Disorders of Emotion Control & Expression after Traumatic Brain Injury.

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Emotion

“The principle currency underpinning human relationships”.
“The motivational force for the best and worst of human behaviour”.

R Dolan

*Emotion, Cognition, and Behaviour.*

*Science, 2002. 8(298),1191-1194.*
Friedrich Nietzsche (1889)

Understanding emotion in others means that you can share other people’s experiences.

“If we don’t learn how our actions and judgements affect others, we will never learn to appreciate other people’s needs and feelings”.

‘Theory of Mind’ (ToM)

**SOCIAL COGNITION**

(the domain of neuroscience)
Key structures in the regulation and expression of emotion

Davidson et al (2000), Science, 289, 591-594

orbito-frontal cortex
anterior cingulate
ventral striatum
hypothalamus
hippocampus
amygdala
insula.

A complex circuit largely mediated by serotonin
Impact of Traumatic Brain Injury

“Whatever the site of injury the principle location of damage is the frontal structures”

(Teasdale & Mendelow 1984)
Deceleration pressure gradients determine motion of brain, relative to skull.

Contusions cluster around anterior temporal and basal frontal regions.

Courville 1937
Amygdala
Emotion Perception & Expression

- Controls our ability to recognise emotion from facial expression.
- Specialised to detect nature of emotional stimuli.
- Perceptions of anger or fear in others can elicit an emotional reaction in the observer.
Insula
Emotional awareness.

**Empathy**

(Shamsay-Toory et al, 2004)

Associated with ventromedial prefrontal cortex

Empathy

“The binding force of social cognition, allowing individuals to share experiences and understand each other’s perspective”.

Eslinger et al 2002
Cognitive Empathy

- Capacity to comprehend another person’s situation - *Perspective-taking*
- Allows us to attribute an emotion to another person’s perspective of their situation.
  - Permits mutual understanding of an emotional state.
  - Helps predict the behaviour of others
- But does not evoke an affective state in the observer.
Emotional Empathy

- The ability to vicariously experience the emotions of others.
- Makes someone well-attuned to another person’s inner emotional world
  - “I feel what you feel”
  - “You’re upset so I’m upset”
- Motivates humans to behave altruistically towards relatives and friends.
Traumatic Brain Injury
&
Emotional Deficit Disorder ?
Deficits in Emotional Empathy

Associated with:-
- right sided orbital lesions
- medial pre-frontal lesions.
  (Shamsay-Toory et al, 2004)
- Lesions affecting the Insular
  (Schulte-Ruther et al 2007)

Therefore, we should expect to find a high number of people with TBI who exhibit a lack of empathy??
Measures of Empathy

Emotional Empathy

- Measured by the BEES. (Balanced Emotional Empathy Scale). Mehrabian (1997)
  - Higher the score – lower the ability to empathise.
- A self-report questionnaire subject to biased reporting and problems associated with a lack of insight.
- Important to obtain information from close relatives.
Sample of BEES Content

Â I cannot feel much sorrow for those who are responsible for their own misery.
Â I am moved deeply when I observe strangers who are struggling to survive.
Â I hardly ever cry when watching a very sad movie.
Â I can almost feel the pain of elderly people who are weak and must struggle to move about.
Â I cannot relate to the crying and sniffling at weddings.
Â It would be extremely painful for me to have to convey very bad news to another.
Â Unhappy movie endings haunt me for hours afterward.
Â It pains me to see young people in wheelchairs.
Â It is very exciting for me to watch children open presents.
Â Helpless old people don't have much of an emotional effect on me.
BEES Scoring

Å +4 = very strong agreement
Å +3 = strong agreement
Å +2 = moderate agreement
Å +1 = slight agreement
Å  0 = neither agreement nor disagreement
Å -1 = slight disagreement
Å -2 = moderate disagreement
Å -3 = strong disagreement
Å -4 = very strong disagreement
Prevalence of Emotional Empathy After TBI

Test of Proportion: $z = 3.919$, $P < 0.001$

Behavioural Characteristics

- Social veneer preserved
  - Relates well at a superficial (social) level.

- Egocentric & Self-centred
  - Neglects the emotional state of others
  - Decreased social awareness.
  - Reduced tact and discretion.

