

# An analysis of EFL students' learning main and sub-skills in terms of hand usage, study style and gender

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## ABSTRACT

The brain asymmetry and contralateral control of the body by the left and right brain hemispheres is known (Crystal, 1997; Fromkin, 1998). It is widely accepted that language lateralization, damage to the left brain, Magnetic Resonance Imaging (MRI) Positron Emission Tomography (PET) and results show that the left brain is regarded as the language learning center. Yet it is difficult to explain counter evidences such as Phinea Gage, an abbot, and Genie's cases. Besides, it is also important to consider the left handed people's cases. It does not matter whether the learnt language is L1 or L2; supposing that the language learning center is strictly limited to (lateralized) only the left hemisphere, it was difficult to explain how the left handed people have learned their L1 or L2. Hence this study investigated how undergraduate students learn the main and sub-skills of ELT according to hand-usage (left or right), study style (individual or group) and gender (male or female) variables. A questionnaire of seven skills including 5 options was applied to 27 left handed and 75 right handed EFL from grade 1 to 4. Fisher's Exact Test (FET) was used to detect the statistical relations among each demographic variable and the students' preference level for each different skill. Although the language learning is usually regarded as main function of the left brain, it was found that left handed students' learning mother and English, visualizing the listened text by the left handed students, visualizing the grammar rules as figure, table and image by most right-handed males, the left handed females' listening music while reading, visualizing the phonetic symbols by the left handed students tend to imply that the right brain has also relation with the language learning. Results were discussed with other findings and some suggestions were posed.

**Keywords:** Brain lateralization, language learning, main and sub-skills, hand usage, study style, gender.

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## INTRODUCTION

For Crystal (1997), 'the functional relationship between the two hemispheres of the brain has been a major focus for the neuropsychology and clinical neurology' (p.260), yet this is not the concern of this article. Common knowledge is that 'the brain is divided into two parts, called cerebral hemispheres; the one is on the right and the other the left. These hemispheres are connected like conjoined twins right down the middle, by the corpus callosum; the left hemisphere controls the movements of the right side of the body, and right hemisphere the movements of the left side. If you point with your right hand, it is the left hemisphere which has directed your action. This is referred to as contralateral brain function (Fromkin and Rodman, 1998, p.35).

Apart from the above stated two areas, Yule (1993, p. 126) states a third area called *supplementary motor area*, which is 'involved in the actual physical articulation of speech'. Two neurosurgeons, Penfield and Roberts, applied minute amount of electrical current to specific areas of the brain, and they could identify those areas where the electrical stimulation would interfere with normal speech production...the motor movements involved in speech production would also be controlled in this general area'.

For Crystal (1997) each hemisphere has its own role, being more involved in the others. A hemisphere is said to be the 'dominant' or 'leading' one for the mental functions. The development of these functions within one

or the other hemisphere is known as 'lateralization' (p.260). For example, the left hemisphere is known for analytic tasks categorization, calculation, logical organization, complex motor functions and language. In this context, the right side is said to be dominant or the perception and matching of global patterns, part-whole relationships, spatial orientation, creative sensibility, musical patterns, and emotional expression or recognition (p.260).

Yule (1993, p.131) states that 'the dichotic listening test shows which hemisphere (ear) is good at verbal or nonverbal sounds'. In this test a signal coming to the right ear goes to the left hemisphere and a signal coming to the left ear goes to the right hemisphere. Yule (1993) states that 'the subjects more often correctly identify the same sound came to the right ear. This has come to be known as the right ear advantage for linguistic sounds'. Yule (1993) continues that 'among the specializations of the human brain the right hemisphere handles nonverbal sounds and the left hemisphere handles language sounds (p.131)'.

Fromkin and Rodman (1998, p.42) agree with Yule (1993) and states that the left hemisphere has an edge in linguistic processing and the right hemisphere is better at nonverbal material... that is, the left side of the brain is specialized for language, not sounds'.

The views about brain lateralization, language center and damage (lesions) to the brain are in dispute. For example, Fromkin and Rodman, (1998, p.40) state that 'even from the birth the human brain is lateralized to the left for language since language usually does not develop normally in children with early left hemisphere brain lesion. They (ibid.) continue that 'damage to the front part of the left hemisphere (called Broca's area) resulted in loss of speech, whereas damage to the right side did not' (p.36). On the other hand, 'patients with lesions in the back portion of the left hemisphere (called Wernicke' area) had difficulty in understanding' (p.37); (Yule, 1993, p.126). Fromkin and Rodman (1998, p.38) also state that 'evidence from childhood brain lesions indicates that language is lateralized and the brain is differentiated in regard to language and non-language abilities'. Currently Magnetic Resonance Imaging (MRI) and Positron Emission Tomography (PET) studies reaffirm the lateralization of the language. Yet Crystal (1997) has a different view about language center and states that although the brain is lateralized, 'these identifications must be made cautiously and there are several activities that usually involve both hemisphere' (p.261). He (ibid.) further states that 'statements about the relationship between anatomical form and intellectual function...must remain extremely tentative' (p.262).

The examples of disputable cases come from the Phineas Gage, an abbot and Genie. Fromkin and Rodman (1998), after explaining the cases of Phineas Gage in 1848 and an abbot in 1770, state that lesions to the left hemispheres result in aphasia, but injuries to the

right do not (p.45). In this context, Yule (1993, p.124) states that 'a huge metal rod had gone through the front part of Mr. Gage's brain, but Mr. Gage's language abilities were unaffected. The point of this amazing tale is that, if language ability is located in the brain, it clearly is not situated right at the front'. In addition to Gage, Genie was deprived of language and social relations until 13 years old, tied to a chair by her father in a small closed room. There were no radio and television and mother was allowed to speak only a few minute. When she was first brought to care, she was unable to speak. Tests showed that she had no left-hemisphere language facility. She was taught sounds and speech and sometime later those same tests showed that Genie was using the right hemisphere of her brain for language functions. She went through many of the same early 'stages' found in normal child language acquisition. Yule (1993, p.133) states that there is not necessarily an exclusive brain localization for language abilities. As a result, it was seen that there are some views and evidences for and against the development of the language in the left and right hemispheres.

