CHAPTER-II
REVIEW

Review was based on APA's Psychological Abstracts retrieval system stored in computer network of National Informatics Centre (Ministry of Planning, Govt. of India), New Delhi. The period was from 1974 to 1994. Retrieval search was guided by Language Laterality, Bilinguals, Handedness, Concurrent paradigm and Development of language lateralization variables. Pre 1974 literature survey was based on some popular texts of Neuropsychology and Physiological Psychology (Antonio & Robert, 1992; Beaumont, 1983; Corballis & Beale, 1976; Gaddes, 1980; Graham, 1990; Green, 1987; Levinthal, 1990).

Retrieval yielded 56 studies which were content analysed for their relevance to the present study. Many of the studies dealt upon trying various methods to study language lateralization, which were included in previous chapter. While many studies simply attempted to study language lateralization in relation to some abnormal or deviant groups, e.g., learning disables, mentally retarded, language disables etc. In the present chapter, studies related to development of language lateralization, particularly among bilinguals were included in
the different sections: Development and Linguality. 1st section is presented in descriptive text while the linguality related studies have been presented in tabular form.

A. DEVELOPMENT OF LANGUAGE LATERALIZATION

With respect to the representation of language, Milner (1974) states that two hemispheres are equipotential during the first five or six years of life. According to Basser (1962) lesions to the left-hemisphere in the first two years are no more disruptive to the subsequent development of speech than are the lesions to the right hemisphere. This must mean that right hemisphere can take over speech functions without obvious loss or efficiency if the left hemisphere is damaged, providing the damage occurs early enough. Lenneberg (1967) has summarised further data which show that lesions to the left hemisphere between the ages of 3-10 years produce only temporary loss of speech functions. There is a marked decrease in equipotentiality after the age of 10 years, and by about 15 years the lateralization of language representation is irreversible.

According to Annett (1973), the incidence of language problems was three times higher with right hemiplegia than left hemiplegia. If the onset of hemiplegia was early in life (before 1 yr of age) incidence of speech disorder was rather low as
probable with left hemiplegia. Annett's findings suggest that the hemispheres may have a kind of equipotentiality at the beginning of life in the capacity to support language functions. If the left hemisphere is damaged at an early age, the right hemisphere may be able to develop language centres on its own. However, Sperry (1974) and Teuber (1974) conclude that shifting of the speech areas in the minor hemisphere affects the normal development of other cognitive abilities and also the effective development of speech.

Lenneberg states that the specialization of one hemisphere for language is acquired slowly through experience. The role of genes would be to provide the left hemisphere some slight, built-in superiority at birth that would gradually, over the first four or five years give it more and more dominance for this function. Another competing hypothesis in the field is Kinsbourne's "invariance hypothesis", stating that the lateralization is present at birth and does not increase with experience. He argues that the hemispheres are equipotential at birth for language learning and yet must postulate some genetic factor to give the left hemisphere a slightly greater language - acquisition ability at birth that makes it slowly dominant. Clearly, there cannot be complete equipotentiality. In fact the language areas of the left hemisphere are not even of the same
size as the comparable areas in right brain at birth or even in fetuses (LeMay, 1982). This indicates that genetic predisposition for left brain language acquisition provides more space for learning.

Woods (1983) studied the role of genetic predisposition and found it specifically important for specific elements of linguistic function, especially speech and complex syntactical and grammatical parts of comprehension and not for all of language. For this compromise Zaidel (1985) has furnished sufficient evidence. Providing the evidence of a right ear advantage in dichotic listening studies in preschoolers, school-age children, and adults, Kinsbourne (1975) and Hiscock (1979) suggested that the concept of progressive lateralization be rejected. Carmon, Nachshon and Starinsky (1976) while studying development of reading among 1st, 3rd, 5th and 7th graders, found that RVF superiority appeared at the 5th grade level (left hemispheric dominance). White and Kinsbourne (1980) studied children of 3 to 12 years and concluded that left lateralization of speech output is complete at 3 year of age, which did not vary with increasing age. Best, Hoffman and Glanville (1982) conclude that the left hemisphere’s linguistic processing ability develops between two and three months of age. When a new syllable was presented to the right ear and musical
note to the left, infants (22-140 days) showed a significant increase in the rate of sucking. No sex or age differences emerged (Lokker and Morais, 1985). Certain researchers measured heart rate instead of sucking (Glanville et al, 1977) and found language lateralization in infancy.

