Polysemous category assignment in mixed contexts

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People have strong senses of category membership [1]. According to exemplar theory, people store typical examples of a category as representations of that category (e.g., “red” and “blue” for COLOR) [2, 3, 4]. However, sometimes categorization is ambiguous. For example, the word “orange” can belong to the category COLOR, and/or the category FRUIT. When presented with other colors, a person will be inclined to group “orange” in COLOR, but if presented with other fruits, “orange” will likely be grouped in FRUIT [5, 6]. Games like the *New York Times*’ Connections exploit polysemous meanings such as these. Work on polysemy suggests that a given sense of a word is made more or less available depending on A) context [7] and B) inherent bias [8]. In this project, we employ a novel method that allows us to measure the strength of association of polysemous words with different senses. **Experiment**: Participants (N=39; American English-speaking) are instructed to group words on a canvas according to how similar they are [9]. The words are presented individually and sequentially. The placement of any word can be adjusted at any point during the trial. Participants are presented with three words belonging to Category 1 (e.g., COLOR: {green, blue, pink}), and subsequently three words belonging to Category 2 (e.g., FRUIT: {apple, banana, grape}). We also present a polysemous Target, which is a potential member of both categories (e.g., orange). The Target is presented once in each of three different positions (see Fig. 1). In Position 1, participants have only been exposed to members of Category 1. In Position 2, participants have seen at least one word belonging to Category 2. In Position 3, the Target is presented last. After placing the final word, participants are prompted to ensure that every word is placed where they want it before continuing to the next trial. We record all placements of each word. We also conduct control trials in which the Target is presented with a) the words from either Category 1 or 2, and b) words from an unrelated category. The control trials measure the basic strength of the Target’s association with each category. We hypothesize that polysemous words are assigned a category based on **A)** the dominant contextual sense and **B)** their inherent bias. We also predict that **C)** people will update their categorization based on changes in context. **Results**: In the control trials, the Target is placed near the other members of its category, as expected (Figs. 2, 3). Across all Positions in the experimental trials, the Target’s final placement does not align closely with either category, reflecting category ambiguity (Fig. 2). Because Category 1 is presented first, it constitutes the dominant contextual sense for most of the experimental trials. Figure 2 shows that despite that dominance, the Targets are not placed closer to Category 1 than Category 2. Examining each category across all trials and Positions (Fig. 3) reveals that, while some categories are intrinsically clustered closer together (reflecting inherent bias), generally, the Target is further from the center of any given category cluster in the ambiguous contexts than in the control contexts. The difference between the control and experimental trials indicates that people update their Target categorization in response to ambiguous contexts. **Discussion**: The results show that while category dominance and category association bias play a role in category assignment (which our method allows us to explicitly measure), participants also update the categorization of polysemous words in ambiguous contexts. This indicates that online category assignment is context-dependent and available to be updated during online processing. The method used in this experiment also provides a first step toward quantitative analysis of polysemous meaning.

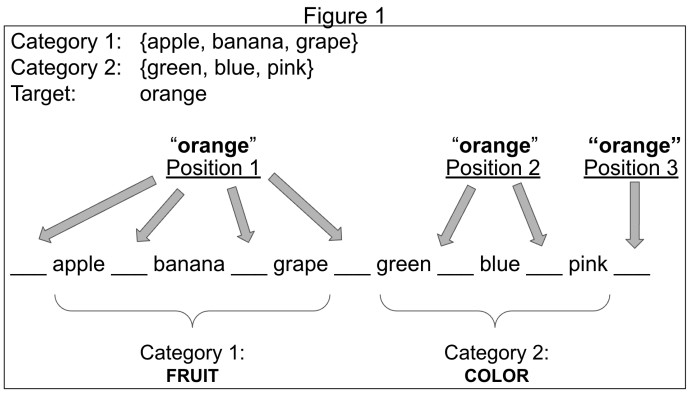


Figure 1: Positions in which Target (e.g., "orange") might appear. In Position 1, Target appears among items in Category 1. In Position 2, Target appears among items in Category 2. In Position 3, Target appears as final word.

