In the Name of God

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Faculty of Persian Literature and Foreign Languages

English Department

Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Arts (MA) in English Language Teaching (ELT)

Entitled:

The Effect on Background Noise on Perception of English Consonants by Iranian EFL Learners

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We hereby recommend that the thesis by

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Entitled

The Effect on Background Noise on Perception of English Consonants by Iranian EFL Learners

Be Accepted in Partial Fulfillment of the Requirements of the Degree of Master of Arts (M.A.) in English Language Teaching (ELT)

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To my Family

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Abstract:

Understanding a foreign language outside standard classrooms and laboratories is often a demanding task. The aim of this quantitative study was to investigate the effect of different types of noise on perception of English consonants by Iranian Learners of English, and to find out whether this effect is different for elementary and advanced learners. Another aim was to answer the question that whether there is a relationship between response time and participants' identification performance. A total of 96 participants who were all students of the University of Tabriz took part in the present study in two groups of advanced and elementary. They identified 24 English consonants in vowel-consonant-vowel position in quiet and in the presence of 8-talker babble and speech-shaped noise. Noise affected all participants' performance significantly. Advanced group outperformed elementary listeners in all conditions. However, both groups' performance in noise followed the same pattern; that is, they produced higher scores for 8-talker babble than Speech-shaped noise condition. It was also observed that there was a significant relationship between participants' response time and their consonant identification performance. The results of the study should be taken into consideration when designing classrooms and laboratories for foreign language learners who learn English through classes only.

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List of Abbreviations

L1: First Language

L2: Second Language

N: Native

VCV: vowel-consonant-vowel

NN: Nonnative

RQ: Research Question

RT: Response Time

AOA: Age of Arrival

FL: Foreign Language

EFL: English as a Foreign Language

SSN: Speech-shaped Noise

MT: Motor Theory

DRT: Direct Realist Theory

PAM: Perceptual Assimilation Model

TC: Two-Category

CG: Category Goodness

SG: Single Category

SLM: Speech Learning Model

Pbt: Paper Based TOEFL

PCI: Percent Correct Identification

SPIN: Speech Perception in Noise

LPC: Linear Predictable Coding

Chapter One

Introduction

1.1. Introduction

Understanding speech in a foreign language is often a demanding task. This difficulty can persist even for advanced second language (L2) speakers. Many studies have reported that, in identical conditions, native (N) speakers outperform non-native (NN) speakers in speech identification tasks (e.g. Bradlow & Pisoni, 1999). This can be even more demanding when facing a foreign language in everyday communication and outside standard classrooms and laboratories where the communication takes place in less than optimal acoustic settings. Inside classrooms and laboratories, NN learners experience foreign language in a quiet and optimal situation without any distraction. This is totally different from the situation where the raw acoustic signals reaching their ears lack the clarity of the speakers in the quiet language laboratories. That is why, when entering the real NN situation, they have to face with the dual challenges of imperfect knowledge and imperfect signal. For example, understanding speech over telephone is harder than it seems, or it is hard to follow conversations in public places like restaurants. It is notable that this perceptual disadvantage in noise continues even for high proficiency and early bilingual speakers (Mayo, Florentine, & Buus, 1997; Tabri, Abu Chacra, & Pring, 2010).

Different types of identification tasks have been used in speech perception studies. Participants may identify sentences (Mayo et al., 1997), words (Rogers, Lister, Febo, & Besing, 2006), or phonemes (Cutler, Weber, Smits, & Cooper, 2004; Hazan & Simpson, 1998). Use of phonemes in identification tasks makes it possible to consider the influence

of acoustic-phonetic factors on N or NN listeners without the interference of linguistic-contextual information.

Adverse conditions experienced in everyday speech understanding can be a result of added energy from other sources, reverberation, or channel distortion. Additive noise has been used in many studies as maskers to simulate the adverse condition in which speech perception takes place (e.g. Brungart, Simpson, Ericson, & Scott, 2001; Cooke, Garcia Lecumberri, & Barker 2008). Studies have been shown that different types of maskers influence participants differently in speech perception tasks (e.g. Garcia Lecumberri & Cooke, 2006; Schimizu, Makishima, Yoshida, & Yamagishi, 2002). Background noise can be considered from two aspects. Certain types of noise provide purely *energetic masking* which is a form of masking caused by interaction of speech and masker at the level of periphery. In other words it refers to listening situations "where competing signals overlap in time and frequency in such a way that portions of one or more of the signals are rendered inaudible" (Brungart et al., 2001, p. 2528). White, and pink noise can be effective energetic maskers. Another aspect of background noise to be considered is *informational masking* which refers to listening situations where "portions of the masker could mistakenly be perceived as being part of the signal to be identified" (Van Dommelen & Hazan, 2010, p. 970). In other words target and masker signals are clearly audible but the listener cannot segregate the elements of target from the elements of masker (Brungart et al., 2001). Competing talker and multi-talker babble can be considered as effective informational maskers (van Dommelen & Hazan, 2010). It should

be noted that a noise type can have both the characteristics of energetic maskers and informational maskers.

