

The Impact of Utilizing Computer Assisted Language Learning on EFL Learners' Foreign Accent Reduction

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Abstract

This study aimed at investigating the impact of utilizing CALL on EFL learners' foreign accent reduction. To this end, 62 participants out of 100 undergraduate freshman English students at Islamic Azad University Central Tehran Branch were selected based on a piloted sample PET and a text-to-read. The selected participants were then nonrandomly assigned to an experimental and a control group, each containing 31 participants. The control group followed teacher instruction on pronunciation (Focus on Pronunciation 2 book and its CD). However, the experimental group received pronunciation instruction through CALL including the use of accent reduction software (Pronunciation Power 2) both inside and outside the class and e-learning by means of conducting group chats via Skype, receiving feedback by email, and doing some online exercises to practice pronunciation. Reaching the end of the semester, both groups took a posttest through the speaking section of the PET and a text-to-read. The results of the study revealed that the experimental group significantly performed better on the posttest following the utilization of CALL applications.

Keywords: computer assisted language learning (CALL), self-paced learning, computer mediated communication (CMC), synchronous and asynchronous communication, electronic learning (e-learning), foreign accent reduction

Introduction

The technological development that the world has been facing during last decades has also influenced areas such as education. Along the same lines, the growing application of technology in foreign language learning has led to the establishment of a new discipline known under the name of Computer-

Assisted Language Learning (CALL). Interestingly, CALL systems have evolved together with the approaches to the teaching of foreign languages, in which the focus has shifted from teaching writing skills, grammar, and vocabulary to teaching oral skills and thus also pronunciation and prosody (Liu, Moore, Graham, & Lee, 2002). As a result of the latter development, teachers and researchers in the field have insisted on paying more attention to segmental and supra-segmental features of speech, the main argument being their importance for communication (Chun, 1998; Eskenazi & Hansma, 1998).

However, other motives for acquiring L2 pronunciation and prosody are mentioned by some scholars; for example, Cylwik et al. (2009) maintained, "Strong foreign accent may cause integration problems which makes it particularly important in the times of global migration and the policy of integration" (p. 124). They further stated that the growing interest in teaching and learning foreign language pronunciation and prosody has also been reflected in the development of computer-assisted pronunciation learning (CAPT) within which programs based on different technologies have been created.

According to Underwood (as cited in Bangs & Cantos, 2004), CALL provides a means for the individualized learner practice which is "one-on-one, self-paced, without need for supervision. Students can practice what they want, whenever they want, for as long as they want. These devices will do all the things the teacher has neither the time nor the inclination to do" (p. 222).

In his thorough overview of CALL settings, Hubbard (2009) categorizes speaking practice in such settings to two types, "pairs or groups of students speaking to one another as they sit in front of a computer engaged in a task, or individual students using the computer to record their voice, often in the context of pre-determined dialogs" (p. 6). Citing from Bernstein, Najmi, and Ehsani, Hubbard states that few limited spoken dialog systems are also allowed by automatic speech recognition (ASR). However, according to Hubbard, these applications are quite different from the ordinary face-to-face interactions. But he claims that interactions created through asynchronous means like using online audio discussion boards (e.g., Wimba) and podcasting are closer to the natural speaking practice. Not only audio and video connections through Skype and other VOIP (Voice Over Internet Protocol) applications provide easy and low-cost interactions, but also some studies (e.g., Abrams, 2003; Beauvois, 1997; Payne & Whitney, 2002) have demonstrated that even asynchronous text-based interactions can indirectly improve speaking proficiency.

In the area of pronunciation, as Hubbard (2009) states, there are three major types of applications. The simplest is mentioned to be the digital version of the tape recorder by means of which learners, after listening to a native speaker's model, record their own voices and compare it with the model. The second model is mentioned by Hubbard to be a combination of recording and speech visualization through which the learners not only listen to the model, but also view a graphic representation of it: "the complex waveform, the spectrogram showing bands of stronger and weaker resonance at different frequencies, or an extracted wavy line representing the pitch contour" (p. 7). Chun (2002) reports various studies (e.g., Bluhme & Burr, 1971; Bot & Mailfert, 1982; Leon & Martin, 1972; Vardanian, 1964, all cited in Chun, 2002, pp. 95-96), which have attempted for such visualizations and further maintains that:

