CHAPTER-V
DISCUSSION

The often cited pattern of lateralization for language, i.e., left hemispheric dominance (Entus, 1977; Geffner and Dorman, 1976; Geffner & Hochberg, 1971; Kimura, 1963; Kraft, 1982; Milner, 1968; Bryden, 1990; De Renzi, 1978; Gazzaniga & Le Doux, 1978; Kingsbourne, 1978; Klatzky, 1970; Springer & Deutsch, 1989; Burgess, Curt and Skodis, Jennifer, 1993; and Hoosain & Shiu, 1989) does not appear to be a generalized trend as per the findings of the present study. Significant role of several individualistic variables such as, age of the subject, bilingualism of the subject, the language of testing (if bilinguals) and the age of the acquisition of the 2nd language was evidenced.

Language learning starts from birth itself with reported left hemispheric involvement (Best, Hoffman & Glanville, 1982; Glanville et al., 1977). By the early-childhood the consistency of left language lateralization has been reported (Carmon, Nachshon & Starinsky, 1976; Hiscock & Kingsbourne, 1978; White & Kingsbourne, 1980). The phenomenon is popularised as the 'invariance hypothesis'. On the other hand, the hypothesis of 'progressive lateralization', which states that specialization
of one hemisphere for language is acquired slowly through experience. Results contrasted both the hypotheses prevalent in the literature as neither there was invariance nor there was progressive lateralization. The pattern revealed in the study was such that with increasing age either the lateralization weakened by adulthood or it became bilateral. However, support for invariance hypothesis was evidenced for the lateralization of language among monolingual subjects and for the first language among late-bilinguals. It seems that what Kinsbourne as well as Lenneberg have stated is based upon monolingual subjects and therefore true for this strata of population. Thus it can be deduced from findings as well as from the prevalent hypotheses that the lateralization of the first language, if it has been allowed to develop by ten years, there would be invariance. However, introduction of the 2nd language at an early age changes the developmental trend as predicted by invariance hypothesis or progressive lateralization hypothesis, which should be termed as "regressive lateralization".

Functional asymmetry of language in favour of left hemisphere is mainly because the studies are generally done on monolingual population. Linguality has been reported to be one of the important variable to influence language lateralization (Walters & Zattore, 1970; Green, 1986).
Results suggested that monolingual subjects process the first language in their left hemisphere and so do the bilingual subjects for the first language, however, weakly. Bilinguals who have acquired the second language in adult-hood have been reported to be less lateralized for language functions than monolinguals (Albanese, 1985; Albert & Obler, 1978; Chary, 1986; Fabbro et al., 1987; Green, 1986; Rogers et al., 1977; Scott et al., 1979; Sharon, 1982; Ten Houten, 1981; Vaid, 1983; Vorales, 1984). Another critical factor in addition to the bilingualism of the subject is the language of testing, as bilingual subjects showed bilaterality for the second language. Similar pattern has been reported by Silverberg et al. (1979). Some of the studies have reported left-hemisphere lateralization for both first and second language (Galloway & Scarcella, 1982; Paradis, 1987; Schneiderman, 1986; Soares, 1984; Vaid, 1983). For polyglots symmetrical cerebral organisation was found for $L_1$ & $L_2$; whereas, in case of $L_2$ there was left laterality. Fabbro & others offered possible explanations for the symmetrical representation of the first language on the basis of sex difference, effect of practice, attention, fluency, automaticity and complexity of language task.

Lack of significant lateralization may be due to the concurrent activation of the two hemispheres as bilinguals
engage themselves in simultaneous interpretation. It has been indicated that simultaneous interpreters have a highly bilateral representation for language in as much as they are polyglots (Albert & Ohler, 1978; Fabbro, 1970; Green, 1986; Schneiderman, 1986; Vaid, 1983).

Even what has been slated above was not found to be true for all bilingual subjects, as the second language was not bilaterally represented among early and late bilinguals at a younger age (10-14 years). Early-bilinguals process the second language in the major hemisphere whereas late-bilinguals process it in the minor hemisphere at the age of 13-14 years. They were bilateral for 2nd language at the age of 20-22 years. Gordon (1980) found no difference in laterality between Hebrew & English for early and late bilingual Ss. However, a high lateralization in one language was coupled with a high lateralization in the other language. Or conversely, a reversal lateralization in one language was usually accompanied by a similar reversal in the second language. On analysing the effect of age of acquisition on laterality for native English speakers who learned Hebrew after puberty, the second language of a bilingual is lateralized to the left hemisphere to the same extent as their native language. The cerebral dominance determined in Gordon's study was the same for each language, no matter when the second
language was learned, how long it has been used or how well it was known. The native English speaker group demonstrated lower laterality in both languages, Hebrew & English, showing that the right hemisphere does contribute to semantic processing. On the contrary, native Hebrew speakers who learned English after puberty did not show the same effect possibly because of the difference between the outcome of thinking in & speaking in the native language and thinking in and speaking in the later learned language. Gordon, further, suggests that there are also differences in how the subject first learned their second language. One situation may be where the subjects are constantly thinking in using the learned language, where as, in another situation the Ss hardly use the learned (second) language. It is true of early bilinguals in North India who learned English since schooling and receiving instructions in English and the late bilinguals, who learned English as a separate subject and still receive the education in Hindi. Thus the overall environment where the second language is learned is very important as it determines how the 2nd language is used. For example, a Hindi speaking Indian learns English in India or in England would differ in the lateralization of 2nd language. According to Walters and Zattore (1978) also, the age of acquisition of the 2nd language, as well as the circumstances under which it is
learned is the important feature in bilingualism.