- Emotional blunting.
  - Insensitive/indifferent to the emotional state of others.
  - Fails to relate emotionally to other people.
  - No warmth or affection to partners and children.
Psychological Impact

Å Rosenbaum and Najenson (1976)
- Wives of TBI soldiers experienced greater distress and lack of emotional connection compared to those with only spinal cord injury.

Å Mauss-Clum and Ryan, (1981)
- 32% reported being married to a stranger.
- A lack of any emotional bond

- Selfish and socially immature (Oddy et al)
- Emotionally distant (Kreutzer et al)
- Partners or spouses experience greater distress than parents.
Marital Discord

Å Keutzer and Zasler (1989):
  38% of spouses report poor communication with their partner.

Å Gosling and Oddy (1999):
  partners expressed gratitude for support received but did not exhibit physical or emotional affection.

Å Milders, Fuchs and Crawford (2003):
  insensitive to partner’s emotional expressions
  impaired understanding of partner’s social behavior
  failed to adjust behaviour in accordance with social rules and demands
Relationship Failure

  - less than a third of their sample remained married after 2 years post injury.

- Stillwell and Stillwell (1997)
  - 30% of 234 severe patient’s relationships ended in divorce 7 years post-injury severe.

- Wood and Yurdakul (1997).
  - 131 participants 5-8 years post-injury,
  - 49% ended in divorce or separation

  - 48 participants 1 year post-injury
  - Divorce rate = 17%; Separation rate = 8%.
Loneliness: a frequent legacy of serious TBI.

TBI mainly affects young males between 19 and 25 yrs.

Early stage of establishing independence in: *friendships, leisure activities, intimate relationships, residence, and employment.*

Social isolation re-creates dependence on family.

A major challenge facing community rehabilitation.
What explains a person’s difficulty recognising, describing, and expressing feelings?

Alexithymia ?
A three factor Personality Construct

1. Difficulty identifying feelings
2. Difficulty describing feelings to other people
3. An externally-orientated thinking style

General Population Prevalence
7-10% (Pasini et al 1992)
Measured by TAS-20
Toronto Alexithymia Scale -20 Item Version

- I am often confused about what emotion I am feeling.
- It is difficult for me to find the right words for my feelings.
- I have physical sensations that even doctors don’t understand.
- I am able to describe my feelings easily.
- I prefer to analyze problems rather than just describe them.
- When I am upset, I don’t know if I am sad, frightened, or angry.
- I am often puzzled by sensations in my body.
- I have feelings that I can’t quite identify.
Alexithymia:
Associated with damage to a number of cerebral structures

- Corpus Collosum (TenHouten et al. 1985, 1987)
- Right anterior cingulate (Lane et al. 1997; Gundel et al. 2004)
- Medial Orbital PFC (Ochsner et al. 2002)

Therefore, pathology of alexithymia reflects that of TBI. Therefore, increased risk of alexithymia following TBI ??
Prevalence of Alexithymia after TBI

Psychological Impact

- Do not recognise their own emotions
  - Therefore insensitive to emotional state of others.
- Emotionally cold
  - Little warmth or affection to partners and children.
- Poor social cognition
  - Lack social tact and discretion.

Alexithymia & Inability to Empathise

Percentage of alexithymic cases reporting low empathy

Ventromedial Prefrontal Cortex
Links thoughts & intentions with reactions of the
Autonomic Nervous System.

Awareness of Emotions
Somatic Marker Hypothesis
Damasio 1994

- Somatic markers - (gut feelings; an ANS response)
- Helps direct attention to the outcome of an action.
  - Aids decision making
- An automatic alarm system
  - Beware of the danger ahead if you choose this option.
- Allows us to think of alternative response options
  - Improves social judgement in risky situations
- Mediates emotional decision making.
  - How we feel about an outcome will mediate action.
Somatic Marker Dysfunction
(Ventro-Medial Dysfunction)

Â No emotional intuition
  ï Diminished sense of right or wrong.

Â Poor decision-making in situations that involve ambiguity.
  ï Difficulty choosing between options or actions with uncertain outcomes

Â Unable to delay gratification
  ï Choose immediate rewards
  ï No thought about consequences of decisions or actions.
Impaired capacity to learn from mistakes

“they make the same (bad) decisions even though they always lead to negative consequences”.

Not due to any loss of intelligence or memory, as measured using conventional psychological methods.

