Quantitative and qualitative differences in performance within the semantic and letter fluency tasks

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Conference presentation / Izlaganje na skupu

https://doi.org/10.17605/osf.io/te52u

Permanent link / Trajna poveznica: https://urn.nsk.hr/urn:nbn:hr:131:014455

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Download date / Datum preuzimanja: 2021-01-09

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INTRODUCTION

- Traditionally, verbal fluency research has differentiated between semantic (SF) and letter fluency (LF).
- Most researchers uncritically assume that there are no category-specific effects in verbal fluency.
- Studies have sporadically reported disproportionate performances across different semantic categories on SF (e.g., Jehabia et al. 2020). Category-specific effects on SF have been reported in studies comparing clinical and healthy populations (e.g., Moreno-Martínez et al. 2017; Neves et al. 2020). For LF, there exists a long-standing division between ‘easy’ and ‘difficult’ words, at least for English, which has found empirical support in recent times as well (e.g., Barry et al. 2008).
- In a previous unrelated study, we found that performance on the category trees in the semantic fluency task was positively associated with executive functioning and visual episodic memory measures, while performance on the category animals was not (Vandek, Gabrić, et al. 2018). In another unrelated study, we found that patients with first-episode psychosis displayed deficient clustering compared to healthy subjects on the animal, but not the tree task (Gabrić, Kuzina, Vandek, et al. 2020).

METHODOLOGY

- SUBJECTS: 16 right-handed Croatian-speaking university students

VERBAL FLUENCY ASSESSMENT:

<table>
<thead>
<tr>
<th>HOW MANY ANIMALS/WORDS STARTING WITH THE LETTER K CAN YOU NAME?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>SF animals</td>
</tr>
<tr>
<td>SF trees</td>
</tr>
<tr>
<td>LF animals</td>
</tr>
<tr>
<td>LF trees</td>
</tr>
</tbody>
</table>

NEUropsychological ASSESSMENT:

- Psychology Experiment Building Language (PBL, Version 2.0), a freely downloadable, open-source software (Mueller & Piper 2014)
- Trail Making Test: 2MT B-A difference (executive control)
- Forward digit span: memory span (working memory)
- Wisconsin Card Sorting Test: perseverations, learning to learn, and failure to maintain set (cognitive flexibility and set-shifting)

STATISTICAL ANALYSES:

- separate paired-sample t-tests (Wilcoxon signed-rank) for comparisons within the semantic and letter tasks
- Spearman correlation coefficients for associations between the fluency and neuropsychological variables

RESULTS AND DISCUSSION

CORRECT WORDS

RESULTS indicate disproportionate performances within the semantic and letter fluency tasks.

<table>
<thead>
<tr>
<th>Incorrect responses</th>
<th>Within semantic</th>
<th>Between semantic</th>
</tr>
</thead>
<tbody>
<tr>
<td>SF animals</td>
<td>9</td>
<td>13</td>
</tr>
<tr>
<td>SF trees</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>LF animals</td>
<td>9</td>
<td>12</td>
</tr>
<tr>
<td>LF trees</td>
<td>6</td>
<td>9</td>
</tr>
</tbody>
</table>

FIRST RESPONSE LATENCY

A longer first response latency on the tree compared to the animal task indicates delayed lexical access to the semantic category trees compared to animals.

INTRUSION RATE

A higher intrusion rate on the tree compared to the animal task indicates that the boundaries of the semantic category trees are less fixed compared to animals.

CLUSTER SIZE ON M AND WCST LEARNING TO LEARN

Subjects were faster on the animal and K compared to the tree and M tasks, respectively, indicating more efficient connectivity between concepts in the semantic category animals compared to trees, i.e., between word forms beginning with K (or /k/) compared to those beginning with M (or /m/).

REFERENCES

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CONCLUSIONS

1. The results indicate that there are important differences in the phenomena and processes underlying performance on different semantic and letter fluency tasks.
2. Results suggest that lexical access was delayed in the tree compared to the animal task.
3. A higher intrusion rate in the tree task suggests that the boundaries of the category trees are less fixed compared to the category animals.
4. Subjects employed clustering and switching at similar rates within the semantic and letter fluency tasks.
5. Shorter between-cluster response latencies on the animal and K tasks compared to the tree and M tasks, respectively, suggest more efficient connectivity within the semantic category animals and presumed phonological category K compared to trees and M, respectively.
6. Performance on the tree task and, specifically, clustering were positively associated with working memory and executive functioning measures, while cluster size on the M task was positively associated with executive functioning. No significant correlations were found with the animal and K tasks.