REFERENCES


Handedness and Dichotic Listening Performance in Patients with Unipolar Endogenous Depression Who Received ECT

BY MORRIS MOSCOVITCH, PH.D., ESTHER STRAUSS, M.A., M.ED., AND JANET OLDS

Unilateral ECT is effective in treating patients with unipolar endogenous depression that is unresponsive to drugs. Because verbal memory is usually less impaired after right rather than left unilateral ECT (1) and because there is some indication that right ECT is more effective than left in alleviating depression (2), right ECT is routinely administered to patients for whom ECT is recommended. This procedure, although appropriate for more than 95% of right-handers and 60% of left-handers who are left-hemisphere dominant for language (3), does not take into account the substantial minority of left-handers and those few right-handers in the general population whose dominance is reversed. It is important, therefore, to know the incidence of left-handedness and right hemisphere dominance for language among patients receiving ECT. The results of our handedness survey indicate a dearth of left-handers among such patients. In addition, the performance of 7 of the woman patients on a verbal dichotic listening task indicates that lateral asymmetries are atypical before ECT treatment but are restored to normal after successful treatment with right unilateral ECT.

Method

A handedness questionnaire was administered to 42 women and 10 men who received ECT at the Clarke Institute of Psychiatry to relieve depression because antidepressive drugs were ineffective or because ECT was the treatment of choice at admission. The patient’s handedness was not a factor in recommending ECT.

The subjects indicated their hand preference as left, right, or either for writing, drawing, throwing, brushing their teeth, and cutting with scissors (4). They were also asked which foot they used to kick a ball and which eye they used to sight in a telescope. They were then questioned if there was any activity requiring the use of one hand for which they used a hand different from the one indicated in the first five items.

We also gathered information regarding the handedness of the patient’s immediate family (grandparents, parents, children, and siblings) by asking the patients to report whether any of these relatives were left-handed in the activities mentioned on the questionnaire.

A dichotic listening test was administered to 7 of the women (mean age = 54) one day before the first ECT session, 4 hours after the second session (about 2 days later), and 3-4 months posttreatment. A Becto model B-ECT machine delivered 200 V for 0.4-1.4 sec over the frontotemporal region of only the right hemisphere. Seven right-handed women (mean age = 44), who were hospitalized for depression but who were


From the Department of Psychology, University of Toronto.
Address reprint requests to Dr. Moscovitch, Department of Psychology, Erindale College, University of Toronto, Mississauga, Ont., Canada L5L 1C6.

This research was supported by Medical Research Grant 35011850 to Dr. Moscovitch.

The authors thank the Clarke Institute of Psychiatry, Toronto, especially Dr. Robin Eastwood and Ms. Susan Stiasny, for providing access to their patient populations and Dr. Susan Denburg and Dr. Bernard Schiff for their comments.

Copyright © 1981 American Psychiatric Association 0002-953X/81/070998/03/$00.50.
receiving drug therapy, served as controls. Each of the control patients was tested twice, 2 days apart.

In the dichotic test, subjects heard two blocks of 30 pairs of speech syllables drawn from the set ba, pa, da, ta, ka, ga. Each syllable lasted 300 msec and was paired with a different one that was computer matched for time of onset, duration, and amplitude. Pairs were presented every 5 sec at 90 dB SPL through TDH-39 stereo headphones, one member of each pair going to each channel (ear). The syllables appeared an equal number of times on each channel.

Subjects attended to one channel during the first block and to the other channel during the second block. They reported only the syllables on the attended channel by pointing to a display of the syllables on each trial.

**Results**

All subjects in our sample were strongly right-handed (mean score, 7.9/8), and only 3 reported that a parent or sibling was left-handed. These findings may be subjected to statistical analysis by taking Bryden’s normal female sample (4) as population measures for the proportion in each handedness category and applying a goodness of fit test to see whether the patient sample had the same population parameter values. In the Bryden sample of subjects 89.7% of the 487 women were right-handers. By comparison the ECT patients showed an excess of right-handers (χ² = 4.59, df = 1, p < .05). In the Bryden sample 15% of the men were non-right-handers. Although our male sample was too small for statistical comparison, it is noteworthy that none reported such hand preferences. In a normal sample of subjects collected by Annett (5) approximately 28.5% of both men and women reported that a parent, sibling, or child was left-handed. One would expect, then, that 13 patients in our sample would indicate a similar pattern. Only 3 did, which is a significant departure from normal (χ² = 7.69, df = 1, p < .01).

