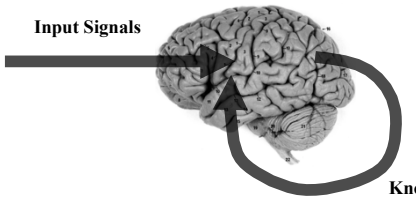
René Descartes

The Brain and Reality



Salvador Dali

The Brain and Reality



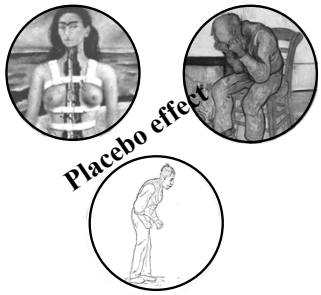
The Brain and Reality

Prof. Richard Gregory, University of Bristol

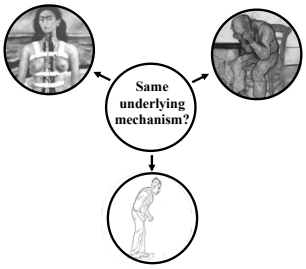
The Brain and Reality

The Brain and Reality

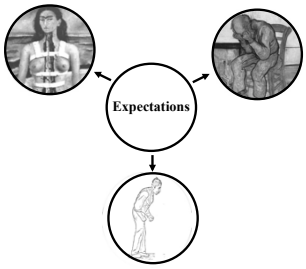
The Brain and Reality



The Brain and Reality



The Brain and Reality

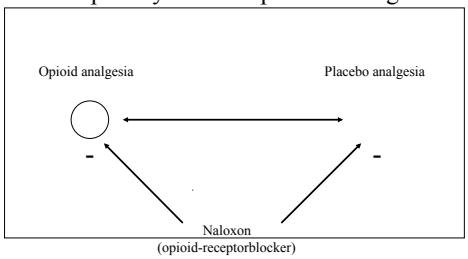


The Brain and Reality

Frida Kahlo

The Brain and Reality

The opioidsystem and placebo analgesia



Levine et al The Lancet 2 (654-657) 1978

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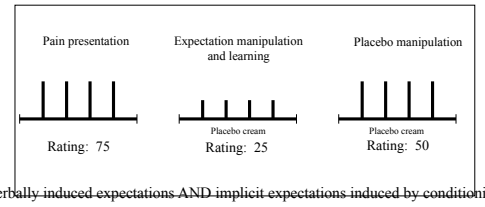
Treatment Expectation and Placebo Analgesia



Verbally induced expectations AND implicit expectations induced by conditioning

Voundouris et al J Per Soc Psychol 48 (47-53) 1985
Voundouris et al pain 38 (109-116) 1989
Voundouris et al pain 43 (121-128) 1990
Montgomery and Kirsch Pain 72 (107-113) 1997

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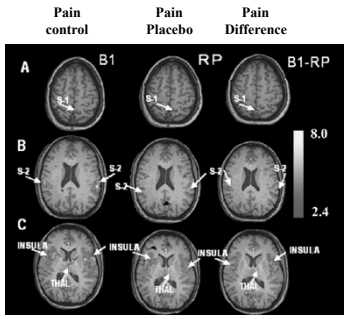
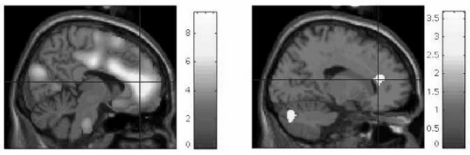


Price et al Pain 127 (63-72) 2007

The Brain and Reality

Anterior cingulate cortex
- Opioid and Placebo effect

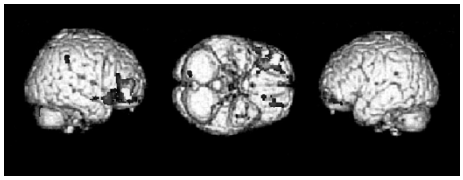


(POP+WOP)-(P+W) (PPL – P)

Petrovic et al Science 295 (1737-1740) 2002

The Brain and Reality

Orbitofrontal cortex
- Placebo effect



(PPL – P)

Petrovic et al Science 295 (1737-1740) 2003

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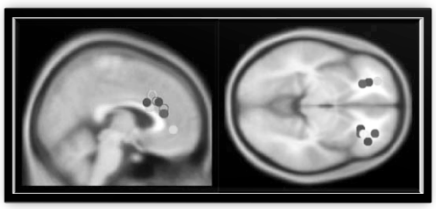

