Development of listening and speaking skills in hearing-impaired EFL students

Desenvolvimento de habilidades de escuta e fala em estudantes com dificuldades de audição estudando inglês como língua estrangeira

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Abstract: This study initiates an exploration of the benefits that a computer-based training could bring to hearing-impaired Secondary students of EFL. A class of six Spanish students (five hearing-impaired and one with a slight cognitive disorder) undertook three sessions of audiovisual training in the computer room. Participants recorded their productions in the course of three sessions, which were analysed taking into account three main variables: tonicity, tonality and tone. Participants with lower outcomes in the first recording showed a higher global improvement in their productions by the end of the training. There were not significant differences between the final outcome of the hearing student and the final outcomes of the five hearing-impaired students.

Keywords: Hearing-impaired; Computer-based training; Tonicity; Tonality; Tone

Resumo: Este estudo inicia uma investigação dos benefícios que um treinamento utilizando-se o computador traz a estudantes de inglês como língua estrangeira com dificuldades auditivas. Uma turma de seis estudantes espanhóis (cinco com dificuldades auditivas e um com um leve distúrbio cognitivo) participaram de um treinamento com três etapas de treinamento audiovisual em um computador. Os participantes gravaram seus desempenhos no curso das três etapas, as quais foram analisadas levando-se em consideração três principais variáveis: Tonicidade, tonalidade e tom. Os participantes com os piores resultados no primeiro registro mostraram uma melhora geral no seu desempenho no fim do treinamento. Não houve diferenças significativas entre o resultado final do estudante sem dificuldade auditiva e os cinco estudantes com dificuldades auditivas.

Palavras-chave: Dificuldades auditivas; Treinamento com computador; Tonicidade; Tonalidade; Tom

1 Introduction

Phonology, which is an important component of the ability of communication, has long been the weak point of L1 Spanish learners of English as a foreign language. Some studies such as the one carried out by H.S. Venkatagiri and John M. Levis in 2007 indicate that phonological awareness may affect the comprehensibility of EFL speakers. Nonetheless, curricular English has traditionally been taught following a "focus on forms" method, paying special attention to the reading and formal writing skills, which did not guarantee an eventual effective oral communication with English speakers. Fortunately, in recent years renewed concepts of second language acquisition have been gaining ground, approaching the learning of a foreign language from a more communicative perspective.

Krashen's theories of second language acquisition are fundamental in this area of study, and nowadays many schools involved in bilingual projects are implementing teaching methods following these principles to a great extend. In this sense, we could agree on the relevance of Krashen's Acquisition/Learning Hypothesis (1981) to the context of the present project. According to Krashen, acquisition is a subconscious process similar to the one used when learning the mother tongue. Therefore, the teaching of a second or foreign language should be focused on meaningful interaction and incidental learning.

Unfortunately, when it comes to deaf oralists, this type of communicative approach loses its validity. Following the definition of the Oral Deaf Education website (sponsored by the Oberkotter Foundation), deaf oralists are children who range from severe to profound deafness that develop speech and listening abilities

thanks to the help of speech therapists, adequate hearing technology and the collaboration of their families. However, the natural way of communication of the deaf community is the Sign Language. This obviously represents a problem to deaf children since when they learn to speak orally in their mother tongue, this is by no means a subconscious process, so let alone learning to speak a second or foreign language. It is also necessary to mention another important obstacle which is also added to their natural difficulty. Given the lack of incidental input, hearing-impaired students suffer from a lack of vocabulary and syntactical constructions in their first spoken language, in this case Spanish. In order to give a solution to this situation specialised schools, such as Tres Olivos School in Madrid, count on special measures and techniques. Some of these techniques commonly used to teach hearing-impaired children are the following:

- The curricular contents are simplified in terms of language so that they can understand and follow the class.
- The teachers speak slowly and clearly so that their hearing-impaired students can read their lips.
- Teachers pay special attention to look face to face to their hearing-impaired students to make sure that they follow the lesson.
- The school counts with the necessary acoustic conditions and technological equipment in order to attend to all of the different students' needs.

We should neither forget that deaf oralists are a minority within the deaf community, whose members mostly communicate in their natural language, Sign Language. This is one of the reasons why there are more resources and adapted teaching systems for deaf people who sign that for deaf people who speak. Another important issue that results in the lack of schools specialised in oral deaf education is the great economical investment in human resources and technical equipment that this type of education requires. Thus, so far, we can only find schools specialised in the integration of deaf oralists mainly supported by private funds.

For all the reasons stated above, in this introduction to action research I have explored other complementary means and resources to enhance the communicative skills also in hearing-impaired students of English as a foreign language.