Although several studies report positive effects of the use of visual displays of intonation among language learners (de Bot, 1983; Hengstenberg, 1980; Lane & Buiten, 1966), other studies found no such effects (Vardanian, 1964; Wichern & Boves, 1980), and none of these display systems came into widespread use. (p. 96)

The third application highlighted by Hubbard (2009) is using automatic speech recognition (ASR) which roughly assesses how close a learner's speech is to a norm for native speakers. Hubbard mentions that the feedback given when applying ASR is usually presented in the form of a meter or numerical score. However, he maintains that the method lacks judgmental accuracy at times as "native speakers may be tagged as non-natives for instance" (p. 7), plus the fact that feedback through this method faces certain limitations since it does not inform the learner where the problem lies and how it can be improved. He finally maintains that, "A few recent applications such as Carnegie Speech (www.carnegiespeech.com) have been able to pinpoint specific phonemes within a word or phrase that need work and offer targeted explanations and exercises for improvement" (p. 7).

Computer Mediated Communication

Computer mediated communication (CMC) is widely practiced and has become perhaps the most researched area in the field of CALL. According to Romiszowski and Mason (2004, p. 398) and Hubbard (2009), CMC is divided along two main dimensions: time – synchronous and asynchronous – and modality – text, audio, and video. Hubbard further adds that:

Synchronous or real-time CMC includes chat, instant messaging, and MOOs (multi-user domain object oriented) in the text mode and most commonly VOIP (Voice Over Internet Protocol) in the audio mode. Asynchronous CMC, where there is delay between sending and reading/responding, includes email, bulletin or discussion boards and voice boards in the audio mode. There are also a number of newer formats such as blogs allowing posted comments and SMS text messaging on mobile phones. (p. 10)

In terms of modality, thus far, the overwhelming majority of CMC studies have been dedicated to text; though according to Romiszowski and Mason (2004), with the recent popularity of online audio and video communication, this might show a shifting trend. In terms of time dimension, despite the strong interest in synchronous CMC, there is also a body of research on asynchronous CMC using email and discussion boards. Warschauer (1995) states that, "E-mail has been used for some time to allow teachers and students to communicate with one another" (p. 95). Ghasemi and Hashemi (2010) maintain that, "The use of CALL and CMC clearly shows the effectiveness of using e-mail...It offers authentic language drills and skill practice, a stimulus for highly motivated discussions and real interactions with native speakers all over the world" (p. 297). In terms of the increasing use of asynchronous CMC, Hubbard (2009) mentions that, "outside of class, the penpals of traditional language learning have been replaced by keypals and the possibilities for tandem language learning by pairs of classes have increased dramatically" (p. 11).

Along very different lines, an increasing number of studies look at settings in which asynchronous and synchronous CMC are mixed. For example, in her study, Belz (2001) made use of both synchronous chat by discussing, questioning, and answering as well as asynchronous chat through which the participants had again question and answer pairs in the form of email exchanges. Or the study by Thorne (2003, pp. 55-60) in which a number of Internet communication tools such as email (asynchronous), web-based threaded discussions, video conferencing (no sound was available rather typing at computer stations), and synchronous chat were utilized in a way that each fitted the communicative task the participants were supposed to accomplish. Thorne concludes that, "For both synchronous and asynchronous CMC, we are moving into an era where language students will already be familiar with a range of communicative options and will be more inclined to select the one that seems to fit the task best" (p. 55).

Electronic Learning

As Middleton (2010) posits, "The term electronic learning or e-learning has been around since at least the mid-1980s and has come to mean a variety of things" (p. 5). According to Shepherd (as cited in Middleton), it has at least three meanings; first, a means by which teaching is conducted through the internet and could also include the use of CDs and DVD-ROMs. The second is mentioned to be a way of reaching distant learners and is said to be more predominant in higher education. The third is mentioned to be virtual classroom which replaces the actual and physical classrooms. He adds that, "The growth in the use of e-learning has been phenomenal from the very first steps which involved lecturers putting their notes on a web page to the fully formed tutorials which make up learning resources such as 'doing political research' (p. 5).