The Brain and Reality

Vincent van Gogh

The Brain and Reality

Study of Emotional Placebo

or

International Affective Picture System (IAPS)

Day 1 **Day 2**

Anxiety reducing drug (benzdiazepine)

Placebo (saline)

Petrovic et al Neuron 46, (957-969) 2005

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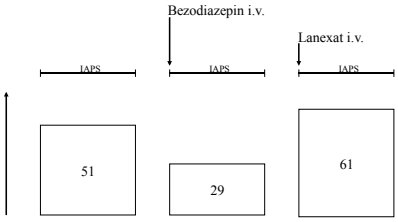
Study of Emotional Placebo

Day 1 – expectation modulation



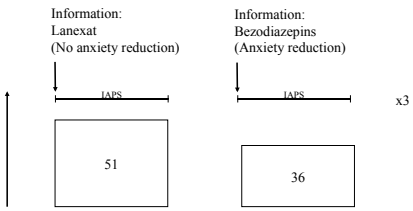
Unpleasantness rating

Petrovic et al Neuron 46, (957-969) 2005

The Brain and Reality

Study of Emotional Placebo

Day 2 – The brain and the placebo effect



Unpleasantness rating

Petrovic et al Neuron 46, (957-969) 2005

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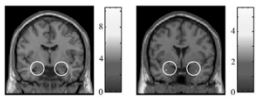
Study of Emotional Placebo

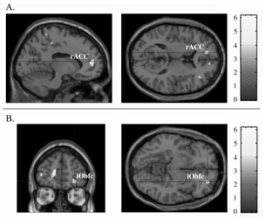
Decreased emotional processing in placbo condition

Placebo dependent inceased activity

Unpleasantness processing

Placebo decrease in unpleasantness





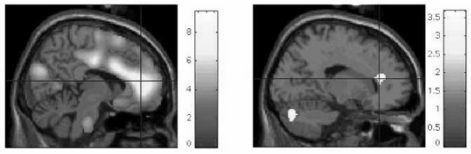
Petrovic et al Neuron 46, (957-969) 2005

The Brain and Reality

Rostral anterior cingulate cortex

The Brain and Reality

Opioid- and Placebo analgesia



(POP+WOP)-(P+W) (PPL – P)

Petrovic et al Science 295 (1737-1740) 2003

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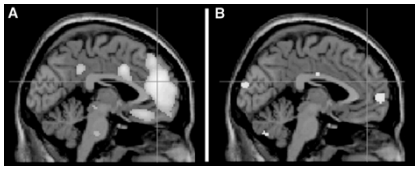

Petrovic et al Science 295 (1737-1740) 2003

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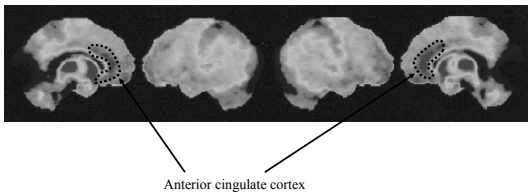
Cortical opioid system

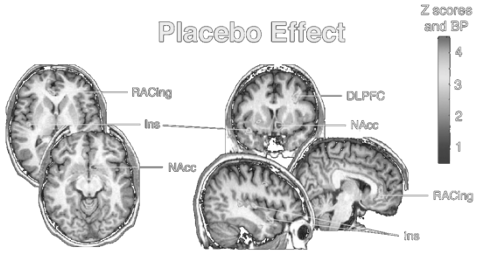


Anterior cingulate cortex

Willoch et al 1999

The Brain and Reality

Opioid receptor imaging of Placebo Analgesia



Zubieta et al Journal of Neuroscience, 25 (7754-7762) 2005

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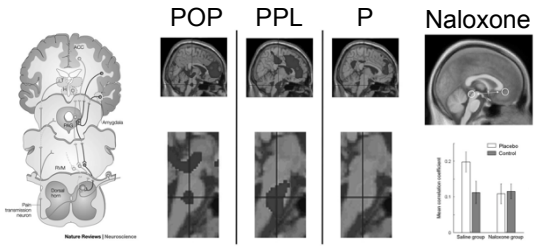
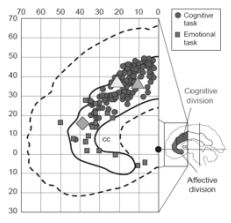


Regression analysis

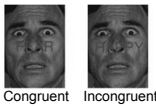
Filelds et al Nature Reviews Neuroscience 2004
Petrovic et al Science 295 (1737-1740) 2002
Eippert et al Neuron 63 (533) 2009

