Brain Dominance and Listening Comprehension Strategy Use of Iranian EFL Learners

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Abstract. The present study aimed to investigate the general pattern of brain dominance of undergraduate Shiraz University students and its effect on the use of listening comprehension strategies. Data was collected from 142 undergraduate Shiraz University students. The Hemispheric Dominance Test (HDT) was given to the participants to categorize them as right-, left- and whole-brain dominant, and the Strategy Inventory for Listening Comprehension (SILC) was administered to evaluate their use of listening comprehension strategies. The results were compared using a one-way between-groups analysis of variance (ANOVA) to see if there were any significant differences between the three brain dominant groups in their overall use of listening comprehension strategies. A MANOVA was also run to find out if the groups had preferences regarding the use of any particular strategy type. Results indicated that Iranian EFL university students were mostly right brained. However, no significant differences were found between right-brained, left-brained and whole-brained learners in their overall pattern of listening comprehension strategy use or their preferred strategy category.

Keywords: Brain dominance, language proficiency, speaking strategies, listening strategies

1. Introduction

When English is learned as a foreign language, learners regularly face

comprehension difficulties in communication, and might experience problems retrieving a word, using or comprehending an idiomatic expression, or grasping a topic. In order to compensate and reduce these difficulties and deficiencies and to facilitate linguistic interaction, the more successful learner uses certain strategies consciously. These strategies have a strong potential for enhancing the development of EFL skills (O'Malley, Chamot, Stewner-Mazanares, Kupper, & Russo, 1985). Research also supports the idea that learners can enhance their communicative language ability by using and learning certain strategies that help them become independent learners (Dadour & Robbins, 1996, cited in Nakatani, 2010). The appropriate and frequent use of such strategies is associated with achievement and proficiency (Oxford, 2003) and more independence and autonomy (O'Malley & Chamot, 1990).

One of the factors which has been shown to have a strong effect on the learners' application of different types of strategies is learning style (henceforth LS) (Vandergrift, 1997), which refers to the individual's characteristics and natural, habitual, and preferred way(s) of absorbing, processing, organizing and retaining new information and skills (Wang, 2008). One such construct in the learning style continuum applicable to second/foreign language learning and teaching is left- and right-brain functioning (Brown, 2007). Gibson (2002) proposed that children differ from each other in terms of brain dominance and that brain dominance has certain effects on their learning and communication, meaning that individuals use different sides of their brains to process different kinds of information.

Dulger (2012) mentioned that brain hemisphericity is linked to learning styles, which are thought to influence an individuals' use of learning strategies. Investigation into the possible relationship between brain dominance and language learning strategies (henceforth LLS), therefore, appears to be a significant step to be taken in language learning research. Since one hemisphere is relatively more skilled than the other in processing different kinds of tasks, one would expect the nature of the task to engage the hemisphere specialized for that task (Alptekin & Atakan, 1990). In other words, if a relationship between brain dominance and strategy use is recognized, LLSs can be taught to learners based on their brain dominance types (Dulger, 2012).

Although LLS research has been widely conducted on second language learners (Ehrman, Leaver & Oxford, 2003; Wong & Nunan, 2011), only few studies have made an attempt to find the relationship between them and a student's learning style (Jie & Xiaoquing, 2006). To the authors' knowledge, no study has been conducted on language learners to find possible relationships between listening comprehension strategy use and brain dominance as a learning style. The following sections attempt to define each of these constructs in detail and to report the findings of previous studies related to each.

1.1. Listening comprehension strategies

Vandergrift (1999) defines LCSs as the strategies that listeners consciously or unconsciously use to understand, analyze, and interpret a text. Due to the listeners' insufficient memory capacity of the target language, different LCSs might be applied to help them acquire, store and retrieve information (Vandergrift, 1992), and to arrive successfully at a reasonable interpretation of utterances, or understand the new information that is ambiguous (Mareschal, 2002).

Research on LCSs indicates that that the use of LCSs can enhance listening (O'Malley & Chamot, 1990). However, it appears that not all listeners apply them in the same fashion. Among factors determining the choice of LCSs, learning style seems to have a strong effect (Goh, 2002; Liu, 2008). For example, as extroverts show a strong preference for social strategies, introverts use metacognitive strategies more frequently (Ehrman & Oxford, 1990) and learners who prefer group study have the tendency to use social and interactive strategies more than others (Rossi-Le, 1989).

