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EFL Learners' Selective Listening Ability: Cocktail Party Effect

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ABSTRACT

This study investigated a group of EFL learners' selective listening ability. The cocktail party effect is the ability to focus on a particular auditory stimulus while filtering out other interfering stimuli. The premise is that selective attention is a capability that humans possess and utilize in their first language, which they may also be able to take advantage of in their second language. Thirty-six Iranian female EFL learners participated in the study. A listening comprehension test, developed to examine the selective listening ability, was administered to the participants. Their overall test performance revealed that they could successfully make use of their selective listening ability in their second language, English. However, statistical analysis showed that their performance significantly varied across the six subsets of the test; each of which was to examine a different aspect of cocktail party effect.

Keywords: Selective listening, cocktail party effect, EFL students, listening comprehension.

INTRODUCTION

The cocktail party effect refers to the listeners' ability to voluntarily pay attention to one channel of discourse and selectively ignore the rest in an environment with a plethora of competing speech signals (Clark & Clark, 1977; Stifelman, 1994). This is the ability that humans inherently possess and utilise so that people may attend to a particular message in a noisy environment like a family get-together when they wish to follow an interesting conversation among the cacophony of others. According to Clark and Clark (1977), this phenomenon poses a serious challenge to the theories of speech perception and implies that perception of continuous speech is a more complex process than the mere parsing and synthesizing of individual sound

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segments. Indeed, the listener cannot help receiving all the acoustic signals prevalent in the environment. However, it is the processing capability of the brain that may attend to a particular stream of signals and reject the other competing ones.

Selective listening requires the segregation and analysis of auditory input comprising multiple channels of speech and non-speech signals. The segregated signals need to be attributed to their correct sources in order to be made intelligible (see Bregman, 1990; Bregman & Ahad, 1996; Bregman, 2004; Kapralos, Jenkin, & Milios, 2003). This process is called auditory scene analysis proposed by Bregman (1990), who suggests that raw acoustic inputs should be parsed to make meaningful representations of every auditory source. Research has shown that several factors including the frequency of sound signals, spatial separation, pitch differences and degree of synchrony affect the segregation of different sources of speech signals into separate auditory streams, which consequently enhance selective listening ability (e.g., Bee & Micheyl, 2008; Brokx & Nooteboom, 1982; Nityananda & Bee, 2011; Stifelman, 1994; Webster & Thompson, 1954).

The idea of the cocktail party effect was raised in the 1950s, mostly due to the difficulties that air traffic controllers experienced in attending to several pilots whose competing voices were delivered via the same loudspeaker to them (Arons, 1992). In 1953, Cherry conducted a series of studies to investigate the diverse aspects of human selective listening ability. Early research on selective listening focused on the listeners' ability in attending to a main channel of auditory input from among the multiple present messages and shadowing the intended message. The participants were instructed to follow a single body of auditory input and repeat the main message out loud (Cherry & Taylor, 1954; Treisman, 1964). Cherry and Taylor (1954) explored the variations in selective attention in terms of diotic or dichotic presentation of speech signals. In the dichotic test, the subjects listened to two unmixed speech signals delivered to the opposite ears. They had to shadow one and ignore the other. They were also asked to report as much of the rejected ear message as they remembered. They found that dichotic presentation of simultaneous messages makes attending to the rejected message more difficult.

Selective attention may be affected by the number of interfering channels (Webster & Solomon, 1955; Yost, 1994, as cited in Stifelman, 1994). Treisman (1964) studied the effect of the number of interfering speech signals on selective attention. He reported that when one interfering channel accompanied the main message, the participants' shadowing performance was not significantly affected. However, the presentation of two interfering speech signals negatively influenced the shadowing of the main message.

Treisman (1964, as cited in Clark, 1977, p. 218) presents a hierarchy of difficulties posed by the interfering messages which affect the shadowing of the main message. The hierarchy follows an ascending order, from the least to the most interfering:

1. A different voice to the opposite ear
2. The same voice to the opposite ear but in a different language
3. The same voice to the opposite ear but in a second language also known to the listener
4. The same voice to the same ear

Maccoby and Konrad (1996) examined the relationship between age and selective listening ability. They studied three groups of children; kindergarten children, 2nd and 4th graders. The children were exposed to the simultaneous delivery of two speech signals and asked to report one intended message and ignore the other. They found that older subjects performed significantly better in reporting the target message, which may be attributed to the high cognitive demands and the complexity of perceptual processing posed by selective listening tasks. Stifelman (1994) studied silent listening comprehension rather than shadowing to investigate the participants' selective listening ability. The participants listened to multiple simultaneous auditory messages and followed one main channel for comprehension while they were to identify some target words in the interfering messages. She reported that as the number of interfering messages increased, the participants' performance significantly decreased in terms of both listening comprehension of the main message and the identification of target words.

