UTILISING NEUROBIOLOGY TO INFORM EFFECTIVE WORK WITH COMPLEX PTSD PRESENTATIONS

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TRAUMA AND DISSOCIATION SERVICE

TDS is an out-patient psychotherapy national trauma unit for the treatment of adults suffering from PTSD, Complex PTSD (CPTSD) and Dissociative Disorders (DD).

We deliver NICE treatments as well as innovative attachment base treatments including Sensorimotor Psychotherapy and Lifespan Integration Psychotherapy.
“Man is to be identified by his affirmative thought, by the singular truths of which he is capable, by the Immortal which makes of him the most resilient and paradoxical of animals.”

Alain Badiou
A NOISY BRAIN

- Response to trauma is complex.

- Chronic physiological arousal and the failure to regulate autonomic reactions to internal or external stimuli affects people’s capacity to utilise emotions as signals.

- They tend to *react* to things rather than *process* information to assess what is needed; often they overreact to stimuli and may become aggressive easily. The challenge in trauma therapy is to work with patients who have diminished capacity of intellectual functions, including language.

- I made some suggestions of possible ways of working with this group of patients informed by the neurobiology of trauma.

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SUMMARY OF THE PRESENTATION

- PTSD (ICD-11)

- Cortical vs subcortical processing and the autonomical arousal model

  The Olfactory Sense (Rinencephalon)
  - Clinical case

  The Earliest Acoustic Memory (Mismatch Negativity: MMN)
  - Clinical case

  Mirror neurones
  - Clinical case

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PTSD (ICD-11)

Essential Features:

Development of characteristic symptoms following exposure to an extremely threatening or horrific event or series of events.

Re-experiencing of the Traumatic Events:

• Intrusive recollections of the event(s) as images, thoughts or perceptions. Dissociative flashbacks (images, sounds, smells and tactile sensations associated to the trauma).
  • Nightmares

• Intense psychological distress when reminded of the trauma

• Physiological reactivity on exposure to cues that resembles /symbolises the trauma or parts of it.

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PTSD

Hyperarousal:
A state of perceived current threat in the form of hypervigilance (with irritability, insomnia, anger) or an enhanced startle reaction. The symptoms must also last for several weeks and interfere with normal functioning.

Avoidance:
Marked internal avoidance of thoughts and memories or external avoidance of activities or situations reminiscent of the traumatic event(s). Inability to recall important parts of the trauma; feelings of detachment towards others and numbness.

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COMPLEX PTSD (ICD-11)
(FORMERLY: ENDURING PERSONALITY CHANGE AFTER CATASTROPHIC EXPERIENCES)

Symptom Pattern
Core symptoms of PTSD (re-experiencing in the present, avoidance, hyperarousal)

Plus
Persistent and pervasive impairments in:

- **affective functioning**: Affect dysregulation, heightened emotional reactivity, violent outbursts, tendency towards dissociative states when under stress
- **self functioning**: Persistent beliefs about oneself as diminished, defeated or worthless; pervasive feelings of shame, guilt
- **relational functioning**: Difficulties in sustaining relationships or feeling close to others.

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A quick recap

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CORTICAL VS SUBCORTICAL PROCESSING

Le Doux found that the memories of fearful experiences involve at least 2 neuronal organisations:

1) An implicit emotional memory system (associated with amygdala)

2) A declarative or explicit memory (linked with hippocampus) associated with conscious recollection. Both usually operate simultaneously and in parallel but the functioning can be dissociated. (Le Doux 1995)

In severely traumatised subjects accessing the cognitive functioning is very difficult as frontal cortex functioning is reduced and the more prominent levels of emotions, such as anger/fear dominate the presentation.

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CORTICAL VS SUBCORTICAL PROCESSING

Accessing these emotions at the level of intervention in therapy is a challenge. This is also relevant in child parts work where at times the arousal level takes over the more functioning accessible apparently normal part of the personality (ANP) (Nijenhuis et al, 2004)

The lower automatic level of processing of emotions can highjack the system before a more complex system (more cognitive) can be connected.
OPTIMAL AROUSAL ZONE OR WINDOW OF TOLERANCE: feelings and reactions are tolerable; we can think and feel simultaneously; our reactions adapt to fit the situation

SIGNS OF HYPERAROUSAL: overwhelm, panic, impulsivity, hypervigilance, defensiveness, feeling unsafe, reactive, racing thoughts, anger or rage

SIGNS OF HYPOAROUSAL: numb, “dead,” passive, no feelings, can’t think, disconnected, shut down, “not there,” can’t defend

AUTONOMIC AROUSAL MODEL [OGDEN, MINTON & PAIN, 2006]
CORTISOL SYSTEM IN PTSD

• Trauma survivors with PTSD show a different cortisol response from that observed under conditions of acute and chronic stress and in disorders such as major depression.