Last but not least, Hugdahl's, (2000, p.211) states that 'the traditional view of a language-visuo/spatial dichotomy of function between the hemispheres has been replaced by more subtle distinctions. The use of MRI to study the role of the planum temporale area in the posterior part of the superior temporal gyrus for language asymmetry and the use of dichotic listening technique to illustrate the difference between bottom-up, or stimulus driven laterality versus top-down, or instruction-driven laterality suggest that the hemispheric dominance observed at any time is the sum result of the dynamic interaction between bottom-up and top-down processing tendencies. Stimulus-driven laterality dominance is always monitored and modulated through top-down cognitive processes, like shifting of attention and changes in arousal.

## LITERATURE REVIEW

The functions and dominance of the hemispheres with some other variables such as hand usage in writing, dominant eye, sport and music were investigated by several researchers especially under brain-based learning theme (Gazzaniga, 1995; Kaya and Akdemir, 2016). For example, Crystal, (1997, p.261) states that the left hemisphere is dominant for language in most right handed people (estimates are usually over 95%). However, the relationship is not a symmetrical one: it does not automatically follow that the right hemisphere is dominant for language in left handed people. Left handers are by no means a homogeneous group, and in over 60% of the cases the left hemisphere is either dominant for language or very much involved ('mixed' dominance).

In another study, Uzun and Cagiltay (2012, p.47) aimed

to find out the effects of handedness whether it has an effect on usability scores and handwriting speed on a Graffiti handwriting recognition system in Palm-OS. It was found that left handed users significantly write slower than right handed users and there are no significant differences between writing speed of left-handed and right-handed users. Also, there is no correlation between writing speed difference on this task. That means, being a fast writer on paper does not mean to be a fast writer on a handwriting recognition system because those two activities need different mental and motor skills.

Gundogan (2005) in explaining the relation between-hand choice and dominant eye, states that educators direct the children while they are learning how to write. That is, teachers want them to use their right hand and this guidance does not reflect the function of the brain asymmetry. He (ibid.) implies that hand choice must be identified in line with Annet et al's questionnaire and teachers must not interfere in their hand choice when children learn holding pencil at the nursery and writing at the elementary school.

Uzun and Alkan (2002, p.6) analyzed the relation of hand dominance and forensic document examination and states that 'biology (genetics), gender, education and environment affect the cerebral dominance'. They (ibid.) further state that there are many studies on writing, but there is no study that strictly shows whether the writing is produced by left or right handed one.

Tarman (2007) investigated hand usage and cerebral lateralization of the 313 graduate students from the four different universities in Turkey. It was found that 88% them right handed, 5% of them two hand preference and 7% of them left hand preference. It was also found that there was no significant difference between hand dominance and gender. Music analysis is in the left brain and music listening is in the right brain (McFadden, 2001, cited in Keles and Cepni, 2006). It is seen that the clusters of the cells examined by the imaging techniques do not constitute a regular structure as believed, and the location of the language-related area in one person does not correspond with that of another person (Ergenc, 1994, cited in Keles and Cepni 2006).

Borklu and Dolu (2010) analysed the hemispheric differences of auditory evoked potential in sportsmen. Evoked potentials (EP) mean the changes in the spontaneous electrical activity of the brain following a sound, light, etc. The study aimed which hemisphere was or/and hemispheres were more effective in team sportsmen using EP recording. The study used 10 right and 11 left handed healthy sportsmen at the Physical Education department and 11 right and 11 left handed healthy students as control group. They identified handedness by means of Annet questionnaire and found that ambidexterity (both-handedness) and left hand usage was seen dominant among the players of basketball, handball, wrestlers, boxers, sculptures, surgeons and the people playing an instrument. They

also found that both hemispheres were more active in sportsmen group than in control group.

Cuhadar (2008: 68) researched the relations of brain lobes and music and went on saying that the 'centers of the musical perception and performance are located in the right front lobe of the brain, but the sense of rhythm is on the left side at the girus insula'. He (ibid.) also states that 'any musical activity is not limited to the right or left brain lobes. It is a process involving both left and right lobes at the same time (p.73). 'The impulses and information that come to the brain are perceived by the centers responsible for them. They then spread across the entire surface by using synaptic bonds, and are stored in different places at the same time. The brain is like a hologram. The laws of the brain's operation are so complex that cannot be grasped by a one-dimensional and causal logic. To understand it, we need new cybernetic rules' (ibid, p.75).

Kasimi and Ulum (2017, p.656) analyzed Oxford's (1989) Strategy Inventory for Language Learning (SILL) as to left and right handed language learners and they found that 'handedness is not an effective factor influencing the right and left hand users' perception on language learning strategies'.

In order to save space and suffice it to say that the online review of the Thesis Center of the Higher Council of Education in Turkey indicates that there are 64 theses at the Masters Level and 9 theses at the Ph.D. currently. It is not possible to review all of them. Yet the analysis indicated that the above stated studies did not include the three variables in one study as this study did. For example, Baysal (2019) studied the relation of SILL with teaching program. Koç (2017) applied an in-service training program for 6<sup>th</sup> grade English teachers. Demirtekin (2017) focused on vocabulary teaching in his study.

As a conclusion, the common view is that the left hemisphere is the only center of language learning although there some opposite examples. People are mostly right handed and use their right hands in writing although all of the left handers do not use their right brain in learning a language. Avcı (2008, p. 3) states that although each semi-sphere is the center of different functions, it stacks together in the process of performing brain functions. The brain functions as a whole. In this context, it was necessary to explore and provide further evidence about the relations of hemisphere dominance and hand usage, study style and gender in a foreign language department.

## Research questions

The literature review indicates that the brain is usually lateralized to the left to function the language. On the other hand, Phineas Gage, an abbot, and Genie's cases tend to deny the common view about the language

center. Besides, second/foreign language and linguistics studies give more importance to the language researches. Yet they usually focus on usual topics such as universal grammar, interference of mother tongue, the effect of the national curriculum, individual differences, second/foreign language theories, etc. (Cook, 1993; Ellis, 1998). It is seen in the literature review that language learners' gender, study style, and hand usage were not studied in relation to left and right hemisphere in the research context. Hence, it seemed important and became necessary to investigate how the students learn main and sub-skill as to gender, hand usage, and study style. In addition, it is known that left and right hemispheres have different functions. It was assumed that if we produce questions from the features of both left and right hemispheres about language skills, this study might shed some lights directly or indirectly not only on the functions of the hemispheres, but also how these skills are perceived by different hemispheres.