Interestingly, research has shown that not only humans but animals also enjoy selective attention capabilities (Wisniewski & Hulse, 1997). Nityananda and Bee (2011) investigated the cocktail party phenomenon in grey frogs. They reported that, like humans, grey frogs may use frequency separation of simultaneous vocalizations to distinguish different sources of signals. They concluded that "the ability of the frogs to segregate concurrent voices based on frequency separation may involve ancient hearing mechanisms for source segregation shared with humans and other vertebrates."

The voluminous literature on cocktail party effect has mostly centered on the selective attention in the first language. From the earliest studies in the 1950s so far, researchers have been concerned with the investigation of diverse aspects of selective attention and the underlying perceptual processes involved in selective listening ability in the first language. However, the present study purports to investigate the selective listening ability of EFL learners in their second language. The study specifically aims at examining whether second language learners can demonstrate a selective listening ability in the second language they are learning, i.e. English. Accordingly, the following research questions were posed:

1. Will the participants' listening comprehension be significantly affected if the main and interfering messages are presented by the same speaker?
2. Will the participants' listening comprehension be significantly affected if the main and interfering messages are presented by different speakers of the opposite sex?

3. Does white noise as the background interface significantly affect the participants' comprehension of the main foreground message?
4. Does music as the background interface significantly affect the participants' comprehension of the main foreground message?

Based on the above research questions, the following hypotheses were formulated:

1. The participants' listening comprehension will not be significantly affected if both the main and interfering messages are spoken by the same speaker.
2. The participants' listening comprehension will not be significantly affected if the main and interfering messages are spoken by two different speakers of the opposite sex.
3. The participants' listening comprehension will not be significantly affected if white noise is included as the background interface.
4. The participants' listening comprehension will not be significantly affected if music is included as the background interface.

MATERIALS AND METHODS

Participants

The participants of the study were 36 intermediate EFL learners who were studying English in Kimia language institute in Shiraz, Iran in the summer term. The participants' proficiency level was ascertained through the institute's standardized placement test. The subjects came from two intact classrooms taught by two female teachers. They ranged in age from 12 to 15 years old. The results of the proficiency test revealed that both classes were homogenous.

Design and Instrument

The research took on the design of a case study. To assess the EFL learners' selective listening ability, the researcher developed a listening test using the latest version of an audio processing and edit software, Wavosaur. In this regard, a number of listening tasks were selected first. The audio files were uploaded into the software to be adjusted for intensity and quality. Then another file, which was intended as the interfering message, was overlaid and the output file was saved to be used in the listening test. The test comprised 6 subsets labeled part 1-6 on the test sheet. Every subset involved an audio file to which the students listened first and a set of corresponding 6 multiple-choice comprehension items on the test paper which they answered based on their comprehension of the main message. The subsets were designed to address different research questions. All the audio texts were spoken by the same male and female speakers. The average speech delivery rate on all the listening items was 144 Words per Minute (WPM). All audio files were recorded at a sampling rate of 44100 HZ, 16 Bit, stereo. All foreground (main) messages

were spoken at an intensity of 250 dB. Overall, the students answered 36 items on the test sheet, 6 for each listening item. The 6 subsets were designed as follows:

Part 1. The audio file consisted of 64 seconds listening text. The foreground message, to which the participants were to attend, was spoken by a male voice. This particular intensity was used since it was proved convenient through trial and error. Besides, the audio files were played to a few pilot subjects to judge the suitability and quality of the sound. Moreover, the loudness and volume of the audio was adjusted during the test to be convenient for the participants. The interfering message, spoken by the same voice, began 10 seconds after the main message was started in order to allow the participants to identify the main channel to follow. The background voice was set at an intensity of 50 dB. Like other subsets, both messages ended simultaneously.