Several attempts have been made to classify listening strategies into meaningful categories that present them in an organized, manageable manner. O'Malley and Chamot (1990), O'Malley et al., (1985), and Vandergrift (1997), for example, identified a number of cognitive, metacognitive and social/affective strategies used by second and foreign language learners. Using O'Malley and Chamot's (1990) and Oxford's (1990) classifications, Afsarnia (1999) designed a listening comprehension strategy inventory, and based on a factor analysis on the items, identified six main categories of meta-cognitive, memory, compensatory,

cognitive, social, and affective strategies, which will be dealt with in detail since they serve as the foundations of the present study.

- **Metacognitive strategies** organize processes at the cognitive level.
- **Cognitive strategies** manipulate incoming information to enhance learning.
- **Memory strategies** help information recall and retention.
- **Compensation strategies** make up for segments of language which are not learned.
- **Social strategies** involve a broad range of interaction with other parties.
- **Affective strategies** reduce fear and other negative self-images (Afsarnia, 1999).

While there are numerous studies on LLSs, the research base for listening comprehension strategies is limited. Several researchers have investigated the relationship between students' listening strategies and their listening abilities (Goh, 2002; Liu, 2008, Vandergrift, 2003), focusing on mental processes of listeners during processing stages. They have found that higher ability listeners were more focused on the task, used more metacognitive strategies more effectively, planned what to listen for and applied both bottom-up and top-down processes.

Other conclusions have emerged from further studies on LCS categories (Bidabadi & Yamat, 2010; Vandergrieft, 1999). For example, it was found that cognitive strategies were used most by all listeners, metacognitive strategies had considerable importance in listening comprehension, socio-affective strategies were rarely reported, gender did not exert a significant effect on listening comprehension outcomes, student motivation was found to significantly influence listening comprehension strategy use, and the learners' individual style affected listening comprehension strategy use.

1.2. Listening style and hemisphericity
Ellis (1990) defined cognitive style as a term for describing the manner in which people perceive, conceptualize, organize, and recall information. In education, cognitive styles are often referred to as learning style, in order to avoid restricting the term to the realm of cognition.

Regarding the various interpretations, learning style is mainly defined in relation to the specific behavior on how individuals learn, conceptualize, remember, perceive, interact and process information. Reid (1995) believed that earning styles are different for each individual, can be measured on continuums, are value-neutral and are linked to students' use of learning strategies.

Ehrman and Oxford (1990) identified about twenty different dimensions of learning styles. Among these dimensions are seven types of multiple intelligence, perceptual learning styles, field-dependence and field-independence, the Myers-Briggs type indicator, and left and right brain learning styles. Of these styles, the left/right brain dichotomy, also known as hemisphericity, seems to be the least emphasized in previous research, although it might contribute to individual differences among humans (Sonnier, 1991). Understanding brain behavior can thus provide us with more insight into the nature and process of learning.

The term hemisphericity is used to characterize a person's inclination to rely on one brain hemisphere more than the other, regardless of the cognitive nature of task demands (Alptekin & Atakan, 1990). Although individuals have the capacity to use both hemispheres of their brain, based on the individuals' dominance one hemisphere may take the lead (Leng & Hoo, 1997).

Few researchers have studied the area of brain hemispheres and their effect on language learning, and those who have, have come up with contradictory results. Alptekin and Atakan (1990) and Tendero (2008), for example, investigated the relationship between second language achievement and hemisphericity, but found no significant relationships between the two. On the other hand, Oflaz (2011) and Tufekci and Demirel (2008) evaluated the effects of right and left brain dominance on students' academic achievement and learning English and found significant differences between the performances of right and left brain students on tests of English.

As for the relationship between brain hemisphericity and information processing, Beck (2001) and Dulger (2012) showed that the left-right mode preference determines the way a student receives information, and that students tend to reach higher levels of achievement when they are

taught according to the ways that are compatible with their right-left mode tendencies. Dulger (2012), Gibson (2002) and Sabatin (2012) proposed that learning strategies of children differ from each other in terms of brain dominance and that brain dominance has certain effects on their learning and communication.

