

Third international NEED-symposium

Emotional Development The Neuropsychological roots

Ghent
Thursday 11-05-2017

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Summary

- I. Definitions
- II. Traditional visions
- III. The emotional brain
- IV. Cognitive-emotional interactions
- V. From structure to connectome
- VI. Conclusions



I. Definitions

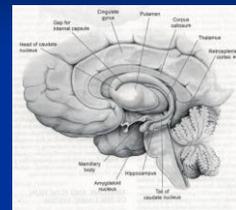
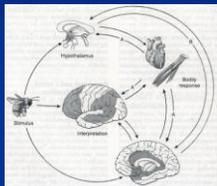
- A. A strong, often short and conscious feeling of wellbeing or uneasiness
- B. The affective aspect of consciousness
- C. Accompanied by physiological body changes and distinguished from cognitive and social states of mind (émouvoir, 1579)
- D. Eight positive versus negative **basic** emotions (Ekman/Plutchik) : happy/sad, anger/fear, confidence/abhorrence, surprise/anticipation. Besides classical, **homeostatic (primary)** emotions : pain, sex, thirst, hunger, fatigue (Denton)

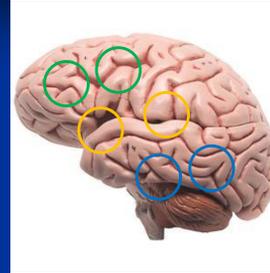
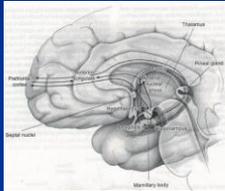
I. Definitions

- E. **Secondary** / social emotions : love, culpability, pride
- F. From holistic “subjective experience” (William James) through dualistic “reward and punishment feelings” (Delgado) to “a set of emotional components” (Peggy Thoits) : from the emotional experience to the affective expression. Emotional evolution from Seo to Seo-R².
- G. Evolution towards affective neurosciences (Kendal, Dosen, Panksepp, Damasio)

II. Traditional visions

- A. Darwin (1872) “The expression of emotions in man and animals ”: survival and natural selection, creating communication and relations
- B. Cognitive theories (Lazarus) and psycho-analytical models (Kernberg)
- C. James and Lange, Cannon en Bard, Schachter: neurophysiological approaches
- D. From limbic lobe (Broca), limbic circuits and triune brain (Papez, Yakolev, McLean) to the “emotional brain” (Davidson)





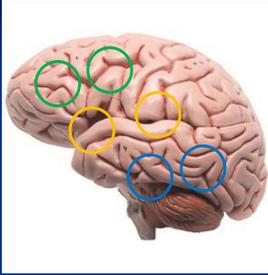
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III. The emotional brain

- A. **Prefrontal cortex**
- B. **Anterior cingulate cortex**
- C. Hippocampus
- D. Amygdala and brainstem
- E. **Ventral striatum**
- F. **Insula**

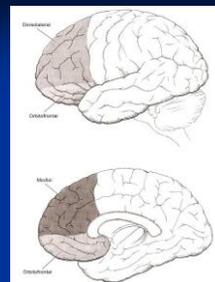


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A. Prefrontal cortex (PFC)

1. Structures
 - a. Dorsolateral prefrontal (cognitive aspects)
 - b. Orbitofrontal (behavioral aspects)
 - c. Ventromedial prefrontal (emotional aspects)
2. Guiding cognition, emotion and behavior
 - a. In animal (Cohen) and man (Alexander, Cummings)
 - b. "Aim" (goal, purpose, objective)



A. Prefrontal cortex (PFC)

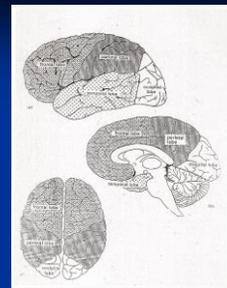
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A. Prefrontale cortex (PFC)

- b. "Aim"
 - (a) representation of the goal
 - (b) strategy to reach it
 - (c) in ambiguous situations : to prefer most adequate responses to more evident reactions (VL PCF)
 - (d) building a future instead of an immediate reward
 - (e) creating a personal style and a personality
 - (f) creation of mentalization (Fonagy), empathy (Baron-Cohen, TES) and mirror activity (Rizzolatti).

