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Hypnosis in the right hemisphere

John F. Kihlstrom^{a,*}, Martha L. Glisky^b, Susan McGovern^c, Steven Z. Rapcsak^d and Mark S. Mennemeier^e

^a University of California, Berkeley, CA, United States

^b Bellevue, WA, United States

^c Tucson, AZ, United States

^d University of Arizona College of Medicine, AZ, United States

^e University of Arkansas for Medical Sciences, AR, United States

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ABSTRACT

Speculations about the neural substrates of hypnosis have often focused on the right hemisphere (RH), implying that RH damage should impair hypnotic responsiveness more than left-hemisphere (LH) damage. The present study examined the performance of a patient who suffered a stroke destroying most of his LH, on slightly modified versions of two hypnotizability scales. This patient was at least modestly hypnotizable, as indicated in particular by the arm rigidity and age regression items, suggesting that hypnosis can be mediated by the RH alone – provided that the language capacities normally found in the LH remain available. A further study of 16 patients with unilateral strokes of the LH or RH found no substantial differences in hypnotizability between the two groups. Future neuropsychological studies of hypnosis might explore the dorsal/ventral or anterior/posterior dichotomies, with special emphasis on the role of prefrontal cortex.

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1. Introduction

Of all the speculations concerning the neural substrates of hypnosis and hypnotizability, perhaps the most popular have been those that implicate the right cerebral hemisphere (for reviews, see Barabasz and Barabasz, 2008; Kihlstrom, 2013). Bakan (1969) was apparently the first to propose that hypnosis was mediated by the right hemisphere (RH), based on an

identification of hypnosis with the creative, intuitive, non-analytic, and holistic processing often held to characterize RH function (e.g., Hellige, 1993; but see Efron, 1990), in contrast to the logical, sequential, and analytic processing associated with the LH. Of course, a strong interpretation of the RH hypothesis is untenable (Jasiukaitis et al., 1997), if for no other reason than that the comprehension of hypnotic suggestions requires linguistic skills normally associated with the LH.

* Corresponding author. Department of Psychology, MC 1650, University of California, Berkeley, 3210 Tolman Hall, Berkeley, CA 94720-1650, United States.

E-mail address: jfkihlstrom@berkeley.edu (J.F. Kihlstrom).

URL: <http://socrates.berkeley.edu/~kihlstrm>

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Nevertheless, over the succeeding years, the idea that the nondominant, typically right, hemisphere is somehow specialized for hypnosis has been extremely attractive to both researchers and theorists (for a comprehensive review, see Crawford and Gruzelier, 1992).

Evidence for RH involvement in hypnosis has come mostly from studies employing behavioral or psychophysiological paradigms (for a comprehensive review, see Kihlstrom, 2013). For example, Bakan himself reported that hypnotizable subjects showed more reflective eye movements to the left, ostensibly indicating greater RH activation, than insusceptible subjects (Bakan, 1969), while other investigators found that hypnosis diminished the right-ear (i.e., LH) advantage frequently found in dichotic listening tasks (Frumkin et al., 1978; Spellacy and Wilkinson, 1987). Hypnotizability has been associated with autokinetic movements to the left (Graham and Pernicano, 1979). In one study, subjects who sat on the right side of a room (thus placing the hypnotist in their left visual half-field, projecting into the right cerebral hemisphere) were more hypnotizable than those who sat on the left (Sackeim et al., 1979), while in another study right-handed subjects given motor suggestions were more responsive on the left side of their body – i.e., the side controlled by the RH (Sackeim, 1982). Hypnotizability has been correlated with performance on “gestalt closure” tasks that seem to capitalize on the holistic information-processing capacities of the RH (Crawford, 1981); and the induction of hypnosis, particularly in hypnotizable subjects, enhanced performance on behavioral tasks that ostensibly capitalized on “RH” functions (Bakan, 1970; Crawford, 1986). On the other hand, many of these observations have proved difficult to confirm and extend (e.g., Bakan, 1970; Cranney and McConkey, 1980; Gur and Gur, 1974; Monteiro and Zimbardo, 1987; Otto-Salaj et al., 1992; Stam et al., 1981; Wallace and Persanyi, 1989).