1.1 *Some important notions about deafness*

Not being able to hear properly has significant neurological, intellectual, affective and social con-sequences on the development of a child.

One direct consequence of the lack of hearing is the difficulty to acquire and control the main language of the society where the child is going to live. Not having a good command of the Spanish (or any other language), will not only limit communication, but also the access to an academic education.

The lack of hearing shapes the way of being and communicating with others. That explains why deaf adults have always tended to create communities which have developed their own language (Sign Language) and culture. The central core of this phenomenon is communication: on the one hand, the difficulty to communicate with hearing people, and on the other hand, the need to communicate at ease with people who share the same experiences.

Before, we could only deal with the communicative situation of hearing-impaired people in a partial manner. Education aimed, first, at compensating for the expressive limitations, providing the deaf child with a good expressive level by means of speech and lip reading; and second, at allowing the access to culture and academic training by means of a bilingual approach. That is to say, either Sign Language + written language and spoken, if possible; or by means of a reinforced monolingual approach: spoken language as the main code + augmentative communication systems.

However, in the last fifteen years, the appearance of digital prostheses for those who present a moderate deafness and the cochlear implant for those who present a severe or profound deafness has radically changed the situation in developed countries. For the first time, we can provide an early functional hearing to almost every deaf child. Functional hearing refers to the ability to understand through hearing the speech already known, which do not imply to hear completely, but sufficiently. In other words, now we can take action on the cause of the difficulties and not only on the consequences.

Yet, neither the prostheses nor the implants can provide a normal hearing. The access to the acoustic form of new words is never perfect, and the discrimination between background and primary sounds in noisy environments is very difficult. Moreover, these technological devices cannot be adapted in the first years because they require surgical intervention, thus the early learning stages of the deaf child are unavoidably affected by the lack of hearing. (cf. MONFORT and JUÁREZ, 2011, information obtained from Tres Olivos webpage, https://sites.google.com/site/logopediatresolivos/todo-sobre-la-sordera-1).

1.2 *Objectives*

Taking into account the educational background describe above, the purpose of my research is to prove that

the use of audiovisual learning methods in an EFL class is not only beneficial for common students, but also for hearing-impaired students. The normal listening activities which usually take place in normal English classes are not really feasible applied to hearing-impaired children, so the audiovisual teaching system presented in this project would have to cover both the minimum listening activities and an extra training to solve the lack of incidental input that deaf children naturally suffer. My aim is to show that an adequate audiovisual teaching could eventually raise their phonological awareness. The experimental part of my study consists of a short-term training (three sessions of one hour each) to deaf EFL students by means of Audacity. Audacity is a free software, cross-platform digital audio editor and recording application. It is available for Window, Mac OS X, Linux and BSD. With this experiment I intend to prove the possible effects of this computer-based tool on the oral productions of the participants regarding intonation and pronunciation.

1.3 *Hypotheses*

Null Hypothesis (H0): Currently, it seems that deaf oralists and hard of hearing students are not expected to reach the same skills in the EFL class than their hearing mates, specially at the speaking level, so it is not guaranteed that when they finish Secondary education they will be able to communicate effectively in English with foreign people.

First Hypothesis (H1): If we provide them with an appropriate training by means of Audacity (or other similar computer-based tools) during the whole period of Secondary education, it will eventually increase their phonological awareness, especially at rhythm and intonation levels.

Second Hypothesis (H2): If as years go by it is hypothesized that the system described in H1 is supported with phonological training (phonemic and rhyming exercises) together with other audiovisual resources such as captioned videos, hearing-impaired students will eventually get used to link spelling with pronunciation, thus «visualizing» the sound of words. Moreover, audiovisual resources usually lead to a more comprehensible input, which is particularly convenient for hard of hearing EFL students given the absence of incidental learning.

2   Research design

2.1 *Literature review*

I have taken the following three research papers as the main starting points where to found my own project. The three of them have an essential thing in common:

they all study the effect of auditory-visual computer-based programs to train the oral productions EFL learners. After seeing the positive results obtained by means of those experiments, I decided to prove by myself the effects of a similar tool, but this time on hearing-impaired subjects. These referential studies are briefly presented below:

- Motohashi-Saigo, M. & Hardison, D. M. 2009. Acquisition of L2 Japanese Geminates: Training with Waveform Displays. Language Learning & Technology, v. 13, n. 2, p. 29-47.
- Hincks, R. & Edlund, J. 2009. Promoting Increased Pitch Variation in Oral Presentations with Transient Visual Feedback. Language Learning & Technology, v. 13, n. 3, p. 32.50.
- Ramírez Verdugo, Dolores. 2006. A Study of Intonation Awareness and Learning in Non-Native Speakers of English. Language Awareness, v. 15, n. 3, p.141-159.
- Tillman, Patricia. 2003. Computerized Phono-logical Awareness Training in Kindergarten Students with Speech-Language Impairment.

