Autonomic Arousal and Inhibitory Control in Aging
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Purpose
To examine whether age affects the degree to which autonomic regulatory activity is related to response control and error-related ERPs during a complex Go/NoGo task involving three levels of working memory (WM) load.

Method (continued)

Revised Working Memory Inhibitory Control Task
• WM load varies (2, 4, or 6 letters)
• Participant memorizes letters associated with each trail
• Series of single letter probes follow
• Go response → probe does not match load letters
• NoGo (withhold) → probe does match load letters

Electrophysiological Recordings
• 128-Channel BioSemi System with an averaged mastoids reference and impedance < 50 kΩ
• Data filtered offline at 1 – 30 Hz
• Regression-based correction for ocular artifact

Electrocardiogram Recordings
• Recorded using 2 chest electrodes
• RSA calculated offline from ECG by extracting high frequency oscillations associated with normal respiration
• RPP was calculated (Heart Rate x Systolic BP/ 100)

Results (continued)
• Within each group, error rates increased and ERN/Pe amplitudes decreased across WM loads.
• Older adults responded more cautiously than younger adults, resulting in fewer NoGo errors, except on catch trials.
• Within the younger group, higher baseline RSA was associated with a larger Pe amplitude in response to catch-trial errors (stats).
• Within the older group, higher baseline RPP was associated with a greater error rate on the catch NoGo trials (stats).

Conclusions
• Autonomic control was not related to WM load but was associated with behavioural and electrophysical responses to unexpected catch trials.
  • In the younger group, those with higher parasympathetic control of cardiac function (higher RSA) at baseline produced a larger electrocortical response to having made a catch-trial error during test, which might be considered an adaptive response.
  • In the older group, higher sympathetic predominance (higher RPP) at baseline, indicating poorer parasympathetic modulation of cardiac function, was associated with a higher rate of catch-trial errors, suggesting poorer response control.

Results indicate that links between cardiac control, electrocortical activity, and performance monitoring may vary as a function of age and provide support for the utility of a neurovisceral integration perspective in our attempts to understand age-related cognitive change.

References

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