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Türkçe ve İngilizce Tek Farklı Sesbirim Çiftini Anlamada Eş Zamanlı Dinleme Testi

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Özet

Bu durum çalışmasında, Türkçe'yi anadili, İngilizce'yi ise orta üstü ve ileri düzeyde yabancı dili olarak kullanan ve sağ elle yazı yazan 34 sağlıklı deneğin, *eş zamanlı dinleme tekniği* yardımıyla duydukları 20 Türkçe ve 20 İngilizce *tek farklı sesbirim çiftini* anlarken beyin yarıküre katkılarının ortaya çıkartılması amaçlanmaktadır. *Tek farklı sesbirim çiftleri* deneklere stereo kulaklıklar yardımıyla verilmiş ve yarıkürelere göre toplanan sonuçlar yüzde olarak gösterilen tablolara dönüştürülmüştür. Elde edilen yüzde değerlerine göre, Türkçe *tek farklı sesbirim çiftlerinin* algılaması sırasında sol yarıkürenin sağ yarıküreye göre daha baskın olduğu, öte yandan İngilizce *tek farklı sesbirim çiftlerini* anlama sürecinde ise sağ yarıkürenin katkısının az oranda yükseldiği görülmüştür. Sonuç olarak İngilizce anlama sırasında sağ yarıkürenin katkısının arttığı diğer taraftan sol yarıkürenin baskınlığının azaldığı ileri sürülebilir.

Anahtar Sözcükler: eşzamanlı dinleme, tek farklı sesbirim çifti, kontra yanal işitsel uyarıcı, yarıküresel baskınlık

Abstract

This case study aims at scrutinizing the different cerebral hemispheric contributions by using a dichotic listening technique during the comprehension of 20 Turkish and 20 English minimal pairs, which is applied on right handed 34 healthy subjects who are native speakers of Turkish and are upper Intermediate – advanced level speakers of English as a foreign language. The minimal pairs were presented through stereo headphones and the results collected in accordance with the hemispheres were transferred into pie charts showing percentages. The percentages reveal that when comprehending Turkish minimal pairs, the dominance of the left hemisphere is higher than the right one; on the other hand, when comprehending English minimal pairs, the percentage of the right hemisphere contribution slightly increases. As a result, it can be noted that in comprehending English the right hemispheric contribution increases while the dominance of the left hemisphere becomes less.

Key Words: dichotic listening, minimal pair, contralateral auditory stimuli, hemispheric dominance

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1- Introduction

Needless to say, our brain is such a complex organ of the nervous system that it makes us feel as human beings in the world when compared to other living creatures. The most outstanding anatomical part of the brain is the cerebral cortex comprising two hemispheres as left and right, where complicated intellectual functions like speaking, thinking, planning, problem solving, and etc. are generated and controlled. The relevant anatomical picture of the cerebral cortex is seen in figure 1.1

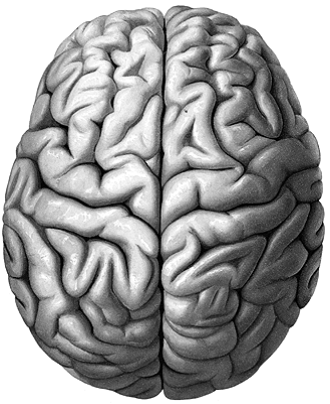


Figure 1.1 Cerebral cortex seen from above (Taylor 1998)

Essentially, the two symmetrical hemispheres of the brain not only gain sensory data from reverse sides but also take part in controlling the movements and functions of our body conversely. Besides, two cerebral hemispheres are connected to each other by corpus callosum which are like cables of neurons called commissures (Carlson, 1998:4). In addition, in accordance with the special localization of certain functions, the cerebral cortex can be subcategorized into four parts (lobes) which are listed as frontal, parietal, temporal and occipital as seen in figure 1.2. Especially in human beings, frontal, parietal, and temporal lobes reveal biophysiological development when compared to the ancient hominids as well as the living primates (Güleç and Güleç , 1985:358). It should be kept in mind that although there are hemispheric subdivisions related to certain functions, and other subparts of the midbrain and hindbrain, all of the segments work in a harmonious way to bring forth highly complicated actions of the nervous system.

