

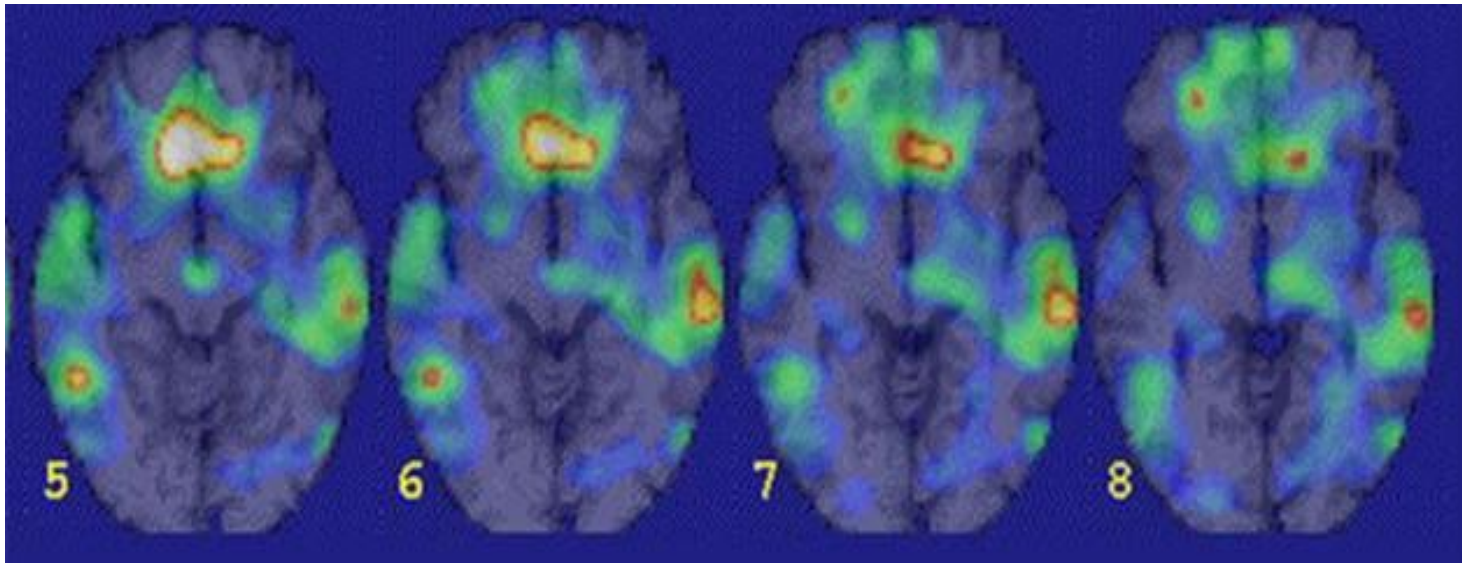
Neuro-cognition of psychological trauma and treatment

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Schema of Trauma formulation