A similar fate befell psychophysiological and brain-imaging studies of hypnosis, hypnotizability, and laterality. Some investigators reported that hypnosis produced a shift from LH to RH activation, as measured by the EEG (Edmonston and Moskovitz, 1990; MacLeod-Morgan and Lack, 1982), while Gruzelier and his colleagues found lateral asymmetries in EDR activity suggesting an inhibition of the LH (Gruzelier et al., 1984; Gruzelier and Brow, 1985). At the same time, both earlier (Morgan et al., 1971, 1974) and later (Graffin et al., 1995) studies failed to produce congruent results. A pioneering PET study by Crawford and her colleagues found that hypnotizable subjects showed dramatic increases in regional cerebral blood flow in the RH following hypnotic induction (Crawford et al., 1993). However, more recent studies have indicated broader patterns of activation involving both cerebral hemispheres (Maquet et al., 1999; Rainville et al., 1999).

Given all this activity, it is somewhat remarkable that, to our knowledge, no investigator has ever addressed the RH hypothesis by testing patients with lateralized brain injury. Some investigators have administered neuropsychological tests, including assessments of lateralized function, to hypnotized or hypnotizable subjects (Gruzelier and Warren, 1993; Query et al., 1983), but these subjects were neurologically intact. Laidlaw (1993) assessed hypnotizability in a group of neurological patients who had suffered closed head injuries, but did not specifically consider laterality. Relatedly,

Persinger and his colleagues (Healey et al., 1996; Tiller and Persinger, 1994) found that the brief application of a weak pulsed magnetic field over the right temporal lobe, inducing activity resembling complex partial epileptic-like seizures, increased hypnotizability in neurologically intact subjects. The present study sought to contribute to neuropsychological investigations of hypnosis by examining hypnotic susceptibility in patients with clearly lateralized brain damage secondary to stroke.

2. Case study: patient GK

2.1. Case description

At the time of testing (1994), GK was a 63-year-old right-handed male who had suffered a LH stroke in 1977, resulting in global aphasia, alexia, and agrafia, as well as a dense right homonymous hemianopia, right hemiplegia, and right hemisensory loss. An MRI scan showed a massive infarction involving the distribution of all three major cerebral arteries supplying the LH. The lesion resulted in virtually complete destruction of the cortex of all four cerebral lobes of the LH as well as the underlying white matter. The RH appeared to be normal.

Following his discharge from the hospital, GK showed continuous improvement of his language and gestural abilities, reaching a plateau after about 2 years in recovery. At the time of testing, more than 15 years after his stroke, his speech and language abilities were consistent with Broca’s (expressive) aphasia. His spontaneous speech was effortful, non-fluent, and slightly dysarthric; his speech output was a grammatical but meaningful, with the omission of functors and simplified sentence structure. His auditory comprehension was excellent for conversational speech, disrupted only when he was dealing with complex sentences. GK walked with a leg brace, and his only other physical limitation was a right hemisensory loss, and a right hemiplegia restricting use of his right arm. Despite these impairments, he lived alone, tended to his daily affairs without any apparent difficulty, and pursued his hobby of building model automobiles and airplanes.

Because GK’s language abilities were relatively well preserved, he was almost unique among those patients who have lost so much of their LH late in life. Accordingly, he was studied by investigators who were interested in hemispheric contributions to various aspects of cognitive and behavioral function (Polster and Rapcsak, 1994; Rapcsak et al., 1991, 1993).

2.2. Methods and results

In the course of events, GK agreed to participate in a study of hypnosis. For this purpose, he was individually administered modified versions of the 12-item Stanford Hypnotic Susceptibility Scale: Form A (SHSS:A; Weitzenhoffer and Hilgard, 1959), followed by the 12-item Stanford Form C (SHSS:C; Weitzenhoffer and Hilgard, 1962). In return for his participation, GK received an honorarium of \$25 plus reimbursement of his travel expenses for each of two sessions lasting approximately 75 min in length.

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