1. Is/are there any potential relation(s) between gender and learning main skills?
2. Is/are there any potential relation(s) between gender and learning sub-skills?
3. Is/are there any potential relation(s) between hand-usage and learning main skills?
4. Is/are there any potential relation(s) between hand-usage and learning sub-skills?
5. Is/are there any potential relation(s) between study style and learning main skills?
6. Is/are there any potential relation(s) between study style and learning sub-skills?
7. What is the density of the choices of main and sub-skills?

## METHODOLOGY

A quantitative case study approach was used in collecting and analyzing the data. The quantitative part refers to the statistical calculations between the skills and variables. The case part of the study refers to the limitation of the study with the research context and ELL Department. The reason for it comes from the Cambridge conference held in 1975 in refining the views about the case. Two different views emerged as a result of that conference: either a bounded system is chosen and issues are explored in it; or an issue is chosen and a flexible boundary is identified in defining the case (Adelman et al., 1984).

### Participants

A field work was done to identify the left and right hand users from prep class to grade four in the ELL department, Faculty of Letters and Science, Ordu University, Turkey, in 1998-1999 academic year (second term). Then, the purpose of the study was explained to potential participants in order to fulfil the ethical rules of the investigation and to get their consents. After they agreed to participate, the above stated questionnaire was given to each volunteer participant to fill in. In this context, the first priority was given to identify the left hand users and 27 of them were included in the study except two non-volunteers. Apart from that, 75 right-handed volunteers were involved in the study. Table 1 shows the number of male, female, left and right handed participants.

**Table 1.** The number left and right handed participants.

Left-handed students			Right-handed students		
Female	Male	Total	Female	Male	Total
15	12	25	63	12	75

### Data collection instrument

A questionnaire that had seven parts was designed by the researcher to collect the data. This was because there are four main (listening, speaking, reading and writing) and three sub-skills (grammar, vocabulary and pronunciation) in the literature. Each skill had six options, each of which shows the students' ways of learning the skill (see Appendix A). Yet the 6th option was chosen only by four students. Hence no statistical calculation was possible and thus this option was excluded. After the analysis it was seen that there were four *levels* indicating the *relations and their extents* for each option. The meaning of each option is: 0 = never, 1 = often, 2 =

sometimes, 3 = rarely. In calculating the relations between variables, a Fisher's Exact Test (FET) was used to detect the statistical relations among each demographic variable and the students' preference level for each different skill. As the cross tables have more than two columns, a post hoc. analysis was carried out with pairwise comparisons with the Bonferroni correction by reassigning the significance level .05 by  $.05/8 = .0063$ .

The questionnaire also asked three demographic questions about the participants such as gender, hand usage in writing and study style. Finally, the density (frequency) of each skill was calculated for gender, hand usage and study style at the level 1. It aimed to explore the much chosen option and it was hoped that these

results might give hints for potential researches.

## RESULTS

Researchers (Frost et al., 1999; Binder et al., 2000; Phillips et al., 2001) stated that 'in fMRI language research, the sex/gender variable is closely related to the nature of the task: individual language tasks may produce different results with respect to female and male regional activation patterns (cited in Kaiser et al., 2009, p.55). As this research aimed to find out *how* EFL students learn main and sub-skills according to gender, hand usage and study style variables, some important and statistical relations were found between the variables and students' ways of learning skills. Hence the relations, that is different results as stated above, of these main and sub-skills with the variables will be explained respectively.

Tables 2 and 3 show the relationship between gender and listening skill.

### Gender difference

Tables 2 and 3 indicate that there is a statistical relationship in getting the d) and e) options of the listening skill and gender ( $p < 0.05$ ). This relation is based on the fact that the male students are more likely to choose the option d) at the level 2 and the option e) of listening skill at the level 1 compared to the female students.

As seen in the Table 4, there is a statistical relationship in getting the option a) of the grammar skill and gender ( $p < 0.05$ ). The reason for it comes from the fact that the male students prefer this option at the level 1 compared to the female ones.

**Table 2.** The relation of gender and listening skill (Option D).

		Listening -D				Total	Chi Square Fisher Exact Test		
		0	1	2	3		Value	df	p-value
Gender	Female	Count	16	39	16	8	11.291	3	0.007
	% within gender	20.30%	49.40%	20.30%	10.10%	100.00%			
Gender	Male	Count	2	5	12	4	11.291	3	0.007
	% within gender	8.70%	21.70%	52.20%	17.40%	100.00%			
Total	Count	18	44	28	12	102			
	% within gender	17.60%	43.10%	27.50%	11.80%	100.00%			

**Table 3.** The relations of gender and listening skill (Option E).

		Listening (E)				Total	Chi Square Fisher Exact Test		
		.00	1.00	2.00	3.00		Value	df	p-value
Gender	Female	Count	46	2	10	21	8.563	3	0.026
	% within gender	58.2%	2.5%	12.7%	26.6%	100.0%			
Gender	Male	Count	11	5	3	4	8.563	3	0.026
	% within gender	47.8%	21.7%	13.0%	17.4%	100.0%			
Total	Count	57	7	13	25	102			
	% within gender	55.9%	6.9%	12.7%	24.5%	100.0%			

### Hand difference

Table 5 and 6 indicate significant relationship depending on students' hand usage (left or right) and their getting two different skills (speaking and reading) ( $p < 0.05$ ). It was seen that left handed students use the option c) in practicing the speaking skill at the level 1 compared to right handed students. Besides, right handed students do

not prefer to use the option d) in getting the reading skill rather than left handed students.