Part 2. The audio file consisted of a 72 second listening text. The foreground message was spoken by the male voice. The background, irrelevant message, spoken by the female voice at an intensity of 50 dB, began 10 seconds after the main message.

Part 3. The audio file consisted of a 64 second listening text. The foreground message was spoken by the female voice. The background message, spoken by the same female voice, was set at an intensity of 50 dB. The background message began 10 seconds after the main message but ended synchronous to it.

Part 4. The audio file comprised a 67 second listening text. The foreground message was spoken by the female voice. The background message, beginning with a 10-second delay, was spoken by the male voice at an intensity of 50 dB.

Part 5. The audio file was a 64 second listening text. The foreground message was spoken by the male voice. As to the background audio channel, white noise at an intensity of 250 dB was used. White noise was used as the background channel since the researcher aimed to use different auditory qualities as the background channel and examine the participants' performance at the presence of different auditory conditions. The interfering white noise began 10 seconds after the main message but ended synchronously.

Part 6. The audio file consisted of a 79 second listening text. The foreground message was spoken by the female voice. The background channel was a song accompanied by orchestral music at an intensity of 50 dB. The song was sung by a male voice in Italian, a language unknown to the participants. The music began 10 seconds after the main message but ended simultaneously.

Procedure

Before the administration of the test, the researcher took time and explained the major objectives of the study to the participants. The participants were provided with non-technical definitions of selective listening ability and cocktail party effect. Then they were given sample listening practices similar to the listening items on the test both to get familiar with the acoustic qualities of the male and female voices and to practice following the main channel message. Afterwards, the participants were given the test and asked to put on their headphones. The listening items were delivered binaurally over stereo Somic® headphones DT-2117. Having listened to every item, the students were given time to answer the 6 corresponding test items on the test sheet based on their comprehension of the main message. The same procedure was followed for all the 6 subsets until the students completed the test in 15 minutes. The reliability of the test was estimated via split-half method using Spearman r formula, which, after the correction of the coefficient for the whole test, yielded an index of r=0.60. As to the scoring procedure, every correct response was allocated 1 point, and every incorrect answer received zero.

RESULTS

The present study was conducted to specifically answer the question whether EFL learners can demonstrate selective listening ability in their second language, English. The idea was then translated into four research questions as delineated above.

The students' overall test performance resulted in a mean score of 21.75 out of 36 total and the standard deviation of 3.67. All the scores fell within one SD above or below the mean. Kolmogorov-Smirnov test was run to examine the normality of the data, which showed that the data were normally distributed. The participants' mean scores on the test was thus above 50% of the test scores.

Concerning the participants' performance on the 6 subsets of the test, both descriptive and inferential statistics were used to describe the characteristics of the raw data and to examine the statistical significance of the differences of the means. Table 1 illustrates the mean scores and standard deviations of the students' performance on each subset.

As shown in Table 1, students' performance on two pairs of subsets, namely, subsets 1 and 3 and subsets 2 and 4, yielded the same mean scores of 3.83 and 2.91, respectively. In subsets 1 and 3 (M=3.83), both the main and interfering messages were spoken by the same speaker, either male or female. In subsets 2 and 4 (M=2.91), the main and interfering messages were spoken by different speakers of the opposite sex, either male or female. Students performance yielded the greatest mean score in subset 5 (M=4.75) where white noise was used as the background interface. The students' mean score in subset 6 (M=3.5) was very close to the means in subsets 1 and 3.

In order to test the research hypotheses and examine the statistical significance of the differences of means, multivariate t test

Table 1
The mean and standard deviation of the students' scores on each subset

Subsets	Part 1	Part 2	Part 3	Part 4	Part 5	Part 6
Mean	3.83	2.91	3.83	2.91	4.75	3.5
SD	1.11	0.66	0.71	1.95	1.13	1.16

Table 2
Multivariate one-sample T^2 test results for subsets 1, 2 and 5

2-tailed t-Test								
Variable	Ho. Mean	Act. Mean	SE Mean	T^2	DF for T^2	F	DF for F	P for F
3	3.000	3.909	0.343	26.849	3, 10	7.160	3, 8	0.012
3	3.000	2.909	0.211					
6	3.000	4.636	0.338					

Table 3
Multivariate one-sample T^2 test results for subsets 1, 2 and 6

2-tailed t-Test								
Variable	Ho. Mean	Act. Mean	SE Mean	T^2	DF for T^2	F	DF for F	P for F
2	3.000	3.636	0.338	10.560	3, 10	2.816	3, 8	0.107
3	3.000	3.909	0.343					
3	3.000	2.909	0.211					

(Hotellings T-square statistic) was used. All calculations were run using StatistiXL software package. Table 2 illustrates the T^2 value for the mean difference among the subsets 1, 2 and 5.

