Suppression of Internal Distraction during External Noise Facilitates Performance

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Background

• Interference in goal-directed behavior can arise from distractions in the external environment, as well as from the internal milieu (e.g., intrusive thoughts).
• We have previously shown that older adults (OA) experience deficits in the suppression of externally-presented distracting information.
• Recent neural data suggests that, consistent with a state of decoupled processing, mind-wandering dampens the processing of sensory information irrespective of that information’s task relevance.
• We sought to investigate the relationship between internal and external distraction, and further explore the impact of this interaction on performance of an externally-oriented task.

Research Questions

• Is internal distractibility affected by the presence of external distraction (auditory noise)?
• How does modulation of internal distractibility relate to performance on an externally-oriented task?
• How is distractibility and task performance during external noise affected by healthy aging?

Methods

Participants

• 10 healthy younger adults (YA): 18–30 years old, 7F, 3M
• 11 healthy older adults (OA): 60–72 years old, 7F, 4M

Experimental Design

• Externally-oriented visual target discrimination task
• Performed with and without auditory noise (“cafe chatter”)
• Initial thresholding task utilized an adaptive staircase algorithm to establish an appropriate task difficulty level (~75% accuracy, without noise)
• After each trial of 5 stimuli, participants indicated where their attention was focused during that trial
• 5 stimuli/trial x 20 trials/run x 8 runs
• 4 runs with each noise condition (in counterbalanced order)

Conclusions

• Internal distractibility is affected by the presence of external noise
• Suppression of internal distraction amid external noise facilitates accuracy on an externally-oriented task
• Contrary to our expectations, no age differences were found in the interaction between internal distraction, external noise, and task accuracy.

Results

Accuracy Without and With Auditory Noise

<table>
<thead>
<tr>
<th>Condition</th>
<th>No Noise</th>
<th>Noise</th>
</tr>
</thead>
<tbody>
<tr>
<td>YA</td>
<td>0.83</td>
<td>0.79</td>
</tr>
<tr>
<td>OA</td>
<td>0.57</td>
<td>0.44</td>
</tr>
</tbody>
</table>

Both YA and OA experience a significant decline in accuracy with auditory noise (~7% percent change)

Accuracy and Suppression of Internal Distraction in the presence of Auditory Noise

<table>
<thead>
<tr>
<th>Condition</th>
<th>No Noise</th>
<th>Noise</th>
</tr>
</thead>
<tbody>
<tr>
<td>YA</td>
<td>0.85</td>
<td>0.65</td>
</tr>
<tr>
<td>OA</td>
<td>0.67</td>
<td>0.45</td>
</tr>
</tbody>
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OA: R=0.680, p=0.021**

Change in self-reported Distraction with Auditory Noise

Auditory noise induces a change in the types of distraction reported, including a significant decrease in Internal Distraction

Reduction of internal distraction was the strongest predictor of task accuracy during the presence of auditory noise

Participants who most reduced their internal distractions in the noise condition had the highest task accuracy

Internal distraction during the no-noise condition was not correlated with accuracy during the no-noise condition (YA p=0.52, OA p=0.31), indicating that the relationship between internal distraction and task accuracy is mediated by the presence of auditory noise

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