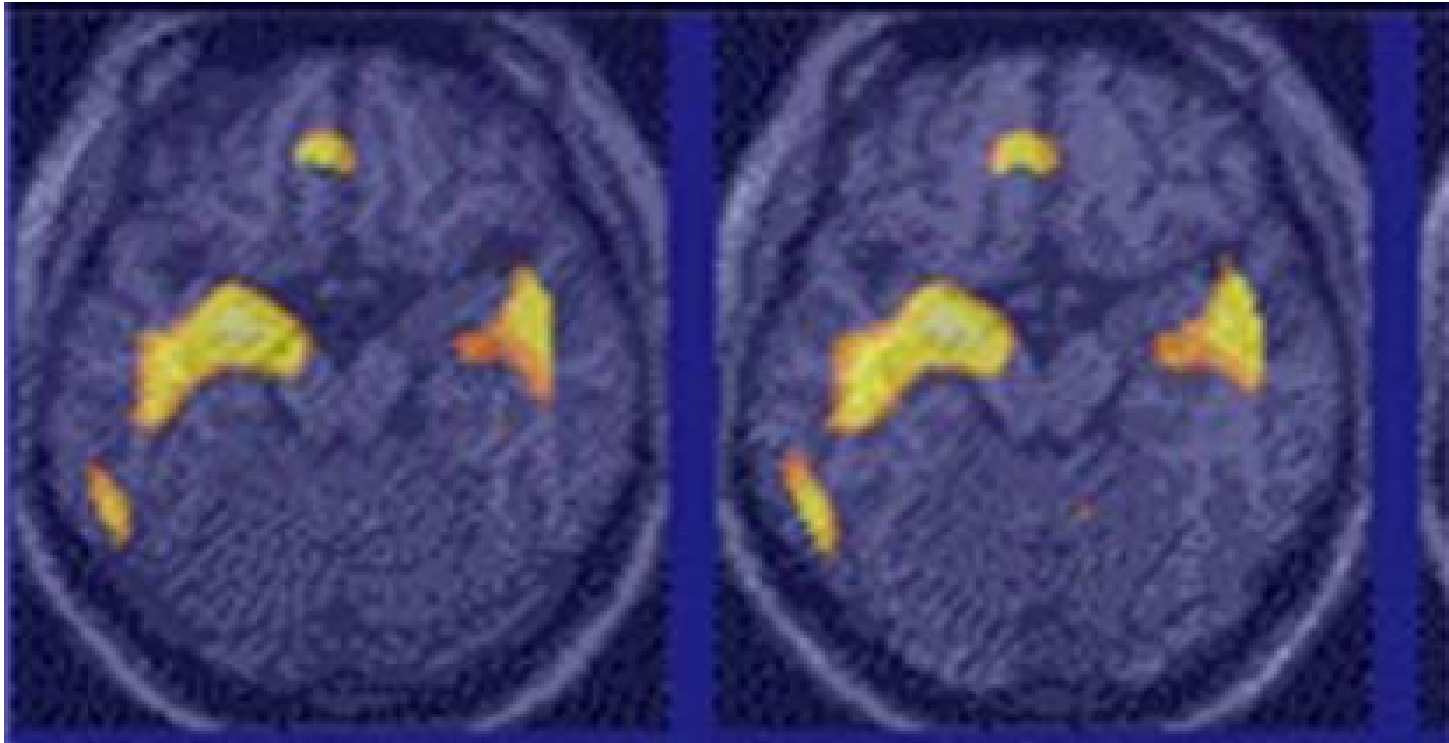
- During traumatic experience
 - Hippocampus and cortex shut down
 - Person becomes emotionally driven