On the dichotic listening test, only 2 of the 7 patients had a right-ear superiority before ECT treatment, whereas 6 showed improved performance on the right ear relative to the left ear after the second ECT session (see Table 1). The control group had a stable right-ear advantage throughout. The groups differed significantly from each other in the first session (Kruskall-Wallis, H = 8.17, df = 1, p < .01) but not in the second (H = 1.29, p < .2). It is noteworthy that the 1 patient who failed to show a right-ear elevation following ECT was the only patient who relapsed within 3–4 months. Five of the healthy ECT patients retested at that time maintained the normal right-ear advantage.

**Discussion**

The virtual absence of left-handers among our depressed patients and among their immediate families was striking, even when sex was taken into account. Other studies on handedness among depressed patients have not reported a low incidence of left-handers, but none of these studies considered the data from the ECT group separately (6, 7). In schizophrenic patients as well an excess of right-handers is found primarily among those whose condition is diagnosed as severe (8). It is known that right-handers of dextral stock are strongly lateralized and are more severely affected by unilateral cerebral injury and recover more poorly than do left-handers. Our data and Taylor and associates’ data (8) suggest that a similar situation applies with respect to schizophrenia and depression.

On the basis of our evidence we do not wish to advocate that there is no need to be concerned about brain dominance in deciding over which hemisphere to place the electrodes when administering unilateral ECT. Even among right-handers a small proportion will have language lateralized to the right hemisphere.

It is also not likely that there are no left-handers who require ECT. Warrington and Pratt (9) reported at least 29 left-handed patients who received ECT to relieve depression. It is not clear from their description, however, what criteria were used to recommend ECT or whether they were unipolar depressed patients; therefore, we cannot properly compare our samples with theirs. Even by a conservative estimate, however, it is very likely that at least some of the patients in their sample were comparable to ours.

Our results on dichotic listening suggest that traditional noninvasive laterality tests would not be useful for identifying that small proportion of ECT patients who may be right-hemisphere dominant for language. Before treatment 5 of our 7 ECT patients did not show the right-ear advantage for verbal material that is typically found in most right-handers and that is indicative of linguistic dominance by the contralateral, left hemisphere. This suggests that the right hemisphere is strongly primed in some depressed patients, a hypoth-
esis consistent with reports of right-hemisphere mediation of emotion (10). Interestingly, the normal right-ear advantage was restored and maintained for up to 4 months following right unilateral ECT.

The best procedure for ensuring that unilateral ECT is directed at the appropriate hemisphere is to follow Warrington and Pratt’s recommendation (9) of testing for dysphasia after the first ECT trial. They found that 98% of right-handers and 75% of left-handers were mildly dysphasic if tested immediately after left, but not right, ECT. This figure is consistent with the incidence of dysphasia following unilateral brain damage (3) or unilateral anaesthetization of the cerebral hemispheres with sodium amytal (3). Should dysphasia be present after right unilateral ECT, the remaining treatments should be applied to the left hemisphere with follow-up tests to ensure that dysphasia is not more severe in the latter case.

Our data indicate that the incidence of left-handedness and, consequently, right-brain dominance is very low among patients who are recommended for ECT. Although this suggests that right unilateral ECT is appropriate for the vast majority of patients, it is strongly recommended that very simple, but sensitive, tests for dysphasia be administered after the first ECT trial to ascertain that the electrodes are placed over the appropriate, i.e., nonlanguage, hemisphere. In addition, we found that some depressed patients may have an atypical pattern of hemispheric activation that is restored to normal after successful treatment with ECT.

REFERENCES