

The unconscious effect of emotional information on spatial working memory performance

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Remembering where negative events occur has undeniable value, but how emotional memories are encoded remains elusive. It is widely recognized that information in working memory (WM) is consciously processed. During the encoding, emotion-related information attracts attention more quickly or occupies more attention resources and has an emotional bias effect. However, evidence that WM can operate on unconsciously represented information is accumulating.

Here, we investigate whether the subliminal presentation of emotional pictures can affect spatial WM performance.

Participants (N=37) were presented with an emotional object-relocation task with different load conditions. An array of 2, 4, 6 or 8 rectangles appeared (1s) on the screen of a computer. After that, pictures selected from IAPS subliminally appeared (16.67 ms) superimposed on each rectangle. For each load condition, half of pictures were negatively-valenced (Mvalence = 2.64, Marousal = 6.55) and the other half were neutral (Mvalence = 5.02, Marousal = 2.51). Participants were then asked to relocate the rectangles in the original position as accurately as possible.

Statistical analysis (two-way ANOVA with valence and load as factors) showed significant effects for load ($F(3,108) = 16.93$; $P < 0.0001$) and for the interaction ($F(3,108) = 3.13$; $P = 0.03$). Post hoc analyses revealed that subliminal presentation of negative pictures increased spatial WM performance only in the load condition with 8 rectangles ($\#$, $P = 0.04$), suggesting that emotional stimuli affect spatial WM performance unconsciously when cognitive load exceeds memory capacity.

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