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# Dichotic Listening in Schizophrenics and Manic Psychotics

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## *Abstract*

Hemispheric lateralization was assessed in schizophrenics and manics using dichotic listening tasks. The sample consisted of 113 schizophrenics, 11 manics and 20 normals. Laterality indices were determined for each of the three groups. Schizophrenics had a significant left ear advantage and mancis had a significant right ear advantage. As expected, the normals had a significant right ear advantage.

The left ear advantage seen in schizophrenics may be an indication of a left hemisphere dysfunction. No definite evidence of a lateralized hemispheric dysfunction emerged with respect to the manics.

Key words -
**Dichotic listening,**
**Lateralized hemispheric dysfunction,**
**Schizophrenia,**
**Manic psychosis**

Dichotic listening technique [1] holds promise for providing a means of assessing speech lateralization in neurologically intact subjects and for studying the cerebral organization of the brain. Different stimuli are simultaneously presented to both ears and subject is required to identify the stimuli. With two competing stimuli, the subject identifies one of them, presented to the dominant or preferred ear. Hence, a preference shown towards right ear for verbal stimuli implies a left hemisphere dominance [2]. A number of studies [3], [4], [5] indicate that right handers show a right ear advantage.

Dichotic listening studies of cerebral laterality in schizophrenia and affective disorders can provide information as to whether these disorders are characterized by alteration of the normal dominance effects. Dichotic listening studies [6], [7], [8], [9] indicate to a left hemisphere dysfunction and a left hemisphere overactivation in schizophrenics. Behavioural studies [10], [11], [12] and electrophysiological studies [12], [13], [14] have also supported this finding.

In affective disorders, a hypothesis of right hemisphere dysfunction is postualted [12], [15], [16], [17], [18]. Though, in most of these studies, an abnormally large right ear advantage was found, no specific evidence for right hemisphere dysfunction was evident.

## Aim

The study aim to determine, by dichotic listening technique, whether a left hemisphere information processing deficit could be elicited in schizophrenics and a right hemisphere deficit in manic psychotics.

Hypotheses tested were

1. Normals would recall more number of words presented to the right ear, in dichotic listening paradigm.
2. Schizophrenics would recall more number of words presented to the left ear in the dichotic listening paradigm.
3. Manics will perform as good as normals in dichotic listening paradigm.

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## Sample

The sample consisted of three groups, viz., 13 schizophrenics, 11 manics and 20 normals as controls. The subjects were right handed, from both sexes, with minimum of SSLC education and good proficiency in English, ranging between 16 and 40 years of age. Patients with auditory deficits or any neurological disorders were excluded. All patients were selected from inpatients or out-patients of NIMHANS.

The three groups were matched for age and education. (Table I)

***Table 1 - Sample Characteristics***

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All subjects right handed
ICD-9 Diagnostic criteria

Test used in the Neuropsychology lab, NIMHANS to assess handedness was used. Prior to the testing, a brief psychiatric interview was conducted with psychiatric patients, to ascertain the clinical stage.

### Selection criteria

### Group I

Patients diagnosed as non paranoid schizophrenics, according to ICD-9 with duration of illness, not more than 2 years, with no active auditory hallucinations were taken.

### Group II

A unipolar or biopolar affective illness, currently diagnosed as manics, according to ICD-9 with no continuous manic illness were included.

### Group III

Normals matched to age and education were taken from the staff of NIMHANS.

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## Material and Methods

A stereotape deck played prerecorded tape of the dichotic listening test. The Stereotape circuit was modified to suppress cross over effect. The recorded test material was presented through a pair of earphones. The pairs of words were delivered at half second intervals.

The dichotic listening word list consist of 36 pairs of common monosyllabic words. In all 128 words were presented to each ear, recorded in such a way that three different words arrived simultaneously at both the ears. Each pair was followed by a 10 sec. pause, during when the subject reported the words heard.

The second list consisted of a series of consonants and vowels presented separately to right and left ear with a masking noise in the contralateral ear. Two lists of 24 syllables each were presented.

The subjects were tested individually in a sound proof room, so as to avoid any extraneous noise. They were seated comfortably with earphones place on the ears. The nature of the dichotic task was described to subjects and they were instructed to listen to both the ears carefully and report as many words as they could identify, in any order they chose, immediately after each dichotic triplet presentation. Practice trials were given to make them familiar with the precise dichotic procedure. Intensities in the two ears were adjusted during the practice trails so that all subjects reported the intensities to be equal. All subjects received intensities within 70-75 dB approximately.

