Age-Related Differences in Conflict Adaptation Are Specific

to Trials Following Congruent Stimuli for Both Working Memory and External Stroop Tasks

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INTRODUCTION

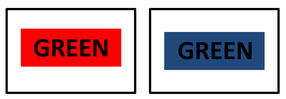
- ***Conflict Adaptation* (CA)**, reduced distractor interference (e.g., Stroop Interference) following an incongruent (i.e., word and color differ) versus a congruent (i.e. word and color the same) trial has been proposed to reflect transient cognitive control processes (Botvinick et al., 2001) that may decline with healthy aging (Braver & Barch, 2002; Faust et al., 2012; Paxton et al., 2008).
- Attention and working memory have been proposed to share cognitive control processes (Kane & Engle, 2003), and recent work has documented a relationship between age, WM capacity, and CA using a traditional Stroop task (Aschenbrenner & Balota, 2015).
- The present study seeks to use a modified version of WM (internal interference) Stroop task (used by Kiyonaga & Egner, 2014) and a matching traditional (external interference) Stroop task to directly examine age-related changes in internal and external transient cognitive control.

TASKS

- **Internal (WM) Interference Task** (modified Kiyonaga & Egner, 2014): Stroop-like analog, begins with single memory word, then 3 successive color patch displays (manual response), then 4th display of recognition memory for word.

Encode Word 3 sec. | Manual Color Response Until Resp. | Manual Color Response Until Resp. | Manual Color Response Until Resp. | Word Memory

- **External Interference Task**: Trial sequences from larger study extracted to provide comparison with internal interference task. Manual color response to color patches with overlapping distractor words, sequences with repeating distractor word used.



Manual Color Response Until Resp. | Manual Color Response Until Resp.

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Internal Task

Older: *n* = 35, *M* = 69.5, *SD* = 5.5 yrs
Younger: *n* = 36, *M* = 19.8, *SD* = 1.2 yrs

External Task

Older: *n* = 54, *M* = 73.5, *SD* = 6.0 yrs
Younger: *n* = 44, *M* = 20.5, *SD* = 1.5 yrs

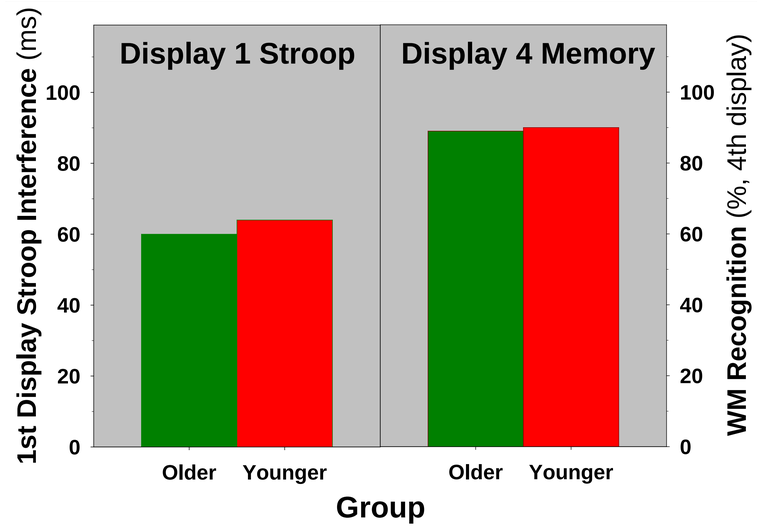
RESULTS

- **Internal (WM) Stroop Interference (see Top Figure):** Equivalent Stroop interference across groups for WM Stroop effect on 1st display.
- **Conflict Adaptation(**see **Middle & Bottom Figures):** Reduced interference following an incongruent trial, $p < .001$, in all cases (i.e. both age-groups for displays 2 & 3 of internal task, and for external task)..
- **Stroop Interference (**see **Middle & Bottom Figures):** Stroop interference on all trials following a congruent trial, $p < .001$, both tasks.
- **Age-related Differences in Stroop Interference (Following Congruent Trial,** see **Middle & Bottom Figures):** For trials following an congruent trial (2nd display of internal task, and external task), older adults produced greater interference, p<.05.
- **Age-related Differences in Stroop Interference (Following Incongruent Trial,** see **Bottom Figure):** For trials following an incongruent trial (of external task), older adults failed to produced significant reversed interference effect, p>.05. All other reverse interference effects depicted in Middle and Bottom Figures are sig., p<.001.

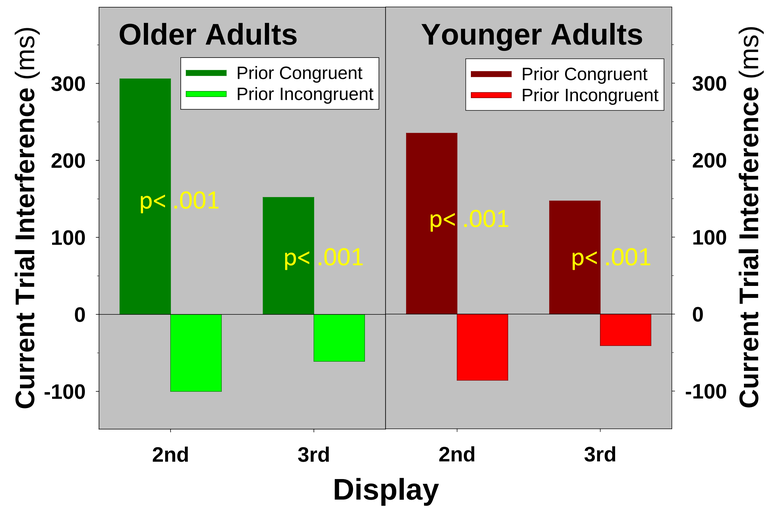
DISCUSSION

- Both younger and older adults produced significant WM interference effects, suggesting a similar ability to hold items active in WM, and similar interference from active WM representations with concurrent processing.
- Both younger and older adults produced robust conflict adaptation effects, however, older adults produced larger interference following a congruent trial in both tasks. This suggests a specific decrement in transient cognitive control that is, perhaps, related to a temporary inappropriate lifting of inhibitory control over the distractor processing pathways on congruent trials. The result then being increased interference on the subsequent trial.
- In contrast to proposals that reactive cognitive control is preserved with age (Bugg, 2014) , we found specific age-related differences in transient control common to both a traditional Stroop interference task, and a new WM Stroop analog task.
- Our finding of a specific age-related difference in conflict adaptation is consistent with proposals that attention and WM share cognitive control systems (Kane & Engle, 2003; Kiyonaga & Egner, 2014).
- Moreover, our finding of a specific decline in control of distractor processing immediately following a congruent trial in both our tasks is also consistent with the recent finding that increased Stroop interference following a congruent trial is related to WM capacity in older adults (Aschenbrenner & Balota, 2015).

Working Memory: Stroop Interference



Working Memory: Conflict Adaptation



External Stroop Task: Conflict Adaptation