Results support the idea that both languages are equally lateralized. If, however, a consistent distinction could be found among Ss who differed either in context or age of acquisition of second language, then the distinction between compound and coordinate bilingualism (Lambert and Rawlings, 1969) could have a more fundamental neurolinguistic basis.

Nature of the task, as well as the level of expertise, influence the lateralized effect to the great extent. The laterality effect in the younger subjects may be attributed to the fact that they do not involve in deeper processing. The different lateralized effects for the bilingual groups indicate a difference in the level of processing among early and late bilingual subjects. It is really very much valued as to how the Ss take the task, whether he is simply reading the material or he is interpreting it simultaneously? In both the conditions the effect would be different. If it is happening, it is in congruence with "bilaterial cooperative processing model" for the 2nd language among adult late bilinguals and early bilinguals for both languages.

The characteristic finding of late bilinguals vanishes by the adulthood, as the laterality of the 2nd language becomes
bilateral. Yet, for considerable years late bilinguals follow right hemispheric processing of the 2nd language. There may be educational implications of this in general, and language learning, in particular. The processing of 2nd language by right hemisphere is somewhat non-normative. There are good number of studies, which report (Hagqerly and Stahl, 1978; Kuroda and Kobayashi, 1986; Lucas and others, 1989; Obritz and others, 1988; Piccirilli and others, 1991; Sommers and Starkey, 1977) learning disability, mental retardation and other abnormalities among subjects having right hemispheric language.

Thus, the second language must be introduced along with the first language in educational curriculum. The involvement of right hemisphere for learning English may effect the functioning of other functions having right hemispheric specialization, due to interference and some disruption may result, e.g., in visuospatial functioning (Sperry, 1974; Teuber, 1974) for learning drawing, painting, geometry, maps etc.

Paradis (1990) took an extremely pessimistic view regarding the research on lateralization of cerebral function in bilingual subjects. Paradis considers idiotic, tachistoscopic and time-sharing paradigm reflecting laterality of language functions in bilinguals to be lacking demonstrated validity. There is also evidence inconsistent with both the manner of
acquisition and the stage of acquisition (Bergh, 1986). Several studies have reported no difference between various sub-populations of bilinguals and unilinguals (e.g., Barton, Goodglass & Shai, 1965; Caroll, 1980; Gallowary & Scarcella, 1982; Gordon, 1980; Hoosain & Shiu, 1989; Hynd, Teeter & Stewart, 1980; Kershner & Jong, 1972; McKeever & Hunt, 1984; Rapport, Tan & Whitaker, 1983; Soares, 1982; Soares, 1984; Soares & Grosjean, 1981; Walters & Zaltore, 1978). Thus, he suggests to abandon such area and to move towards some productive research. Berquier and Ashton (1992), argue that Paradis's conclusions are, in fact, incorrect. The problems which were there in the previous studies are now acknowledged and are being overcome. Moreover, recognized shortcomings seems to be more a thing of satisfaction than of despair. We must continue researching with a more controlled and advanced methodology. Variables of study should be more specific, e.g., the target group may be the late adult bilingual subjects.

Regarding future avenues, it would be interesting to study a sample in which Ss start learning two languages while living in the family environment where both the languages are equally used and reinforced. It could be found out whether such Ss also develop bilaterality by the adult hood, if yes, for which language? It can also be tested whether reading of 2nd language,
of such a text which is not being interpreted (as the words are out of vocabulary), is unilateral or not? If the reading be fast enough that there is no scope for simultaneous interpretation may result in right hemispheric dominance. Another study may be conducted on the spontaneous speaking in 2nd language on a thoughtful topic in which the bilingual subject forms a thought in 1st language and then converts it into 2nd language and speaks. This sort of design may exhibit left hemispheric dominance. Lateralization of the 2nd language may also be worked out in a mature group which has utilized both languages so much that it is now equiproficient.

A particular suggestion for designing study with concurrent motor-verbal paradigm is in regard to heterogeneity of variance, which inflates, need to be controlled, e.g., blocking of Ss or some latin square. Post hoc treatment by transformation (e.g., $\sqrt{x}$ tried in the present study) fails to shrink the F-ratio.