

[Neuropsychologia](#). 2018 Oct;119:434-447. doi: 10.1016/j.neuropsychologia.2018.08.020 . Epub 2018 Aug 29.

Good to be stressed? Improved response inhibition and error processing after acute stress in young and older men.

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Abstract

While aging and stress are both known to affect cognitive functions, little is known on whether and how age modulates stress effects on executive functions and their neural correlates. The current study investigated the effect of acute stress on response inhibition and error processing and their underlying cortical processes in younger and older healthy men, using EEG. Forty-nine participants (30 young) were stressed with the Trier Social Stress Test (16 young, 9 older) or underwent a friendly control procedure (14 young, 10 older) and subsequently performed a Go/No-Go task with two levels of task difficulty while performance (reaction time, error rate), stimulus-locked (N2, P3) and response-locked (Ne, Pe) ERPs were measured. Previous results on age-related cognitive deficits were replicated, with slower responses and reduced and delayed N2 and P3 components, as well as reduced Ne and Pe components in older participants. Independent of age, acute stress improved response inhibition, reflected in higher accuracy for compatible trials and enhanced inhibition-related components (N2, P3 and N2d, P3d of the difference waves No-Go minus Go), and improved error processing, reflected in enhanced error-related components (Ne, Pe and Ne_d, Pe_d of the difference waves error minus correct trial). Our findings indicate that acute stress leads to a reallocation of cognitive resources, strengthening inhibition and error processing in young and older healthy men to a similar degree. Neural generators of the analyzed ERPs are mainly part of the salience network, which is upregulated immediately after stress. This offers an explanation as to why response inhibition, in contrast to other executive functions, improves after acute stress.

Highlights

- Acute stress improves response inhibition accuracy in healthy men.
- Acute stress enhanced the neural correlates of response inhibition, N2 and P3.
- Acute stress enhanced error processing reflected by enhanced Ne and Pe amplitudes.
- This beneficial stress effects may result from activation of the saliency network.
- These beneficial stress effects were independently of age.

KEYWORDS:

Aging; ERP; Error processing; Go/No-Go; Response inhibition; Stress

DOI: [10.1016/j.neuropsychologia.2018.08.020](https://doi.org/10.1016/j.neuropsychologia.2018.08.020)