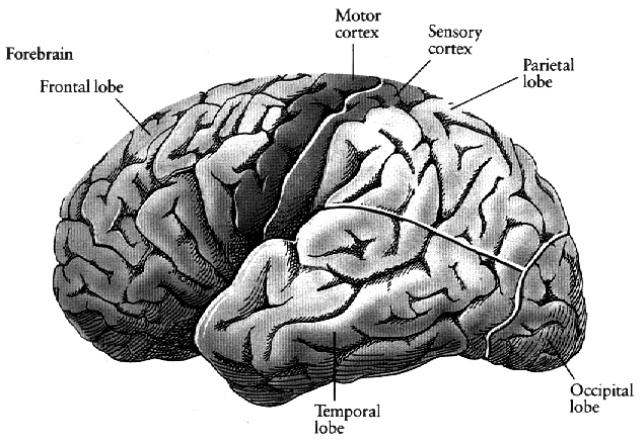


Figure 1.2 Lobes of the Cerebral Hemispheres
(Bloom and Lazerson, 1988:23)

When the localization of language centers in the brain is taken into account, it can be said that the left hemisphere is responsible for language related functions. As is seen in figure 1.3, there are two important areas called Wernicke and Broca. Production of the speech sounds is realized in Broca's area and comprehension is put into practice in Wernicke's area. Broca and Wernicke areas are connected by a collection of nerve fibers which are also called arcuate fasciculus.

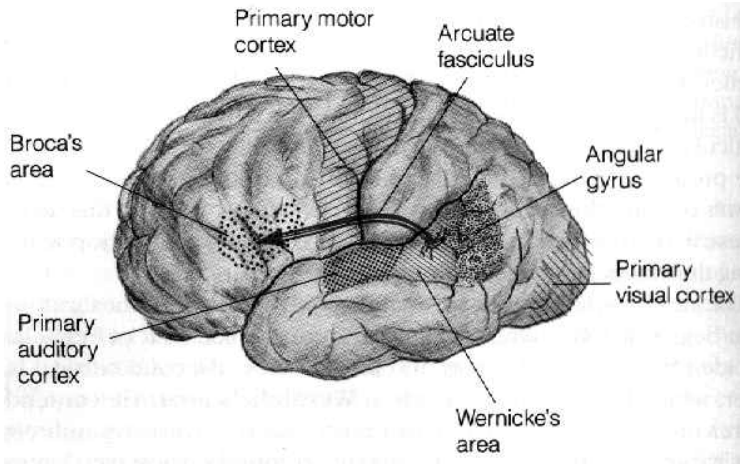


Figure 1.3 Broca's and Wernicke's areas and arcuate fasciculus on the left hemisphere (Pinel, 1993:556)

Dichotic listening test can be regarded as one of the classical and noninvasive tools of neuropsychological testing methods which are put into practice to examine general intelligence, hemispheric language lateralization, memory, and perceptual-motor function. As a matter of fact there are different versions of the dichotic listening test which was developed by Doreen Kimura who worked as a neurologist at *Montreal Neurological institute* in 1961. In terms of neurolinguistic processing, dichotic listening is mostly based on speech comprehension in which auditory signals coming from the ears arrive in the auditory cortex by the help of which are sent to the Wernicke's area where interpretation process is completed as is presented in figure 1.3. In a standard dichotic listening test, subjects mainly hear three spoken digits sequentially presented to left ear and three different digits to the right one simultaneously via stereo headphones. After the listening process the subjects are asked to report as many digits as possible. Originally, Kimura performed her studies of dichotic listening on patients with temporal lobe lesions, but interestingly, she found that the patients repeated more digits which was presented to right ear when compared to the left. In the same context, it was found that the subjects in the control group revealed the same outcome, in other words, the stimuli presented to right ear is comprehended and recalled more accurately due to the length of cerebral route. It was pointed out that the advantageous ear was the right one which is contralateral to the dominant left hemisphere. In other words, although both hemispheres gain signals from both ears, the left hemisphere is superior in terms of processing contralateral stimuli. Until now, very many different versions of the dichotic listening tests in which the methods of digits, words, nonsense syllables, formant transitions, backward speech, tone used in linguistic decisions, tonal sequences with frequency transitions, ordering temporal information, movement-related tonal signals, and etc. have been carried out. It should be kept in mind that right handed subjects present right ear advantage only when recognizing language based stimuli given to the contralateral ear (Fromkin and Rodman, 1988:349 – 410), (Janke and Shah, 2002:736), (Kolb and Whishaw 1990:363), (Pinel, 1993:148-149). The contralateral auditory pathways are presented in figure 1.4.

