

The effect of memory reconfiguration via creative thinking is enhanced with transcranial direct current stimulation on the left angular gyrus

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Introduction

Creative problem-solving relies on reorganizing existing knowledge to restructure memory structures, yet its behavioral and neural mechanisms remain unclear.

The angular gyrus (AG) may play a key role in creativity-driven memory restructuring by integrating semantic information.

Method

36 healthy college students (18 females; 18–38 years).
A within-subject design for two sessions spaced 3 to 7 days.

Behavioral

Free association task. Generate continuous associations for cued word (e.g., cow).

Relatedness judgement task. Rate the semantic relatedness between word pairs (e.g., cow-star) on a scale from 1 (completely unrelated) to 10 (completely related).

Creative story generation task: Use three unrelated words to generate creative stories (e.g., cow, star, zip).

Results

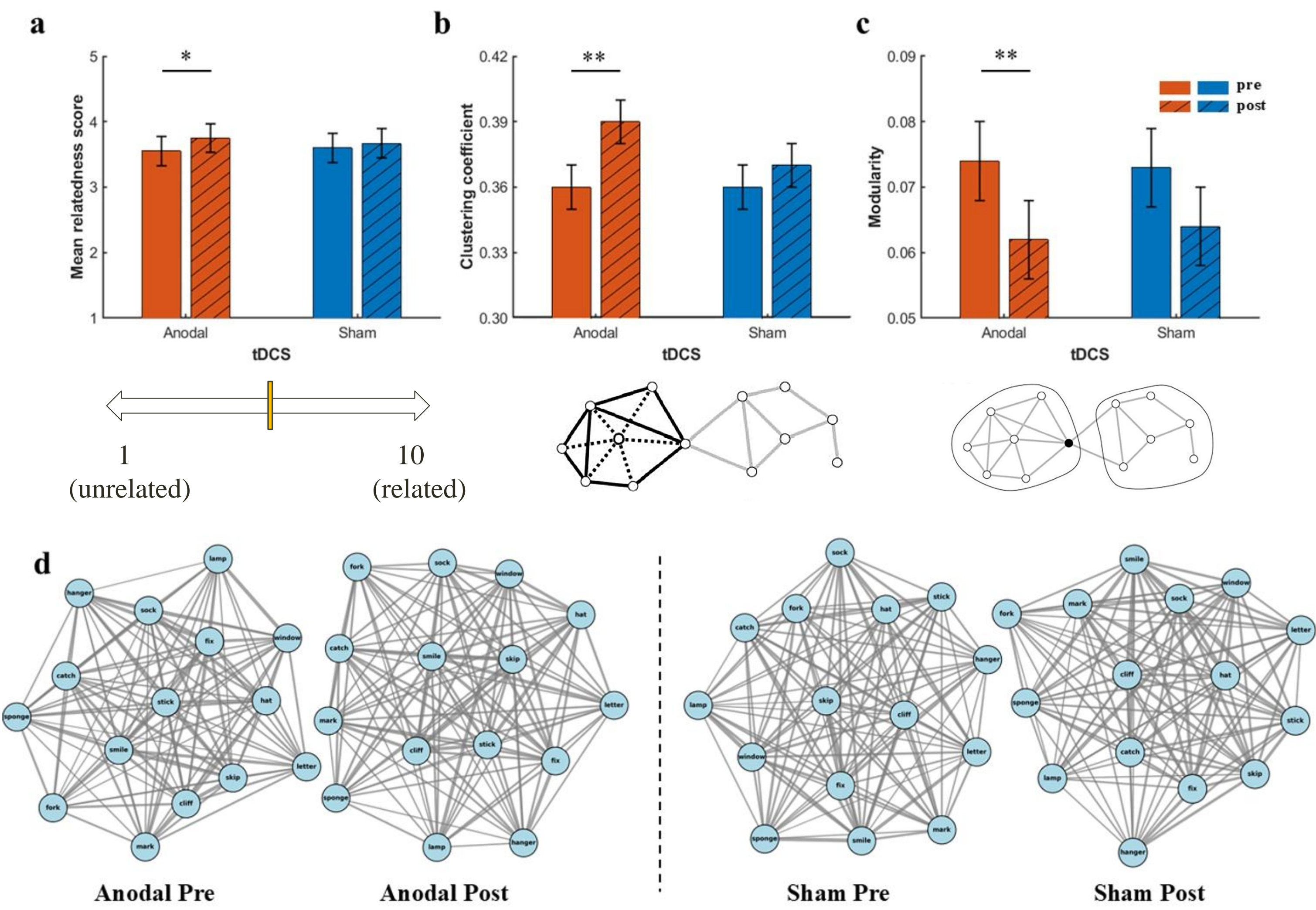


Fig. 2 Effects of stimulation and creation on knowledge restructuring. (a-b) Creative ideation strengthens the associations between unrelated words, (c) making them less likely to be confined to specific modules, particularly under the anodal tDCS. (d) Display of four memory networks.

