

Age-Related Differences in Cognitive Control: Conflict Adaptation Within and Between Tasks







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INTRODUCTION

- The ability to handle conflict from task-irrelevant distractors during task performance changes with age and age-related dementia (Balota & Faust, 2007), perhaps due to age-related declines in frontoparietal cortical networks (Campbell et al., 2012).
- Conflict from task-irrelevant distractors have been proposed to trigger transient control processes (Botvinick et al., 2001) that rely on dorsolateral prefrontal areas (Liu et al., 2004) found to change in healthy aging (Braver & Barch, 2002; Paxton et al., 2008).
- Transient control processes are predicted to result in **conflict adaptation (CA)**, a trial-to-trial preparation for future conflict (Botvinick et al., 2001) that acts to modulate the magnitude of interference from distractors (e.g., reduced distractor interference immediately following a trial where a distractor conflicts with target processing).
- Prior work in our labs has suggested that the range of task control demands that might elicit robust CA may narrow with age (i.e., **reduced CA range hypothesis**, Faust et al., 2012).
- Recent evidence suggests that CA may be reduced when task control demands are varied by changing aspects of distractor or target processing across successive trials (Faust et al., 2011; Funes, Lupiáñez, & Humphreys, 2010).
- The present study is designed to test the reduced CA range for healthy aging hypothesis by assessing CA in younger and older adults for trial sequences where distractors either do or do not change in number and location across successive trials.

TASKS

- Because repetition of targets and distractors across successive trials can bias estimation of CA (Mayr, Awh, & Laurey, 2003; Notebaert et al., 2006), we performed separate analyses of 2-trial sequences in which distractors/targets do (**Repetition Sequences**) or do not (**Alternation Sequences**) repeat.
- Manual response spatial Stroop task was used with 3-color target patches and distractor words (Red, Green, Blue). 4 blocks of 168 trials, 50% conflict trials.
- Trial Sequence Types** (2 successive trials):
 - Alternation Sequence:** neither target nor distractor repeats
 - Repetition Sequence:** target and/or distractor repeats
 - Matching Distractor Locations:** constant distractor type
 - Distractors Switch Location:** distractor type switches
- Example Stimuli:** Overlapping vs. Flanking Distractors
 - Overlapping: Incongruent =  Congruent = 
 - Flankers: Incongruent =  Congruent = 

Analysis

Because age effects in Stroop tasks reflect, in part, general slowing (Verhaeghen, 2011), we used a z-score transform of RT data (Faust et al., 1999).

PARTICIPANTS

- Older:** $n = 31, M = 72.8$ yrs
- Younger:** $n = 31, M = 19.8$ yrs

RESULTS

- Distractor Interference** (see **Top Figure**): Age x Distractor interaction, $p < .001$. Equivalent flanker distractor interference across groups, with greater increase for older adults with overlapping distractors.
- Conflict Adaptation (CA) Repetition Sequences** (see **Middle Figure**): Age x Prior Type interaction, $p = .030$. Older adults did not reduce distractor interference to the extent that younger adults did following a conflict (incongruent) trial.
- Conflict Adaptation (CA) Alternation Sequences** (see **Bottom Figure**): Age x Prior Trial Distractor Location (match [same task], switch [different task]) x Prior Type (congruent, incongruent) interaction, $p = .023$. Older adults did not reduce distractor interference (i.e., no CA). By contrast, the younger adults produced strong CA when the distractors switched locations, but did not

DISCUSSION

- The present results support age-related changes in transient control processes that may narrow the range of processing situations that are effectively adapted to by dynamically changing control processes.
- In contrast to proposals that there is not an age-related decline in processing Stroop-like interference (Verhaeghen, 2011) we found equivalent interference across age-groups, but age-related increases in distractor interference when flanking distractors were replaced by a single distractor overlapping the target (i.e., more Stroop-like).
- In contrast to proposals that reactive cognitive control is preserved with age (Bugg, 2014), we found an absence of transient CA effects for alternation sequences in older adults but robust CA in younger adults. However, we did find more modest age-related declines in CA for repetition sequences.