B. LINGUALITY AND LANGUAGE LATERALIZATION

While content analyzing the abstract retrieved, 16 studies were referring to more than one language, comparing monolinguals with bilinguals or comparing 1st and 2nd language along with other variables. Main findings of these studies are presented in Table-1 having three columns: Author(s) (year); Sample/Variable/Method; Findings.

Table-1 : Studies of language lateralization and linguality related variables.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Author(s)</th>
<th>Type of Sample/Variable/Method</th>
<th>Findings</th>
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<tbody>
<tr>
<td>1.</td>
<td>Walters &amp; Zalters (1978)</td>
<td>College bilingual students (English-Spanish), Native 1st &amp; 2nd language. Tachistoscopic visual field presentation.</td>
<td>Indicated left-hemisphere involvement for processing of both languages, regardless of which was learned first. Less unilaterality of language function was found among bilinguals.</td>
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<tr>
<td>2.</td>
<td>Gordon (1980)</td>
<td>English-Hebrew (10-65 yrs) bilinguals. Dichotic test. 1st &amp; 2nd language.</td>
<td>Lateral dominance was the same for both languages regardless of when the 2nd language was learned, how long used or how well it was known.</td>
</tr>
</tbody>
</table>
3. Sewell & Panou (1983) Undergraduate. Mono & Late bilinguals (English - French and English - German). Visual field asymmetries for 1st and 2nd language. Confirms left - hemispheric involvement for the processing of verbal material. Processing of spatial task may be influenced by Ss linguistic backgrounds. Reduced laterality among bilinguals for 1st language was found.


6. Ohuzet, Conrad, Bryden & Boljik (1988) Learning - disabled school children 16 yr. 2 mo. to 13 yr. 7 mo.) bilingual dextrals and sinistrals. Handedness, Dichotic paradigm. Fluent bilinguals were bilateral and significantly different from other groups for native language. Monolinguals revealed greater right - than left - hand disruption in concurrent tapping.


9. Fabbro, Gran, Basso & Rava (1990) Polyglot school students and Monolinguals. Cerebral lateralization, V-M interference paradigm, Automatic speech production, linquacy. No hemispheric lateralization for 1st & 3rd language, but 2nd showed left lateralization in one method, but V-M interference was found for LNG-1 & LNG-2 in meaning-based mode of simultaneous interpretation.
| 10. | Green, Michelson, Vaid, White & et al. (1990) | Professional interpreters. Matched bilinguals and monolinguals. Lateralization, time-sharing (Shadowing & Paraphrasing task.) | Monolinguals were left lateralized for both tasks but bilinguals were left lateralized only for shadowing. Found consistent pattern of lateralized differences in mono & bilinguals. |
| 15. | Chernigovskaia (1992) | Bilinguals (Russian - English). Unilateral seizure by electrical stimulus, performance & verbal task. Restoration of 1st & 2nd language. | 1st language was supported by both hemispheres, but 2nd language by left hemisphere only. Both hemispheres play different roles in the cerebral organization of languages in bilingualism. |
Among the sixteen studies sampled in Table-1, 13 were empirical and three were theoretical in nature. An attempt to deduce trend even in the handful of studies was very difficult owing to heterogeneity of mode of language processing from study to study, e.g., automatic speech production, reading, semantic and syntactic processing, translating from 1st language to 2nd language or from 2nd language to 1st language, shadowing, paraphrasing, simultaneous interpretation etc. Few studies have compared lateralization of monolinguals and bilinguals e.g., Swell & Panou (1983) reported no difference for 1st language, whereas Green (1986) found differences for the 1st language. On the other hand, number of investigators have compared lateralization of 1st and 2nd language among bilinguals. Walters and Zattore (1978) reported no difference (i.e. Left laterality) whereas Green (1986) and Fabbro et al (1990) reported bilateralization or reduced lateralization even for 1st language. On the other hand, Swell & Panou (1983) reported reduced laterality for 2nd language. Right hemispheric dominance has been reported by Fabbro et al (1991) and Vaid & Corina (1989) for the 2nd language. Thus, the findings range from left lateralization through reduced laterality to right lateralization for the 2nd language. Variations from left lateralization to bilaterality for the 1st language was obtained among bilinguals.
PROBLEM, OBJECTIVE AND HYPOTHESES