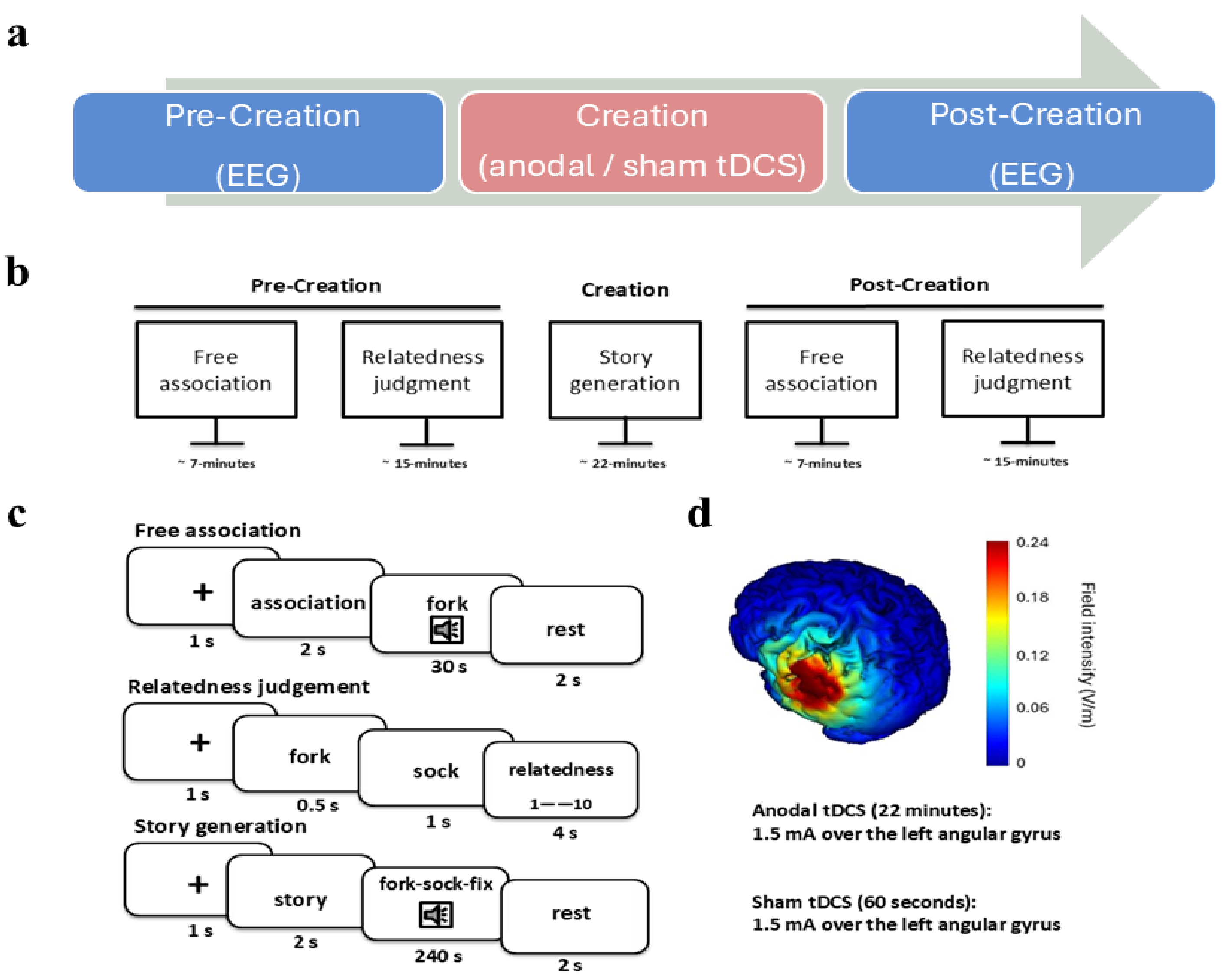


Fig 1. Experimental procedure.

Neural

EEG recording. Continuous EEG signals were recorded using a 32-channel wireless EEG headset.

Brain Stimulation: Anodal transcranial direct current stimulation (tDCS) over the left AG was used to increase its neuronal excitability compared to sham stimulation.

