

# Discovery in the brains of army veterans with chronic pain could pave way for personalized treatments

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A new study is the first to investigate brain connectivity patterns at rest in veterans with both chronic pain and trauma, finding three unique brain subtypes potentially indicating high, medium, and low

susceptibility to pain and trauma symptoms. The findings provide an objective measurement of pain and trauma susceptibility and could pave the way for personalized treatments and new therapies based on neural connectivity patterns.

Chronic pain and trauma often co-occur. However, most previous research investigated them in isolation and using subjective measures such as surveys, leading to an incomplete picture. A new study in *Frontiers in Pain Research* has filled in some of the blanks. It found three unique brain connectivity signatures that appear to indicate veteran susceptibility or resilience to pain and trauma, regardless of their diagnostic or combat history. The study could pave the way for more objective measurements of pain and trauma, leading to targeted and personalized treatments.

## **Chronic pain and trauma are linked but not studied together**

"Chronic pain is a major public health concern, especially among [veterans](#)," said first author Prof. Irina Strigo of the San Francisco Veterans Affairs Health Care Center. "Moreover, [chronic pain](#) sufferers almost never present with a single disorder, but often with multiple co-morbidities, such as trauma, post-traumatic stress, and depression."

Researchers already understand that both pain and trauma can affect connections in our brains, but no one had studied this in the context of co-occurring trauma and pain. Much pain and trauma research also relies on subjective measurements such as questionnaires, rather than objective measurements such as [brain scans](#).

## **Identifying brain connectivity signatures of pain and trauma**

Taking a different approach, the researchers behind this new research studied a group of 57 veterans with both chronic back pain and trauma. The group had quite varied symptoms in terms of pain and trauma severity. By scanning the veterans' brains using functional magnetic resonance imaging, the researchers identified the strength of connections between brain regions involved in pain and trauma. They then used a statistical technique to automatically group the veterans based on their brain connection signatures, regardless of their self-reported pain and trauma levels.

Based on the veterans' brain activity, the computer automatically divided them into three groups. Strikingly, these divisions were comparable to the severity of the veterans' symptoms, and they fell into a low, medium, or high symptom group.

The researchers hypothesized that the pattern of brain connections found in the low symptom group allowed veterans to avoid some of the emotional fallout from pain and trauma, and also included natural pain reduction capabilities. Conversely, the high symptom group demonstrated brain connection patterns that may have increased their chances of anxiety and catastrophizing when experiencing pain.

Interestingly, based on self-reported pain and [trauma symptoms](#), the medium symptom group was largely similar to the low symptom group. However, the medium symptom group showed differences in their brain connectivity signature, which suggested that they were better at focusing on other things when experiencing pain, reducing its impact.

## **Putting the findings into future practice**

"Despite the fact that the majority of subjects within each subgroup had a co-morbid diagnosis of pain and trauma, their brain connections

differed," said Strigo.

"In other words, despite demographic and diagnostic similarities, we found neurobiologically distinct groups with different mechanisms for managing pain and trauma. Neurobiological-based subgroups can provide insights into how these individuals will respond to brain stimulation and psychopharmacological treatments."

So far, the researchers don't know whether the neural hallmarks they found represent a vulnerability to trauma and pain or a consequence of these conditions. However, the technique is interesting, as it provides an objective and unbiased hallmark of pain and trauma susceptibility or resilience. It does not rely on subjective measures such as the surveys. In fact, subjective measurements of pain in this study would not differentiate between the low and medium groups.

Techniques that use objective measures, such as [brain](#) connectivity, appear more sensitive and could provide a clearer overall picture of someone's resilience or susceptibility to pain and [trauma](#), thereby guiding personalized treatment and paving the way for new treatments.

**More information:** Irina A. Strigo et al, Understanding pain and trauma symptoms in Veterans from resting state connectivity: unsupervised modeling, *Frontiers in Pain Research* (2022). [DOI: 10.3389/fpain.2022.871961](https://doi.org/10.3389/fpain.2022.871961). [www.frontiersin.org/articles/10.3389/fpain.2022.871961/full](http://www.frontiersin.org/articles/10.3389/fpain.2022.871961/full)

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