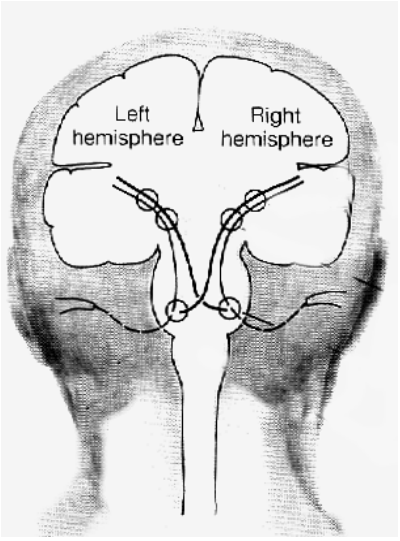


Figure 1.4 Contralateral pathways – posterior view (Kolb and Whishaw 1990:362)

2- Material and Method

In this study, 34 right handed healthy subjects (17 male and 17 female) who are native speakers of Turkish and are upper intermediate – advanced level speakers of English as a foreign language, and who are the 3rd and 4th year students of the Department of Linguistics at Hacettepe University were given a dichotic listening test. The study aims at unearthing possible contributions of left and right hemispheres during the comprehension of two sets of minimal pairs both in Turkish and English. It should be kept in mind that all the subjects in this study use Turkish as an acquired language since their birth, and use English as a learned foreign language. The average age of the subjects was 21.4, ranging from 20 – 24.

By taking previous versions of dichotic listening tests as a basis, a new version was produced. In its basic concept, the subjects who participated in this experiment listened to 20 sets of minimal pairs first in Turkish and then in English via stereophonic earphones. It should be pointed out that the verbal stimuli presented to both ears comprise linguistically meaningful sound units which are easy to grasp and comprehend so that the subjects would not experience difficulty during comprehension.

Minimal pairs can be defined as pairs of words that are phonetically similar except for one unit of sound or phoneme which can lead to a change in meaning (Macmanis, et. al. 1987:94). For instance, in English *pat* and *bat* constitute a minimal pair in which /p/ and /b/ are regarded as different phonemes the usage of which result in two different meanings. The related minimal pairs which were put into practice in this test can be listed as follows: Turkish minimal pairs, bal – dal, kel – kal, bas – tas, masa – tasa, davul – bavul, mor – zor, oda – oba, renk – denk, sopa – soba, şekil – tekil, tepsi – hepsi, unut – umut, tavuk – kavuk, torba – çorba, sal – sel, masa – maşa, şal – şan, bölge – gölge, etek – elek, hap – kap, English minimal pairs, pot – put, lock – look, bull – pull, fire – higher, boy – toy, top – tap, ear – air, gold – cold, glass – class, bag – back, fine – pine, watch – wash, fat – hat, vote – boat, thanks – tanks, light – right, mine – nine, hut – cut, feet – heat, rain – pain.

The sound tracks of the related minimal pairs which were put into practice in this experiment were prepared by the help of a computer sound software (Sound Forge, 1999) which is operated for an IBM compatible computer. First of all, 40 Turkish and 40 English minimal pair sounds were recorded at 44.100 kHz on the computer in sound waves and then were synchronized into such an order that the two minimal pairs of the same language could be heard in different lines in Left or Right earphones at the same time. Therefore, for each language, twenty synchronized sets of minimal pairs were generated. After the synchronization process, before each minimal pair sound wave, a beep sound was added in order that the subject would be stimulated. Besides, a 5 second long silence was inserted after each sound wave to enable subjects to write down one of the comprehended minimal pairs. A sample of the processed sound waves of minimal pairs from the computer screen of the applied software are represented in figure 2.1.

