Evidence Against the Phenomenon of Hemispheric Lateralization in Categorical Perception

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Introduction

The Sapir-Whorf Hypothesis is a classic theory suggesting that the language we speak impacts how we perceive the world, proposing that language experience shapes even "low-level" perception. Recent research in the area has focused on hemispheric lateralization in categorical (object) perception, finding that people process categories differently in the left and right cerebral hemispheres (LH and RH), theoretically because the LH dominates language processing. Studies have shown that RTs to target stimuli are faster when targets come from a different lexical category than distractors (e.g., cats versus dogs), but significantly more so when targets appear in the right visual field, which feeds into the LH. We sought to further examine these lateralized perceptual processes, by both replicating and extending the original studies (by Gilbert et al., 2006; 2008) across different experiments.

Methods

Gilbert et al.’s original paradigm (2006)

- Stimulus display ring of 12 color squares, 11 of identical color (distractors) and one of unique color (the target).
- Target either within-category or between-category (see Figure 1).
- Display presented for 200 ms; keyboard press to indicate which half of the screen contained the target.
- RTs to targets were faster when target was between-category, but more-so when target was in right visual field (RVF).
- Followed same paradigm as Gilbert et al.’s (2006) original paradigm using color squares, but with cats and dogs as categorical stimuli.

Experiment 1 - Animals Version

- Exp. 1 compared perception of famous and unknown faces, separately in different visual fields.
- Developed a new but similar paradigm to Gilbert et al. (2008) to test complex stimuli (human faces).
- Used four stimuli instead of 12, to accommodate for increased complexity and difficulty.
- Tested new paradigm with both Animal Shapes Version and Faces Version, to bridge old paradigm and new one.
- Display presented for 200ms; keyboard press indicating which half of the screen contained the target.
- Utilized one-back match tasks to tax verbal WM (using color names) or visual WM (using grids).

Results

- Exp. 2 did not replicate Gilbert et al.’s (2008) findings. Why? The only deviation made was in the stimuli. Exp. 3 sought to replicate Gilbert et al.’s results.

Discussion

- Exp. 1 showed famous faces did not constitute a lexical category, and our 4-item paradigm had no Whorfian results. Given subsequent failed replications, these results make sense.
- Exp. 4 achieved similar trends to Gilbert et al., except that secondary verbal WM task did not interfere with the trend. Our effect of category signifies that the experiment was done correctly.
- To implicate the language centers of the brain in the hemispheric lateralization observed in the no-interference condition, disruption of the phenomenon on the verbal interference condition—but not the nonverbal interference condition—was imperative.

Conclusions

Based on the results of Experiments 2, 3, and 4, we are forced to call into question Gilbert et al.’s (2006 & 2008) previous findings and their implications. The statistical methods used by Gilbert et al. are questionable, and this purported effect of hemispheric lateralization in categorical perception needs further scrutinization. Our next step is to quadruple our sample sizes to increase our power even further, and analyze this data every possible way—at the very least using the methods used by Gilbert et al., as well as more conventional methods—to determine how they got their effects and whether their claims are justified. For the time being, this line of experiments has churned up more questions than it has answered. This “Whorf Effect,” upon which a decade of research has been based, may not exist.