As shown in Table 2, the p value of 0.012 is much smaller than 0.05. This indicates that the differences between the means are statistically significant. In other words, the students have performed significantly better on the subsets 1 and 5. Accordingly, the first, second and third null hypotheses are rejected. Table 3 shows the T^2 value for the mean difference among subsets 1, 2 and 6.

As shown in Table 3, the p value (0.107) is bigger than 0.05. This indicates that the difference between the means is not statistically significant. Accordingly, the fourth null hypothesis is accepted. That is, the participants' listening comprehension was not significantly affected when music was added as the background interface.

DISCUSSION AND CONCLUSION

Literature on cocktail party phenomenon almost lacks empirical evidence on EFL learners' selective listening ability. The present study aimed at investigating the EFL learners' selective listening ability and their comprehension of a foreground message at the interface of different background auditory inputs.

The results regarding the participants' overall test performance indicated that intermediate EFL learners had an above average selective listening ability in their second language (i.e. their mean score was larger than 50% of the total test score). However, their performance on the subsets of the test varied significantly with regard to variations in the background channel interface. The students had their lowest performance on the subsets 2 and 4 where the foreground and background messages were presented by two different speakers of the opposite sex. This is inconsistent with the findings of Treisman (1964) who reported that the gender differences in voice may enhance selective attention in the first language. In addition, according to Stifelman (1994), pitch difference between the interfering messages is one of the factors that boost selective attention. On the other hand, despite the previous reports in the literature, the present findings showed that the participants' comprehension of the foreground message significantly improved when either message was presented by the same voice, either male or female. In this regard, Multivariate t test (Hotellings T-square statistic) showed that the students' performance significantly improved on the subsets 1 and 3 where both the foreground and background messages were presented by the same male and the same female voices, respectively. In these subsets, the acoustic qualities of the foreground and background voices were similar except for the sound intensity.

The participants had their best performance on the subset 5 where white noise was added as the background interface. Multivariate t test showed that this difference is statistically significant. This may be attributed to the processing capabilities of the brain in which non-linguistic stimuli are processed in the right hemisphere so that the competing noise presents the least interference to the language processing capacities (see Chastain, 1988; Yule, 1996).

With regard to the sixth subset, statistical analysis revealed no significant difference in the students' performance comparing with subsets 1 and 2. Though the background song in the 6th subset was in a language unknown to the participants, it still posed the same level of interference as the background message in the subset 1.

Overall, the study demonstrated that Iranian intermediate EFL learners' were able to listen selectively in English in a variety of listening environments. Still, the participants' performance on different subsets of the test varied significantly. Although the students had never experienced authentic contexts where a mob of English speakers might speak simultaneously, they could utilize their selective listening ability in following a main channel of discourse on the test. This may account for the fact that selective attention is an inherent human and even non-human ability (see Nityananda & Bee, 2001), which might be transferred into the language learners' second language.

There seems to be a universe of vacancies to be filled by further research to investigate the various aspects of cocktail party effect in EFL learners. Further research

could also be called upon to compensate for the limitations of the present study. As to the limitations, the present study did not control for the variables of age, gender and affective factors. Moreover, the study did not control for the semantic value though research has shown that meaning can affect listening comprehension (Bloomfield, Wayland, Rhoades, Blodgett, Linck, & Ross, 2010). Research has shown that there is a significant correlation between age and selective attention in the first language (Maccoby & Konrad, 1996). All participants of the present study were female students at the intermediate level of proficiency. However, recent research suggests that gender factor must be taken into account in cocktail party studies. For example, Zundorf, Karnath, and Lewald (2011), in their study on gender differences in sound source localization, reported that male participants outperformed females in localization of specific sound sources from among multiple sound signals. Future studies may include participants of either sex across all levels of language proficiency while, at the same time, controlling for affective factors and using qualitative sources of data as well.

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