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

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QUANTITATIVE AND QUALITATIVE DIFFERENCES IN PERFORMANCE WITHIN THE SEMANTIC AND LETTER FLUENCY TASKS

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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. Jebahi 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" letters, at least for English, (Borkowski et al. 1967) 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, Kužina, Vandek, et al. 2020).

METHODOLOGY

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

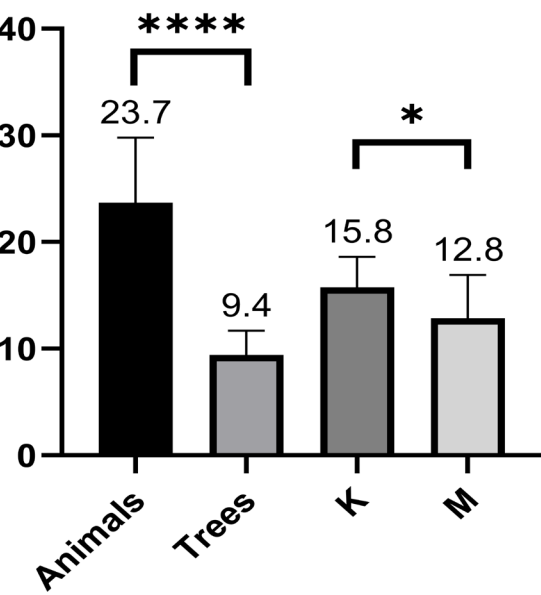|	Semantic fluency (N = 15)	Letter fluency (N = 12)
Age (years)	22.200 ± 2.624	23.000 ± 2.256
Education (years)	15.067 ± 1.751	15.583 ± 1.730
Percentage of males (%)	40.00	41.67

VERBAL FLUENCY ASSESSMENT:	NEUROPSYCHOLOGICAL ASSESSMENT:
HOW MANY ANIMALS/WORDS STARTING WITH THE LETTER K CAN YOU NAME? - Semantic fluency: animals vs. trees - Letter fluency: K vs. M - 60 seconds for each task - Clustering and switching analyses performed according to Troyer et al. (1997) - Dependent variables: <u>correct words</u> (raw), <u>error rate</u>, <u>first response latency</u> (ms), <u>clustering rate</u>, <u>cluster size</u>, <u>between-cluster response latencies</u>, <u>within-cluster response latencies</u>	- Psychology Experiment Building Language (PEBL, Version 2.0), a freely downloadable, open-source software (Mueller & Piper 2014) - Trail Making Test: <u>TMT B-A difference</u> (executive control) - Forward digit span: <u>memory span</u> (working memory) - Wisconsin Card Sorting Test: <u>perseverations</u>, <u>learning to learn</u>, and <u>failure to maintain set</u> (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
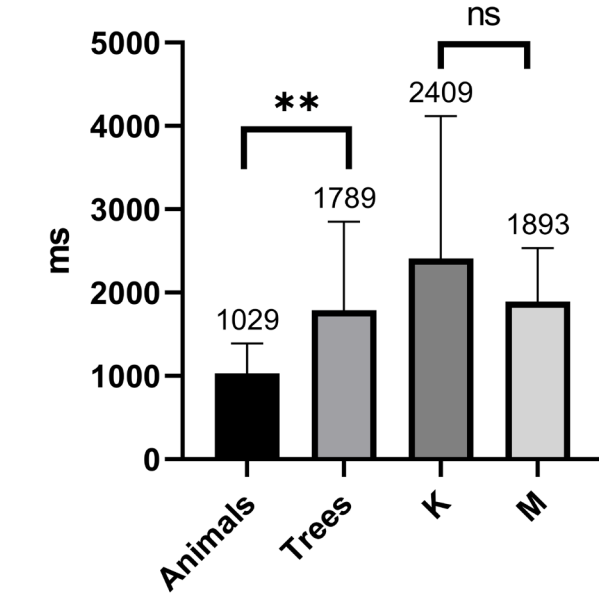
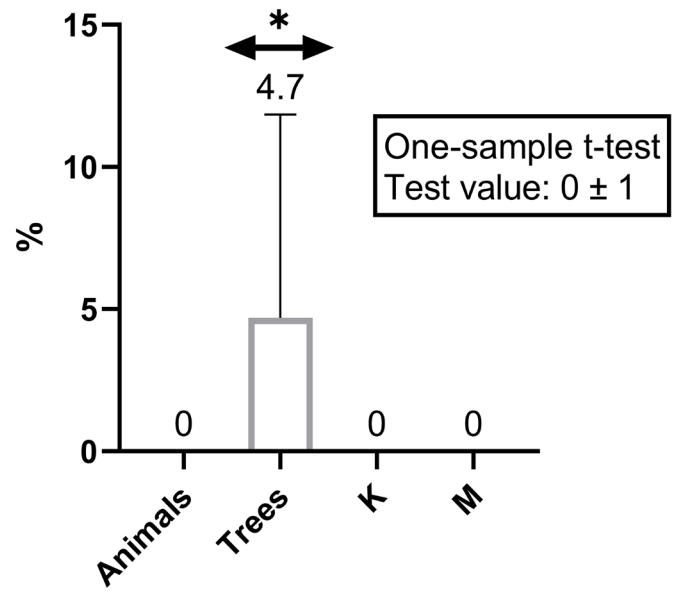## RESULTS AND DISCUSSION

CORRECT WORDS

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

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*.