• Patients with PTSD have lower cortisol levels than healthy controls and people with other psychiatric diagnoses (Yehuda R et al. 1990, Kellner M et al. 1997).

• Patients with PTSD respond to dexamethasone by suppressing their cortisol levels to a greater extent than healthy people do (Yehuda R et al. 1995, Stein MB 1997). This hyper-suppression of cortisol suggests that cortisol receptors are more sensitive (Yehuda R et al. 1995). This hyper-suppression is opposite to the non-suppression seen in depressed patients (Carroll BJ. 1982).

• These suggest that PTSD patients may be extremely sensitive to external events and may hyper-respond, even to non-dangerous environmental stimuli (Yehuda R et al. 1996).
HUMAN BRAIN

In the course of evolution, the human brain has developed 3 interdependent parts:

1. **BRAINSTEM AND HYPOTHALAMUS** (primarily associated with the regulation of internal homeostasis (e.g. regulation of hormones)

2. **LIMBIC SYSTEM**, in charge with maintaining the balance between the internal world and the external reality (oral and genital function; parental care; audio vocal behaviour and play)

3. **NEOCORTEX**, responsible for analysing and interacting with the external world. (primarily oriented to the external world; reasoning strategies to attain personal goals, making decisions, weighing a range of options and predicting outcomes of our own actions; also deciding which stimuli is useful and which is not)

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HUMAN BRAIN

Together the 3 systems control a range of regulatory functions:

1. **INTERNAL VEGETATIVE FUNCTIONS**: rhythms of rest/sleep and activity, feeding, reproductive cycles...

2. **CONTROL RELATIONSHIPS WITH THE OUTSIDE WORLD**: assessing novelty (analysed against the previously stored knowledge), danger, gratification, selection of what is needed and discard what is not relevant.

3. **LEARN FROM EXPERIENCE**: the organism needs to be able to engage in routine tasks without being distracted by irrelevant stimuli...

4. social function of the brain allows to engage in complex social systems.

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AMYGDALE

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ventromedial frontal cortex
planning and decision making

hippocampus

basal ganglia

basal forebrain

hypothalamus

memory and attention

homeostasis

visceral

neuroendocrine output

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“Therapy is not simply method and technique, at the heart of it all is the spirit of our work”

Ron Kurtz (body-centered psychotherapist)

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OLFACTORY SENSE

Olfactory cells in the nose are neuronal cells originating in the central nervous system (CNS).

All sensory information except smell passes through the Thalamus before reaching the cortical areas.

Smell has to be volatile, dissolve in water and oil and only gets stimulated if the air penetrates the nose upwards to the posterior area of the nose (this occurs during the inspiration). The response takes milliseconds.

The threshold of smells is extremely small (methilmercaptan, is mixed with natural gas in amounts of 1/25 000 000 000 of a mgs/1 ml of air) and the adaptation is extremely fast (approximately 50% after 1 second of the stimulus).
OLFACTORY SENSE

Transmission (little known): Nose-cells connect to the olfactory tract and connect with 2 areas of the CNS:

1. Medial Olfactory Area (MOA) (in front and above the hypothalamus)
2. Lateral Olfactory Area (LOA) (wired directly to amygdala)

From MOA and LOA: connection with hypothalamus, thalamus, hippocampus and brain stem. These areas have a control role in relation to automatic responses to smells - including fear, pleasure, excitement etc...

LOA also connects with temporal lobe cortex and prefrontal cortex. The suppression of the lateral olfactory tract will suppress the complex response to smell.

In animals sense of smell is directly linked to emotion, territorial behaviour, aggression and sexuality.

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- Subjects were less good at identifying smells than healthy controls; this was associated with more aggression/impulsive behaviour.

In summary:

- Directly linked to the amygdala and frontal lobes
  - It takes milliseconds to reach it
  - Linked to survival in animals
MARY AND THE ROSE OIL

- 50 year old Australian married woman
- Mother of 3 children (ages 10, 12 and 16)

- Physically, emotionally and sexually abused by mother from birth to age 18. Abuse included force-feeding until age 7; being fed on her own vomit; hit with stick on her legs.

- In her teens, suffered from anorexia and required 2 short admissions in hospital due to this problem.

- Self harm: superficial cuttings around knee area for a number of years, also superficial cuttings in her wrists and taking small overdoses of her regular medication.

- OCD: compulsive cleaning of her house for up to 9 hours a day.
Referred to the TSS for 2\textsuperscript{nd} opinion.

Apart from 2 admissions in her teens, no further contact with mental health services until maturity. At the time of her referral to our unit, she had been an inpatient for 2 years due to dissociative fugues.

8 sessions of EMDR triggered current situation: abreaction in one of the EMDR sessions, since then has stopped minor self harm but started severe self harm while in dissociative fugue.