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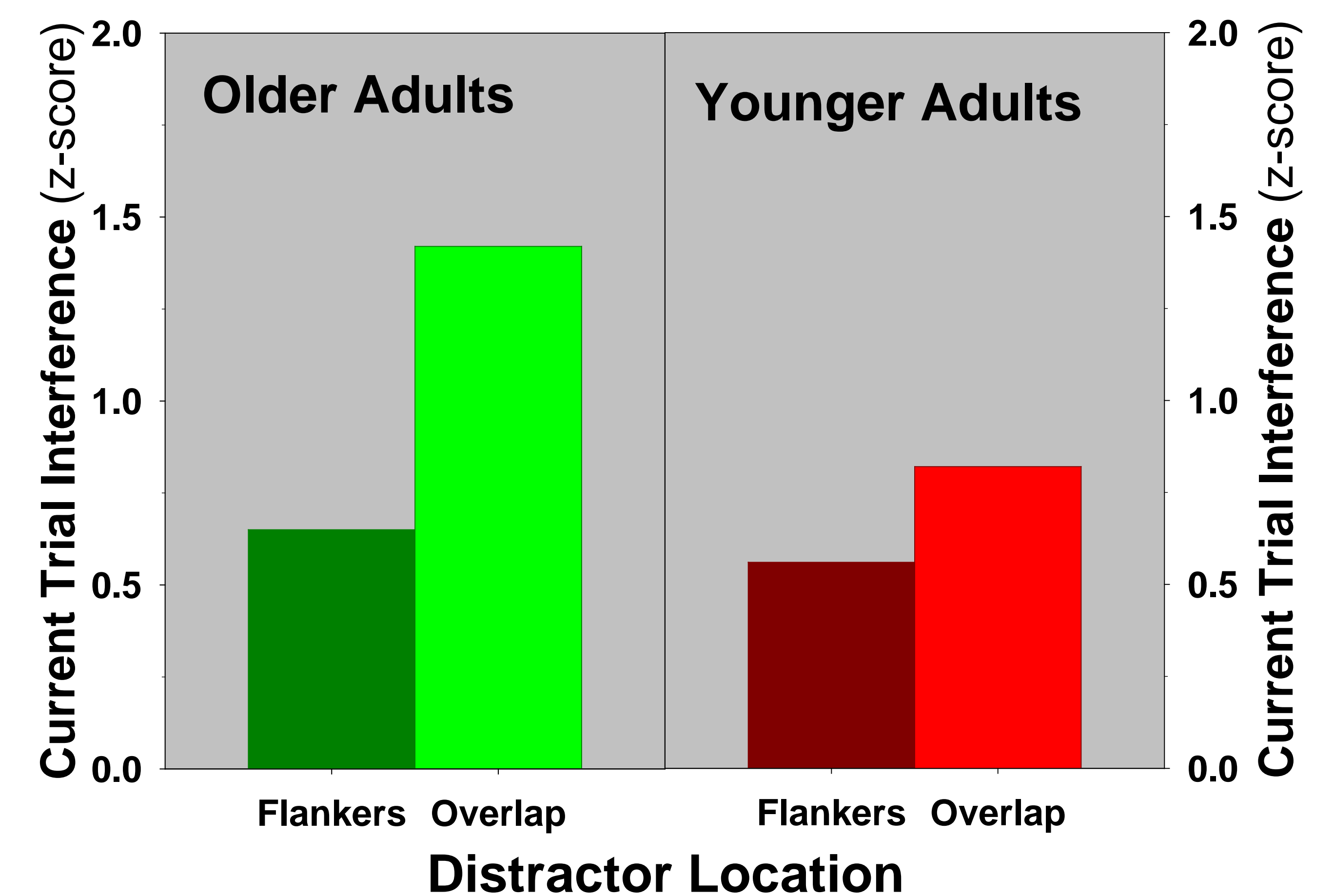
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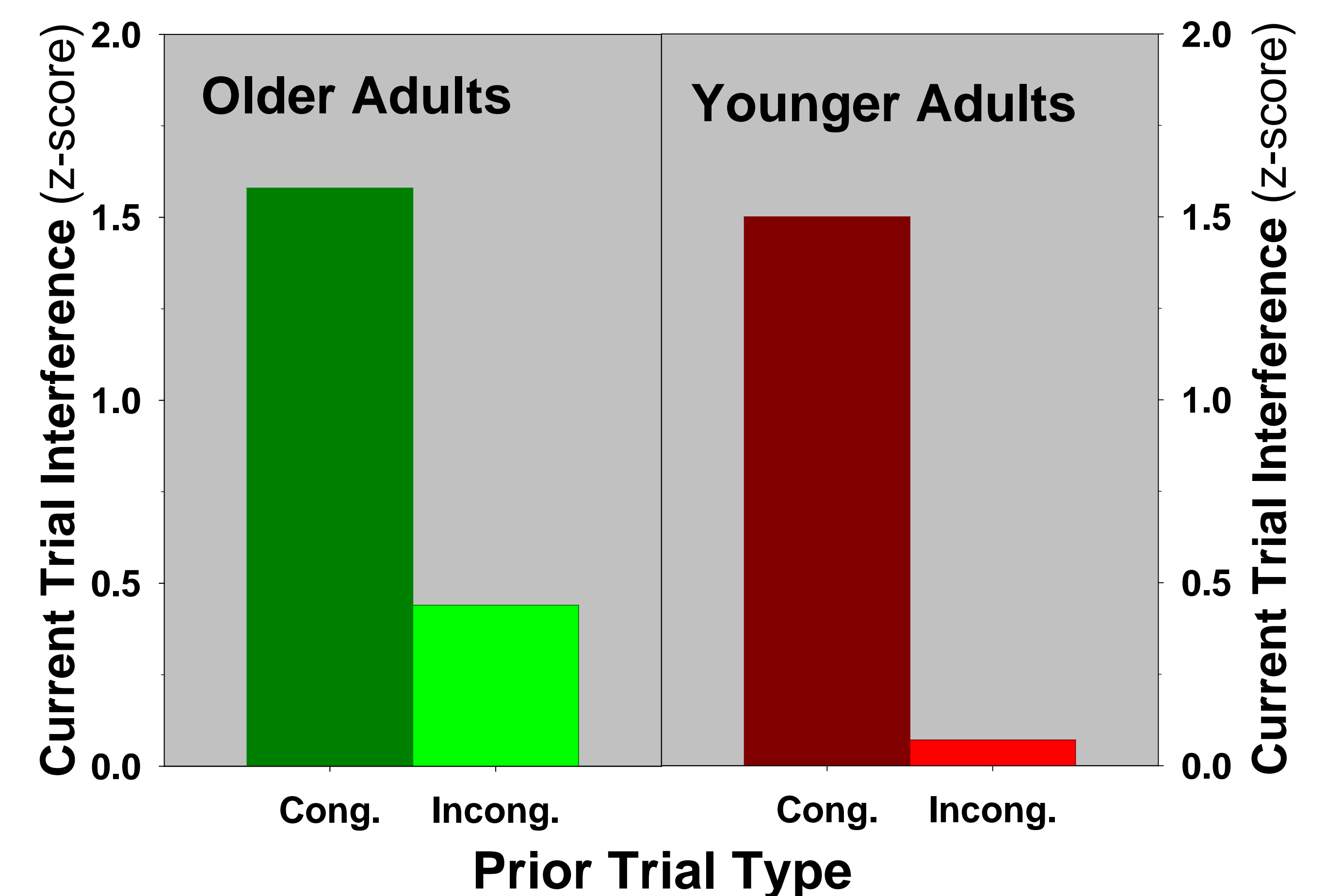
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Distractor Interference Effects



CA: Repetition Sequences



CA: Alternation Sequences

