CARDIAC AUTONOMIC REGULATION AND COGNITIVE CONTROL IN OLDER AND YOUNGER ADULTS
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BACKGROUND
- Respiratory sinus arrhythmia (RSA) is an index of cardiac autonomic control and should be advantageous for cognitive control performance.
- Older adults demonstrate declines in both cognitive and cardiac autonomic control, but little is known about the link between them.
- Data has shown that RSA does not relate to cognitive control for all tasks and can be opposite of the direction expected.
- We proposed that relations between RSA and cognitive control would be more evident when the task depended on the more metabolically-costly proactive rather than reactive cognitive control strategies.

PRESENT STUDY
We recorded pre-task RSA in older and younger adults and examined its relationship with accuracy on a Stroop paradigm that involved responding to lures designed to elicit either a "proactive" or "reactive" response strategy.

- **Basic Task**: "accept" congruents; "reject" incongruent lures (e.g., red/RED)
- **Memory Task**: "accept" congruents; "reject" incongruent lures and memory contingency lures, i.e., a predefined congruent item (e.g., green/GREEN)
- **Super Memory Task**: "accept" congruents; "reject" incongruent lures and super memory contingency lures, i.e., a predefined congruent of a particular case-size (e.g., GREEN but not green)

**Incongruent Lures**
- **Cannot** anticipate by maintaining cue
- **Should elicit a reactive strategy** based on late correction

**Memory & Super Memory Contingency Lures**
- **Can** anticipate by maintaining cue
- **Should elicit a proactive strategy** based on early selection

Specific Hypotheses:
- Proactive control will lead to faster and more accurate responses for memory and super memory contingency lures.
- Older high pre-RSA task will relate to better performance on proactive control trials (i.e., memory & super memory contingency lures), especially among older adults.

METHODS
Participants
- 23 younger adults (18 women, M = 20.0 years)
- 22 older adults (17 women, M = 68.0 years)

Procedure
- Participants completed 3 Stroop tasks (Basic, Memory, Super Memory)
- Each version was completed twice
  - **Standard Phase**
  - **Incentive Phase**
    - Received 30 points for correct responses
    - Lost 1.50 points for errors and lost points for responding too slowly
    - Points converted to money ($5 - $15) on completion of task

Participants completed Stroop tasks in identical order (Basic, Memory, Super Memory), with incentive phase always following standard phase.

RESULTS
- **Incongruent Lure-Accuracy**
  - Task (2) x Phase (2) x Group (2)
  - Accuracy during both Standard and Incentive Phases
  - Older Adults showed higher accuracy for Incentive Phase compared to Standard Phase
  - Younger Adults showed lower accuracy in Incentive Phase compared to Standard Phase

- **Memory vs. Super Memory Contingency Lure Accuracy**
  - Task (2) x Phase (2) x Group (2)
  - Younger Adults showed higher accuracy in both Standard and Incentive Phases
  - Older Adults showed lower accuracy in Incentive Phase compared to Standard Phase

**CONCLUSIONS**
- Lures that could benefit from the use of a proactive strategy (i.e., memory & super memory contingency lures) elicited faster and more accurate responses than those more dependent on a reactive strategy (i.e., incongruent lures).
- Higher levels of pre-task RSA were most strongly and consistently associated with responses involving proactive control (i.e., memory & super-memory contingency lures), especially for older adults.
- These findings support a model of neurovisceral integration that links cardiac autonomic control and cognitive performance.

- They also indicate that cardiac autonomic control is most relevant when performance relies on the use of proactive control, i.e., a cognitive control strategy that involves the sustained, active maintenance of goal representations over time and, as a result, represents a more resource-demanding and metabolically-costly operation.

**References**

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