According to Middleton (2010), "Accounts of e-learning tend to have two features. First, they are uncritical of the method, whatever that might be. Second, they are designed to convince an audience perceived to be skeptical (p. 7)". The starting point of the literature was based on what Booth (2007) called an "evaluation bypass" (p. 298), according to which the evaluation is more likely to be based on the popularity of the methods and techniques rather than their efficiency. It is due to what Middleton speculates: "Popularity is far easier to measure than effectiveness" (p. 7).

However, Lambeir, and Ramaekers (2006) in their criticism point to the fact that such virtual learning environments focus on 'the individual' and 'the personal' and alter learning into a process of managing information rather than discovery and state that, "E-learning environments go hand in hand with procedures of normalization and standardization that tend to turn education into an activity which predominantly consists of the delivery of information and ways of retrieving and referring to it" (p. 544). In their attempt to underscore the dialogic and critical models of learning as desirable for higher education, they further argue that, "The individualization of the learning process, which is put high in these contexts, promises to be rather minimalistic, since what is at center stage is an individual learning path, rather than the individual person themselves" (p. 544).

Foreign Accent Reduction

What constitutes a foreign accent? A foreign accent, as Felps, Bortfeld, Gutierrez-Osuna (2008) state, "can be defined as deviations from the

expected acoustic (e.g., formants) and prosodic (e.g., intonation, duration, and rate) norms of a language” (p. 922). According to the modulation theory of speech (Traunmüller, 1994, p. 5), a speaker’s utterance results from the modulation of a voice quality carrier with linguistic gestures. In this context, Traunmüller identifies the carrier as the organic aspects of a voice that reflect the morphological between-speaker variations in the dimensions of speech, such as those that are determined by physical factors (e.g., larynx size and vocal tract length). Thus, in analogy with the source/filter theory of speech production, “which decomposes a speech signal into excitation and vocal tract resonances, modulation theory suggests that one could deconvolve an utterance into its voice quality carrier and its linguistic gestures” (Fant, as cited in Felps, Bortfeld, & Gutierrez-Osuna, 2008, p. 922). Therefore, according to this view, “a foreign accent may be removed from an utterance by extracting its voice quality carrier and convolving it with the linguistic gestures of a native-accented counterpart” (p. 922).

In contrast with voice conversion, which seeks to transform utterances from a speaker so that they sound as if another speaker had produced them (Abe, Nakamura, Shikano, & Kuwabara, 1988; Arslan & Talkin, 1997; Childers, Wu, Hicks, Yegnanarayana, 1989; Kain & Macon, 1998; Sundermann, Ney, Hoge, 2003; Turk & Arslan, 2006), accent conversion seeks to transform only those features of an utterance that contribute to accent while maintaining those that carry the identity of the speaker.

Moreover, according to what Dogil and Reiterer (2009) posit, “the phonetic subsystem is generally thought to be more difficult to acquire, as it is assumed to rely mostly on hard-wired biological processes that cannot be easily influenced by conscious learning efforts” (p. 5). Accordingly, everyone who acquires an L2 after a certain critical period (Lenneberg, 1967) will exhibit a foreign accent. According to Lenneberg, there is, however, no agreement regarding the cut-off point, that is, the age at which accent-free mastery of the L2 on both the segmental and supra-segmental levels should still be possible.

Along with Stevick (1978, p. 145) and Pennington and Richards (1986, p. 207), Celce-Murcia, Brinton, and Goodwin (2007, p. 29) also point out the vulnerability of learners who, while wishing to attain native-like pronunciation in the target language in order to avoid stigma attached to having a foreign accent, may be reluctant to lose their accent for fear of alienating themselves from their native language peers. As a consequence, they think that affective and personality factors (e.g., extroversion and sociability) may either impede or promote acquisition of second language phonology.

In fact, Pennington (1994) suggests that, “Learners perceive three barriers to pronunciation improvement: physiological (‘I can’t change’), psychological (‘I don’t need to change’), and socio-cultural (‘I don’t think it’s good to change’)” (p. 92). She further suggests that the goal of instruction is not only to improve learner performance, but also to provide “a basis for change in the psychological and social dimensions of pronunciation” (p. 105).

