Project Introduction Assignment: Massive Memory

Background

Our project, titled "Massive Memory," aims to replicate Experiment 1 from the study by Brady et al. (2008), which demonstrated that long-term memory could retain highly detailed representations of objects, challenging the prevailing belief that it primarily stores only the general "gist" of visual information. This study is a landmark in cognitive science, illustrating that human visual long-term memory can preserve intricate details even when storing thousands of unique images (Brady et al., 2008). Brady et al. examined memory fidelity by presenting participants with a large number of objects and later testing their ability to recognize these objects among similar alternatives. The key finding of this study is that participants achieved high accuracy even in conditions that required memory of fine object details, which suggests a robust visual storage capacity in long-term memory. This result challenges computational and neural models of memory that traditionally emphasize capacity limits (Brady et al., 2013; Schurgin, 2018).

Experimental Design

In our replication of Brady et al. (2008), we employ three distinct conditions to evaluate visual memory fidelity. In the Novel Condition, participants are presented with a choice between an object they have previously seen and a new object from a completely different category. The Exemplar Condition requires participants to differentiate between a previously seen object and a visually similar object within the same category, testing their ability to recognize fine details within similar groupings. Finally, the State Condition challenges participants by asking them to distinguish between the same object in its original form and an identical object in a different state or pose, further testing the depth of memory detail retained. These conditions allow us to measure the extent to which detailed representations are maintained in long-term visual memory (Brady et al., 2008; Brady & Tenenbaum, 2013).

Limitations

Due to time and logistical constraints, we will simplify the design by limiting the number of images to approximately 100–200, with a viewing duration of around 5–10 minutes per session, a scaled-down version of the original 5.5-hour protocol used by Brady et al. This adjustment will enable us to explore the effects within a manageable timeframe while preserving the experiment's integrity. Moreover, we plan to streamline the repeat-detection aspect to optimize training sessions (Brady, Konkle, & Alvarez, 2011).

Methods

Our experiment will be implemented using JsPsych, leveraging its timeline and plugin features to replicate the original trial structure accurately. Each trial will consist of presenting the stimuli for a fixed duration, followed by a two-alternative forced-choice task where participants select the object they recognize. Trials will be counterbalanced and randomized as per the conditions to ensure consistency and minimize potential biases.

Discussion

We anticipate that this scaled-down replication will reflect Brady et al.'s findings, highlighting that participants can recall detailed object information even when faced with similar alternatives. This experiment will contribute to understanding the boundaries of visual memory fidelity and serve as a foundation for future experiments on the scalability of memory detail storage (Brady & Alvarez, 2015). Our findings have the potential to validate the massive storage capacity of human visual long-term memory, aligning with Brady et al.'s results and supporting their assertion that memory fidelity extends beyond simple categorical recognition to include fine-grained details (Brady et al., 2008; Schurgin, 2018).

Team Information

This project is conducted by Edwin Ruiz, Akhil Subbarao, Tanishq Rathore, Shane West, and Darwin Yu. Project files, data, and notes are accessible through our shared Google Drive and GitHub repository.

References

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