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How does using object names influence visual recognition memory?

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ABSTRACT

Two recent lines of research suggest that explicitly naming objects at study influences subsequent memory for those objects at test. Lupyan (2008) suggested that naming impairs memory by a representational shift of stored representations of named objects toward the prototype (labeling effect). MacLeod, Gopie, Hourihan, Neary, and Ozubko (2010) and MacLeod, Ozubko, Forrin, and Hourihan (submitted for publication) suggested that naming enhances memory by influencing the distinctiveness of named objects (production effect). However, these studies cannot be directly compared because they differ in several procedural details such as the format of the naming task, composition of study objects from different categories, control task, and type of lures used at test. Here we systematically manipulate those factors to better understand how using object names influences visual recognition memory. When objects belonged to unique categories, vocal naming (as used in the production effect) produced comparable memory as a non-naming task (preference rating) and both produced significantly better memory than key-press naming (as used in the labeling effect). Naming objects at study only impaired memory relative to preference rating when objects belonged to one of two categories, a condition in which names have little or no distinctiveness. Theoretically, our results pose challenges to the representational shift account that proposes special mechanisms tied to the use of object names.

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Introduction

Language is critical for human communication and central to social interactions. To facilitate communication, object names are automatically accessed in preparation for speech (e.g., Meyer & Damian, 2007; Morsella & Miozzo, 2002; Navarette & Costa, 2005). The seemingly automatic activation of object names has consequences for perceptual and cognitive processes, even outside of communicative goals. For example, gaze duration for pictures is correlated with name length and spoken name duration (Zelinsky & Murphy, 2000), objects that belong to the same linguistic category are perceived as being more similar than objects belonging to different linguistic categories (Goldstone, 1994; Roberson & Davidoff, 2000), and picture

recall is influenced by the length and phonological similarity of picture names (Coltheart, 1999; Schiano & Watkins, 1981).

Having names for objects influences perception and memory. But is there an effect of overtly using object names? Many theories of object categorization (e.g., Ashby, Alfonso-Reese, Turken, & Waldron, 1998; Kruschke, 1992; Lamberts, 2000; Nosofsky & Palmeri, 1997) and object recognition (e.g., Joyce & Cottrell, 2004; Riesenhuber & Poggio, 1999; Serre, Oliva, & Poggio, 2007) assume a bottom-up process where object representations are compared to category representations in order to name an object (Palmeri & Tarr, 2008). If overtly using object names systematically affects how object are actually represented, this could have theoretical consequences for these theories.

Two recent lines of research have reported that intentionally and overtly naming objects during study can systematically influence subsequent visual memory for those objects at test. One reported impaired memory while the other reported enhanced memory. However, these

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lines of research are difficult to compare and integrate because their paradigms differ along many experimental factors. Our empirical goal is to systematically investigate differences between these paradigms, allowing us to better understand how using object names influences recognition memory, which can have important theoretical implications. We describe these two lines of research in turn below.

Lupyan (2008) reported impaired recognition memory after naming objects at study. Specifically, memory was worse for objects labeled as chairs or lamps compared to objects rated for preference – a finding dubbed the *labeling effect* (Lupyan, 2008; see also Richler, Gauthier, & Palmeri, 2011). Lupyan (2008) proposed a representational shift hypothesis to explain this impaired memory (see also Lupyan, 2012): Overtly naming objects exaggerates effects of object categorization, activating features associated with prototypical examples of the object's category. In a top-down manner, these features become coactive with the visual features of the named object and systematically alter the object representation stored in visual long-term memory. Overtly labeling a picture of a chair as a "chair" shifts its visual memory representation toward the chair prototype. The subsequent mismatch between a previously studied chair presented again at test and its "shifted" visual memory representation leads to a false sense that the previously studied object is a new chair, impairing memory performance.