The Brain and Reality

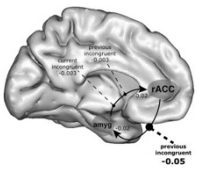
Anterior Cingulate and Attention



Emotional Stroop Task



Congruent Incongruent



Bush et al Journal of Neuroscience, 4 (215-225) 2000
Etkin et al Neuron 21 (871-882) 2006

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rACC in placebo analgesia:
Interaction between attentional processes and opioid system

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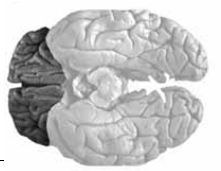

Orbitofrontal cortex

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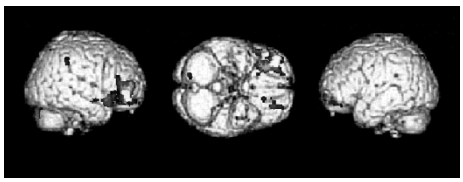
Orbitofrontal cortex



(PPL – P)

Petrovic et al Science 295 (1737-1740) 2003

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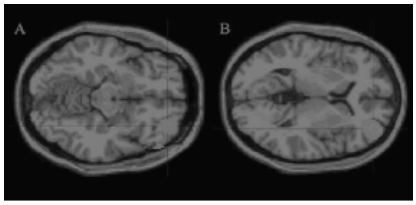
Placebo analgesia vs. opioid analgesia



Petrovic et al Pain 150 (59-65) 2010

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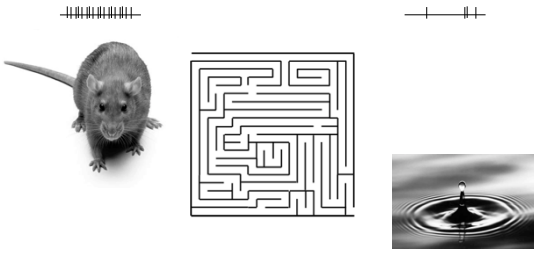
Motivational and homeostatic goals in Obfc



Schoenbaum Neuron 47 (633-636) 2005

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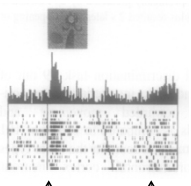
Expected reward and Obfc



Reward expectation Reward

Tremblay and Schultz Progress in brain research 126 (193-215) 2000

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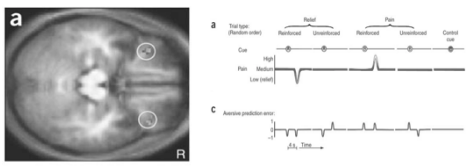
Aversive error-signal



Seymour et al Nature Neuroscience 8 (1234-1240) 2005

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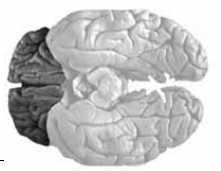
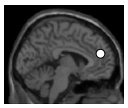


Orbitofrontal cortex in placebo analgesia:
Cognitive processes including emotional goals, expectations, emotional tracking and aversive error signals.

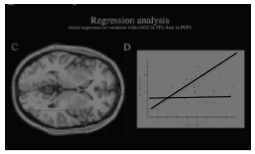
The Brain and Reality

The Brain and Reality

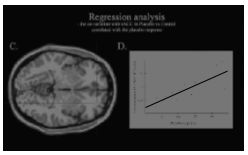


rACC-ROI used in the PPI correlation

Placebo analgesia (PET-study)



Emotional placebo (fMRI-study)



Petrovic et al Pain 150 (59-65) 2010

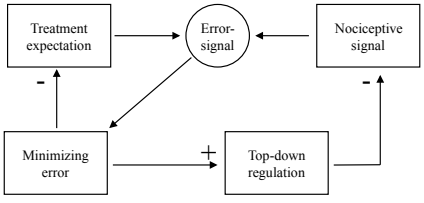
The Brain and Reality

Why do we have the placebo effect ?

Hypothesis: The placebo effect is just a concequence of a system trying to <u>understand</u> and <u>predict</u> the world.