### Study style

The analysis of Tables 7 and 8 show significant relationship depending on students' study style (single or

**Table 4.** The relations of gender and grammar skill (Option A).

		Grammar A				Total	Chi Square Fisher Exact Test		
		.00	1.00	2.00	3.00		Value	df	p-value
Gender	Female	Count	35	8	25	11	9.657	3	0.018
		% within gender	44.3%	10.1%	31.6%	13.9%			
	Male	Count	5	8	5	5	9.657	3	0.018
		% within gender	21.7%	34.8%	21.7%	21.7%			
Total		Count	40	16	30	16	9.657	3	0.018
		% within gender	39.2%	15.7%	29.4%	15.7%			

**Table 5.** The relations of handedness and speaking skill (Option C).

		Speaking C				Total	Chi Square Fisher Exact Test		
		.00	1.00	2.00	3.00		Value	df	p-value
Hand Usage	Right	Count	53	1	10	11	7.737	3	0.042
		% within left-right	70.7%	1.3%	13.3%	14.7%			
	Left	Count	19	4	1	3	7.737	3	0.042
		% within left-right	70.4%	14.8%	3.7%	11.1%			
Total		Count	72	5	11	14	7.737	3	0.042
		% within left-right	70.6%	4.9%	10.8%	13.7%			

**Table 6.** The relations of handedness and reading skill (Option D).

		Reading D				Total	Chi Square Fisher Exact Test		
		.00	1.00	2.00	3.00		Value	df	p-value
Hand usage	Right	Count	57	8	3	7	8.443	3	0.028
		% within left -right	76.0%	10.7%	4.0%	9.3%			
	Left	Count	13	4	4	6	8.443	3	0.028
		% within left-right	48.1%	14.8%	14.8%	22.2%			
Total		Count	70	12	7	13	8.443	3	0.028
		% within left-right	68.6%	11.8%	6.9%	12.7%			

group) and in getting the option b) of the two different skills (reading and grammar) ( $p < 0.05$ ). It was revealed that the students studying the lessons individually prefer to use the option b) of the reading skill compared to the students who like to study in a group. On the other hand, all of the students studying in group do not use the option b) of the grammar skills, yet most of the students studying individually prefer to use this option (b).

Table 9 shows that there is a significant relationship between females' being left or right handed and in choosing the option a) of the speaking skill ( $p < 0.05$ ). The relation is based on the fact that the left-handed

female students are more likely to choose the option a) of the above stated skill at level 3 compared to right handed female students.

Table 10 shows that there is a significant relationship between females' being left or right handed and in choosing the option d) of the reading skill ( $p < 0.05$ ). The relation is based on the fact that the left-handed female students are more likely to choose the option d) of the above stated skill at the level 2 compared to right handed female students.

Table 11 shows that there is a significant relationship between females being left or right handed and in

**Table 7.** The relations of study style and reading skill (Option B).

			Reading B				Total	Chi Square Fisher Exact Test		
			.00	1.00	2.00	3.00		Value	df	p-value
Study style	Single	Count	22	29	29	16	96	6.369	3	0.038
		% within study style	22.9%	30.2%	30.2%	16.7%	100.0%			
	Group	Count	0	1	1	4	6			
		% within study style	0.0%	16.7%	16.7%	66.7%	100.0%			
Total	Count	22	30	30	20	102				
	% within study style	21.6%	29.4%	29.4%	19.6%	100.0%				

**Table 8.** The relations of study style and grammar skill (Option B).

			Grammar B				Total	Chi Square Fisher Exact Test		
			.00	1.00	2.00	3.00		Value	df	p-value
Study style	Single	Count	35	24	19	18	96	6.470	3	0.042
		% within study style	36.5%	25.0%	19.8%	18.8%	100.0%			
	Group	Count	6	0	0	0	6			
		% within study style	100.0%	0.0%	0.0%	0.0%	100.0%			
Total	Count	41	24	19	18	102				
	% within study style	40.2%	23.5%	18.6%	17.6%	100.0%				

**Table 9.** The relations of hand-gender and speaking skill (Option A).

			Speaking A				Total	Chi Square Fisher Exact Test		
			.00	1.00	2.00	3.00		Value	df	p-value
State (hand)	Left-handed female	Count	0	5	4	7	16	9.33	3	0.016
		% within handedness	0.0%	31.3%	25.0%	43.8%	100.0%			
	Right-handed male	Count	11	34	7	11	63			
		% within handedness	17.5%	54.0%	11.1%	17.5%	100.0%			
Total	Count	11	39	11	18	79				
	% within handedness	13.9%	49.4%	13.9%	22.8%	100.0%				

choosing the option c) of the pronunciation skill ( $p < 0.05$ ). In getting the pronunciation skill the left-handed female are more likely to choose the option c) of the above stated skill at level 1 and 2 compared to right handed students at level 1 and 2 compared to right handed students.

Tables 12 and 13 show that among students who use their right hands, there are statistical relationships between gender and getting the options (d) and (e) of the listening skill ( $p < 0.05$ ). These relations can be explained like this: The female students who use their right hand choose the option d) of the listening skill more at the level 2 compared to the right handed males. Similarly, the

female students using their right hands choose the option e) of the listening skill more at the level 0.00 compared to the right handed males.

Table 14 demonstrates that among the students using their right hands, there is a statistical relationship between the gender and in getting the option d) of the writing skill. The reason for it comes from the fact that the females using their right hands chose the option d) at the level 2 while the males did not choose it at the level 2 in achieving the writing skill.

Table 15 shows that among the students there is a significant relationship between gender and choosing the

**Table 10.** The relations of hand-gender and reading skill (Option D).

			Reading D				Total	Chi Square Fisher Exact Test		
			.00	1.00	2.00	3.00		Value	df	p-value
State (hand)	Left-handed female	Count	9	0	3	4	16	9.08	3	0.015
		% within handedness	56.3%	0.0%	18.8%	25.0%	100.0%			
	Right-handed male	Count	50	6	2	5	63			
		% within handedness	79.4%	9.5%	3.2%	7.9%	100.0%			
Total	Count	59	6	5	9	79				
	% within handedness	74.7%	7.6%	6.3%	11.4%	100.0%				

**Table 11.** The relations of hand-gender and pronunciation skill (Option C).

			Pronunciation C				Total	Chi Square Fisher Exact Test		
			.00	1.00	2.00	3.00		Value	df	p-value
State (hand)	Left-handed female	Count	12	2	2	0	16	8.65	3	0.023
		% within handedness	75.0%	12.5%	12.5%	0.0%	100.0%			
	Right-handed male	Count	53	1	1	8	63			
		% within handedness	84.1%	1.6%	1.6%	12.7%	100.0%			
Total	Count	65	3	3	8	79				
	% within handedness	82.3%	3.8%	3.8%	10.1%	100.0%				

**Table 12.** The relations of hand-gender and listening skill (Option D).

			Listening D				Total	Chi Square Fisher Exact Test		
			.00	1.00	2.00	3.00		Value	df	p-value
State (hand)	Right-handed female	Count	11	32	13	7	63	11.173	3	0.005
		% within handedness	17.5%	50.8%	20.6%	11.1%	100.0%			
	Right-handed Male	Count	0	2	8	2	12			
		% within handedness	0.0%	16.7%	66.7%	16.7%	100.0%			
Total	Count	11	34	21	9	75				
	% within handedness	14.7%	45.3%	28.0%	12.0%	100.0%				