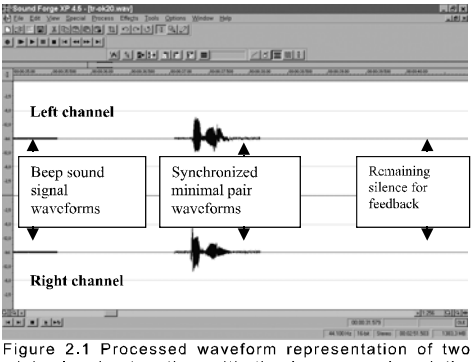


Figure 2.1 Processed waveform representation of two minimal pairs together with the beep sound and the remaining silence in Left and Right channels as seen on a computer screen.

In the first phase of application, the subjects were presented a picture of a house and a sun comprising basic shapes in the universe like rectangle, square, triangle, and circle. After filling in the spaces for their student number, age, and putting a tick into the boxes of sex and their dominant hand when writing, students were asked to draw a similar picture by using their right hand in the relevant box, below the given model. Then, by using the same model again subjects were required to draw a similar picture by using their left hands. In the light of the subject drawn pictures of the model, the results revealed that all the right handed subjects performed better in drawing pictures by using their right hands when compared to their left hands. A sample drawing of a subject is shown in figure 2.2.

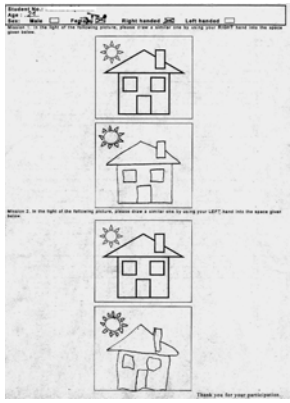
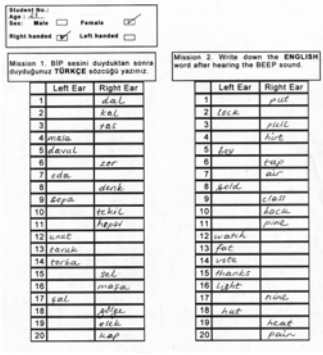


Figure 2.2 A sample drawing of a subject

After completing the drawing phase, the subjects were asked to wear stereophonic headphones by the help of which the sound tracks of the processed minimal pairs were sent to both ears. Subjects were asked to write down one of the minimal pairs heard on the reverse page of the drawings which is shown in figure 2.3.



Mission 1. BIP sesini duyduktan sonra duyduğunuz **TÜRKÇE** sözcüğü yazınız.

	Left Ear	Right Ear
1		dal
2		kal
3		ras
4	mala	
5	davul	
6		zor
7	eda	
8		dersk
9	kapa	
10		tekst
11		kapar
12	unut	
13	taruk	
14	torba	
15		sol
16		maşa
17	sal	
18		gülşe
19		elek
20		kap

Mission 2. Write down the **ENGLISH** word after hearing the BEEP sound.

	Left Ear	Right Ear
1		pull
2	tock	
3		pull
4		hut
5	bar	
6		cup
7		air
8	gold	
9		cloth
10		lock
11		pine
12	watch	
13	fat	
14	vote	
15	thanks	
16	light	
17		nine
18	hut	
19		heat
20		pair

Figure 2.3 A sample dichotic feedback of a subject

3- Results and Discussion

The findings in the light of the written minimal pairs on feedback papers were grouped and counted as the ones received from the left ear and the right and then the numbers found were transformed into pie charts reflecting the mean percentages of the stimulus captured by the left ear and right hemisphere, and by the right ear and left hemisphere of the cerebral cortex. As can be seen in figure 3.1, subjects used 62 % of their left hemispheres, which was the expected result in comprehending Turkish minimal pairs.

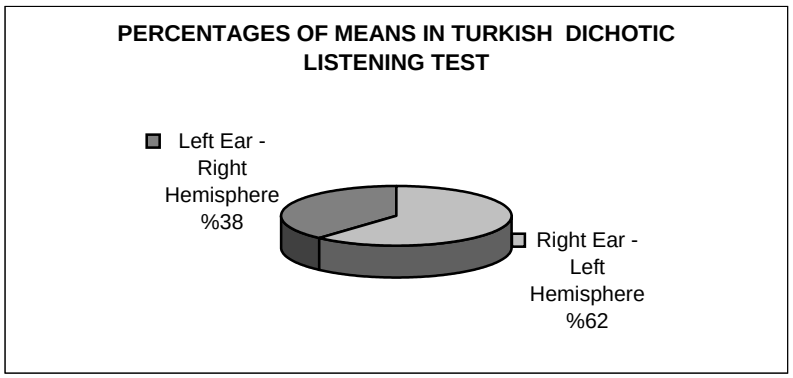


Figure 3.1 Percentages of means in Turkish dichotic listening test on minimal pair recognition