Several services involved in her care: psychiatric team, A&E, surgeons, police, helicopters.

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CLINICAL PRESENTATION

• Dissociative fugues: disappears unaware of what she does or where she is, finding herself in the middle of nowhere, in the countryside, with deep cuts in her legs.

• As a result of this she had part of her leg amputated, had MRSA infection; surgeons concerned they may need to amputate leg or that she may die in one of her dissociative fugues.

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SUMMARY OF PREVIOUS TREATMENTS

- Inpatient admissions for eating disorder in teens
- Psychoanalytic Psychotherapy, twice a week for a number of years (in her 40s)
- EMDR, 8 sessions (in her 40s)
- Ongoing inpatient treatment due to high risk of accidental death due to self harm (2 years by the time she was referred to TSS)
- Psychotropic medication at the time of referral included: antipsychotics, antidepressants, benzodiazepine, anticonvulsants.
TSS ASSESSMENT

3 sessions (of 2 h each), due to severe dissociative episodes.

Major trigger during assessment: when asked about her appetite, she changed her presentation, becoming childlike, aggressive and wanting to scratch the psychiatrist’s face. The use of rose oil brought her back to her adult self within seconds.

The interview continued using rose oil to prevent further dissociative episodes.

Diagnosis made: DID.
TREATMENT RECOMMENDATIONS

Rose oil as part of her treatment:

Used by the patient on strap around mobile phone. This stopped most dissociative fugues.

Used in the inpatient unit by nursing staff:
• reduced the use of IM tranquilisers
• reduced restrictions by nursing staff
   (both methods were used to prevent self-harm).

Used during therapy sessions to ground her and prevent/reduce dissociative episodes

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“Living things are called organisms because of the overriding importance of organisation, and each part of the pattern somehow contains the information as to what it is in relation to the whole”

R O Becker, (The Body Electric)
PTSD: PHYSIOLOGICAL AROUSAL MODEL

- Hyperarousal to intense but neutral stimuli and or loss of stimulus discrimination may be due to abnormalities in habituation to the acoustic startle response (Shalev et al. 1992, Ornitz & Pynoos 1989).

- The failure to habituate to acoustic startle suggests that traumatised people have difficulty evaluating sensory stimuli and mobilising appropriate levels of physiologic arousal (Shalev et al. 1992).

- These patients suffer from heightened physiologic arousal in response to sounds, images, and thoughts related to specific traumatic incidents, responding with increases in heart rates, skin conductance and blood pressure (Malloy et al. 1983, Pitman et al. 1987).

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THE EARLIEST ACOUSTIC MEMORY (MMN)

The ability to detect unusual and possibly dangerous events in the environment is fundamental in ensuring the survival of biological organisms (Tiitinen et al. 1994).

MMN is an early auditory event-related potential (ERP) elicited when infrequent ("deviant") sounds occur in a sequence of repetitive ("standard") sounds, even in the absence of conscious awareness of these sounds. The proposition that MMN may form part of an acoustic detection system that humans and some animals have as part of their survival mechanism.

MMN: generated by an automatic (attention-independent) preconscious neural process that contrasts ongoing sensory inputs with a memory trace encoding the physical features of preceding (standard) stimuli. MMN appears to have at least two main subcomponents: (1) a supratemporal MMN subcomponent with a bilateral auditory cortex generator and (2) a frontal MMN subcomponent with a frontal cortex generator.

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THE EARLIEST ACOUSTIC MEMORY (MMN)

The process generating MMN may represent a "call" from preattentive mechanisms to focus attention on a sudden and unexpected change in the auditory environment (Näätänen, 1990).

Näätänen (1995) proposed that MMN provides the best available physiological measure of automatic central processing in audition.

MMN indexes a preconscious cognitive process that is of great importance to the subsequent "conscious" behaviour of the animal (Tiïtinen et al., 1994).

The observation that MMN plays a role in alerting an organism to the introduction of novelty into its environment suggests that disturbances of MMN may relate to abnormalities of arousal and to disrupted processing of auditory stimuli relevant to the development of psychopathology.
MMN IN PTSD

It is known that MMN amplitude increases and latency decreases in states of higher vigilance (Lang et al. 1995).

MMN abnormalities have been obtained in PTSD studies including smaller amplitudes (Menning et al. 2008) and shorter duration (Gene-Cos, 2009). A reduced response in PTSD could represent a compensatory mechanism for chronic hyperarousal and a shortened duration of the MMN could be interpreted as a protective mechanism in order not to be overwhelmed by the arousal levels, a shutting down process would have occurred, electrophysiologically reflected as a shorter MMN duration; clinically this would show as a dissociative phenomena?

MMN dampened down as a possible protective inhibition to the increased arousal or anxiety symptoms associated with this condition?

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ANN

59 year old, Portuguese, linguist (spoke 5 languages), married, one child. No medical or psychiatric history prior to assault in 1998.