A. Prefrontal cortex (PFC)

3. PCF disorders in depression and intellectual disability
 - a. emotional "aims"
 - b. emotional anticipations
 - c. no "hot executive"
4. Lateralization :
 - a. left: approach attitudes are hypoactive in depression
 - b. right : withdrawal attitudes are hyperactive

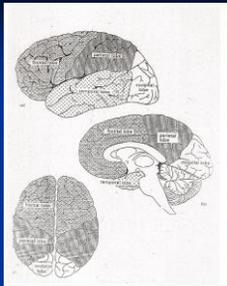


A. Prefrontal cortex (PFC)

5. Reward and punishment (OF)
 - a. left : oriented to reward, hypoactive in depression
 - b. right : oriented to punishment, hyperactive
6. Consequences for coaching: help the PCF
 - a. support the emotional "aim"
 - b. support emotional anticipation

B. Anterior Cingulate cortex (ACC)

1. Cingulate gyrus
 - a. Anterior
 - (a) dorsal
 - (b) ventral
 - b. Posterior
2. Cognitive and emotional guiding
 - a. "Choice" (selection)
 - (a) ventral : from many emotional experiences to one unique affective response
 - (b) dorsal : response selection in conflictual situations (conflict monitoring) ; the *best* choice



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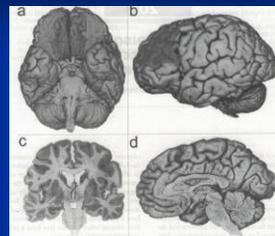
- b. Evaluation of and quick responses to complex situations (verbal, non-verbal, faces, gestures)
- c. Effortful control of changing behavior

B. Anterior cingulate cortex (ACC)

- 3. ACC disorders in depression, anxiety and ID
 - a. a lack of "choices"
 - b. no emotionally driven change in behavior and attitudes
- 4. Consequences for coaching: help the ACC
 - a. support goal-directed emotional "choices"
 - b. support conflict monitoring

C. Hippocampus (Hc)

- 1. "Contextualization"
 - a. Emotional valence (besides cognitive valence) of contextual informations all around the stimulus and its key information
 - b. Supporting an exact interpretation of the total situation



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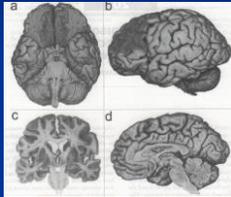
2. Active in negative emotional context :
verbal, non-verbal and double bind
3. Active in positive emotional context : in conversations, games

C. Hippocampus (Hc)

4. Disorders in depression :
 - a. Hc hypotrophy in longer lasting depressions
 - b. consequence of stress mechanisms: ACTH, cortisol and reduction of neuroplasticity
 - c. false context evaluation impedes recovery
5. Consequences for coaching : help the Hc support context modulation

D. Amygdala (AM)

1. "Focus" (point)
 - a. direct the attention to the affectively salient stimuli (+ and -)
 - b. incitement to choose for further interaction with these stimuli
 - c. explore new, surprising stimuli
2. Connections to the brainstem ("low road") for exact affective perception
and to the PFC ("high road") for conscious emotional and social implementation



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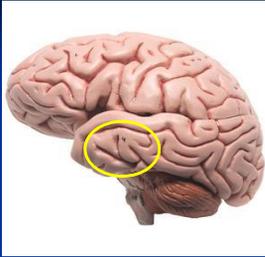
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D. Amygdala (AM)

3. Disorders in depression (and PTSD, mourning)
 - a. frequent overactivation and hypertrophy
 - b. too much focused on cues
 - c. hypervigilance and worrying
4. Consequences for coaching: help the AM support close relations

E. Ventraal striatum (VS)

1. Basal ganglia
 - a. Inferomedial centrencephalon
 - b. Corticosubcortical loops (fronto-striatal)
 - c. Nucleus accumbens
 - d. Dopaminergic innervation
2. "Reward"
 - a. behavior directed to recompenses
 - b. cues with "motivational salience" are best encoded and push to action



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E. Ventriaal striatum (VS)

3. Positive attitude
 - a. anticipation to happiness
 - b. directed to pleasure
 - c. motivation to action
4. Disorders in depression (and SUD)
 - a. no desires, no appetite
 - b. anhaedonia : no motivation to search for happiness anymore
5. Consequences for coaching : help the VS
Support the need of including feelings of wellbeing, "reward" and an anticipation of good luck

F. Insula (IN)

1. The hidden cortex
 - a. six gyri under the Sylvian sulcus
 - b. the anterior part of the insula (island) is part of the limbic system
2. "Integration" of sensations and feelings



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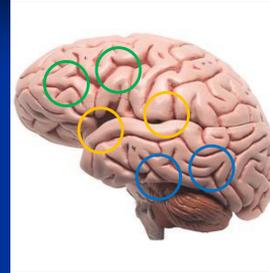
3. Right insula directed to the orthosympathetic system and left insula to the parasympathetic system
 - a. body feeling
 - b. smell and taste
 - c. emotions in voices and faces
 - d. the memories of (un)happy experiences

F. Insula (IN)

4. Disorders in depression (and focal epileptic seizures) inadequate perception and integration of one's body image, smells, tastes, emotional experiences
5. Consequences for coaching : help the IN stress the importance of the body and the senses in emotional relationships

