

Language improves visual memory, but production helps more

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Much research has demonstrated that language interacts with other cognitive processes [1]. For example, naming objects during learning has been found to impair visual object memory due to top-down influences of concepts or to enhance memory by promoting more distinctive encoding [2,3]. Here, we investigate how language production and comprehension shape long-term visual memory for real-world scenes. By manipulating the linguistic task and its semantic detail, we aim to elucidate the hitherto poorly understood interaction of language and memory.

In several experiments, participants completed old-new recognition memory tasks with a single stimulus set of 216 scenes drawn from 6 categories (e.g., kitchens, playgrounds). Each experiment included three encoding blocks: two verbal and one non-verbal control task. A recognition test followed each encoding block. Memory was assessed with the sensitivity index. In comprehension experiment 1, participants either matched each scene to an auditory category label or to a short scene description containing the category label and additional details (e.g., *Kitchen with red walls, white cabinets, and a black island*), cf. Figs. 1 and 2. Both verbal conditions significantly improved memory over the image-study control condition (Cohen's $d=1.08$ and $d=0.88$), and descriptions outperformed simple category labels ($d=1.07$).

In production experiment 2, participants generated labels themselves or selected and read aloud the appropriate label from displayed choices. Again, both verbal conditions outperformed the visual search control ($d=1.58$), and generated labels yielded better memory than reading aloud a choice ($d=0.84$). This finding suggests an additional benefit of generation, which was not explained by differences in label length. Two further studies addressed additional conditions and examined the performance of alternative control tasks.

Comparisons across experiments showed that memory was superior in the generation task, with heard descriptions also outperforming all other verbal and non-verbal conditions ($d_s > 0.4$). Descriptions were beneficial because they drew attention to semantic details during encoding, thereby enriching the encoded memory and facilitating discrimination. Yet this mechanism can't explain the benefit of generation, which overall contained fewer details. Nor can this benefit arise from label selection, as this possibility conflicts with selection also happening in other tasks (e.g., Exp 2). Instead, generating a label requires selective attention to visual features guided by prior knowledge, communicative experience and context, resulting in more efficient scene compression into memory and better subsequent discrimination. Overall, the results demonstrate that language is an effective tool for enhancing long-term visual memory.

References

- [1] Michael J. Spivey. Cognitive Science Progresses Toward Interactive Frameworks. *Topics in Cognitive Sciences*, 2023, 15(2), p. 219-254.
- [2] Lupyan, G. (2008). From chair to "chair": a representational shift account of object labeling effects on memory. *Journal of Experimental Psychology: General*, 137(2), 348.
- [3] Richler, J. J., Palmeri, T. J., & Gauthier, I. (2013). How does using object names influence visual recognition memory?. *Journal of Memory and Language*, 68(1), 10-25.

Figures

Figure 1: Trial structure of experiments 1 and 2

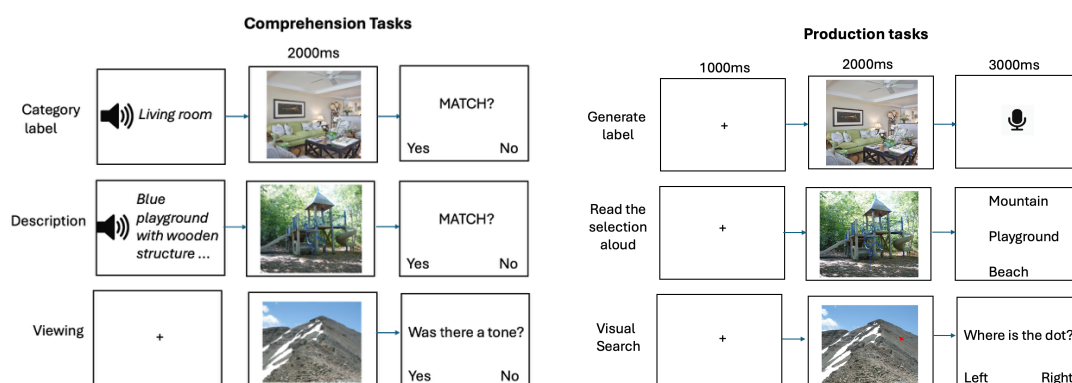


Figure 2: Results of experiments 1 and 2 (Error bars show ± 1 SE)

