

Is Whorf Right? (or Left?) Evidence from Aphasia Patients

Yulia Paluy¹ (yulapaluy@gmail.com)
Aubrey L. Gilbert^{1,2} (mayfly@gmail.com)
Juliana V. Baldo³ (juliana@ebire.org)
Richard B. Ivry^{1,2} (ivry@berkeley.edu)

¹Department of Psychology, and ²Helen Wills Neuroscience Institute, University of California, Berkeley, CA, 94720,
³Center for Aphasia and Related Disorders, VA Northern California Health Care System, Martinez, CA, 94553

Keywords: categorical perception; hemispheric laterality; color; linguistic relativity; aphasia.

Previous research suggests that language affects color discrimination primarily in the right visual field (RVF), and less so in the left visual field (LVF), what has been dubbed a “lateralized Whorfian effect” (Drivonikou et al., 2007; Gilbert et al., 2006). The visual pathways carry information from each visual field to the contralateral hemisphere and so the lateralized Whorfian effect is thought to arise from left hemisphere (LH) contributions to language. In this study, LH stroke patients diagnosed with various types of aphasia performed a speeded visual search task from Gilbert et al. (2006). Unlike age and education-matched controls, the aphasic patients did not show a Whorfian effect in the RVF. Surprisingly, they did show the effect in the LVF. These results suggest a functional reorganization after stroke related to the interaction of language, perception and thought.

Method

Fifteen right-handed, monolingual, English-speaking, LH stroke patients diagnosed with aphasia (mean age=65, SD=7; mean education=17, SD=2) and twelve controls (mean age=62, SD=7; mean education = 16, SD=2) performed a speeded visual search task. During each experimental trial, a fixation marker appeared at the center of a screen, surrounded by a ring of 12 squares. One (target) square was a different color from the remaining 11 squares (distracters). The colors in each target-distracters pair were either in the same lexical category (e.g., two different shades of green), or in two different lexical categories (e.g., one green, one blue). Participants focused on the fixation cross and identified the side of the screen containing the target by pressing one of two nearby keys with their left hand.

Results and Discussion

The results for the controls replicated Gilbert et al. (2006): reaction times to targets in the RVF were faster when the target and distracters belonged to different lexical categories, than when the target and distracters were in the same category; this effect was absent in the LVF. The RVF advantage for the between-category condition was absent in the aphasic participants. Interestingly, these individuals' reaction times to targets in the LVF were faster in the

between-category condition. The effect observed in the LVF for the patients suggests a functional reorganization following damage to language regions of the LH.

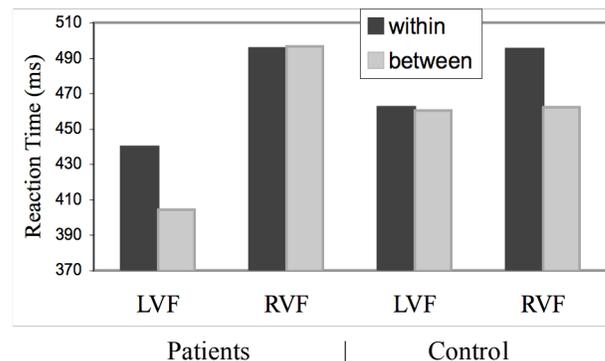


Figure 1: The interaction of visual field x target type (within/between), by group (patients/controls) was significant: $F(1,25)=12.69$, $P < .01$.

Voxel-based lesion-symptom mapping (Bates et al., 2003) was performed based on difference scores of the RTs for within and between-category conditions in each visual field. The region found to be most acutely associated with the patients' categorical perception deficit in the RVF was a part of the left anterior insula. However, this effect was relatively weak. We also failed to find a strong relationship between aphasic subtype and the difference scores, although the number of patients in each subgroup is small. Further research is needed to elucidate whether specific brain regions are related to the reversal of the lateralized Whorf effect.

References

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