Discouraged by inconsistent findings, Paradis (1990) has suggested to abandon lateralization studies of bilinguals. Berquier and Ashton (1992), while replying Paradis, have stressed the importance of such studies with methodological refinements. Paradis (1992) further replied Berquier and Ashton and stressed his view point of futility of lateralization of two languages. This time he consolidated his view point on the basis of contrary clinical evidences. In any case, the topic has become so controversial and generated heat would lead to proliferation of empirical studies to prove or disprove the position taken by Paradis. Therefore, the present study was undertaken to study language lateralization of Ist and 2nd languages among Hindi-English bilinguals along with monolinguals (Hindi) in the light of present controversy, with an objective toward its resolution.

The framework to achieve the objective was made in a developmental perspective out of bivariate contingency: (1) Age of testing which implies the duration of the use of the language as well as its fluency; and (2) Age of acquisition of 2nd language through formal school education. Indian school education system provides two popular types: (1) education through regional (mother) language, i.e., in Ist language (Hindi) and introduce
2nd language (English) from VIth Grade. (2) Education through English since beginning. Such groups or subpopulation of bilinguals may be termed as Late and Early bilinguals. Obviously, both variables are relevant in lateralization of bilinguals. Few investigators, e.g., Furtado and Webster (1991), Gordon (1980), Green (1986) and Schouten et al (1985) have specifically assessed the effect of age of acquiring 2nd language or the degree of proficiency in 2nd language. In general the literature offers two competing hypotheses with regard to development of language lateralization: a progressive lateralization and invariance hypothesis, however these have been advanced in unilingual context. Therefore, the second objective of the study is to test the tenability of these hypotheses in bilingual context. Thus, the problem can be explicitly stated as Developmental pattern of language lateralization among monolinguals and early-late bilinguals.

On the basis of available studies certain hypotheses were advanced, with regard to Age (of testing) being adolescents and adults as subjects, the invariance hypothesis would be operative. Thus age x hand interaction would not be significant. The effect of linguality would interact with hand and there is a likelihood that bilinguals would exhibit reduced laterality than monolinguals. However, among bilinguals the age of
acquisition of 2nd language would significantly affect the language lateralization in the sense that late bilinguals would have reduced laterality than early bilinguals. Still further the laterality of 1st and 2nd language would also differ in the sense that the English lateralization would be weaker than Hindi (language x hand). The language lateralization would also be significantly influenced by mode of processing the verbal task. Since greater hemispheric involvement has been reported while reading loudly than silently, therefore, language lateralization would be stronger under loud condition (mode of processing x hand).

Further, the pattern of lateralization of varied linguality would be influenced by mode of processing and may be different at different age levels (linguality x mode of processing x hand; linguality x age of testing x hand). More explicitly monolingual would show stronger lateralization while engaged in loud processing than silent in comparison to bilinguals. The monolinguals are less likely to be influenced by age than bilinguals. However Ss of different age groups should be equally affected by mode of processing hence non significant interaction is expected between age, mode of processing and hand.

Among the bilinguals, reduced language laterality of late bilingual's in comparison to early bilingual's is likely to be
manifested for the 2nd language (English) in comparison to 1st language (Hindi). Weak language lateralization of late bilingual's in comparison to early bilingual's is not likely to vary due to differential mode of processing. The pattern of language lateralization of early and late bilinguals would be distinct if tested at an early age (13-14 years) than at later age (20-22 years).

In order to test various hypotheses implying higher order interaction of various selected independent variables, a complex design and sophisticated methodology was required. Description of methodology follows in the next chapter.