Medial prefrontal activation failed



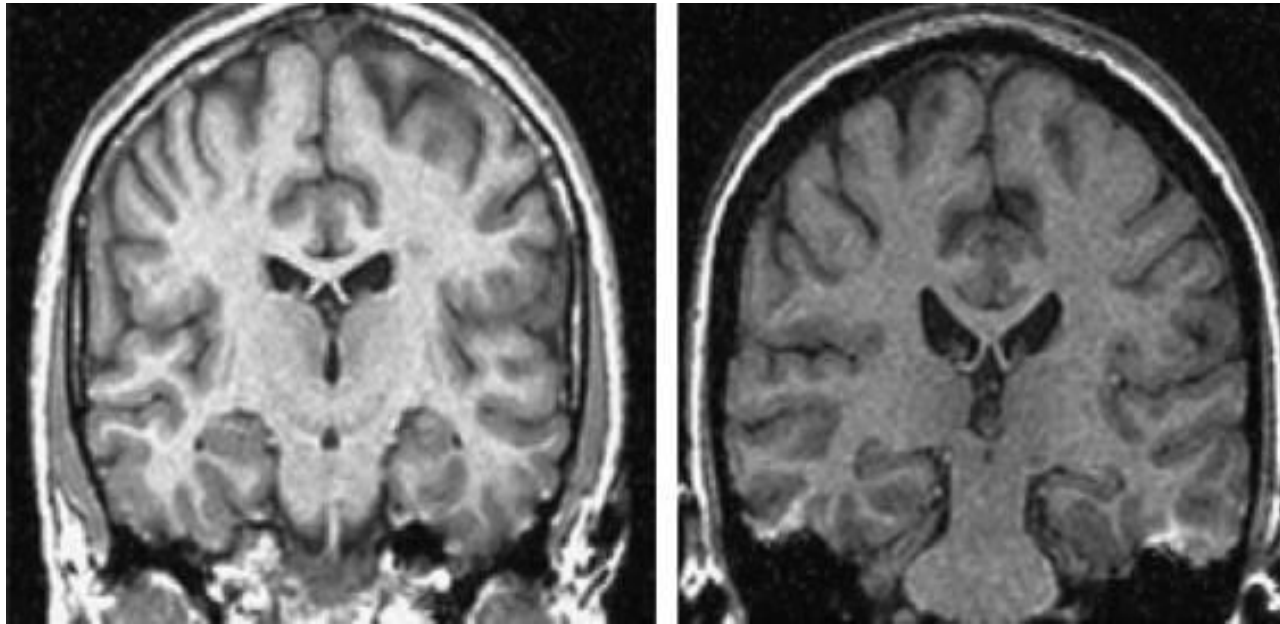
- Medial prefrontal activation failed in a group of combat veterans with PTSD, compared with combat veterans without PTSD, during exposure to traumatic combat-related slides and sounds (*yellow area in prefrontal cortex*)

Amygdala activation increased during acquisition of conditioned fear learning



Women with abuse-related PTSD had greater increases of amygdala activation during fear learning than women without PTSD

Smaller hippocampal volume in PTSD



- Hippocampal volume on MR image in PTSD. Smaller hippocampal volume in a representative patient who has PTSD (*right*) relative to a non-PTSD subject (*left*)

Treatments of PTSD

(international society of traumatic stress studies)

- CBT
- EMDR
- Debriefing
- Art therapy

Why EMDR (eye movement
desensitization and
reprocessing)?