**Table 13.** The relations of hand-gender and listening skill (Option E).

			Listening E				Total	Chi Square Fisher Exact Test		
			.00	1.00	2.00	3.00		Value	df	p-value
State (hand)	Right-handed female	Count	37	2	6	18	63	9.032	3	0.019
		% within handedness	58.7%	3.2%	9.5%	28.6%	100.0%			
	Right-handed male	Count	5	4	1	2	12			
		% within handedness	41.7%	33.3%	8.3%	16.7%	100.0%			
Total	Count	42	6	7	20	75				
	% within handedness	56.0%	8.0%	9.3%	26.7%	100.0%				



**Table 14.** The relations of hand-gender and writing skill (Option D).

			Writing D				Total	Chi Square Fisher Exact Test		
			.00	1.00	2.00	3.00		Value	df	p-value
State (hand)	Right-handed female	Count	16	16	19	12	63	7.400	3	0.049
		% within handedness	25.4%	25.4%	30.2%	19.0%	100.0%			
State (hand)	Right-handed male	Count	2	6	0	4	12	7.400	3	0.049
		% within handedness	16.7%	50.0%	0.0%	33.3%	100.0%			
Total		Count	18	22	19	16	75			
		% within handedness	24.0%	29.3%	25.3%	21.3%	100.0%			

**Table 15.** The relations of hand-gender and grammar skill (Option C).

			Grammar C				Total	Chi Square Fisher Exact Test		
			.00	1.00	2.00	3.00		Value	df	p-value
State (hand)	Right-handed female	Count	21	18	9	15	63	8.143	3	0.027
		% within handedness	33.3%	28.6%	14.3%	23.8%	100.0%			
State (hand)	Right-handed male	Count	8	0	0	4	12	8.143	3	0.027
		% within handedness	66.7%	0.0%	0.0%	33.3%	100.0%			
Total		Count	29	18	9	19	75			
		% within handedness	38.7%	24.0%	12.0%	25.3%	100.0%			

**Table 16.** The relations of hand-gender and pronunciation skill (Option D).

			Pronunciation D				Total	Chi Square Fisher Exact Test		
			.00	1.00	2.00	3.00		Value	df	p-value
State (hand)	Right-handed female	Count	19	11	27	6	63	7.785	3	0.037
		% within handedness	30.2%	17.5%	42.9%	9.5%	100.0%			
State (hand)	Right-handed male	Count	4	6	1	1	12	7.785	3	0.037
		% within handedness	33.3%	50.0%	8.3%	8.3%	100.0%			
Total		Count	23	17	28	7	75			
		% within handedness	30.7%	22.7%	37.3%	9.3%	100.0%			

option c) of the grammar skill. Its reason derives from the fact that most of the males using their right hands do not use this option while the right handed females use this option more at the level 1 compared to the females in getting the grammar skill.

Table 16 indicates that among the students there is a significant relationship between gender and choosing the option d) of the pronunciation skill. The reason is that the males using their left hands did not show a different style from neither right handed males nor right handed females in terms of getting the skill.

#### Density of the choices of the main and sub-skills

It is seen in Table 17 that 7 left and 32 right handed females chose the option d); 4 left and 5 right handed male chose the option a) of the listening skill. As to speaking, 5 left and 34 right handed females chose the option a) and 7 left and 8 right handed male chose the option a). Besides, 21 right handed females chose the option b); 8 left and 21 right handed female chose the option e) of reading as 4 left handed male chose the option d) and 4 right handed male the option e) of the

**Table 17.** The distribution of the choices of the main skills at level 1.

Choices		Main skills																			
		Listening					Speaking					Reading					Writing				
		A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E
Females	Left hand	4	3	2	7	0	5	2	2	4	2	1	4	2	0	8	4	2	4	5	2
	Right hand	14	9	5	32	2	34	7	1	12	7	11	21	3	6	21	18	16	3	16	10
Males	Left hand	4	1	1	3	1	7	0	2	1	1	1	2	1	4	3	4	1	1	3	1
	Right hand	5	0	1	2	4	8	1	0	2	1	3	3	0	2	4	1	1	2	6	2

reading skill. Finally, 5 left handed female chose the option d) and 18 right handed female chose the option a) of the writing skill while 4 left handed male chose the option a) and 6 right handed male chose the option d) of the writing skill.

As shown in Table 18, it is also seen that 6 left handed female chose the option d) of the vocabulary skill and 22 right handed females chose the option b) as 4 right handed male chose the option a) as well as 4 left and 4

right handed male chose the option d). Besides, 5 left handed female chose the option d) and 18 right handed female chose the option c) and d) of the grammar skill. On the other hand, 5 left handed and 4 right handed male chose the option d) of the grammar skill. Lastly, 5 left handed female chose the option d) and 30 right handed females chose the option a), 4 left handed and 6 right handed male chose the option d) of the pronunciation skill.

**Table 18.** The distribution of the choices of the sub-skills at level 1.

Choices		Sub-skills														
		Vocabulary					Grammar					Pronunciation				
		A	B	C	D	E	A	B	C	D	E	A	B	C	D	E
Females	Left hand	5	3	1	6	0	1	4	4	5	2	5	2	2	5	2
	Right hand	19	22	2	13	5	7	15	18	18	3	30	10	1	11	11
Males	Left hand	2	2	1	4	1	4	1	1	5	0	3	1	1	4	1
	Right hand	4	2	0	4	2	4	4	0	4	0	3	0	1	6	2

## DISCUSSION

Although there is a common understanding about the brain asymmetry and contralateral control of the body by the left and right brain hemispheres (Crystal, 1997; Fromkin and Rodman, 1998), there are some disputes about the language learning and its centers. It is widely accepted that language lateralization, damage (lesion) to the left brain, PET and MRI results tend to show that the left brain is usually regarded as the language learning center, yet it is difficult to explain counter evidences such as Phinea Gace, an abbot, Genie's cases, etc.. In this context, Khosravizadeh and Teimournezhad (2011, p.11) state that 'left-hemisphere language dominance is less reported in left-handers than in right handed individuals'. In the same way, 27 left handed foreign language students' cases in this research direct attention to one point for the first time as follows: It does not matter whether the learnt language is L1 or L2; supposing that if the language learning center is strictly limited to

(lateralized) only the left hemisphere, it was difficult to explain how the left handed participants have learned their L1 or L2. That is so say, if the left hemisphere uniquely is responsible for language learning, the left handed students/people should not have learned their mother tongue (L1). More than this, if the above stated assumption was true, the left handed students/people should not have learned any foreign/second language. Similarly, if it was true, we should not have had any students in the Foreign Languages Department dominantly using their left hands while writing or feeding themselves. It is seen in this article that the 27 students know their mother tongue (L1) and they are learning English as a foreign language. The left handed participants are not extreme cases in this study; one can see, at least, several left-handed students in every foreign language department in Turkey or abroad. Hence the dominant view about the language learning center in the brain needs to be questioned.

