Commentary

TOWARD A VERIDICAL INTERPRETATION OF RIGHT-HEMISPHERE PROCESSING AND STORAGE

Christine Chiarello[1] and Mark Beeman[2]

[1]University of California, Riverside, and [2]Rush Medical Center

In a recent article, Metcalfe, Funnell, and Gazzaniga (1995) presented experimental data from split-brain patient J.W., which they believe supports the view that the right hemisphere "tends not" to engage in "generalizations, conjectures, inferences, and fantasies," "does not store the results" of such operations, and thus "is not confused by them" (p. 163). They argued that right-hemisphere processing is "more literal" than that of the left hemisphere, permitting "more veridical" memory storage (p. 157). We have two objections to their analysis. First, to support their storage hypothesis, they cited evidence from studies of hemispheric processing differences. Unfortunately, they got the facts wrong. Second, the split-brain data they reported, although interesting, are not as clear-cut as one would like. We conclude that hemisphere differences in memory cannot be attributed to tendencies to process information interpretively versus veridically.

What are the facts? A large body of research suggests that semantic priming can be obtained within either hemisphere of the normal brain, but that there are principled differences in the nature and extent of this priming. Although we welcome new interpretations of this data, we do object to the inaccurate and misleading depictions of this work by Metcalfe et al. (1995). For example, directly associated pairs such as *bee-honey* and *doctor-nurse* produce equivalent priming across hemispheres (Chiarello, Burgess, Richards, & Pollock, 1990), not "more priming in the left hemisphere," as Metcalfe et al. claimed (p. 158). In fact, none of the nine different priming contrasts reported in that study obtained greater left-hemisphere than right-hemisphere priming. Similarly, Metcalfe et al. cited Beeman et al. (1994, Experiment 2) to support the claim that "the left hemisphere should show semantic priming with related stimuli to a greater extent than should the right hemisphere, and it does" (p. 157). However, there were two types of semantic priming in that study: direct priming from one prime word closely related to the target and summation priming from three words, each distantly related to the target. The direct primes were more effective for left-hemisphere targets; the summation primes, which would seem to be more relevant to interpretive processing, were equally (Experiment 2) or more (Experiment 1) effective for right-hemisphere targets. The summation priming results were ignored.

Other priming data were also incompletely cited. Metcalfe et al. noted that the right-hemisphere advantage for exact physical matches (Marsolek, Kosslyn, & Squire, 1992) is consistent with the idea that the right hemisphere is superior "on veridical information, whereas the left hemisphere generalizes over . . . related information" (p. 157). However, in the same study, there was symmetric priming for cross-case matches, contrary to the hypothesis that the right hemisphere is "less capable of generalization" (p. 157).

The semantic priming data, and subtle comprehension deficits observed in patients with right-hemisphere damage (RHD), have persuaded us that the right hemisphere may be more likely than the left hemisphere to activate "semantic information that is necessary for drawing inferences" (Beeman, 1993, p. 80). However, we do not believe that the "right hemisphere may be the seat of inferential processing," as attributed by Metcalfe et al. (p. 157). Rather, we argue that because right-hemisphere activation is diffuse, it is difficult to select for further processing, and "the [left hemisphere] may capitalize on [the activated] information to actually generate the inference" (Beeman, 1993, pp. 107–108).

As Metcalfe et al. noted, stronger evidence comes from studies including both patients with left-hemisphere damage (LHD) and patients with RHD, but their descriptions of such studies are either inaccurate or incomplete. Contrary to the report given by Metcalfe et al., Chiarello and Church (1986)—a study investigating rhyme, visual, and semantic similarity judgments—did not find that RHD patients "were less impaired on all tasks, including the semantic task," than LHD patients (p. 158). In fact, RHD and LHD patients performed equally well on the visual and semantic tasks, and reliably worse than control subjects on the latter task. Furthermore, when reporting that LHD patients respond "excessively literally" (p. 158) to jokes (Bihrle, Brownell, Powelson, & Gardner, 1986), Metcalfe et al. failed to describe the performance of RHD patients in the same study. When selecting good punch lines to jokes, RHD patients chose surprising endings that did not cohere, suggesting that the left hemisphere has difficulty assessing relatedness. LHD patients chose unsurprising endings that cohered with the premise, suggesting that the right hemisphere overemphasizes relatedness, rather than responding "excessively literally." Moreover, Metcalfe et al. did not refer to research suggesting that the left hemisphere (in RHD patients) tends to respond more literally than the right hemisphere (in LHD patients) (e.g., Brownell, Potter, Michelow, & Gardner, 1984).