Facing all the varieties of factors that influence the acquisition and thus, the instruction of pronunciation, one is left with the startling challenges of assisting the learners in their attempt to remove their foreign accent. In this regard Gilbert (2008) mentions that, “Teaching pronunciation involves a variety of challenges. To begin with, teachers often find that they do not have enough time in class to give proper attention to this aspect of English instruction” (p.1). He further maintains that, when teachers are able to manage the time:

The instruction often amounts to the presentation and practice of a series of tedious and seemingly unrelated topics. Drilling sounds over and over again (for example, minimal pair work) often leads to discouraging results, and discouraged students and teachers end up wanting to avoid pronunciation altogether. (p. 1)

According to Cylwik et al. (2009), CALL has a number of potential advantages: liberating from time limitations and teacher dependence by being able to study and practice at one’s desired setting and extent, being able to practice at one’s own pace, being able to store the user’s profile to monitor the progress, having access to a number of additional materials such as visualizations, recordings, animations, individualizing learning process, and finally removing the stress related to the fact that the learner is being listened to by his/her colleagues, “the last of which seems particularly important in the case of pronunciation/prosody learning” (p. 124).

As a result of the literature studied and presented here, the researchers sought to find out whether utilizing CALL could reduce EFL learners’ foreign accent. To scrutinize the issue under investigation, the following question was raised:

- *Does utilizing computer-assisted language learning have any significant impact on intermediate EFL learners’ foreign accent reduction?*

Method

In order to find a proper answer to the posed question, the researchers followed certain procedures and utilized certain instruments, which are reported in the following section.

Participants

The participants were selected from among English-majoring freshman students taking oral/aural course at Islamic Azad University Central Tehran Branch. From among four intact classes (100 students), 62 students ranging in age from 18 to 35 were selected firstly, based on their scores on a language proficiency test (a sample PET) and secondly, based on their scores on a text-to-read. The two-stage selection and homogenization was for the purpose of including participants who were homogeneous in terms of both their overall proficiency and the strength of their foreign accent prior to the treatment.

The selected participants were then non-randomly assigned to two equal-sized groups, one experimental and one control, each scattered in two classes. Since the male participants were very few, to remove gender as an intervening variable, the tests were only given to female students.

It is worth noting that 30 other freshman students, who were similar to the actual participants of this study, participated in the pilot study of the aforementioned language proficiency test and a text-to-read. In addition, all the weekly quizzes and educational tutorials were also piloted with this group.

Instrumentation

To homogenize the participants based on their language proficiency and minimize the individual differences among the participants, a piloted sample PET (Preliminary English Test) was employed, which is published by Cambridge English for Speakers of Other Languages (ESOL, 2009). The PET consisted of four sections: reading (35 items), writing (eight items), listening (25 items), and speaking (four subparts). The writing section included three subparts. The first subpart consisted of five items, which were

scored objectively. However, the other two subparts were scored applying General Marks Scheme (PET handbook, 2009).

It must be mentioned that each paper was rated by two raters. The PET speaking test was conducted by two examiners (an interlocutor and an assessor) with pairs of candidates. The assessor took no part in the interactions. It took 10-12 minutes for each pair of candidates. The speaking test is generally divided into four parts (a two-minute interaction on a general topic, a two-minute interaction on a visual stimulus, a three-minute speech on a verbal prompt, and a three-minute general discussion). To rate this section, the same two raters used the Cambridge ESOL Common Scale for Speaking.

Since the focus of the study was on foreign accent reduction, the researchers also needed to homogenize the participants in term of the strength of their foreign accent. For this purpose, a text was given to the participants to read and their voices were recorded to be rated based on an analytic pronunciation rating scale (0-12 point) drawn from the pronunciation section of Rating Scale for Oral Proficiency Test at UC Berkeley (derived from UCLA's OPT).

Some weekly-quizzes were also used in both groups. These quizzes were made up of two sections, the first section included some short video clips based on which the participants had to answer the related questions and the second part consisted of some pronunciation questions focusing both on the segmental and supra-segmental features.

In addition to the tests and quizzes, certain instructional instruments were utilized in each group. The "Pronunciation Power 2" software was used in the experimental group. This software is designed based on foreign accent reduction at intermediate level of language proficiency and focuses on segmental and supra-segmental features as well as overall speech rate by capturing the speech of any user after (s)he has listened to a native-like model trying to reproduce the model's speech as similarly as possible. The software covers almost all the salient properties of a foreign accent, which according to Gut (2007), "include the durational features, vowel reduction, consonant cluster reduction, overall speech rate, intonational variables, pitch range, and pitch movement" (p. 75).