It is seen in Crystal (1997), and Khosravizadeh and

Teimournezhad (2011) that 90% percent of the people in the world are right handed regardless of their nationality, religion or cultural effects. Yet some researchers in Turkey, for example Gundogan (2005) seem to have bias against people's using their right hands. What he implies is that the majority of the people in Turkey are Muslim and using right hand suggested by Islam while eating, drinking unless they are skilled left handed by birth. He (ibid) also implies that parents have a presupposition on children's learning hand usage. There are some examples of the right hand usage from other cultures as illustrated by SchwelInus at al. (2012) cited in Yildiz et al. (2015) whose study shows that 93% of the students use their right hands in writing in Toronto (America), which is known as predominantly non-Muslim area. Hence, it can be claimed that the right hand usage may be the nature of the human body all over the world.

Tables 2, 3, 5, 12, and 13 show the relations of the listening skill with the males, left handed students, and right handed females. The article d) of this skill was undertaken by males (Table2) as well as right handed females (Table 12), which refers to listening to the text while reading the written form of it and this agrees with the function of the left brain. Yet the article c) of this skill was done by the left-handed students (Table 5), which refers to the visualizing the listened text. What these findings mean that some of the learners employ the left side of the brain (in listening) while others use the right side of it (in visualizing) while listening.

Tables 4, 8 and 15 show that there are relations of grammar skill with males, group study and most right handed males. Although Kimura (1999) tells that 'female dominance has been detected in ...grammatical usage' (cited in Kaiser et al., 2009, p.51), no relation was seen between the grammar study and female students in this study. The option a) was done by males (Table 4) and this skill refers to using the grammar rules in the speech and option b) was chosen by group learners (Table 8), which refers to writing the rules several times. These articles are in agreement with the function of the left brain, yet the option c) was chosen by mostly right handed males (Table 15), which refers to visualizing the grammar rules as figure, table and image. This way of learning also supports the use of the right hemisphere of the brain as stated above.

Tables 6 and 10 indicate the relations of the 'reading' skill with the right-handed students, group study and left-handed females. The d) option of this skill was chosen by left handed students (Table 6) and right handed females (Table 10), which refers to reading while listening something. As seen in the literature, music analysis is in the left brain and music listening is in the right brain (McFadden, 2001, cited in Keles and Cepni, 2006). Hence left handed females' listening to music while reading (learning a language) means that the right hemisphere, too, contributes to language learning. In addition, listening to music while reading agrees with the

above stated comment in Tables 2 and 12; the option d).

Table 9 shows the relation between speaking skills and the left-handed females. The option a) of this skill was chosen by the left handed females, which refers to speaking to someone else to practice. This relation agrees with what Halper (1992) says as follows: 'In psycholinguistics research there is a general female advantage in language production and verbal fluency' (Kaiser et al., 2009).

Tables 11 and 16 show the relations of the pronunciation skills and left-handed students. Females students prefer using the option c), which refers to visualizing the phonetic symbols and the male students prefer the option d), which refers to improving pronunciation by reading (practicing) the text aloud. Visualizing the phonetic symbols refers to the use of the right brain. Finally, vocabulary is the only skill that has no relation between male or female students.

Table 17 shows that 4 left and 5 right-handed males chose the option (a) of the listening skill and the use of the same option by the different handers is interesting. Besides, 7 left handed and 32 right handed female used the option d) of the listening skill and left handed students' choosing this option is worth considering. Table 17 also indicates that 5 left and 34 handed females as well as 7 left handed and 8 right handed males chose the option a) of the speaking skill. Right handed students' choice of this option is normal because the left hemisphere is about speaking, yet left handed students' choice of this option is important. In addition, 8 left handed and 21 right handed female chose the option e) of the reading skill. This option reveals that both left and right handed students can listen to music while reading. That is, not only the right hemisphere, but also two different hemispheres can deal with the music. Moreover, 4 left handed and 18 right handed females as well as 4 left handed males chose the option a) of the writing skill that refers to thinking aloud (speaking) about the topic. Here left handed male and female students' choice of this option is uncommon this is because speaking is lateralized to the left hemisphere.

Table 18 displays that 4 left and 4 right handed males chose the option d) of the vocabulary and opposite handers' choice of the same option is interesting. Similarly, 5 left handed and 18 right handed females chose the option d) of the grammar skill as well as 5 left handed and 4 right handed males. As seen the above stated music ability by the two different hemispheres, this option (recognizing the grammar rules in texts), too, can be done by the two different hemispheres. Finally, 5 left handed and 30 right handed females do the option a) of the pronunciation skill that refers to repeating the vocabulary and rules aloud. Here left handed students' choice of the speech is not a usual case. Last but not least, 4 left handed and 6 right handed males chose the option d) of the pronunciation skill that refers to reading the pronunciations aloud. Since reading aloud indirectly

includes speaking, left handed students' choice of the reading (speaking) is important in that speaking is usually associated to the left hemisphere (Broca area).