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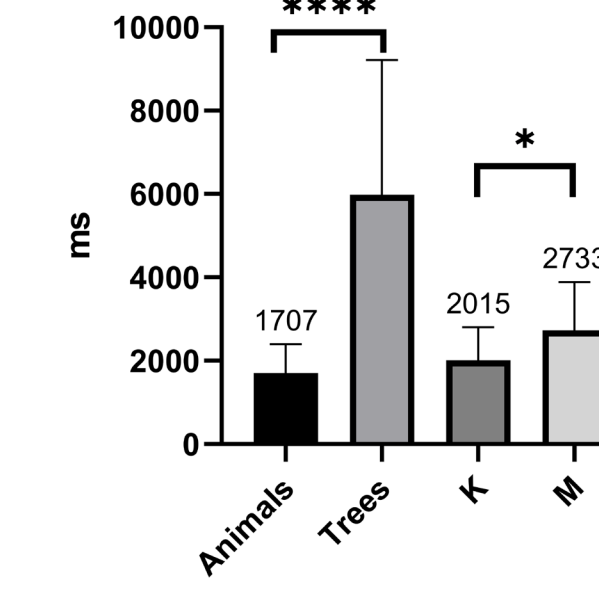
Subjects were faster on the animal and K compared to the tree and M tasks, respectively, indicating more efficient connectivity between concepts in the semantic category *animals* compared to *trees*, i.e. between word forms beginning with K (or /k/) compared to those beginning with M (or /m/).

CORRECT WORDS ON *TREES* and WCST LEARNING TO LEARN
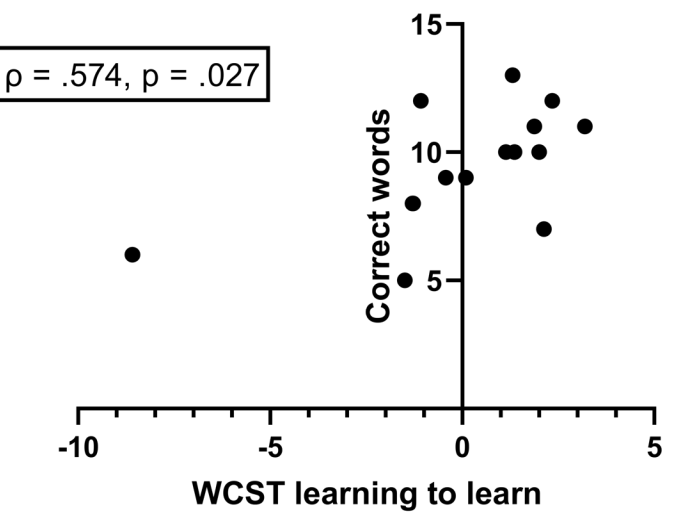
Results suggest that the tree task and, specifically, clustering (not shown on the poster) on the tree, but not the animal task were executively relatively demanding.

CLUSTER SIZE ON *M* and WCST LEARNING TO LEARN
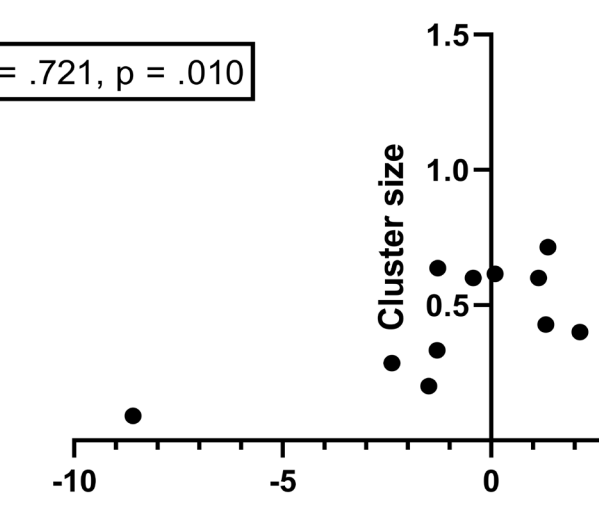
Results suggest that performance and, specifically, clustering on the M, but not the K task was executively relatively demanding.

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.

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