While the above studies have addressed the relationship between hemisphericity and general language learning strategy use, no other work has specifically tackled the issue of LCSs, and if a study has tried to explore the relationship between LSC and learning styles, brain dominance has been excluded. Hence, more research seems to be needed to discover the nature and types of relationships that might exist between the use of LCSs and hemisphericity in a language learning context.

1.3. Objectives of the study
The present study aims to investigate the brain dominance pattern of Shiraz University EFL students and to find out whether brain dominance has any effect on LCS use of these EFL learners. Two research questions were thus put forward:

1. What is the brain dominance pattern of Shiraz University EFL students?
2. Is there any significant difference between left-, right-, and whole-brain dominant EFL students in their use of listening comprehension strategies?

1.4. Significance of the study
The issue of brain dominance and strategy use can be of great importance to language learners and material designers. Learners can take advantage of the results of this study by knowing how factors such as brain dominance patterns affect their performances through the use of special listening comprehension strategies. If such relationship is found, they can be taught to compensate for their learning shortages by employing learning strategies suited to their brain dominance (Wong & Nunan, 2011). On the other hand, if no relationship exists, students can be encouraged to employ a variety of different strategy types, to improve their learning, although such strategies might seem to fall out of their

comfort zone. This study might also be useful to material producers and curriculum developers. Since different students with different preferences and tendencies might employ different types or amounts of LLSs, it can help if a variety of listening tasks are included in course books to accommodate different brain dominance preferences.

2. Method

2.1. Participants

A total number of 175 undergraduate students majoring in English Language and Literature at the Department of Foreign Languages and Linguistics of Shiraz University initially participated in this study based on accidental sampling. However, 23 were excluded because of their incomplete responses to the questionnaires. Left-handed students were also excluded from the study since left handed and right handed students are shown to exhibit totally different patterns of lateralization of cognitive functions and certain aspects of LLSs use (Gholami Mehrdad & Ahghar, 2011). Such being the case, the final sample consisted of 142 male and female participants consisting of 40 freshmen, 25 sophomores, 31 juniors, and 46 seniors. They were 18 to 45 years old.

2.2. Instruments

As the study aims at investigating the relationship between brain dominance and listening strategy use of language learners, two questionnaires were used. The Hemispheric Dominance Test (HDT) was used to assess the students' brain dominance patterns, and the Strategy Inventory for Listening Comprehension (SILC) was also administered to evaluate the students' listening strategies. These questionnaires were chosen because they were the most comprehensive in what they intended to measure and were highly related to the objectives of the present study. Each of these instruments will be described separately in the following sections.

2.2.1. The Hemispheric Dominance Test (HDT)

The first questionnaire, the Hemispheric Dominance Test (HDT), was administered to determine the participants' brain dominance in information processing. The HDT is a 39-item Brain Dominance

Inventory devised by Davis, Nur, and Ruru (1994), with alternatives (a, b, c) for each item. All "a" statements describe the behavior of the left brain dominant learners; all the "b" answers speak of the behaviors of right brained learners; while all the "c" responses describe the attitudes of the whole brained learners. To assign students into groups, first, the number of "a", "b", and "c" responses of the participants should be counted separately. Then, the total of all "a" options should be subtracted from all "b" options. Finally, if the "c" score is 17 or higher, the "b" minus "a" score should be divided by three, and rounded up to the nearest number. Accordingly, all who got negative scores were assigned to the left brain dominant group. The holders of positive scores were considered as right brain dominant, and those who got zeroes were categorized as whole brainers.

2.2.2. Strategy Inventory for Listening Comprehension (SILC)

The second questionnaire, the Farsi version of Strategy Inventory for Listening Comprehension (SILC) (Afsarnia, 1999), was administered to see what listening strategies different students made use of. The reason for choosing the Persian version was to prevent any confusion or misunderstanding on the part of the students. The criteria for choosing this questionnaire was that this questionnaire has been validated both in its English and Persian versions at Shiraz University. The Farsi version of SILC is a 67 Likert scale item questionnaire on six different types of strategies, namely, metacognitive (1-27), memory (28-36), compensatory (37-42), cognitive (43-59), social (60-63), and affective strategies (64-67). The maximum possible scores for strategies in this questionnaire are as following: 135 for metacognitive strategies, 45 for memory strategies, 30 for compensatory strategies, 85 for cognitive strategies, 20 for social strategies, and 20 for affective strategies. The validity of the instrument was found through a factor analysis done by Afsarnia (1999). The reliability of the Farsi SILC was obtained in the present study by calculating Cronbach's Alpha and the index obtained was 0.93.