Moreover, to operate the instructions in both groups, there were some course books like 'Focus on Pronunciation 2' covered in the control group and 'Expressways 4' covered in both groups, which contains a full range of situations and contexts, offers intermediate-level students expanded vocabulary, complex grammar, and a choice of functional expressions. It

must be mentioned that both the 'Focus on Pronunciation 2' and 'Pronunciation Power 2' cover the same content, that is both focus on segmental (vowels and consonants), supra-segmental (pitch, rhythm, intonation, contours, word stress, sentence stress), and overall speech rate features. That is why these two materials were selected to be applied in the present study, the former in the control and the latter in the experimental group.

Furthermore, to remove any probable problems dealing with computer and online sessions and interacting via Skype, a series of educational tutorials were designed and given to the participants of the experimental group in the form of CDs. It is worth noting that these educational tutorials were designed, with the help of 'Captivate 4 software' by the researchers, in a very easy-to-grasp manner. To be exact, all the steps of working with a computer and the software 'Pronunciation Power 2', getting online and working with the Skype program, doing the online exercises, searching for a new word via online dictionaries, and sending the completed exercises to the researchers for scoring were explicitly demonstrated in the CDs. The demonstrations were accompanied by Persian narration for the purpose of reducing the participants' technophobia in dealing with CALL applications.

At the end of the treatment and as the posttest, the speaking section of the PET (applied during the homogenization phase) and a piloted parallel text to that of the homogenization phase were administered to the participants of both groups. Then, their voices were recorded and rated applying the above-mentioned analytic pronunciation rating scale (0-12 point). Ultimately, a questionnaire, containing six open-ended questions, was given to the participants in the experimental group to find out how they felt about and thought of using CALL applications.

Procedure

At the outset of the study, a piloted sample PET was administered to 100 students. The researchers aimed at selecting the participants obtaining similar levels of language proficiency. The set criterion for selecting the participants was considered as one standard deviation above and below the mean score (which turned out to be 25 to 40). Then, to further homogenize the 74 selected participants in terms of their foreign accent the speaking section of the PET and a text-to-read was given to them. As a result, 62 female participants whose scores fell within one standard deviation above

and below the mean score of the participants retained for the purpose of the study. Subsequently, they were non-randomly assigned to two groups, each including 31 of the targeted participants, in four classes: two classes as the control and two classes as the experimental group.

The experimental group underwent pronunciation instruction through utilizing CALL applications both inside the class (face-to-face teaching-learning) and via online sessions (e-learning). The inside-the-class sessions were held four hours and a half once a week and the online sessions were held for an hour twice a week. Moreover, the e-learning included both synchronous (via Skype, conference calls, group chats) and asynchronous communication (via email while the recipient was offline). Prior to starting the treatment in the experimental group, as explained before, tutorial CDs were distributed among the participants.

To fulfill the instruction during the face-to-face classroom learning, the pronunciation software (Pronunciation Power 2) was employed. Moreover, the participants would take the software home and practice with it at their own tempo to get feedback on the inappropriateness of their speech production not only at the level of segmental features but also supra-segmental. Furthermore, to accomplish the e-learning, the participants appeared online for an hour twice a week based on a timetable at their conveniences. During online sessions, they were first referred to some educational websites (mainly www.esl-lab.com) to practice pronunciation and do some online listening exercises which chiefly focused on discrimination of sounds.

The participants in this group were also asked to read a text, which was given to them every session, record their voice, and email it to the researchers to rate. The researchers would also send by email their feedback pinpointing all the mispronunciation and aspects of foreign accent. Then, they had to take part in a group chat or a conference call during the class sessions (synchronous conferencing) to speak about a topic they had in their book (*Expressways 4*) and based on which they received feedback on the appropriateness of their speech after their speech was over to prevent making them embarrassed in front of other partners.

Nevertheless, the control group got the chance to have pronunciation instruction merely inside the class using a course book (*Focus on Pronunciation 2*) and its related CD. Of course, the participants here were also asked to read the same texts, those given to the participants in the experimental group, and record their voice and hand it to the researchers in

the coming session to be rated. In their feedback, the researchers would take into account exactly the same features they considered for the experimental group as explained earlier. As an out-of-class practice, the participants in this group were asked to do all the listening and pronunciation exercises in their book 'Focus on Pronunciation 2' and hand the completed exercises to the researchers the next session.

