Visual Memory Recall

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Introduction

The purpose of this study is to examine the effects of prompt modality (text or images) on free recall performance. In addition, we wish to understand whether the capacity for visual imagery has any effect on performance or the temporal structure of free recall.

Most people report that they are capable of visual mental imagery - forming images in their "mind's eye" even when the sources for those images are not immediately available to their senses. For example, you may be able to picture an elephant in your head, even though there is no elephant in the room. An estimated 2-4% of the population reports no such capability, despite no other neurological or psychological issues, and this absence of visual imagery is known as aphantasia. Studies of this phenomena suggest that aside from conscious experience, those with aphantasia have no other cognitive deficits and perform normally on most tasks (Pounder et al., 2022). One explanation for this is that tasks assumed to require mental imagery to solve (e.g., spatial reasoning or mental rotation) are being solved by other strategies and approaches.

Free recall is a well-established paradigm for the study of memory where participants recall as many words as possible associated with a particular category (Bousfield & Sedgwick, 1944). It has use in various clinical settings (e.g. Troyer, 2000) and has been used to study the structure of memory (Rhodes & Turvey, 2007; Hills, Todd & Jones 2015). In this experiment, in addition to the standard presentation of categories as a text or verbal prompt, we also present participants with an image or visual prompt for free recall. Longer duration trials than the clinical standard of one minute allow exploration of more complex temporal structure and deeper memory structure.

We hypothesize that participants with low mental imagery capabilities will recall fewer words when presented with categories defined by an image than when presented with categories defined verbally. We also predict that differences may depend on the type of category. The present study is exploratory in nature, and also seeks to establish performance differences between different categories in participants with normal imagery.

Methods

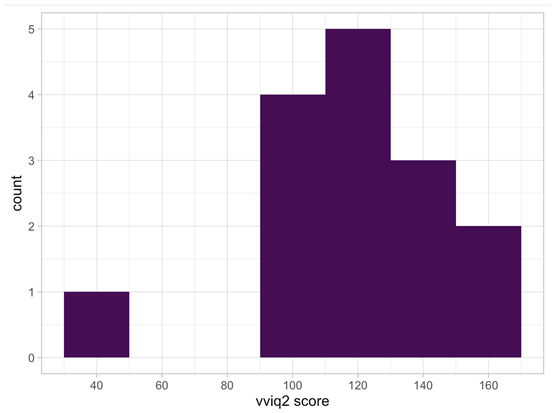
Fifteen SUNY Oswego students (12 female and 3 male with a mean age of 18.46) enrolled in Psychology courses were recruited through the SONA platform. All participants reported normal or corrected to normal vision.

Each participant completed a demographic questions and then an online version of the Vividness of Visual Imagery Questionnaire 2 Scale (Marks, 1995). This scale evaluates how strong mental imagery is using a series of scenarios where participants are asked to imagine various components and self-report how vivid their imagery is for each item on a five point Likert scale. Figure 4 shows two example questions from this scale.

Following this, participants completed a short practice and two five minute free recall trials. The practice trial asked participants to name "things found on a desk" for 30 seconds to familiarize them with the task interface. In the actual free recall trials, participants were presented with one of two different categories (beach, farm), and either presented with an image of a beach or farm or the text "things found at the" followed by the category name. Each participant either saw an image of a beach and text about a farm or an image of a farm and text about a beach. The order of prompt modality (image or text) was randomized for each participant, as was the order of categories.

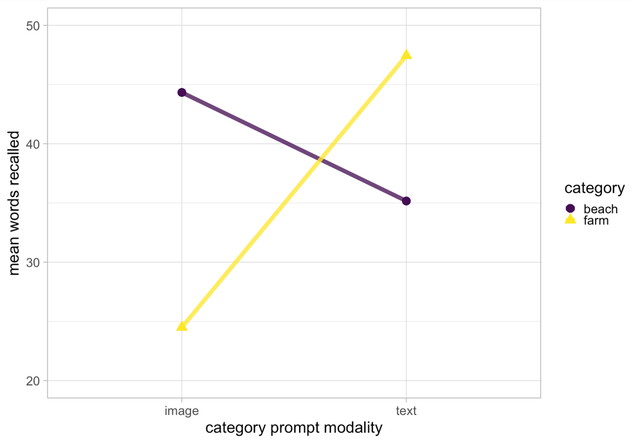
Results

Figure 1. Distribution of participant VVIQ2 scores.



The distribution of VVIQ2 scores shows that most of the participants had a VVIQ2 score over a 100 which indicates normal mental imagery performance.

Figure 2. Mean number of words recalled by recall prompt modality and category.



A two-way ANOVA was performed to analyze the effect of recall prompt modality (image or text) and category (things found on a beach or farm) on free recall performance.
It revealed a statistically significant interaction between the effects of recall prompt modality and category ($F(1,26) = 7.291$, $p < .05$).
Simple main effects analysis showed that recall prompt modality did not have a statistically significant effect on recall performance ($p = .257$), nor did category ($p = .684$)..

Materials

Figure 3. Example of text and image categories.

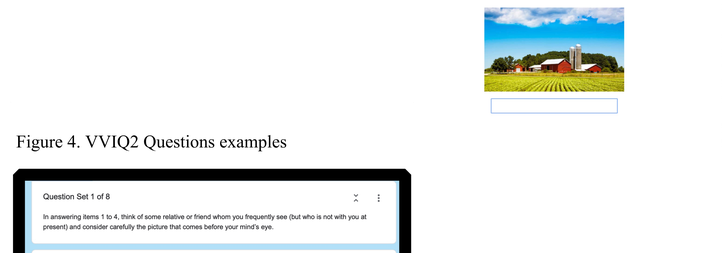
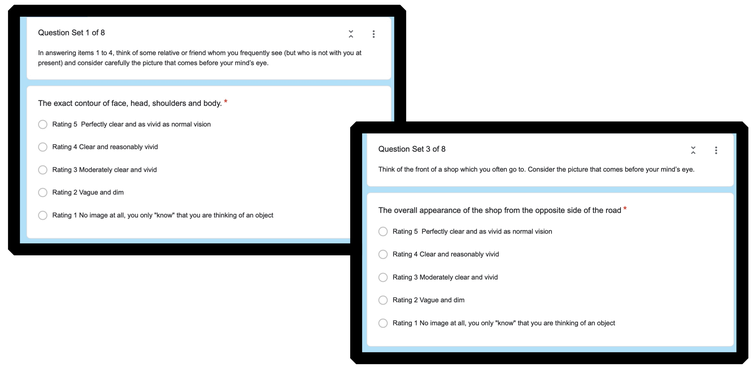


Figure 4. VVIQ2 Questions examples



Discussion

The preliminary results of this study mean that it is difficult to assess our primary hypothesis. Only one participant had a low enough VVIQ2 score to be considered aphantasic, so comparison between those groups is not possible with the current data. In addition, this participant chose 1 for each response, with no variation at all, so it is also possible they were not taking the task seriously.

While we did not find any significant differences in recall for different category modalities, we did find an interaction between modality and category, which suggests that certain types of category may be easier to recall or associate with in different modalities. The categories in this study were chosen because they were relatively easy to provide images for and were likely part of most people's experiences. The difference could be related to the role that these scenarios play - we are more likely to imagine ourselves at the beach than on a farm.

In the future, we plan to collect more data from a wider range of participants, including specific recruitment of aphantasic participants. We also plan to utilize a wider range of categories and category types. We are also interested in the potential effects of certain demographic variables (e.g., age) and how they might interact with different category types and modalities.

References

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