The subjects of Motohashi-Saigo and Hardison's study (2009) were English learners who were starting to learn Japanese as an L2. Their perception and production was trained through a web-based program displaying waveforms, so they received both auditory and visual feedback for their productions. By the end of the experiment, their general improvement proved to be higher than that of the students who had only been trained with auditory feedback.

For their part, Hincks and Edlund (2009) used a computer program that showed the pitch variation of the speaker by means of flashlights. The subjects were Chinese learners of English. By the end of the study, the speech variation had increased more in the test group (audio-visual feedback) than in the control group (audio-only feedback).

Finally, in the study carried out by Ramírez Verdugo (2006), two groups of 10 Spanish learners were compared. The experimental group received intonation training by means of the computer-based program *Speech Analyzer* and the control group only followed its normal English lessons. The results showed an improvement in the experimental group's intonation awareness- raising, as the participants used a wider variety of tones in the post-test. Regarding tonicity and tonality, they also reached a closer approximation to the target language than the participants in the control group, who by contrast did not show any significant improvement.

As regards the data of the study, Halliday's theory of intonation has been followed for the sake of the analysis. To provide a brief account of this theory, I will refer here to the overview offered by Ramírez Verdugo (2005, p. 2087):

Halliday (1994, p. 292) distinguishes three subsystems of intonation: tonality, tonicity and tone. Tonality refers to the system that divides speech into its separate individual 'tone groups' or intonation units. Each intonation unit contains a single unit of information and represents the speaker's perception and management of the whole message. Tonicity refers to "the construction of feet into tone groups, showing how the tone group serves to organize discourse into information units" (HALLIDAY, 1994, p. 292); within each unit of intonation, the most prominent word receives the tonic prominence indicating the focus of information. Tone refers to the system of contrasting pitch movements in each unit of intonation. Hence, tonality and tonicity realize the textual metafunction, while tone expresses the interpersonal metafunction and the status of information as perceived by the speaker (cf. BENSON et al., 1988, p. 40; HALLIDAY, 1994, p. 36; TENCH, 1996, p. 80, 86).

My second hypothesis derives from the investigation of resources and references related to captioned videos, as well as to phonetic and rhythm-based exercises to teach deaf English-native children. According to the National Captioning Institute (NCI), research dating back to the 1980s and the inception of closed captioning for television demonstrates the usefulness of captioning as a reading instruction tool for those with hearing impairments as well as many other learning limitations (Koskinen, 1986; Parlato, 1985). Numerous studies, such as the one carried out by Gwen C. Nugent (1983), prove the importance of visuals in deaf education and shows that deaf and hearing-impaired students score higher when watching captioned videos than when watching visuals alone or captions alone.

In a study carried out by Guardino, Syverud, Joyner, Nicols and King in 2011, the effectiveness of phonological instruction with 6 deaf students, ages ranged between 7-12 years old, in an oral program was investigated. They were enrolled in oral self-contained classrooms in a public elementary school in the United States. Tutoring took place in three locations on the school campus so that the students could receive intensive instruction without interruption. The participants had varying degrees of unaided hearing loss, ranging from mild to profound. All the students were chosen on the basis of their difficulties with reading. A multiple case study design was implemented for a period of 10 weeks. Tests of nonsense words were administered to monitor weekly progress in phonological decoding. Intervention journals were completed for each tutoring session to provide qualitative information. Although the results were mixed, all 6 participants showed gains in phonological decoding skills.

As explained in their study, "phonological awareness is the ability to auditorily distinguish the units of speech; it includes awareness of individual words, their syllables and their phonemes. […] Whereas phonological awareness involves only spoken language, phonological decoding connects spoken language with written language. Because both phonological awareness and phonological decoding often rely on the ability to receive and process auditory input, acquisition of these skills may be exceedingly difficult for students who are deaf and hard of hearing".