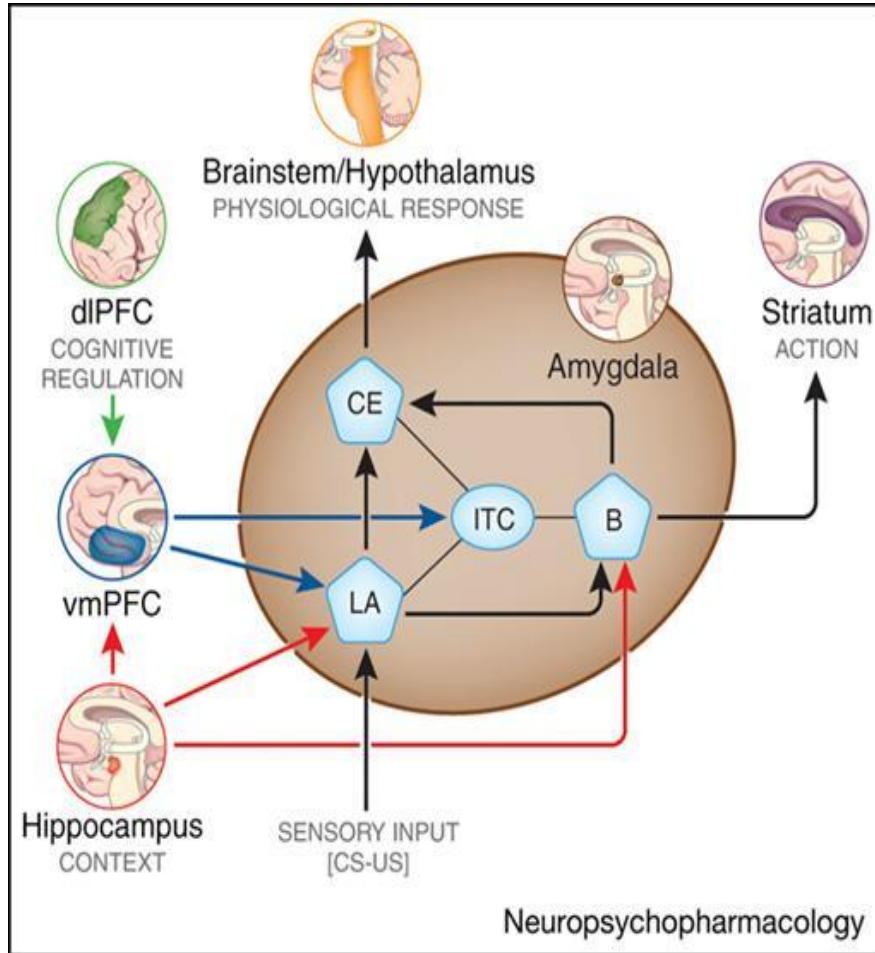
Meta-analysis of EMDR efficacy

- Overall post-treatment effect size for EMDR was **medium** and significant
- Results indicate efficacy of EMDR when effect sizes are based on comparisons between the EMDR and CBT.

[Clin Psychol Rev.](#) 2009 Nov;29(7):599-606

dysregulation of PFC and
amygdala in PTSD

PFC, hippocampus and amygdala



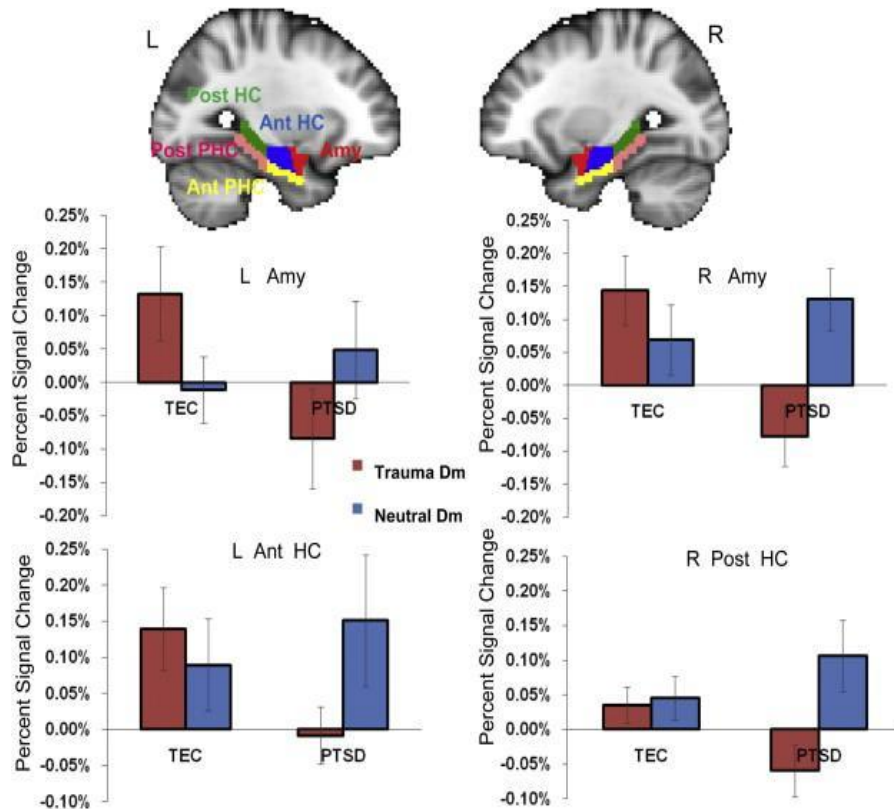
- Lateral nucleus (LA) of the amygdala receives afferent sensory input
- Projections from hippocampus to basal nucleus (B) of amygdala process **contextual information** during conditioning (**gate** fear expression)
- During **extinction learning** and consolidation, inhibitory connections between **vmPFC** and **the intercalated (ITC)** cell masses are established
- During **cognitive regulation**, the dorsolateral prefrontal cortex (dIPFC) regulates fear expression through projections to the vmPFC