Analyses

Individual-based semantic memory networks. The memory structures were represented with nodes (words), and edges (semantic relatedness between word pairs).

ERP analysis. The N400, an ERP marker of semantic integration, is used to assess changes following creative ideation under anodal and sham stimulation.

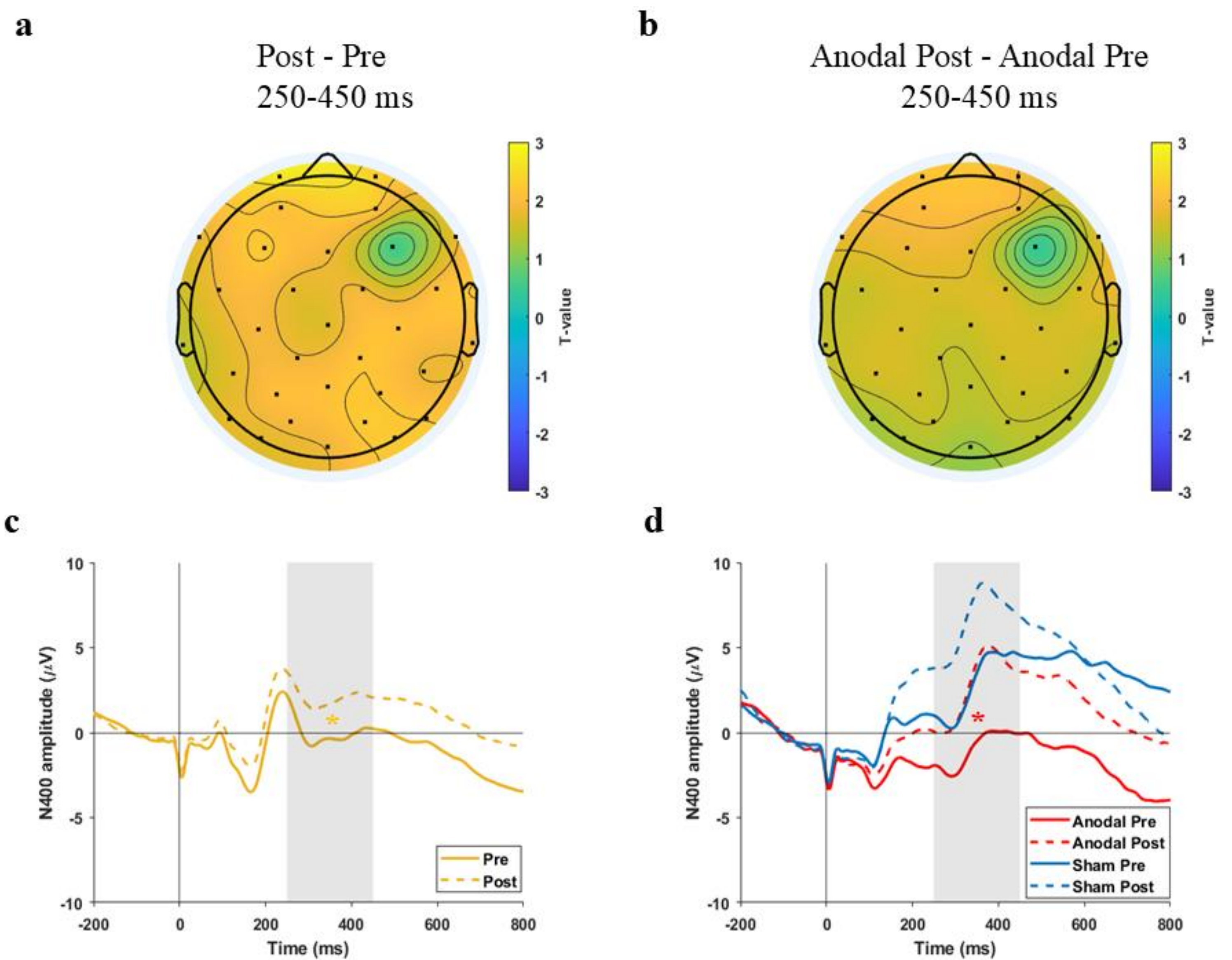


Fig. 3 Effects of stimulation and creation on N400 restructuring. (a, c) Creative ideation facilitates the semantic integration of unrelated words by reducing the mismatch between words to promote a new understanding, (b, d) particularly under the anodal tDCS.

Discussion

Creative ideation facilitates semantic memory restructuring, reduces N400 (lower semantic integration effort), primarily in the frontal regions under anodal tDCS.

These findings highlight the role of creativity, particularly with left AG stimulation, in facilitating memory reconfigurations.

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