Introduction Outline

**What is verbal fluency?**

* Verbal fluency is a semantic retrieval paradigm where individuals list members for one or more category prompts.

**Why should “I” as the reader care?**

* **Everyday examples of verbal fluency**
* Individuals engage in this process frequently, throughout everyday interactions.
  + Constructing a grocery list
  + Bilingual individuals being prompted in one language and then later on another.
  + ~~Considering new hobbies~~
* **Clinical examples of verbal fluency**
  + Used during age-related impairment screenings.
    - VF procedures commonly represent “semantic memory component” of neuropsychological batteries
    - VF performance thought to be a sensitive marker for age-related impairment
* Measures the quantity of responses, while also considering…
  + Semantic similarity of neighboring responses (clustering)
  + The overall similarity of responses for a given trial (how semantically clustered overall)
  + How frequently individuals switch between semantically similar and distant items.

(Clark et al., 2009)

**The structure of standard vf tasks**

* A standard verbal fluency task will follow a single trial format.
  + Only one test-phase necessary to measure ability to extract domain-specific concepts.

**Does this task fairly represent how this cognitive process occurs in real life?**

* Although only one trial is necessary for verbal fluency, many instances where an individual may be prompted for the same category more than once.
* **Everyday example**
  + Losing your original grocery list and needing to construct a new list.
  + Bilingual individuals being asked to list items in one language versus the other
  + ~~Being asked by multiple individuals what hobbies you’re considering taking up.~~

**Clinical example**

* Also, clinical contexts in which verbal fluency may be repeated.
  + Being dissatisfied with a dementia diagnosis 🡪 seeking out a second opinion 🡪 undergoing the same standardized verbal fluency procedure

**Is it fair to just treat both vf attempts as individual fluency trials?**

Multiple attempts at verbal fluency might not be independent (in close succession).

* Trial 2 responses could be conscious episodic retrievals.
  + Thinking back to original attempt
* Could experience unconscious episodic priming. High probability for …
  + A word to be generated on Trial 2, if it was already generated on Trial 1
  + Repeating words based on their ordinal position from Trial 1 (Jeff’s idea for serial position curve from before thesis proposal, figures sent but not clear if this will be included)
  + Repeating specific response sequences from Trial 1 on Trial 2 (Bigrams and trigrams)

**Then how can the second trial be measured in a ~~fair~~ way?**

* The repeated fluency task paradigm is a variation of verbal fluency.
  + Same category prompt will be presented more than once across trials.

**What differences have been observed already?**

* Response lengths increase between Trial 1 and Trial 2 (RL ANOVA)
* ~~Responses on Trial 2 are significantly more likely if generated on Trial 1 (repetitions).~~
* Average semantic cluster size expands between Trial 1 and Trial 2 (Clustering analyses)

**Will repeated fluency attempts modulate performance across age groups universally?**

**Younger and older adults perform differently on standard fluency procedures.**

* Clinical applications of repeated fluency are more relevant to older adults.
  + Screened for and diagnosed with dementia at higher rates than middle-aged and younger adults.
* Normal healthy aging associated with a decline in vf performance.
  + The first reported declines in performance typically occur at age 50, with the steepest declines in performance often occurring slightly before the age of 65 (Gonzalez-Burgos et al., 2019; Van Der Elst et al., 2006)
  + Younger adults are generally expected to outperform older adults on verbal fluency.
  + Younger adults are also expected to demonstrate more pronounced differences.
    - This outcome would suggest that repeated attempts at verbal fluency differentially influences performance as a function of age.

**Does the inclusion of a repeated trial opportunity sufficiently represent multiple fluency attempts?**

Repeated fluency task paradigm provides sufficient number of semantic retrieval opportunities but…

* Not likely that clinical/everyday applications of repeated fluency are spaced equally.
  + **Some attempts may occur in close proximity:** Constructing a grocery list 🡪 losing that version of the list 🡪 Having to write a new grocery list.
  + **Some attempts may be spaced farther apart**: Receiving a dementia diagnosis 🡪 seeking out a second opinion 🡪 completing the same standardized verbal fluency procedure
* Varying the delay interval between fluency trials addresses this concern
  + Short-term delays 🡪 matter of minutes between attempts (motivating 1-minute delay)
  + Long-term delays 🡪 matter of days between attempts (motivating 24-hour delay)

**Why is this important**

* **Everyday scenarios**: Provides valuable insights surrounding the way that we extract domain-specific knowledge across different contexts
  + Could represent evidence of a more integrated declarative process.
    - Already evidence to suggest that semantic priming/cueing plays a role during episodic retrieval tasks
* **Clinical scenarios**: Could potentially reduce risk of individuals completing the same verbal fluency procedure more than once (because clinics use standardized measures)
  + Lowers possibility of overperforming and underdiagnosing semantic memory impairment

Method

Participants

* Sampled 201 participants
  + *Immediate condition*: n= 100
  + *Delayed condition*: n= 101
* Data collected through prolific.co
  + JATOS server
* **Excluding participant data from analyses (n= 21)**
  + Failure to follow instructions (7)
  + Reported not understanding/trying on the task (3)
  + Data missing/incorrect (11)
  + Participants with too many perseverative errors
* **Analyses used data from 180 individuals**
  + Older participants: n = 95 (53%)
    - 60+ years old
  + Younger participants: n = 85 (47%)
    - 18-25 years old
  + Immediate condition: n= 84
  + Delayed condition: n=96
* Combined group/condition breakdown: (i.e. age) and conditions (i.e. delay interval)
  + *Older adults in the delayed condition → old-delayed (n= 47)*
  + *Older adults in the immediate condition → old-immediate (n= 48)*
  + *Younger adults in the immediate condition → young-delayed (n = 37)*
  + *Younger adults in the immediate condition → young-immediate (48)*

|  |  |  |
| --- | --- | --- |
|  | **Immediate**  **96** | **Delayed**  **84** |
| **Older Adults**  **95** | Immediate-Old 48 | Delayed-Old 47 |
| **Younger Adults**  **85** | Immediate-Young 48 | Delayed-Young 37 |

Procedure

**Repeated fluency task**: Verbal fluency prompting same category across multiple trials.

* Category prompt: “name animals”
  + Response method: type response → press enter.
* Fluency trial duration: 90-sec
* Groups: age
  + Old
  + Young
* Condition: delay interval
  + Immediate: Fluency trial 1 → distractor → fluency trial 2
    - Distractor task: solve arithmetic problems.
      * Distractor duration: 60-sec
      * *Equations*: (a/b) ± (c/d)
        + Response method: select from numeric values.

Different response method from fluency task.

* + - * + [a, b, c, d] all positive integers
        + (a/b) and (c/d) both positive integers
        + (a/b) ± (c/d) is a positive integer ≤ 12.

* Delayed: Fluency trial 1 → [24-hour interval] → fluency trial 2
  + Fluency trial same as immediate condition
  + Delay interval: trial 1 open for (2-hour window)
  + Fluency trial 2 opens 24 hours after fluency trial 1.
  + Trial 2 window 24 hours
    - Participants asked to start trial 2 near approximate time of day when trial 1 was started.

Results

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**~~Will repeated fluency attempts modulate performance universally?~~**

**~~Younger and older adults perform differently on standard fluency procedures.~~**

* ~~Clinical applications of repeated fluency are more relevant to older adults.~~
  + ~~Screened for and diagnosed with dementia at higher rates than middle-aged and younger adults.~~
* ~~Normal healthy aging associated with a noticeable decline in Verbal fluency performance around age 65.~~
  + ~~Younger adults are generally expected to outperform older adults on verbal fluency.~~