1.2. Statements of the Problem and Purpose of the Study

Although it is apparent that noise affects speech perception negatively and this effect is much more obvious in NN listeners than N listeners, little is known about the details of the effect of background noise on speech perception among Iranian learners of English who speak Azerbaijani as their first language (L1). As far as it is known, no study has investigated the effect of different kinds of background noise in speech perception for Iranian learners of English.

On the other hand, unlike N groups, NN participant groups in speech perception studies have not been reasonably homogeneous and controlling variables such as L2 exposure, age of arrival (AOA), and competence have been problematic. Thus, comparisons across the groups tested in different studies of NN speech perception have been problematic. In general, proficiency classification of NN population for perceptual research has been carried out less directly and often estimated by self-assessment (e.g. Hazan & Simpson, 2000; Von Hapsburg, Champlin, & Shetty, 2004; Weiss & Dempsey, 2008), which has proved to be unreliable (Cooke, Garcia Lecumberri, Scharenborg, & Van Dommelen, 2010). There is not any systematic and direct comparison in literature

between English as a Foreign Language (EFL) learners' perception in noise at different proficiency levels.

Response time (RT) has been considered as an important factor in estimating participants' processing difficulty in psycholinguistic studies. Unfortunately, only few studies have measured participants' RT in speech perception studies (e.g. Cook et al., 2010).

The aim of this study was to investigate the effect of speech shaped noise (SSN) and multi talker babble on perception of English intervocalic consonants for Iranian EFL learners who speak Azerbaijani as their first language at elementary and advanced levels. Another aim was to find out whether there was a relationship between participants' RT and consonant identification performance at different proficiency levels.

1.3. Significance of the Study

In the time that the number multilingual speakers is increasing worldwide, it's of great significance to know about the details of NN perception. Knowing about the extent of difficulties that NN listeners face in adverse conditions is considerably important in developing theories and models of general speech perception. It also sheds light on the roles of acoustic, linguistic, and contextual factors in speech identification.

On the other hand, the context that NN speakers learn the language should be designed in a way that prepares learners to cope with the difficulty of identifying the

foreign language. So the finding should be taken into account when designing classroom and laboratories especially in EFL context where learners' exposure to English is through attending classes only.

1.4. Research Questions and Hypotheses of the Study

This study was conducted based on three research questions (RQ):

RQ1: Does background noise affect perception of English consonants by Iranian EFL listeners?

Null Hypothesis 1 (H01): Background noise does not affect the perception of English consonants by Iranian EFL learners.

Alternative Hypothesis 1 (H1): Background noise affects the perception of English consonants by Iranian EFL learners.

RQ2: Does proficiency level affect the perception of English consonants by Iranian EFL listeners?

Null Hypothesis 2 (H02): Proficiency level does not affect the perception of English consonants by Iranian EFL learners.

Alternative Hypothesis 2 (H2): Proficiency level affects the perception of English consonants by Iranian EFL learners.

RQ3: Is there a relationship between participants' RT and consonant identification performance?

Null Hypothesis 3 (H03): There is not a relationship between participants' RT and consonant identification performance.

Alternative Hypothesis 3 (H3): There is a relationship between participants' RT and consonant identification performance.

1.6. Definition of Key Terms

1.6.1. Background noise

Background noise is the sum of all noise or interference in a measurement which is independent of the data signal. Put it in simple terms, that is any kind of noise that is not the sound you intentionally listen to. Different kinds of background noise have been used in studies. In this study multi talker babble and speech-shaped noise have been used.

1.6.1.1. Babble

Babble noise is inarticulate or imperfect speech which is like incoherent murmuring. Babble noise can consist of several talkers. 8-talker babble was used in this study since it is considered as an effective informational masker (Simpson & Cook, 2005).

1.6.1.2. Speech-shaped noise (SSN)

SSN is a stationary noise which does not have any intelligible components. It is considered as a pure energetic masker.

1.6.2. Signal-to-noise ratio (SNR)

SSN is a term that refers to the measurement of the level of an audio signal as compared to the level of noise that is present in that signal. In other words, SNR is a direct comparison or ratio of the level of the signal to the amount of noise expressed in decibels (dB).

1.6.3. Speech perception

Speech perception is the way a listener can interpret the sound that a speaker produces as a sequence of discrete linguistic categories such as phonemes, syllables, or words. In A Dictionary of Linguistic and Phonetics (Crystal, 2003, p. 428), it is defined as “the process whereby a listener extracts a sequence of discrete phonetic and linguistic units from the continuous acoustic signal of speech”. It has been estimated that a person can encode up to 25 to 30 phonetic segments per second while listening to speech (Liberman, 1970).

Perceiving speech is a process which begins at the level of the sound signal and the process of audition. After processing the initial auditory signal, speech sounds are further processed to extract acoustic cues and phonetic information. This speech information can