Increased med.temporal perfusion reduce cortisol in PTSD

- **higher** cerebral blood flow in **right superior temporal, and fusiform gyri** in PTSD
- **inverse** correlation between cortisol and medial temporal lobe perfusion **herald hippocampal damage**

[Biol Psychiatry](#). 2003 15;54(10):1077-86
Neuropsychopharmacology 2010 35, 136-146

cerebral glucose metabolism and perfusion patterns in PTSD



- PTSD patients showed
 - Reduction in left hippocampal activity associated with high arousal symptoms

Hemodynamic responses of EMDR in PTSD: lat. PFC desensitization vs. symptom improve.

- **Recall with EM** associated with significant decrease in oxygenated hemoglobin concentration in **lateral PFC** compared with Recall without EM.
 - amount of **decrease** significantly correlated with **clinical improvement**
 - performing EM during Recall **reduces the over-activity of the lateral PFC**

[Neurosci Res.](#) 2009 65(4):375-83

- fewer benzodiazepine receptors and/or reduced affinity of receptor binding in the medial prefrontal cortex in patients with PTSD
- alterations in benzodiazepine receptor function in this area may underlie many of the symptoms of PTSD

[Am Journal of Psy, VOL. 157, No. 7](#)



Hyperactive emotion processing *interrupted* memory and attention

- examine differences in functional networks associated with
 - working memory (DLPFC and lat. parietal cortex)
 - emotion processing (amygdala, VLPFC, and fusiform gyrus)
- Enhanced activity in **ventral emotion processing regions** associated with trauma distractors in PTSD group
 - associated with **working memory and attention regions** disrupted by distractor stimuli

EMDR and fear plasticity

Overactivation of limbic region before EMDR

- between patients and controls confirmed the maximal activation in the **limbic cortex** of patients occurring before trauma processing

rPFC hyperactivation in T0

- significantly higher activation was found at T0 in **left rPFC**, and in right visual cortex

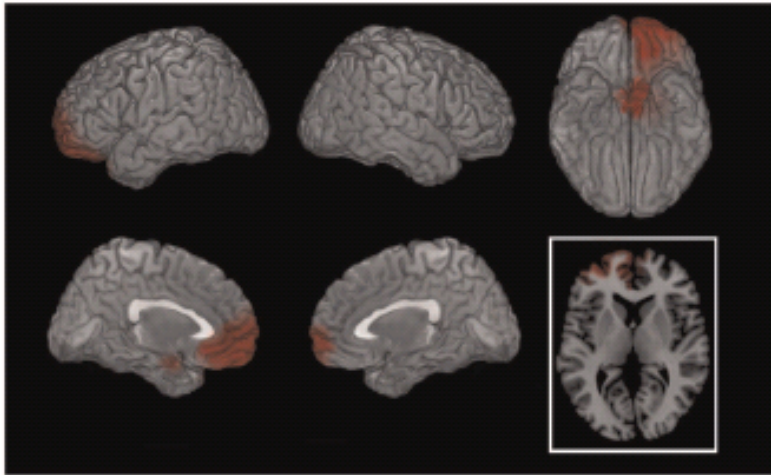


Figure 3. SMDR BS: PATIENTS - CONTROLS (gamma band). Cortical representation of the cluster of voxels in which the EEG signal showed significant differences between groups. Activation increases according a p value < 0.01 and an F value over 2 z-score are depicted by red color scale. Top row left: lateral view of left hemisphere; Top row middle: lateral view of right hemisphere; Top row right: view from below; Bottom row left: medial view of left hemisphere; Bottom row middle: medial view of right hemisphere; Bottom row right: transverse section at prefrontal cortex level (z = 5). Regional details are presented in Table 3. doi:10.1371/journal.pone.0085753.g003