III. The emotional brain

A. PFC	Aim	Reach the goal	- <i>Anticipation</i>
B. ACC	Choice	Conflict monitoring	- <i>Response selection</i>
C. HC	Context	Atmosphere	- <i>Context monitoring</i>
D. AM	Focus	Exploration	- <i>Emotional memory</i>
E. VS	Reward	Anticipation	- <i>Wellbeing</i>
F. IN	Integration	Body and senses	- <i>Togetherness</i>



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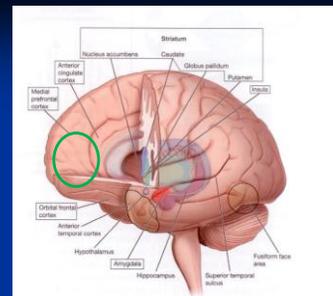
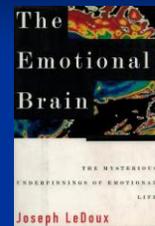
IV. Cognitive-emotional interactions

A. Neocortical integration

- a. split brain studies (Gazzaniga, Sperry)
- b. the double code (LeDoux)

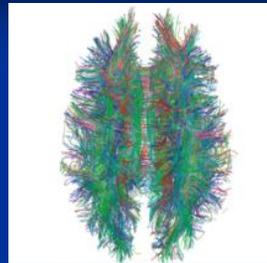
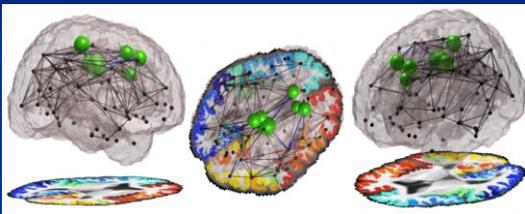
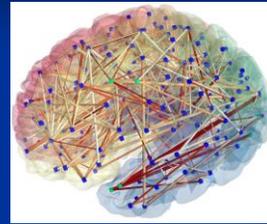
B. Somatic marker vision (Damasio)

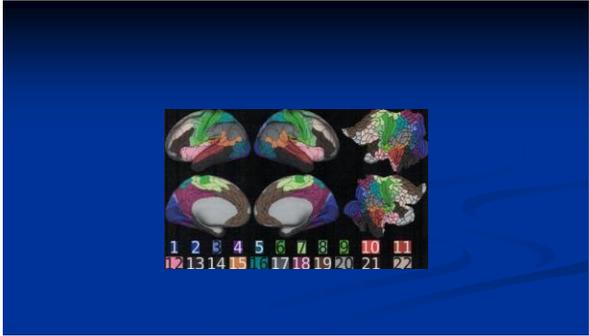
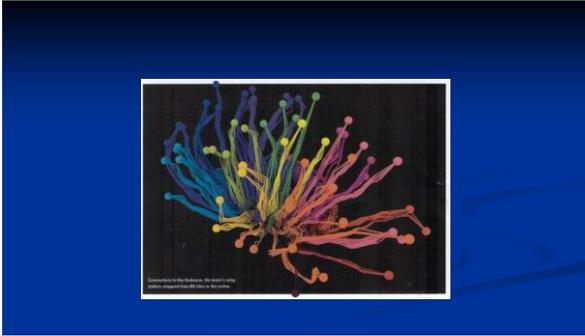
Visceral, sympathetic, emotional feelings are integrated with cognition into a conscious emotional experience in the ventromedial PFC.



4. The Human Connectome Project and the Brain Atlas

- a. A functional “mapping of the human brain”
- b. non-invasive neuro-imaging of cognition and emotion (MRI, fMRI, DTT)
- c. Washington University, Minnesota University, Oxford University
- d. datasets worldwide (from 2013 on)
- e. the emotional brain becomes “tangible” in healthy people, in neuropathology, in psychopathology and an ID cohort is foreseen in the years to come





Year	Author(s)	Journal	Key Findings
1990	Sperry	Brain	Split-brain studies showing lateralization of language and motor control.
1995	LeDoux	Journal of Neuroscience	Role of the amygdala in emotional processing.
2000	LeDoux	Journal of Neuroscience	Neural pathways of fear: the amygdala as a central hub.
2002	LeDoux	Journal of Neuroscience	Neural pathways of fear: the amygdala as a central hub.
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2015	LeDoux	Journal of Neuroscience	Neural pathways of fear: the amygdala as a central hub.
2016	LeDoux	Journal of Neuroscience	Neural pathways of fear: the amygdala as a central hub.
2017	LeDoux	Journal of Neuroscience	Neural pathways of fear: the amygdala as a central hub.

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VII. Conclusions

- A. Growing insights into the *question of emotions* in neurobiology, neuropsychology, psychiatry and ID research
 - B. An *emotional brain* interwoven with a cognitive brain and a social brain
 - C. Evolution to a mapping of the (emotional) brain (in ID) by the *human connectome project*
-