Moreover, the participants of the control group were put into groups of four or five students and were asked to prepare a conversation and act it out in the class in the following session, the topics of which were selected from the more-practice-section of the 'Expressways 4'. They were also asked to read and gather information about the topics and discuss them in class in the coming session, on which they again would receive feedback from the teacher. The CALL instruction was entirely absent in the control group. The time allotted to the sessions was exactly similar to that of the experimental group (four hours and a half once a week), however, due to the nature of homework exercises in this group which were done individually, the researchers could not control the time students would spend on them.

It is worth mentioning that every session both groups received listening and pronunciation weekly-quizzes as an opportunity to listen to and imitate the correct and native-like pronunciation patterns in an attempt for foreign accent reduction. After nine instructional sessions, the two groups took a posttest on a PET speaking section and a text-to-read. All the performances were recorded and rated by two raters applying the analytic pronunciation rating scale explained earlier. Also, a questionnaire was administered to gather data on the attitudes and feelings of the participants in the experimental group regarding CALL applications in pronunciation instruction.

Results

To both guarantee maximal accuracy of the procedure and verify the hypothesis, the following statistical analyses were conducted.

Piloting the PET

Firstly, the PET was piloted with 30 intermediate students who were similar to the participants of the study regarding their level of language proficiency. Afterward, NRT item analysis including item facility and item discrimination

was conducted for each item. After omitting 10 malfunctioning items – five items in the reading section, one item in the writing section (which was scored objectively), and four items in the listening section – the reliability of the test was estimated using the Cronbach's alpha formula and it came out to be 0.75 (Table 1).

Table 1 – Reliability of the modified PET

Cronbach's Alpha	N of Items	N of cases
.748	55	30

Administering the PET

Following the piloting phase, the PET was given to 100 intermediate students, the descriptive statistics of which are presented in Table 2. The participants who scored one standard deviation above and below the mean (N = 74) were selected to take part in the second phase of the homogenization process based on their scores on a text-to-read.

Table 2 – Descriptive statistics of the PET

N	Mean	SD	Range	Minimum	Maximum
100	32.0900	7.41292	33.00	16.00	49.00

Inter-rater Reliability of Rating the PET Writing and Speaking Sections

The writing sections of the PET were given to two raters to rate based on the PET General Mark Scheme for Writing (2009). The inter-rater reliability of the writing parts came out to be 0.84, showing a significant correlation between the two raters' scores (Table 3).

Table 3 – Inter-rater reliability of rating the PET writing and speaking sections

Writing		Rater 2
Rater 1	Pearson Correlation	.839**
	Sig. (2-tailed)	.000
	N	28
**Correlation is significant at the 0.01 level (2-tailed).		
Speaking		Rater 2
Rater 1	Pearson Correlation	.845**
	Sig. (2-tailed)	.000
	N	28
**Correlation is significant at the 0.01 level (2-tailed).		

The participants were also rated by the same two raters, the interlocutor and the assessor, on the speaking section utilizing the PET Cambridge ESOL Common Scale for Speaking (2009). The inter-rater reliability of the speaking section was 0.85, showing a significant correlation between the two sets of scores (Table 3).

The Results of Homogenizing the Participants for Foreign Accent

In the next phase of the study, since 74 out of 100 students held the same level of the language proficiency, the participants had to be homogenized in terms of holding a foreign accent. Therefore, their scores on the text-to-read were taken into consideration. In this fashion, two raters rated the participants performances on the text they had read based on the analytic pronunciation rating scale described before and 62 of the participants were selected. Table 4 below illustrates the descriptive statistics of the amount of holding a foreign accent. Table 5 demonstrates the inter-rater reliability between the two raters' set of scores, which came out to be 0.88, showing a significant correlation.

Table 4 – Descriptive statistics of the scores of both groups on the amount of holding a foreign accent

N	Mean	SD	Range	Minimum	Maximum
74	6.27	1.81	9.00	2.00	11.00

Table 5 – Inter-rater reliability between the two raters’ sets of scores indicating the amount of holding a foreign accent

		Rater 2
Rater 1	Pearson Correlation	.884**
	Sig. (2-tailed)	.000
	N	28
**Correlation is significant at the 0.01 level (2-tailed).		