Decrease PF and Cingulate cortex in EMDR

- decreased **prefrontal and cingulate** cortex during EMDR in PTSD patients
 - changes **correlated significantly** with those occurring in neuropsychological tests

Capable of cognitive processing of trauma after EMDR

- traumatic events processed at cognitive level following successful EMDR
 - supporting distinct neurobiological patterns of brain activations during bilateral ocular stimulation associated with a significant relief from negative emotional experiences

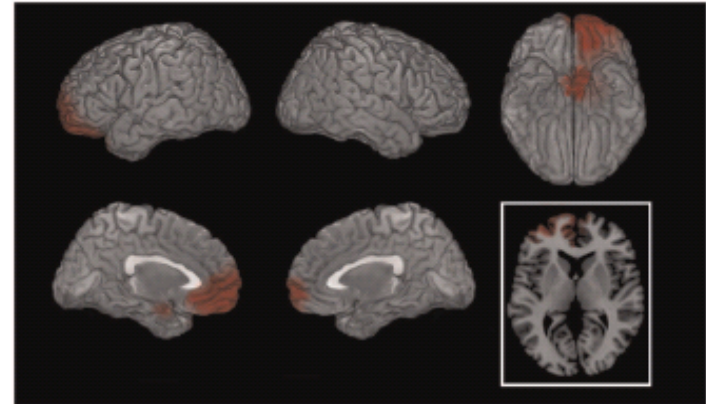


Figure 3. EMDR (E) PATIENTS - CONTROLS (gamma band). Cortical representation of the cluster of voxels in which the EEG signal showed significant differences between groups. Activation increases (scored on a p-value < 0.01 and an F-value over 2) are displayed by red color scale. Top row left: lateral view of left hemisphere; Top row middle: lateral view of right hemisphere; Top row right: view from below; Bottom row left: medial view of left hemisphere; Bottom row middle: medial view of right hemisphere; Bottom row right: transaxial section at prefrontal cortex level level (z = 5). Regional details are presented in Table 3. doi:10.1371/journal.pone.0065751.g003

EMDR reduce vividness and more memory accessible

- EMDR during retrieval reduce subjective vividness and objective memory accessibility during future recall
- In EM group, self-rated vividness of recalled+EM picture decreased

Brief psychotherapy v. EMDR for PTSD

- Both treatments equally effective in reducing PTSD symptom severity
 - response pattern indicated that EMDR led to significantly sharper decline in PTSD symptoms than brief eclectic psychotherapy
- drop-out rates
 - EMDR: 29%
 - brief eclectic psychotherapy 36%

Future applications

EMDR vs. antidepressant in OCD

- after treatment YBOCS scores 19.06 (antidepressant) and 13.6(EMDR)
- EMDR was more effective than citalopram in improvement of OCD signs

EMDR with quicker improvement of OCD

- both therapeutic methods (EMDR and Citalopram) had significant effect in improving OCD
- in short term EMDR has better effect in final outcome of OCD

Treating trauma in psychosis with EMDR

- PTSD symptoms, auditory verbal hallucinations, delusions, anxiety, depression, and self-esteem all improved significantly
- Paranoid ideation and feelings of hopelessness did not improve significantly
- EMDR not lead to symptom exacerbation in subjects

CBT vs.EMDR in children PTSD

- **Both** approaches produced significant reductions on all measures
 - results maintained at follow-up
- Treatment gains of **EMDR** reached in **fewer sessions** (EMDR 4th sessions vs. CBT 8th sessions)

EM produces more distress reduction

- EMDR-with EM led to greater reduction in distress than desensitization-without EM
 - Heart rate **decreased** when EM began
 - skin conductance **decreased** during EM
 - heart rate variability and respiration rate **increased** significantly as EM continued

CBT: DLPFC and meta-cognition use

- activation of **DLPFC** cortex reflect use of metacognitive strategies
- **parahippocampal activation** related to reactivation of contextual fear memory
 - After successful CBT, **no** significant activation found in DLPFC or parahippocampal gyrus

Thank you