2.3. Data collection procedure

The two questionnaires were administered to the students in order to determine their brain dominance preference and to identify their

speaking and listening strategy use. Following clear instructions on how to fill out the questionnaires, the students were given enough time to answer the questionnaires carefully and patiently. It was particularly emphasized that there were no right or wrong answers, that the students should be honest in answering the questions, and that their responses were to be kept confidential.

3. Results

3.1. Descriptive Statistics

Table 1 shows the descriptive statistics for students' brain dominance. As can be observed, 64 of the 142 students were right brainers, 50 were left brainers and 28 were whole brainers.

Table 1. Descriptive statistics for three main types of brain dominance

	N	Percent
Right	64	45.1
Left	50	35.2
Whole	28	19.7
Total	142	100

Table 2 shows the descriptive statistics for the LCS use of learners with different types of brain dominance. All right brainers, left brainers, and whole brainers used all categories of LCS at a medium level except for metacognitive strategies, which they used at a high level ($M > 3.50$).

Table 2. Descriptive statistics for categories of LCS use of learners with different brain dominance orientations

	BD	N	Mean	SD
Metacognitive	right	64	3.6753	.46670
	left	50	3.5430	.48687
	whole	28	3.5595	.55343
	Total	142	3.6059	.49231
Memory	right	64	3.4913	.58688
	left	50	3.4200	.52226
	whole	28	3.3611	.64052
	Total	142	3.4405	.57430

	BD	N	Mean	SD
Compensatory	right	64	3.4714	.45090
	left	50	3.3067	.46822
	whole	28	3.2321	.48078
	Total	142	3.3662	.47025
Cognitive	right	64	3.3281	.59444
	left	50	3.3165	.51362
	whole	28	3.0777	.52809
	Total	142	3.2746	.55909
Social	right	64	3.2148	.67973
	left	50	2.9850	.61943
	whole	28	2.9554	.47655
	Total	142	3.0827	.63072
Affective	right	64	3.0000	.82013
	left	50	2.7250	.73584
	whole	28	2.8839	.88580
	Total	142	2.8803	.80871

3.2. The effect of brain dominance on LCS use

A one-way between groups ANOVA was conducted to find out whether there was any difference between learners with the three levels of hemisphericity in terms of their overall use of LCSs. Table 3 indicates that the mean difference between the LCS use of the three groups is not significant (F=1.283, p>0.05).

Table 3. Results of the ANOVA for overall LCS use by left brained, right brained and whole brained learners

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	446.786	2	223.393		
Within Groups	24196.538	139	174.076	1.283	.280
Total	24643.324	141			

A MANOVA was then run to investigate the differences between the left brained, right brained and whole brained learners with respect to their use of each LCS category (affective, social, metacognitive, cognitive, memory, and compensation). Preliminary assumption testing was performed to check for normality, multicollinearity, linearity,

homogeneity of variance covariance matrices, and univariate and multivariate outliers, with no serious violations noted. The results are summarized in Table 4. As seen, the results reveal that there was no statistically significant difference between left-, right-, and whole brained learners on the combined dependent variables, (F(12,268)=1.951, p=.052.).

Table 4. Multivariate tests for the effect of brain dominance on different categories of LCS

Effect	value	F	hypothesis df	Error df	Sig.
Wilks'Lambda	.846	1.951	12.000	268.000	.052

4. Discussion

4.1 Pattern of Brain dominance

With respect to the first question of the study regarding the general pattern of brain dominance of Shiraz University undergraduate EFL students, the results revealed that the majority of students are right brained (around 45%), indicating that they are intuitive and holistic and process information in a parallel manner (Brown, 2007; Tendero, 2008).

From the remaining students of the present study, 50 (about 35%) were found to be left brain dominant, meaning that they were logical, verbal, punctual, advanced planners, processed information in a linear manner, spoke with fewer gestures and preferred a formal study design (Brown, 2007; Tendero, 2008). The other 28 (about 20%) were shown to be whole brain dominant, meaning that they were in the "middle of the road" (Tendero, 2008, p. 69). As such, they tended to balance using their right and left brains in processing data and information for comprehension. They were more likely to be either verbal, tactual or kinesthetic, responded to both word meaning and pitch, were either sequential or random, processed information either linearly or in chunks, responded to both logic and emotion, did things with advance planning or with no plans at all, recalled both peoples' names and faces, talked with or without gestures; and felt good about both formal or informal study designs (Tendero, 2008).