When compared to the left hemisphere, the contribution of the right hemisphere was found to be lower than the left. That is, the contribution of the right hemisphere was 38 % when comprehending stimuli given through the ears. In accordance with these results, it can be noted that the dominance of the left hemisphere in comprehending minimal pairs in Turkish seems to be reasonable and expectable due to the fact that the language centers in the brain are mostly located on the left hemisphere for the right handed people who are the speakers of a native tongue. The auditory signal sent via the right ear reaches to the auditory cortex and the related Wernicke's area on the left hemisphere more quickly due to the shorter contralateral pathway passing through corpus callosum. On the other hand, the auditory signal received by the left ear reaches the right hemisphere first and then is transferred to the left for comprehension. Therefore, the distance of signal transmission naturally bocomes longer for auditory signal processing.

It appears to be interesting to note that while comprehending English minimal pairs as is demonstrated in figure 3.2, the dominance of the left hemisphere decreased to 53 %, in other words, it lessened its contribution by 9 % than the

amount presented for the comprehension process in Turkish. The other interesting finding for English dichotic listening test was that subjects used 47 % of their right hemispheres, which also revealed a 9 % increase in the neurolinguistic processing in comprehension.

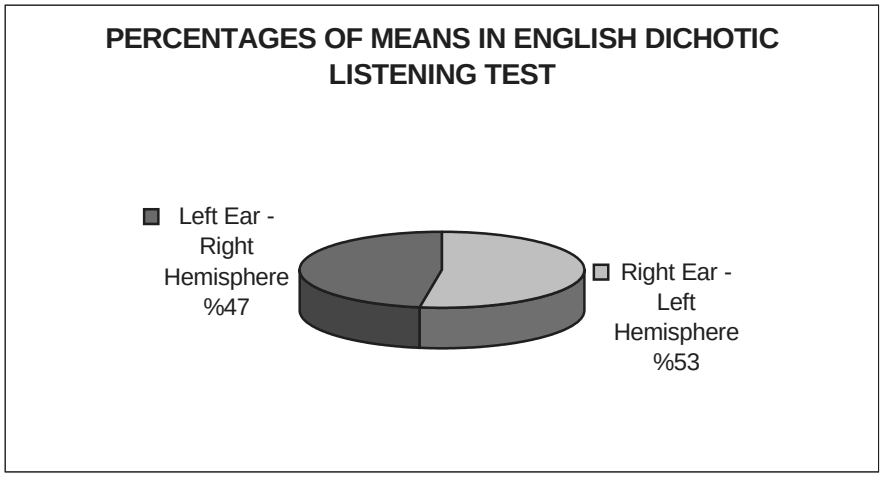


Figure 3.2 Percentages of means in English dichotic listening test on minimal pair recognition

It can be stated that although the left hemisphere retained a dominant state in both tests, the contribution of the right hemisphere in the process of comprehending minimal pairs presented in English as a foreign language increased by 9 %. In other words, the right hemisphere which is not responsible for language processes played a noteworthy role in comprehending the foreign language stimuli which followed contralateral pathways in the cerebral cortex. In the light of the neurolinguistic studies which have been carried out over the years in the world, it is a very well known fact that left hemisphere of the cerebral cortex is responsible for comprising two areas of language like Broca's area for production and Wernicke's area for comprehension of speech for the right handed people principally. However, in this case, the percentage of the minimal pair comprehension in English in the right hemisphere increased. In the light of all the aforementioned points, it can be proposed that the right hemisphere has a greater role in language processing for English as a foreign language when compared to the same processes for Turkish as a native tongue. It is also notable to mention that the increased percentage of the right hemisphere seems to be effective in the process of learned behavior of the foreign language, English. Although dichotic listening test appears not to be a complex technique when compared to other highly complicated and contemporary medical brain scanning methods like PET (positron emission

tomography), it can be extracted that the right hemisphere has a complementary role in comprehending the auditory stimulus given in the learned foreign language.

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