Each subject was later given three trials of the same dichotic words list followed by 2 lists of consonant-vowel given to left and right ear separately, interspread with a rest pause of 10 minutes.

As the subject spoke the words and syllables, each were recorded on the scoring form. The number of correct words reproduced by the subject from the right and left ears was determined for each trial of the dichotic listening test.

### Analysis and data reduction

1. Mean and SD for each trial for the right and left ear in the three groups were determined.

2. A lateralization index was determined by using the formula [19].

R-L)/(R+L)

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## Results

Correct responses for each ear were considered for analysis in dichotic listening paradigm. In the second and third task, the number of syllables correctly reproduced on each side of the ear were considered for analysis.

Within each group, means and SDs were found separately for scores obtained on both the ears (Tables 2-4).

***Table 2 - No. of correct responses obtained for the normal group***

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***Table 3 - No. of correct responses obtained for schizophrenic group***

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***Table 4 - No. of correct response obtained for schizophrenic group***

### *Table 4 - No. of correct response obtained for schizophrenic group*

Within each group, paired 't' test values were also calculated to test the significance of difference between the two ears performance (Table 5).

***Table 5 - 't' values for all the three groups***

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Laterality index and quotient were determined for each subject in the three groups using the formula given earlier, where R is number of correct responses on the right ear and L is the number of correct responses on the left ear [19].

Thus a positive quotient would indicate a right ear advantage, a negative quoteint manifests left ear advantage and a quotient of zero, no ear advantage. Laterality index is, found to be maximum for normals, followed by manics, and is negative for schizophrenics indicating a reversed laterality (Table 6).

***Table 6 - Laterality indices for all the three groups***

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The 't' values calculated between the three groups also indicated that normals differ significantly from schizophrenics in laterality, similar results being true for manics and schizophrenics, however there was no significant difference between manics and normals in laterality (Table 7).

***Table 7 - Significance of difference in laterality among groups***

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In the second and third task, the scores were the number of syllables correctly identified. Median test was carried out between the groups to determine the differences and no significant results emerged, between any combination of the groups, either for the left or the right ear.

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## Discussion

The main aim of this study was to determine, if a left hemisphere information processing deficit could be elicited in schizophrenics using a dichotic listening technique and an attempt was also made to determine if there was a right hemispheric dysfunction in manics using the same technique.

In the normal control group, as expected, more words were correctly recalled from right ear compared to the left ear, indicating a right ear advantage or a left hemisphere dominance for word perception. Similar findings are reported [2], [4], [7]. Normals also tend to improve over the suppressed ear performance with practice, and this improvement is significant compared to the improvement in the right ear effect. This improvement is not seen in either schizoprhenics or manics.

In schizophrenics, the performance of the left ear was found to be significantly better than the right ear, which indicates a reversed laterality in schizophrenics and supports the postulated left hemispheric dysfunction in schizophrenics. The possible association between schizophrenia and left hemisphere dysfunction has received experimental support in a number of investigations [7], [13], [15].

Other studies using dichotic listening task and other information processing tasks [8], [17], [20] also indicate towards a left hemisphere dysfunction.

Contradictory results were also fund in some studies [21]. However, in these studies, the sample was not homogeneous, including both paranoid and non-paranoid schizophrenics. Hence, in the present study, only nonparanoid schizophrenics were included to reduce this bias.

In manics, a right ear advantage has clearly emerged similar to normals, which is in confirmity with many other studies [17], [18]. Though manics showed a right ear advantage, their performance is poorer in both quality and quantity of recall, as compared to normals, especially in the right ear.

The normals also show maximum laterality effect, the positive value indicating a right ear preference for verbal tasks, and a left hemisphere dominance for language, which is in confirmation with known findings. With competing speech messages presented simultaneously to both ears, more messages are processed accurately the right ear channels [2]. A high percentage of right handers show a right ear advantage [4].

The poor laterality evidenced by schizophrenics is also indicative of absence of left hemisphere advantage for verbal processing. Schizophrenics are found to show poor inter-hemispheric transfer [22] and an overactivation of left hemisphere which is dysfunctional [7], [9]. In manics, a right ear advantage similar to normals is seen. However, in the present study, a right hemisphere dysfunction is not found. The left ear recall has not been significantly low as compared to normals which if present, would indicate a right hemisphere dysfunction in manics.

In spite of the fact that sample size was small, there appears to be an evidence for lateralized dysfunction in the schizophrenic group. Let hemispheric dysfunction is schizophrenics may probably explain the thought and associated disturbances in schizophrenics.


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