## CONCLUSION AND SUGGESTIONS

Kaiser et al. (2009) state that language experiments on lateralization usually take the handedness into account, yet Szaflarski et al. (2012, p.89) says that 'semantic language function is typically lateralized to the left hemisphere in both right and left handed individuals. While it usually correlates with language lateralization, handedness is not a dependable predictor of hemispheric language dominance especially in left-handers'. Similarly, Desmond et al., (1995) tell that 'language dominance and handedness are not perfectly correlated either, ...some right-handed patients have a right-hemisphere dominance for language, while left-handers may display a leftward dominance' (cited in Toga et al. (2003, p.38). Likewise, Knecht et al., (2000, p.2512) states that 'language is lateralized to the left hemisphere of the brain, but can occasionally also be found in the right hemisphere'. In Ergenc' view (1994) the location of the language-related area in one person may be different from that of another person (cited in Keles and Cepni 2006). For Geschwind and Galaburda (1985) cited in Lust et al. (2010), 'one possible difference for being left-hand dominance is possibly due to differences in sex hormones level before birth' and 'the level of sex hormones during the prenatal development are different between boys and girls (Swaap et al., 1997) and 'this may affect handedness and brain development' (Halpern, 2000, cited in Szaflarski et al. (2012). In short, the linguistics books published in the early 1990s such as Fromkin and Rodman (1998) and Yule (1993) do not provide as much information as the recent researches cited above.

The average information about handedness for Geschwind (1970) and Hughdahl and Davidson (2002) is that approximately 95% of the right handers and 60/70% of left handers have a left lateralized dominance for language (cited in Kaiser at al., p.53). In other view 'approximately 97% of right-handers have their speech and language localized to the left hemisphere, while only 3% demonstrate a right-hemisphere lateralization or bilateral language representation. These relationships degrade to only 70/30 in left-handed individuals (Coren, 1992). Thus, some right-handed patients have a right-hemisphere dominance for language, while left-handers may display a leftward dominance (Desmond et al., 1995 cited in Toga and Thompson, 2003, p.38).

The analyses indicated that six relations emerged between the female students and skills. These are listening d) and e), reading d), speaking a), pronunciation c) and writing d) and two relations appeared between male students and skills; grammar c) and pronunciation d). Hence it could be argued that female students are

more talented to speak/learn a foreign language as stated by Kaiser et al. (2009, p.51). They (ibid) state that 'women are said to learn and speak new languages more easily than men' and having more female students in the language departments in Turkey can an evidence of this.

As a conclusion, although the language learning is usually regarded as main function of the left brain, it was seen in this study that left handed students' learning mother or another language, visualizing the listened text by the left handed students, visualizing the grammar rules as figure, table and image by most the right-handed males, the left handed females' listening to music while reading, visualizing the phonetic symbols by the left handed students tend to imply that the right brain has also relation with the langue learning. The tables 17 and 18 showed that both left and right handed learners' choice of the same option 9 times in learning the main and sub-skills can be an evidence of right brain that helps language learning.

New quantitative researches can be carried out by improving and applying a standard scale consisting of the features of the left and right hemisphere to measure the effects of the variables stated in this research. Similarly, some qualitative researches can be undertaken by asking face to face questions to the left and right handed participants about the main and sub-skills together with the variables. In this way, the possible relations between and main and sub-skills of the EFL with variables such as gender, study style and hand choice can be grounded on strong evidences. Whatever was done, the potential studies will lack of finding equal numbers of left and right handed participants in the same department as this study did.

## REFERENCES

- Adelman, G., Jenkins, D., and Kemmis, S. (1984).** Rethinking case study, in Bell, J. et al. (eds.) *Conducting Small-Scale Investigations in Educational Management*. London: P. C. P., 93-102.
- Avci, D. E. (2008).** Teaching strategies for using brain hemisphere dominance. *Gazi University Journal of Gazi Education Faculty*, 28(2): 1-17.
- Baysal, E. A. (2019).** The preparation, implementation and evaluation of language learning strategies curriculum. *Afyon Kocatepe Üniversitesi, Sosyal Bilimler Enstitüsü. Afyonkarahisar*.
- Borklu, T., and Dolu, N. (2010).** The hemispheric differences of auditory evoked potential in sportsmen. *Journal of Health Science*, 19(2): 108-118.
- Cook, V. (1993).** *Second Language Learning and Language Teaching*. (2<sup>nd</sup> edition), London: Edward Arnold.
- Crystal, D. (1997).** *The Cambridge Encyclopedia of the English Language*. (4<sup>th</sup> edition), Cambridge: Cambridge University Press.
- Cuhadar, C. H. (2008).** Music and brain. *Cukurova University, Journal of Social Science Institute*, 17(2): 67-76.
- Demirtekin, M. (2017).** *Hacettepe Üniversitesi, Türkiyat Araştırmaları Enstitüsü, Ankara*.
- Desmond J. E., Sum J. M., Wagner A. D., Demb J. B., Shear P. K., Glover G. H., Gabrieli, J. D., and Morrell, M. J. (1995).** Functional MRI measurement of language lateralization in Wada-tested patients. *Brain*, 118: 1411-9.
- Ellis, R. (1998).** *Second Language Acquisition*. (2<sup>nd</sup> edition), Oxford: Oxford University Press.
- Fromkin, V., and Rodman, R. (1998).** *An Introduction to Language*.

