Effect of driving experience on change detection based on target relevance and size

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1. Introduction

- Learning to drive involves learning to prioritize safety-related information over unrelated information for attentional selection.
- Visual conspicuity, such as size, can also affect selection strategies (e.g., larger objects tend to be selected better than smaller objects).

Research questions

- Does learning to drive involve learning to prioritize visual information differently based on relevance?
- Do experienced drivers allocate more resources to less visually conspicuous relevant information and thus select small and large road users similarly?
- Do novice drivers select road users based on size?
- Does this experience effect disappear when selecting irrelevant information?

2. Method

Participants

<table>
<thead>
<tr>
<th>Group</th>
<th>n</th>
<th>M age (SD)</th>
<th>M years of experience (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experienced</td>
<td>19</td>
<td>23 (1.9)</td>
<td>7 (1.5)</td>
</tr>
<tr>
<td>Novice</td>
<td>19</td>
<td>19 (1.9)</td>
<td>0.5 (0.3)</td>
</tr>
</tbody>
</table>

Design

- Cycle repeats 300 times or until participant responds
- Target type variables: (1) safety relevance and (2) size.

3. Results

Error rate

- Driving experience x safety relevance (p < .01):
  - Experienced drivers detected irrelevant targets more accurately than novice drivers (p < .01), but there was no difference between the two groups when detecting relevant targets. In general, relevant targets were detected more accurately than irrelevant targets (p < .001).

Response time (of correct detections with log₁₀ transformation)

- Safety relevance x size (p < .01):
  - Large relevant targets were detected faster than small ones (p < .05), but large and small irrelevant targets were detected similarly. Overall, relevant targets were detected faster than irrelevant targets (p < .001).

- No experience x relevance x size interaction on response time or error rate.

4. Conclusions

- All observers detected relevant targets better than irrelevant targets, but experienced drivers appear to have more efficient selection strategies as they had more spare resources to select irrelevant targets.
- Regardless of experience, relevant information is given precedence for processing and visual conspicuity is used to determine its priority for selection. Irrelevant information is downgraded and visual conspicuity does not affect its selection.
- Alternatively, familiarity with typical speeds, size, and behaviour of each vehicle type might have affected detection speed. Observers were likely less familiar with irrelevant objects in the driving context which might have slowed detection speed.
- Absence of a three-way interaction suggests that the paradigm may not be sensitive enough if those effects exist. Nevertheless, we found an effect of driving experience with a minimal age difference between groups and we have shown that all drivers appear sensitive to visual conspicuity in relevant information. This may be useful for driver training programs to teach drivers to better detect small road users.

5. References


6. Acknowledgements

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