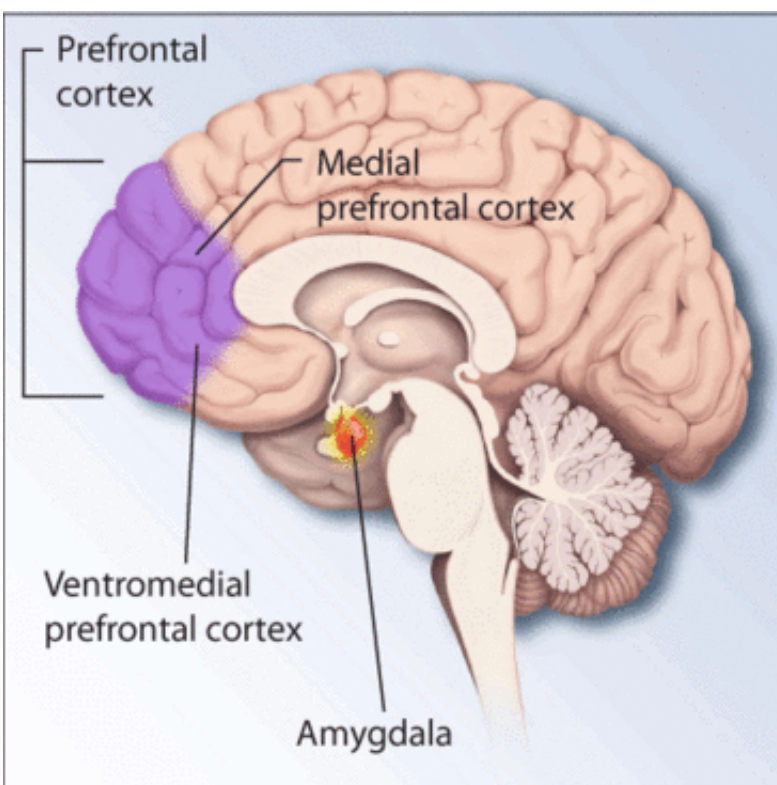


Soldiers with PTSD more 'tuned' to angry faces because of over-connected brain circuits

January 20 2016



Regions of the brain associated with stress and posttraumatic stress disorder.
Credit: National Institutes of Health

Soldiers with post-traumatic stress disorder (PTSD) are more 'tuned' to perceive threatening facial expressions than people without PTSD because of more over-connected brain circuits, according to a new study

published in the journal *Heliyon*. The researchers behind the study, from The Hospital for Sick Children (SickKids) in Canada, in partnership with the Canadian Armed Forces, say understanding how this works could help researchers develop better ways to assess when soldiers are ready to be redeployed.

A study of the Canadian Armed Forces estimates that 86% of those serving in the [armed forces](#) will experience some kind of trauma, such as physical or sexual assault, combat or disaster. This leads to around 7% of those in the Canadian Military developing PTSD at some point in their lives, the risk being higher in soldiers compared to civilians.

PTSD is diagnosed by a physician or psychologist, and can be treated with psychotherapy and medication. However, it is difficult to assess as the symptoms can vary considerably; many are similar to those of concussion - such as memory loss and attention deficit - so the two conditions can be confused. Understanding the [brain](#) circuitry that makes PTSD patients more sensitive to threatening facial expressions could help identify ways to scan the brain and diagnose the condition.

"The heightened perception of anger in PTSD is driven by complicated brain circuitry where the mechanism of communication among a number of key regions that control fear and emotion is over-connected," explained Dr. Benjamin Dunkley, lead author of the study from SickKids.

"Potentially, our new findings can tell us about the heightened threat perception people with PTSD experience - known as hyperarousal - and allow us to develop novel ways of assessing treatment and determining when a soldier is ready to return to deployment."

Individuals with PTSD have a heightened perception of threat, caused by changes in brain activity. Parts of the brain crucial for emotional

reactions, called the amygdalae, are overactive and trigger the "fight or flight" response more readily. The part of the brain that is important for inhibiting fear, called the ventral medial prefrontal cortex, is underactive. However, we do not yet understand how these two regions communicate.

In the new study, Dr. Dunkley and the team showed Canadian Armed Forces soldiers with and without PTSD pictures of angry and happy faces and monitored their brain activity. They carried out the study with 20 soldiers with PTSD and 25 without, and compared the brain activity in the amygdalae and ventral medial prefrontal cortex between the two groups.

The results showed that the soldiers' behavioural reactions to the faces were similar, but their brain responses were very different. The researchers found that a high number of [brain regions](#) were over-connected in soldiers with PTSD when they were shown photos of angry faces, but not when they looked at happy faces.

Furthermore, they found that both the amygdala and the ventral medial prefrontal cortex were highly connected to other brain regions in [soldiers](#) with PTSD when looking at angry faces. This suggests that the heightened perception of threat experienced by those with PTSD is caused by a set of brain regions and circuits becoming over-connected.

"We were surprised to find that all key brain circuits were over-connected in PTSD," said Dr. Dunkley. "This may be why emotional responses are so immediate and automatic, and why threatening faces are such a trigger. These findings emphasize the challenges of living with this PTSD and treating PTSD."

Similar studies had been done previously using MRI, but this method involves a time lag between the response and the measurement, which

affects the results. For the new study, the researchers used a technique called magnetoencephalography (MEG) that can directly measure [brain activity](#) in real-time.

"The latest advances in imaging techniques are pushing forward the boundaries of what we know about the human central nervous system, and are increasingly being used to study psychiatric and neurological conditions, providing valuable information about the neurobiological basis of such disorders," said Dr. Dunkley. "PTSD is a complicated, multifaceted disorder that can be now be studied using these advanced techniques."

More information: "Threatening faces induce fear circuitry hypersynchrony in soldiers with post-traumatic stress disorder" [dx.doi.org/10.1016/j.heliyon.2015.e00063](https://doi.org/10.1016/j.heliyon.2015.e00063)

Provided by Elsevier

Citation: Soldiers with PTSD more 'tuned' to angry faces because of over-connected brain circuits (2016, January 20) retrieved 10 February 2023 from <https://medicalxpress.com/news/2016-01-soldiers-ptsd-tuned-angry-over-connected.html>

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