Checking the Homogeneity of the Two Groups

In order to ascertain the homogeneity of the groups; first, the descriptive statistics of each group was measured, the results of which are shown in Table 6 below. Second, the amount of the Skewness ratios (-0.12 and -0.49) indicated that the two sets of scores were distributed normally, since they range between ± 1.96 and thus, comparison through *t*-test was legitimate.

Table 6 – Descriptive statistics of the two groups on holding a foreign accent prior to the treatment

Groups	N	Mean	SD	Skewness	Std. Error of Skewness	Skewness ratio
Control	31	6.185	1.209	-.052	.421	-.12
Experimental	31	6.266	1.184	-.208	.421	-.49

The next step was to run an independent samples *t*-test to compare the mean scores of the two groups on holding a foreign accent. The result, as indicated in Table 7, showed that the variance fulfilled the condition of the homogeneity at 0.05 level of significance ($F = 0.045, p = 0.83 > 0.05$).

Since the homogeneity of the variances of the two groups was proved, the results of the *t*-test with the assumption of equal variances are reported here. The results ($t = 0.26, df = 60, p = 0.79 > 0.05$) indicated that there was no significant difference between the two groups’ mean scores on the foreign accent prior to the treatment meaning that the two groups were homogeneous (Table 7).

Table 7 – Comparing two groups' mean scores and variances prior to the treatment

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	.045	.83	-.26	60	.792	-.080	.304	-.688	.527
Equal variances not assumed			-.26	59.9	.792	-.080	.304	-.688	.527

The Results of the Two Groups' Posttest

Following the treatment, the two groups took a posttest through the speaking section of the PET along with a text-to-read. Subsequently, their voices were recorded and rated by two raters utilizing an analytic pronunciation rating scale. After that, the statistical computations required to respond to the research question and verify the hypothesis were put into effect. To begin with, the descriptive statistics of the scores of both groups on the posttest were obtained. Table 8 illustrates the scores of both groups on holding a foreign accent.

Table 8 – Descriptive statistics of both groups on holding a foreign accent posttest

Groups	N	Mean	SD	Skewness	Std. Error of Skewness	Skewness ratio
Control	31	6.387	1.134	.072	.421	0.171
Experimental	31	7.588	1.153	-.160	.421	-0.380

As demonstrated in Table 8, the amount of the Skewness ratios (0.17 and -0.38) indicated that the two sets of scores were distributed normally, since they range between ± 1.96 . It is apparent that the participants in the experimental group obtained a higher mean score, which showed that they

performed better on the posttest. To indicate the significance of the difference between the mean scores, an independent samples *t*-test was run. As Table 9 below demonstrates, the results of the Levene's test of equality of variances did not turn out to be significant ($F = 0.002, p = 0.96 > 0.05$) and consequently the results of the *t*-test with equal variances are reported.

Table 9 – *t*-test of the two groups' mean scores on the posttest

	Levene's Test for Equality of Variances		<i>t</i> -test for Equality of Means						
	<i>F</i>	Sig.	<i>t</i>	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	.002	.96	4.13	60	.000	1.201	.290	.6202	1.782
Equal variances not assumed			4.13	59.9	.000	1.201	.290	.6202	1.782

According to Table 9, the results of the *t*-test ($t = 4.13, df = 60, p = 0.0005 < 0.05$), indicated that there was a significant difference between the groups' mean scores. Furthermore, since according to Table 8, the experimental group obtained a higher mean than the control group on the accent posttest (7.58 and 6.38, respectively), the conclusion is that utilizing CALL applications had a significant impact on the foreign accent reduction of the participants.

Following the rejection of the null hypothesis, the researchers intended to determine how much of the obtained difference could be explained by the effect of the treatment and thus computed the effect size. The effect size using Cohen's *d* turned out to be 1.07 and partial eta square came out to be 0.22 ($F_{1,60} = 17.09, p = 0.0005, \text{partial eta-squared} = 0.22, \text{power} = 1.0$). This indicated that CALL instruction accounted for 22% of the variance in the accent reduction of the participants in the experimental group which is a large effect size. Moreover, considering the fact that power was 1 and based on what Larson-Hall (2010) posits, "We would like power to be at least 0.80 so that we have a four in five chance of finding a statistical effect" (p. 309), it is concluded that the findings of the study were statistically powerful.