Bechara, Tranel, Damasio (2000).
Characterization of the decision-making deficit of patients with ventromedial prefrontal cortex lesions. Brain 123 (Pt 11): 2189–202

The Role of Ventromedial Prefrontal Cortex in Decision Making: Judgment under Uncertainty or Judgment Per Se?” Cerebral Cortex 17.11
Impact on Somatisation

The inability to recognise and/or describe one’s own emotional state increases the risk that psychological distress will be expressed as physical symptoms.
Alexithymia & Somatisation

SCL-90 measure of somatic distress

N = 83/196 TBI cases, mixed severity

- Alexithymia M = 17.47, SD = 9.03
- No-alexithymia M = 9.50, SD = 9.19

\[ t_{[81]} = 3.838, p < .0005 \]

Alexithymia accounted for 17.7% variance in somatisation scores

\[ R^2 = .177, F_{[1,81]} = 18.595, p < .0005. \]

TBI cohort recorded a significantly higher proportion of alexithymia (63.9%) than rates reported for:
- Depression 45% (Z = 2.65, p < .005)
- Social phobia 28% (Z = 3.87, p < .0001)
- Panic disorder 34% (Z = 4.02, p < .0001)
- But not anorexia 68% (Z = -0.56, p > .05).
Alexithymia & Suicide Ideation


N = 105 TBI: Controls matched - Age; gender, estimated VIQ

Direct logistic regression correctly classified 67.6% of cases. Odds ratio for TAS-20 scores indicated that for every point increase on TAS-20, the odds of reporting SI increased by a factor of 1.035. Only worthlessness made a unique significant contribution to the model.
TBI group reported higher rates of alexithymia on TAS-20 (54.7% vs. 11.1%), (** = p< .0005; * = p<.005).
Alexithymia & Aggression 2

Higher aggression questionnaire ratings in TBI group

\((** = p< .0005; * = p<.001)\).

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<td>TAQ Total</td>
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What explains the link between alexithymia and aggression?

**Altered Personality**

- Emotionally distant / egocentric
- No empathy
  - A lack of sensitivity towards emotional state of others.
- Angry disposition
- Little/no remorse for angry outbursts
- Will not accept responsibility
- Attributes blame to external factors
Developmental Implications
Map of human cortical development.
Cortical grey matter development between ages 5 to 20 years.

Implications of TBI in Childhood

- Delayed maturational development
  - ‘Childish’ behaviour
- Delayed social cognition
  - Slow to recognise and respond to social cues
- Lack of emotional sensitivity.
  - Less able to experience or exhibit age-related empathy

- Unable to delay gratification
- Impulsive decision making.
- Lack of tolerance
- Shallow irritability
- Quick temper
  - No remorse
  - No moral compass

PFC damage in childhood prevents or delays the development of a moral or social frame of reference.
Lack of Moral Template

Â More likely to engage in selfish actions that break moral rules or cause harm to others.


Â Indifference to punishment and reward. No sense of guilt or remorse; no moral responsibility (Anderson et al, 1999).

Â Increases the risk of ‘Pseudo-psychopathy (Blumer and Benson, 1975)

ï Acquired behaviours similar to those seen in psychopathic individuals.
Pseudo-psychopathy

- Two patients - 20 and 23 years old at time of follow up
- Intellect, memory and language developed normally
- Impaired decision making, unable to make realistic plans for the future
- Disruptive behaviour - physical & verbal abuse
- Sexual irresponsibility coupled with a lack of guilt and remorse.
- Lack of empathy for others and an egocentric perspective on the world.
- Failed to acquire social and moral knowledge. Both exhibited moral reasoning appropriate for a ten year old
- “Behaviour akin to that of a psychopath”

Lesions in the vmPFC produce characteristics similar to those in people with psychopathic personality traits.


Link between prefrontal cortex injury and a lack of moral reasoning in criminal psychopaths.

- Adrian Raine (2000)
TBI & Criminality

60% of criminals in British prisons have a history of head trauma.


- “Over 60% reported ‘Head Injuries’.
- 16% had experienced moderate-to-severe TBI
- 48% mild TBI.
- Adults with TBI were younger at entry into custodial systems
- Reported higher rates of repeat offending.
Treatment

Å Pharmacology
   ï SSRI antidepressants

Å Psychological interventions
   ï Cognitive-behaviour-therapy
   ï Mindfulness training

Å ‘Hormonal’
   ï Oxytocin
      Å Social bonding (the love hormone!!)
      Å Improves social cognition via increased empathy?
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