Our second, less strenuous, objection concerns the new data that Metcalfe et al. presented. Because J.W. more accurately rejected "new" stimuli using his right than his left hemisphere, Metcalfe et al. argued that the right hemisphere stored veridical representations, whereas the left hemisphere inferred and stored similar, as well as target, stimuli. However, although J.W.'s left hemisphere more often mistook category co-examplars of the targets as "old," this was also true for "extracategorical" foils. Although Metcalfe et al. claimed that these new " 'unrelated' patterns were apparently still similar enough to the presented patterns" (p. 160) to have been inferred by the left hemisphere, they were randomly generated (Experiments 1 and 2) or completely new items that fooled students only 4% to 5% of the time (Experiment 3). Any post hoc argument that the extracategorical foils were treated by J.W.'s left hemisphere as related would be rather circular. Reinterpreting an unexpected pattern of results based on assumptions the experiment was intended to test would not be very convincing.

When all is said and done, the major claims made by Metcalfe et al. rest primarily on data from a single, albeit unique, patient. Thus,

Address correspondence to Christine Chiarello, Department of Psychology, University of California, Riverside, Riverside, CA 92521; e-mail: chrisc@galaxy.ucr.edu.

Copyright © 1997 American Psychological Society

Downloaded from pss.sagepub.com at NORTHWESTERN UNIV LIBRARY on June 23, 2016

converging evidence is especially important and needs to be carefully examined. A complete and accurate description of the relevant external data does not support their stated hypothesis. Even if one accepts their conclusion that the right hemisphere does maintain "an accurate record of the past" (p. 163), this does not appear to reflect typical processing within the right hemisphere. In fact, the evidence consistently suggests that right-hemisphere language processing characteristically encompasses its own unique "interpretations, interpolations, and inferences" (p. 163) (see integrative reviews in Beeman, 1993; Beeman & Chiarello, in press; Burgess & Chiarello, 1996).

REFERENCES

Beeman, M. (1993). Semantic processing in the right hemisphere may contribute to drawing inferences from discourse. *Brain and Language, 44,* 80–120.

Beeman, M., & Chiarello, C. (in press). *Right hemisphere language comprehension: Perspectives from cognitive neuroscience.* Mahwah, NJ: Erlbaum.

Beeman, M., Friedman, R., Grafman, J., Perez, E., Diamond, S., & Lindsay, M. (1994). Summation priming and coarse semantic coding in the right hemisphere. *Journal of Cognitive Neuroscience, 6,* 26–45.

Bihrle, A.M., Brownell, H.H., Powelson, J., & Gardner, H. (1986). Comprehension of humorous and non-humorous materials by left and right brain-damaged patients. *Brain and Cognition, 5,* 399–412.

Brownell, H.H., Potter, H., Michelow, D., & Gardner, H. (1984). Sensitivity to lexical denotation and connotation in brain-damaged patients: A double dissociation? *Brain and Language, 22,* 253–265.

Burgess, C., & Chiarello, C. (1996). Neurocognitive mechanisms underlying metaphor comprehension and other figurative language. *Metaphor and Symbolic Activity, 11,* 67–84.

Chiarello, C., Burgess, C., Richards, L., & Pollock, A. (1990). Semantic and associative priming in the cerebral hemispheres: Some words do, some words don't . . . sometimes, some places. *Brain and Language, 38,* 75–104.

Chiarello, C., & Church, K.L. (1986). Lexical judgments after right or left hemisphere injury. *Neuropsychologia, 24,* 623–630.

Marsolek, C.J., Kosslyn, S.M., & Squire, L.R. (1992). Form-specific visual priming in the right cerebral hemisphere. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 18,* 492–508.

Metcalfe, J., Funnell, M., & Gazzaniga, M.S. (1995). Right-hemisphere memory superiority: Studies of a split-brain patient. *Psychological Science, 6,* 157–164.

(RECEIVED 7/31/95; REVISION ACCEPTED 1/3/96)

Downloaded from pss.sagepub.com at NORTHWESTERN UNIV LIBRARY on June 23, 2016