Attacked in street with knuckleduster. Developed a sub-arachnoid haemorrhage: 2 brain operations required: first, right internal carotid artery aneurysms; second, a year later, left internal carotid artery aneurysm.

She was left with persistent headaches, morning vomiting, right sided hemi-paresis memory difficulties loosing all her languages and memories of her life.

Re-learned English with speech therapist; never recovered mother tongue and has no explicit memories of her childhood or early adult life prior to learning English.

Severe PTSD with profound psychological and social impairment: constant images of the assault and marked hyperaousal symptoms; unable to leave house, look after family or herself; carer thought-out day and, night with husband. Leaving in constant terror.

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Severe hyperarousal symptoms, marked startle response to any environmental noises (at home as well as anywhere else).

“Catastrophic” responses were common.

Psycho-education using very simple terms and words that were accepted or recognised.

Tape recorder for Ann to take it home and listen to it at least the day before the next session.
ANN IN THERAPY

Initial treatment, using Sensorimotor Psychotherapy (for the first 6 months):

- Ann was unable to be mindful or be grounded.

- Therapist worked inviting the patient to become aware of her body reactions to environmental noises; initially for patient to notice just the noises, later on this was connected to her own body reactions to the noises. This was done in a light manner and quick way at the speed of the noises in the therapy room.

- Learning to habituate to noises around clinic consisted essentially in Ann noticing own breathing and how noises around the clinic affected this.

- Later on the same was done in relation to her marked trembling.

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ANN

Patient slowly was able to settle, with marked decrease in reactivity to noises.

Afterwards engagement with therapy in relation to specific traumatic events was easier as Ann felt less triggered and able to stay more present.

Basic approach: (Sensorimotor Psychotherapy) contact statement and tracking body reactions in relation to noises as it was the most intrusive sensory experience.

Therapist becoming the acoustic novelty detection mechanism (MMN) until the patient was able to do it for herself?

Brain neuroplasticity changes?

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“The overwhelming question in neurobiology today is the relationship between the mind and the brain”

Crick & Koch (the problem of consciousness)

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MIRROR NEURONS

These neurons “mirror” the behaviour of another subject as if the observer were acting themselves. They fire both when the subject acts and when the subject observes the same action performed by another. (Rizzolatti & Craighero, 2004)

Possible functions: understanding the actions of other people; learning new skills by imitation; empathy. (Keysers & Gazzola, 2010)

Functional Magnetic Resonance Imagining (fMRI) studies suggest that in humans, inferior frontal cortex and superior parietal lobe contain Mirror neurons (Iacoboni et al, 1999).
MIRROR NEURONS

Kohut ‘s self-object transferences of mirroring and idealization:
• the need for idealisation and identification in children. self-worth reflected back ("mirrored") empathically by caregivers. These experiences allow them to learn self-soothing and other skills to development a healthy sense of self.

• In addition, self-object relationship as part of being part of a larger human identification with others.

• Kohut believed that the need for such self-object relationships does not end at childhood but continues throughout all stages of a person's life.

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SONIA

24 y old British woman. Gave birth to a severely disabled child who had frequent seizures.

Child died aged 1 year after a seizure at home. Mother had learnt to be “a nurse”; detached herself from her own emotions and attend to her child’s clinical problems.

Partner abandoned her while child was alive as “he could not cope” Diagnosis: PTSD as a result of looking after child, numerous times she had to do CPR on the baby.

Sonia reunited with partner before funeral.

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SONIA IN THERAPY

Referred to therapy when 6 months pregnant. Unable to relate to her pregnancy in any way, “the place of the crime is my belly”. Sonia would walk or sit down without touching her belly: “it feels odd”

At 8 months pregnancy: Sonia unable to talk to her baby, buy any baby items or think about names. Therapist suggested to titrate the contact with her belly. Sonia becomes immediately sick.

Therapist modifies procedure: Sonia to observe therapist touching her own belly, slowly and progressively. Sonia experiences nausea but able to tolerate.

Next sessions, focusing on tracking somatic responses as Sonia observes therapist and using grounding techniques when deregulated.

After 4 sessions, Sonia mentions she can engage with her unborn baby; has a name and has bought pushchair and clothes.

She gives birth to a healthy child and feels well connected to her.

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SUMMARY

Response to trauma is complex.

Chronic physiological arousal and the failure to regulate autonomic reactions to internal or external stimuli affects people’s capacity to utilise emotions as signals.

They tend to react to things rather than process information to assess what is needed; often they overreact to stimuli and may become aggressive easily. The challenge in trauma therapy is to work with patients who have diminished capacity of intellectual functions, including language.

I made some suggestions of possible ways of working with this group of patients informed by neurobiology of trauma.

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“To observe the human being in front of us is fascinating. To work with their pain is a privilege”
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