

The neural substrates of creative thinking  
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Creativity has long fascinated artists, philosophers and psychologists alike. More recently, the cognitive components and neural underpinnings of creativity have become of considerable interest in cognitive neuroscience. From a neuroscience perspective, creativity requires the rapid combination and recombination of existing mental representations to create novel ideas and ways of thinking. Most of the work linking creativity to the brain has focused on the frontal lobes. This work includes fMRI studies reporting greater activation of the prefrontal cortex in tasks involving creativity and observational reports that some patient groups with frontal lobe abnormality (autism; schizophrenia) have increased creative acumen. Another line of work points to the role of the hippocampus in creativity. The hippocampal system, through its interaction with neocortical storage sites, provides a relational database necessary for the creation, updating, and juxtaposition of mental representations. The flexible and novel use of these representations suggests a critical role for the hippocampus in creative thinking and hippocampal damage has been linked to disruptions in the creative and flexible use of language and in imagining future events.

In the present study we examined creative thinking in a group of patients with neurological damage to either the ventromedial prefrontal cortex (vmPFC) (N=6) or the hippocampus (HC) (N=5) and 11 demographically (e.g., age, sex, education) matched healthy comparison participants (NC). Each participant completed the Torrance Test of Creativity (TTCT), a nationally normed test that examines verbal and non-verbal creative thinking. Patients with HC damage were impaired on all tests (figural = 74.6, SD = 17.5; verbal = 57.0, SD = 8.33) of the TTCT compared to the NC group (figural = 102.1, SD = 11.6; verbal = 100.2, SD = 23.8) and impaired on the figural test compared to the vmPFC group (figural = 85.5, SD = 11.4; verbal = 94.5, SD = 14.9; see Figure 1). Patients with vmPFC damage did not score significantly different from the NC group. These results indicate the significant contribution of the hippocampus to creative thinking, while damage to the vmPFC alone is not sufficient to impair creative thinking. This work further contributes to our understanding of creative thinking and its instantiation in the mind and brain.

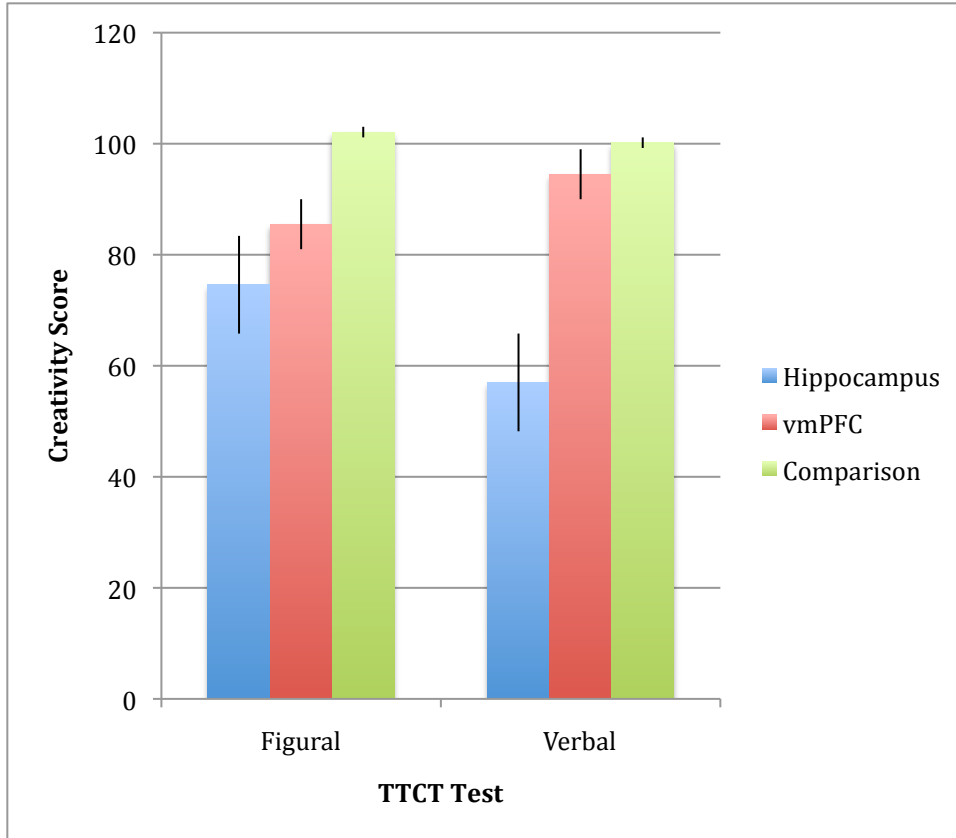


Figure 1. Torrance Test of Creativity subtest scores for patient groups and comparisons.