Whereas representational shift predicts memory impairment from naming, in an independent line of research, MacLeod and colleagues reported enhanced memory from naming. Recognition memory was better for words (MacLeod, Gopie, Hourihan, Neary, & Ozubko, 2010) and line drawings of objects (MacLeod et al., submitted for publication) named out loud than those named silently. This was dubbed the *production effect* (MacLeod et al., 2010) and was explained by MacLeod et al. in terms of distinctiveness: Vocal production of a name leads to more unique processing of the study item during encoding that can be "replayed" at test. A match between processing at study and reprocessing at test facilitates recognizing that item as "old" (Conway & Gathercole, 1987; MacLeod, 2010; MacLeod et al., 2010; Ozubko & MacLeod, 2010). Alternatively, Dodson and Schacter (2001) proposed a metacognitive explanation for production effects. They suggested that saying words out loud at study reduces rates of false recognition because participants expect to remember having said a word out loud and the absence of this expected information is used as a cue that a test item is new. So unlike the labeling effect, the production effect has been explained without appealing to anything "special" about naming *per se*. Vocalizing the name of an object is just one of many things a person could do to make a memory representation more distinctive.

Critically, details of the experimental procedures used to test for the labeling effect (Blanco & Gureckis, 2011; Lupyan, 2008; Richler et al., 2011) and the production effect (MacLeod, 2010; MacLeod et al., 2010, submitted for publication; Ozubko & MacLeod, 2010) differ in several important respects. Both use a relatively standard study-test procedure for recognition memory, but, as shown in

Fig. 1, the two paradigms differ on the exact nature of the naming task, the control task, and the composition of study objects from different categories (see also Fig. 2). In the present article, we explore the missing cells in Fig. 1, along with some not illustrated. Our goal was not merely to fill in a table of missing experimental conditions, but to explore key factors that might help elucidate the conditions under which a labeling effect (impaired memory from naming) or a production effect (enhanced memory from naming) can be obtained, with an eye toward a theoretical understanding of how using object names affects object representations and object memory.

First, the overt naming task differs between paradigms. In studies of the production effect, participants say the name of an object out loud (henceforth referred to as *vocal naming*). In studies of the labeling effect, participants are given a two-alternative forced choice key-press for the name of an object (henceforth referred to as *key-press naming*). In the following experiments we directly compare vocal naming and key-press naming. Theoretical accounts of the production effect predict that vocal naming leads to better memory than key-press naming, either because a vocal response leads to more distinctive memory than a key-press response (MacLeod et al., 2010) or because participants expect to remember a vocal response better than a key-press response (Dodson & Schacter, 2001). In contrast, representational shift does not make specific predictions, but is compatible with several different scenarios: On the one hand, the representational shift account could explain equivalent memory for vocal naming and key-press naming because representational shift occurs whenever category labels are explicitly activated and used. On the other hand, the representational shift account could explain worse memory for vocal naming leads compared to key-press naming because vocal naming is more overt, exaggerating the effects of categorization, leading to an even greater representational shift. Only by including both

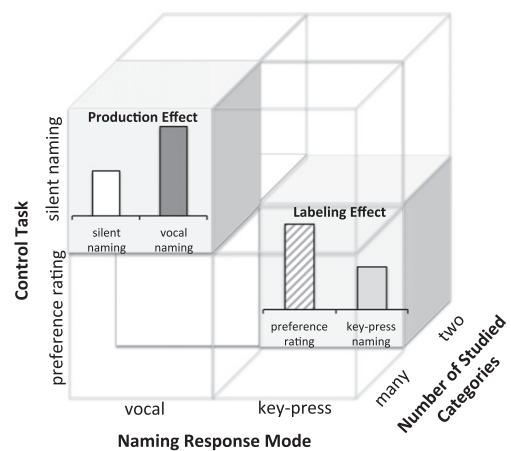


Fig. 1. An illustration of three of the experimental factors that differ between experiments on the production effect and experiments on the labeling effect. Also illustrated are idealized data for the production effect (better memory following vocal naming vs. silent naming) and the labeling effect (worse memory following key-press naming vs. preference rating).

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