Age-Related Effects in a Novel Dual-Task Stroop Paradigm

Nathan Ward¹, Erika Hussey¹, John Gaspar¹,2, & Arthur F. Kramer¹

¹The Beckman Institute of Advanced Science and Technology, University of Illinois  
²The National Advanced Driving Simulator, University of Iowa

Background

General-purpose cognitive abilities tend to decline with age
- Older adults demonstrate exaggerated Stroop effects relative to younger adults [1-2]
- Multitasking abilities also decline over the lifespan [3-5]
Canonical measures of cognitive control (like Stroop) are subject to strategies that may challenge the validity of such tasks
- Subjects easily ‘game’ the Stroop task by circumventing the written material altogether

We created a modified Stroop task that introduces a secondary task to test:
1. The degree of overlap between age-related deficits in cognitive control and dual-tasking
2. The role of a secondary task that shifts subjects’ attention to relevant (ink color) vs. irrelevant information (word)

Methods

24 Older adults (61-81 years) and 34 Younger adults (18-24 years) completed 3 versions of the Stroop task:

<table>
<thead>
<tr>
<th>Single Task Stroop</th>
<th>Dual Task Stroop (Count Ink)</th>
<th>Dual Task Stroop (Count Word)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GREEN</td>
<td>XXX</td>
<td>GREEN</td>
</tr>
<tr>
<td>XXX</td>
<td>BLUE</td>
<td>XXX</td>
</tr>
<tr>
<td>BLUE</td>
<td>GREEN</td>
<td>BLUE</td>
</tr>
<tr>
<td>RED</td>
<td>XXX</td>
<td>RED</td>
</tr>
</tbody>
</table>

Count blue? (3)  Count BLUE? (1)

Cognitive Control Effects

Stroop Cost: Incongruent RTs – Neutral RTs
- Older adults > Younger adults

Stroop Facilitation: Neutral RTs – Congruent RTs
- Older adults = Younger adults

Dual-Tasking Effects

Dual Task (Count Word) > (Dual Task (Count Ink) = Single Task)
Older adults = Younger adults, regardless of dual-tasking demand

Conclusions

(1) Age-related effects persist only for high cognitive control demands (Stroop costs), regardless of dual-tasking demands.

(2) The nature of the secondary task influences Stroop performance, such that a task that is consistent with the goal of Stroop (count ink) leads to faster response times compared to a task that is inconsistent (count color), regardless of age.

(3) We offer a novel measure of cognitive control that has been validated across age groups.

Future Directions

(1) Can modified Stroop performance help us to understand the general-purpose mechanisms involved in real-time situations of driving under distraction?

(2) Verify validity of modified Stroop task measures using structural equation modeling

References & Acknowledgments


For more information: njmedeir@illinois.edu