Results of the Open-Ended Questionnaire

To find out how the participants in the experimental group felt about and thought of CALL applications, an open-ended questionnaire was given to them and reading their opinions, the following points were obtained: Almost all of them expressed their satisfaction with CALL. They wrote that it was an innovative method they had never experienced before. Few of the students mentioned they felt uneasy about dealing with technology, but they declared that the tutorials helped them a lot and as they were gradually into the procedures the unease was removed.

Moreover, most of them welcomed the software (Pronunciation Power 2). Majority wrote that they not only reduced to some extent their foreign accent (we call it 'to some extent' since reducing a foreign accent needs much more time than a semester, i.e., four months, to occur), but also learned how to improve speaking and listening comprehension abilities. They pointed out that having software as an instructor was helpful because they were able to practice pronunciation at their own pace. They were even able to pre-study and re-practice what they had practiced before as much as they desired. They maintained that they were able to listen, watch, read, and at the same time speak via the software, which they mentioned was impossible to do in a routine classroom setting.

Nonetheless, they mentioned some technological problems they encountered. The most frequently reported technological problem dealt with connection breakdowns and slow pace of dial-up connections. Another problem that the researchers also witnessed was an occasion in which everyone faced 'stop connecting via Skype' after the fourth session of e-learning due to which all participants had to make use of Yahoo Messenger and Google talk. Moreover, some of them reported that they had to upgrade their computers at home to be able to install the software or connect via Skype. Finally, they stated that doing the online exercises helped them learn surfing the internet and assisted them in overcoming their fear of learning through CALL applications.

Discussion and Conclusion

This study aimed at investigating whether utilizing CALL had any significant impact on intermediate EFL learners' foreign accent reduction. Since the participants were homogenized both in terms of their overall language

proficiency and their foreign accent prior to the treatment and the only procedural difference in their instruction was use of CALL, the significant difference between the two groups in terms of foreign accent reduction at the end of the treatment period could be logically attributed to the impact of utilizing CALL applications inside the class and through e-learning.

The researchers observed that during the online sessions the students were actively involved in freely expressing themselves without any anxiety and fear of making mistakes. It can be interpreted that one reason for the significant impact of CALL in the context of this study might have been lower level of oral performance anxiety during the synchronous and asynchronous interactions which are in nature different from the face-to-face classroom interactions. Another plausible line of reasoning may be the fact that using the software in the experimental group provided the participants the opportunity to practice at their own pace as well as to the extent they desired. This in turn may have resulted not only in greater quantity of practice but also a practice of a different quality; perhaps a self-monitored and self-tailored type of practice.

Moreover, the online sessions and the email exchanges between the instructor and the students created a friendly atmosphere which could have been another reason behind the success of the experimental group. Another advantage of the online interactions was that all participants were able to express their ideas whenever they wanted without interrupting others, because the option of typing a text was always available. This of course is not possible in the classroom setting, since one cannot understand anything if all learners start talking about their ideas, and when waiting for their turns to come, parts of those ideas may be lost or even the time may be over before many get the chance to express themselves.

Finally, part of the success of the experimental group could have been due to the nature of the feedback given through CALL. Since both the participants' performances and the researchers' comments and feedback were saved as files and then emailed, the researchers could keep all the files and investigate and evaluate each individual's progress or even regress and design better activities and curricula for their improvement. While doing all these inside the usual classroom setting is not achievable due to the time limitation.

As a final point, some suggestions are provided for the researchers who are interested in this field of inquiry. In so far as the participants of this study were adult students, a similar research on students of different age range

may come up with different results. Similar studies can also be carried out to investigate the comparative impact of utilizing CALL applications inside the classroom through face-to-face teaching-learning and that of the e-learning or the synchronous and asynchronous modes of e-learning to find out which one is more effective with respect to its impact on foreign accent reduction. Furthermore, many teachers seem to sweep pronunciation teaching under the carpet, and do not deal with it in any systematic way. Research is required to find out the reasons why teachers are often so reluctant to deal with pronunciation.

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