The distribution of different brain dominance orientations in this study is similar to other studies such as Dulger (2012), who studied undergraduate Turkish EFL learners and found about 41% of them to be right, about 40% left and around 21% whole brain dominant. Dulger (2012) believed that this distribution may have happened due to the fact that teachers' methods of teaching had shifted in such a way as to encourage more right brain activities and spatial and imagination skills.

However, the results of the present study are different from those of Ali and Kor (2007) whose results regarding students of mathematics in Malaysia revealed that 71% of the students were left brain, 24% right brain, and 5% whole brain dominant. In their study, they explained the left brain dominance of the majority of their students by relating it to logical and mathematical thinking necessary for obtaining success in studying mathematics.

Such a difference in brain dominance results suggests that these differences can be related to students' majors, different teaching methods and materials and/or different learning activities. Moreover, factors such as culture, age, and gender seem to be necessary variables to be considered in brain dominance studies (Dulger, 2012; Tendero, 2008).

4.2. The effect of brain dominance on LCS use

This section is related to the second research question of the study, i.e. 'Is there any significant difference between left-, right-, and whole- brain dominant EFL students in their use of listening comprehension strategies?'.

With regard to both overall LCS use and categories of LCSs use, the results showed that there was no significant difference between left brain, right brain and whole brain students. According to Alptakin and Atakan (1990) and Danesi (1988), one would expect the nature of the task and incoming information to engage the hemisphere specialized for that task. However, although there is some allocation of functions to specific brain dominance, this does not mean that the other hemisphere is incapable of such functions. Rather, it means that the other hemisphere is less competent in that particular function. Hampson (1994) also suggested that hemispheric specialization does not necessarily

mean that the other hemisphere of the brain cannot perform a function at all or is not routinely involved in a particular activity, but it means that one side of the brain is more adept than the other in some functions and activities. Empirical studies that have come up with results similar to those of the present study are Kucuk (2012) and Naimie, Abuzaid, Siraj, Shagholi, and Al Hejaili (2010), that found no significant difference between students with different learning styles with regards to their language learning strategies.

Contrary to our findings, Bidabadi and Yamat (2010) and Ahmady (2002) found a statistically significant correlation between learning style preferences and listening strategy use. Such contrast can be explained in terms of the particular group of students participating in each study and the demographic features of the group such as age, gender and field of study which might have affected the results.

5. Pedagogical Implications
To teach and learn more effectively, instructors and learners need to better understand and appreciate individual differences and how they can affect the learning process. They could find ways to combine activities that accommodate both left and right brain learners, employing not only the usual linear, verbal model but also, the active, image-rich, visuo-spatial models so that learners would be able to use both hemispheres. Of course, adopting teaching techniques that will serve the needs of all the students might be difficult, but if teachers consider their students' learning style and balance their instruction by making use of a wide variety of tasks in the classroom, they can achieve success in this regard (Jhaish, 2010).

Since the findings of the present study did not yield to any significant difference between the groups and their use of general or specific LCS strategies, it is suggested that teachers explicitly instruct students on the use of LLSs during their classes. By providing opportunities for learners to practice language learning strategies, teachers can increase students' autonomy and self-esteem in the process of language learning inside and outside the classroom.

6. Limitations of the Study

Like other studies, the present study has a number of shortcomings and there are aspects that limit the generalizability of its findings, but they also pave the way for further research focus.

With regard to instruments used in the study, the reliability of the questionnaires as a sole research instrument for identifying learning style such as brain dominance has been discussed, and it is mentioned that no instrument is entirely valid for every person. It is, therefore, suggested that diagnosing hemisphericity through the inventories need to be complemented with other assessment techniques such as interviews and observations to obtain more objective data and increase the reliability of the Test.

Although the SILC is convincing in providing greater insights into the processes of listening as well as being quick and easy to administer, it might fall short of considering exclusive and inclusive aspects of listening strategy use.

Since this study employed accidental sampling, a random sampling procedure would also be more effective and might produce different results. However, due to the existing contextual limitations, such procedure was not possible to follow.

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