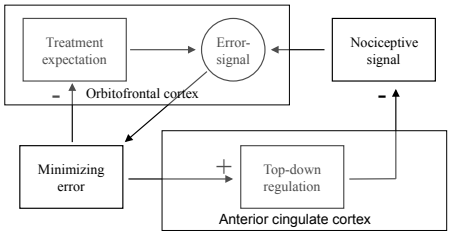
The Brain and Reality

To understand the world
- through expectation and error-signals



The Brain and Reality

To understand the world
- through expectation and error-signals



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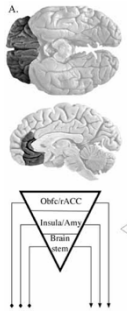
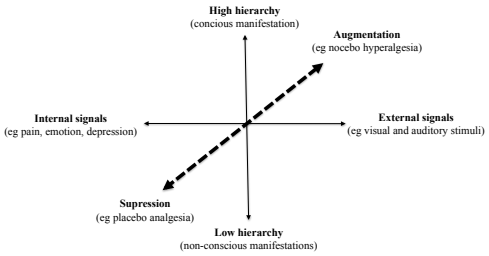


Internal signals

The Brain and Reality

Placebo and Expectations



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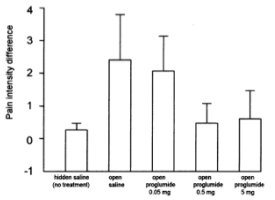
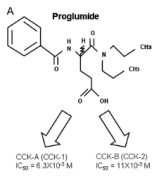
Nocebo Hyperalgesia and the CCK-system



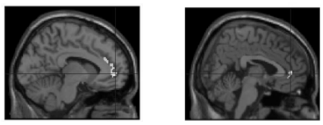


Benedetti et al Journal of Neuroscience 26 (12014-12022) 2006

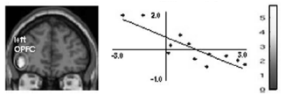
Placebo analgesia and the opioid system

Nocebo Hyperalgesia

Placebo (habituation) Nocebo (habituation)



Nocebo



Colloca et In progress
Konge et al Journal of Neuroscience 28 (13354-13362) 2010

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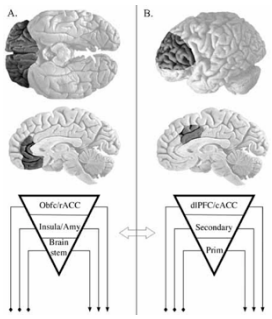
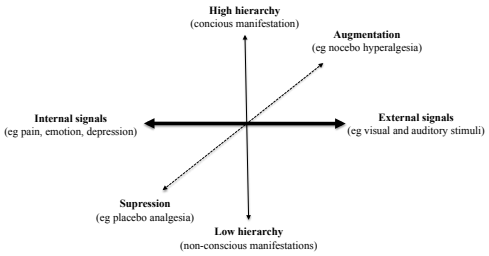


Internal signals External signals

Placebo and Expectations



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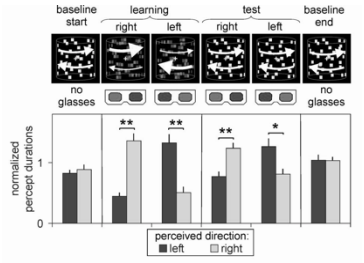
The Brain and Reality

Magic glasses



Sterzer, Frith and Petrovic Current Biology 18 (697-8) 2008

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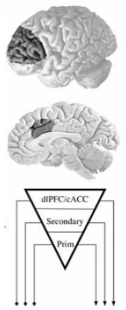

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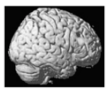
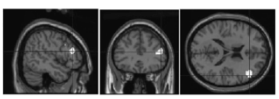
Complex associative learning
- Expectations and error-signals

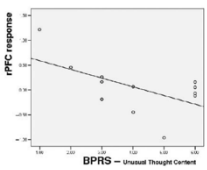
Turner et al Cerebral Cortex 14(872-880) 2004

The Brain and Reality

Schizophrenia and expectations / error signals







Corlett et al Brain 130 (2387-2400) 2007

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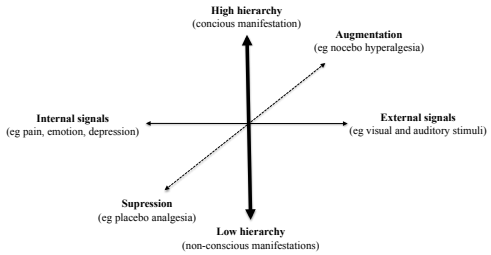
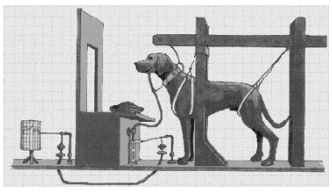
Placebo and Expectations