- (6th edition), Philadelphia, San Diego: Harcourt Brace Jovanovich Publishers.
- Gazzaniga, M. S. (1995).** Consciousness and the cerebral hemispheres. In M.S. Gazzaniga (Ed.). *The cognitive neurosciences*. (pp. 1391–1400). Cambridge MA: MIT Press.
- Gundogan, N. U. (2005).** El tercihi ve Dominant Göz, Tıp Bilimleri Dergisi, 25 (2), 1-2.
- Hugdahl, K. (2000).** Lateralization of cognitive processes in the brain. *Acta Psychologica*, 105(2–3): 211-235.
- Kaiser, A., Haller, S., Schmitz, S., and Nitsch, C. (2009).** On sex/gender related similarities and differences in fMRI language research, *Brain Research Review*, 61: 49-59.
- Kasimi, Y., and Ulum, O. G. (2017).** The relation between right and left hand usage and language learning strategies. ULEAD, Annual Congress, 649-656.
- Kaya, Z., and Akdemir, A. S. (2016).** Learning and teaching: Theories, approaches and models. Ankara: Çözüm Publishing.
- Keles, E., and Cepni, S. (2006).** Brain and learning. *Journal of Turkish Science Education*, 3(2): 66-82.
- Khosravizadeh, P., and Teimournezhad, S. (2011).** Handedness and lateralization of the brain. *Broad Research in Artificial Intelligence and Neuroscience*, 2(1): 11-16.
- Knecht, S., Dräger, B., Deppe, M., Bobe, L., Lohmann, H., Flöel, A., Ringelstein, E. B., Henningsen, H. (2000).** Handedness and hemispheric language dominance in healthy humans. *Brain*, 123: 2512-2518.
- Koç, H. K. (2017).** A suggested in-service teacher training program for ELT teachers on the use of language learning strategies for the 6th graders, Gazi Üniversitesi, Eğitim Bilimleri Enstitüsü, Ankara.
- Szafarski, J., Rajagopal, A., Altaye, M., Byars, A. W., Jacola, L., Schmithorst, V. J., Schapiro, M. B., Plante, E., and Holland, S. K. (2012).** Left-handedness and language lateralization in children. *Brain Research*, 1433: 85-97.
- Tarman, S. (2007).** Hand dominance and cerebral lateralization in musicians. *International Asia and North Africa Studies, Congress Paper*. Ankara, 693-710.
- Toga, A. W., and Thompson, P. M. (2003).** Mapping brain asymmetry. *Neuroscience*, 4: 37-48.
- Uzun, E., and Cagiltay, K. (2012).** A usability study of online handwriting recognition system graffiti. *Suleyman Demirel University, Journal of Technologic Faculty*, 4(1): 46-57.
- Uzun, N., and Alkan, N. (2002).** Hand dominance and its significance in forensic document examination. *New Symposium*, 40(1): 3-9.
- Yıldız, M., Açıkan, M., Berber, V., Bulut, S., and Zalimhan, R. (2015).** Ergonomic preferences of the primary students during writing: pencil grasp, hand preference, sitting and paper position. *The Journal of Academic Social Science Studies*, 40: 61-71.
- Yule, G. (1993).** *The Study of Language*. Cambridge: Cambridge University Press.

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## Appendix A

### Questionnaire

Dear Participant,  
 Learning can take place in different ways. For example, one can learn by writing, the other can learn by listening, etc. In short, one's learning style can be different from others. This questionnaire was prepared to investigate how you learn/study the language skills. Please read the each option of the skill carefully and put a tick [ ] in the box that is very convenient for you. Please fill in the questionnaire sincerely. Thank you very much for your participation. E. T.

#### A-Demographic Questions

- 1- Sex/Gender : Male [ ] Female [ ]  
 2- Which hand you use in writing? : Left [ ] Right [ ]  
 3- How do you study lesson? : Alone [ ] In group [ ]

#### B- Questions about Four Main Skills (Listening, Speaking, Reading, and Writing)

C- Put 0 for never used ones, 1 for often used ones, 2 for sometimes used ones and 3 for rarely used ones.

##### 1-Listening: How do you study/learn listening skill?

- a [ ] I read/speak the listened text aloud. d [ ] I read the listened text aloud while listening.  
 b [ ] I write the words of the listened text. e [ ] I learn the words and grammar of the listened text.  
 c [ ] I visualize/concretize the listened text. f [ ] Other... [not calculated because of less choice].

##### 2-Speaking: How do you study/learn speaking skill?

- a [ ] I practice/talk to someone. d [ ] I read the written form of the speech/text aloud first.  
 b [ ] I write the words of things I will say first. e [ ] I learn the words and grammar that I will use.  
 c [ ] I design speech as concrete, visual. f [ ] Other... [not calculated because of less choice].

##### 3-Reading: How do you study/learn reading skill?

- a [ ] I talk to someone about the text. d [ ] I listen to something (music) while reading.  
 b [ ] I write the text as abstract, the same, etc. e [ ] I learn the words and grammar of the text.  
 c [ ] I illustrate the text as picture, shape, etc. f [ ] Other... [not calculated because of less choice].

##### 4-Writing: How do you study/learn writing skill?

- a [ ] I think aloud about the topic first. d [ ] I read various resources on the subject.  
 b [ ] I write the same topic several times. e [ ] I learn the necessary words and grammar for the topic.  
 c [ ] I visualize it by drafting, brain storming). f [ ] Other... [not calculated because of less choice].

#### D-Questions about Sub-Skills (Vocabulary, Grammar, and Pronunciation).

E-Put 0 for never used ones, 1 for often used ones, 2 for sometimes used ones and 3 for rarely used ones.

##### 5-Writing: How do you study/learn writing skill?

- a [ ] I repeat and pronounce new words. d [ ] I try to learn the words from reading text.  
 b [ ] I write the words at least 3-5 times. e [ ] I listen to pronounced form of the words.  
 c [ ] I draw words as pictures, shapes, etc. f [ ] Other... [not calculated because of less choice].

##### 6-Grammar: How do you study/learn grammar skill?

- a [ ] I use the grammar rule in my speeches. d [ ] I try to see the rule in reading texts.  
 b [ ] I write the grammar rule several times. e [ ] I listen to the rule from someone or on the internet.  
 c [ ] I concretize the rule as table, figure and visual. f [ ] Other... [not calculated because of less choice].

##### 7-Pronunciation: How do you study/learn pronunciation skill?

- a [ ] I repeat words and rules aloud. d [ ] I improve the pronunciation by reading texts aloud.  
 b [ ] I study by writing phonetics of words. e [ ] I listen to the pronunciation from someone/internet.  
 c [ ] I visualize the phonetic symbols of words. f [ ] Other... [not calculated because of less choice].

## Appendix B

## An overview of analysis table

Skills	Tables	Between Who	Relations Between Skill and Variables
Listening d	Table 2	Males	Listening and gender
Listening e	Table 3	Males	
Listening c	Table 5	Left handed students	Speaking and hand choice.
Listening d	Table 12	Right handed females	Listening, hand choice and gender.
Listening e	Table 13	Righ handed females	Listening, hand choice and gender.
Grammar a	Table 4	Males	Grammar and gender.
Grammar b	Table 8	Study in group	Reading and study style.
Grammar c	Table 15	Mostly right handed males	Grammar, hand choice and gender.
Reading d	Table 6	Right handed students	Speaking and hand choice.
Reading b	Table 10	Study in group	Reading and study style.
Reading d	Table 10	Left handed females	Reading, hand choice and gender.
Speaking a	Table 9	Left handed females	Speaking, hand choice and gender.
Pronunciation c	Table 11	Left handed females	Pronunciation, hand choice and gender.
Pronunciation d	Table 16	Left handed males	Grammar, hand choice and gender.
Writing d	Table 14	Right handed females	Writing, hand choice and gender.