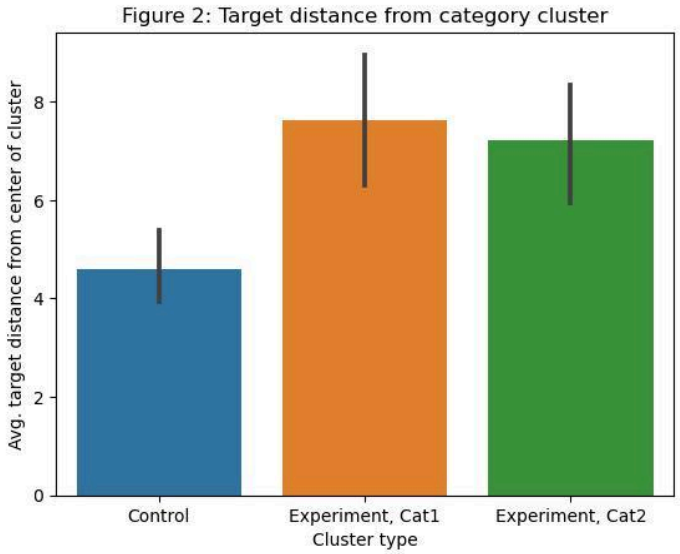
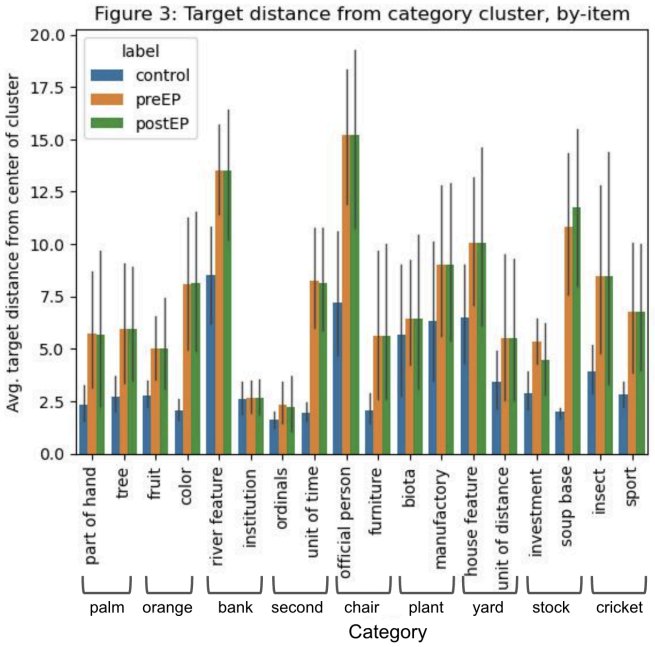


Figure 2: Average distance of Target from center of a given type of cluster (control trials, where one unambiguous category is presented; Category 1 in experimental trials; or Category 2 in experimental trials) at the end of a trial.

Figure 3: Average distance of Target from center of a given category cluster, shown by-item. For each category pair, Category 1 is on the left and Category 2 is on the right. Distances given in 1) control trials, 2) experimental trials before the end prompt (preEP), and 3) experimental trials after the end prompt (postEP).



References [1] Murphy (2016), *Psychonom. Bull. & Rev*. [2] Medin & Schaffer (1978), *Psych. Rev*. [3] Nosofsky (1987), *Journal of Exp Psych.* [4] Smith (2014), *Psychonom. Bull. & Rev*. [5] Oden & Spira (1983), *Quarterly Journal of Exp. Psych*. [6] Basili et al. (1997), *Applied Artificial Intelligence*. [7] Frisson (2009), *Lang. and Ling. Compass*. [8] Rodd (2020), *Perspectives on Psych. Science*. [9] Starr et al. (2025), *Proc. of the 47th Annual Conf. of the Cog. Sci. Soc.*