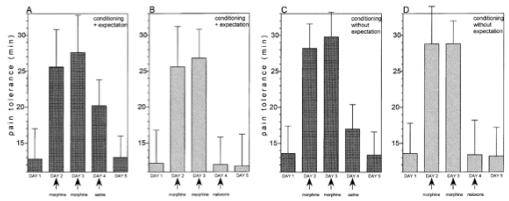


The Brain and Reality



The Brain and Reality

Placebo and Conditioning effects



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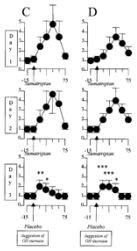
Placebo and Conditioning effects



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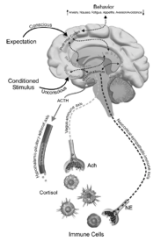
Placebo and Conditioning effects



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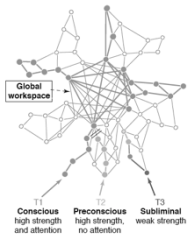
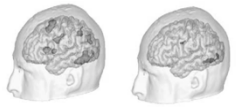
Consciousness vs. Non-consciousness





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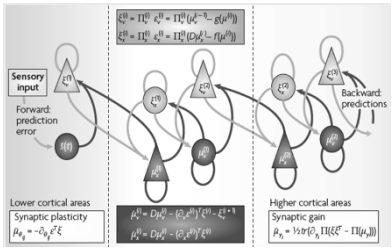

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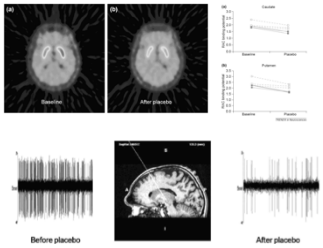

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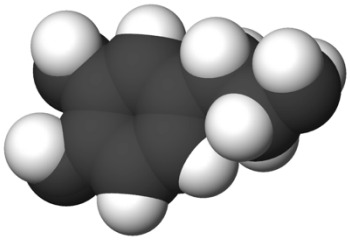
Midbrain dopamine system



Reward processing, expectations and errrosignaling.

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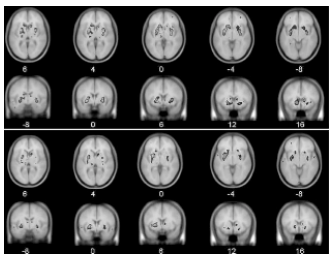
Placebo och Amphetamine

Amphetamine

Placebo



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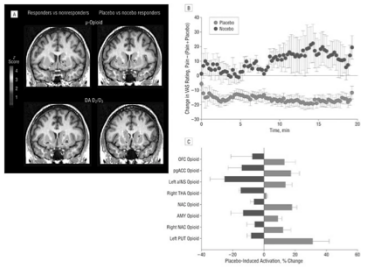
Opiod and Dopamine involement in placebo analgeisa



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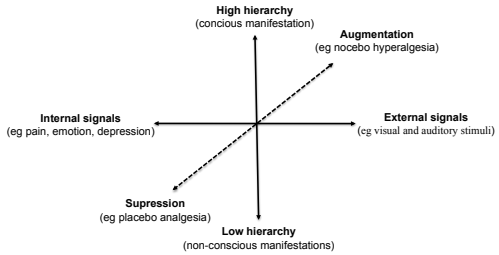
Placebo and Expectations



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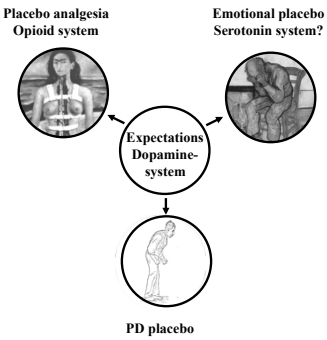

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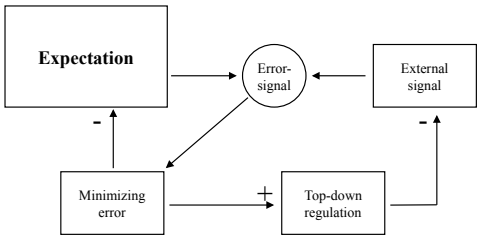
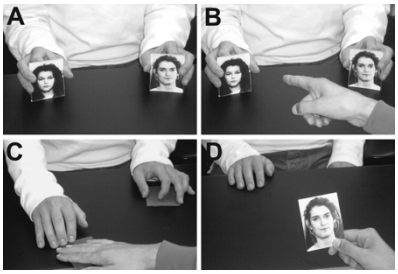
Expectation of stability in the external world



Hjärnan och Verkligheten



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