Sterne and Goswami (2000, Phonological awareness of syllables, rhymes, and phonemes in deaf children. *Journal of Child Psychology and Psychiatry,* v. 41, n. 9, p. 609-625) conducted three experiments to investigate the impact of teaching phonological awareness skills (i.e., syllabic awareness, rhyme awareness and phonemic awareness) to 15 profoundly deaf children versus 26 age-matched hearing peers. The average age of the participants was 11 years old. The results from the syllabic awareness experiment indicated that deaf students can make phonological length judgements just as well as their age-matched hearing peers. The results from the rhyme awareness experiment indicated that deaf students were able to make simple rhymes, but were unable to achieve the same level as hearing children. The results from the phonemic awareness experiment indicated that most of the deaf students were able to use some phonological information. Sterne and Goswami concluded that deaf students can develop phonological awareness, but that their phonological skills do not develop at the same rate as those of their hearing peers, and perhaps develop differently as well.

2.2 *Context of the Study*

I have developed my research work at Tres Olivos, a school specialised in deaf children. Tres Olivos was opened in the academic year 2001-2002. It started with 300 students approximately, and nowadays it provides schooling for more than 900 students, 74 of whom are hearing-impaired. The school's educational project was born thanks to the support of the "Fundación Dales la Palabra" and of the "Asociación Entender y Hablar", led by Marc Monfort and Adoración Juárez. The teaching methodology and resources used in this school, as well as in other specialised schools worldwide (such as Clarke Schools for Hearing and Speech in the U.S.) aim at one essential objective: the social integration and independence of their deaf students once they are adults by means of the use of the spoken language. Thus the school counts with a very well-prepared team of speech-therapists who teaches them to accurately speak despite their lack of hearing. Furthermore, the school has at its disposal all the necessary hearing equipment and conditions to achieve a successful performance.

Given the number of hours that deaf students have to devote to attend speech-therapy classes, there are subjects such as English or P. E that they do not take with the rest of their classmates. The subjects of my study have been the six deaf students of a 1º ESO class, with whom I have worked one hour a week from March to May 2011. They follow a different book (Essential Grammar in Use) than the rest of their partners. Due to the fact that their vocabulary level and understanding is lower than that of their hearing partners, teaching them English have been mainly focused so far on simple grammar and vocabulary, leaving the listening and speaking skills a bit apart. However, I believe that the teaching method applied with them should also include their other handicapped skills. If an adapted training is carried out to develop their listening and speaking skills, that will probably increase their ability to communicate in English by the end of the Secondary Education.

2.3 Participants

The participants of my study have been the six 12-13 year-old students of a 1ºESO class, three boys and three girls, who have studied all their school years at Tres Olivos. At the school, speech-therapists teach deaf children bimodal sign language supported by cued-speech until the second phase of Infant education, approximately. Later on, they stop using signs and cued-speech, but they continue with the speech-therapy sessions to support their normal classes. By the time they enter Secondary Education, they have already reached a good cognitive level. Some details on the participants' difficulties which affect the results of this study are detailed below:

- *Subject A*: Severe deafness. Hearing aids. Her parents are deaf too, therefore she also speaks Sign Language.
- *Subject B*: Profound deafness in one ear and severe deafness in the other ear. Hearing aids. ADHD (Attention Deficit Hyperactivity Disorder).
- *Subject C*: No deafness. Slight cognitive disorder due to a physical problem which did not enable her to speak until she was operated with five years old. It mainly affects the participant in the area of maths.
- *Subject D*: Profound Deafness. Double cochlear implant.
- *Subject E*: Bilateral Profound Deafness. Double cochlear implant. Attention Deficit and difficulties in the executive function.
- *Subject F*: Profound Deafness. Double cochlear implant. SLI (Specific Language Impairment) that hinders him the task of reading out loud with regard to rhythm. Also his vocabulary is quite limited and he has problems identifying stylistic features.

2.4 *Materials and method*

This study has been carried out in the school computer room, by means of the program Audacity. The six participants worked on a dialogue from the student's book that their hearing partners use in their English class. They had worked on the dialogue with their English teacher the day before the start of their computer-based training. Therefore, a previous first contact had already been established, but they did not hear the original audio track until the first day of computer-based training. During the training, they could read and hear the dialogue at the same time that they saw its waveforms in Audacity. I also instructed the most advanced students to pay attention to the waveform of the original track and then try to produce a similar shape when they recorded their own track. A set of headphones with microphone incorporated was provided to the students, who all have a Frequency-Modulation equipment for the correct reception of the sound waves.

Each of the six subjects recorded the same dialogue an average of three times. The first and last of the students' productions have been analysed and presented in this research paper. The recordings were carried out in the course of three sessions (once a week), where some difficulties took place: there were sometimes people at the same time, thus making them less comfortable to freely record their voices. Also some technical problems with the headphones occurred in some session, making it less productive as the participants had to record by turns. However, in spite of these limitations, the data gathered show interesting information regarding the students' productions. Thus, given the small number of participants and the only partially controlled conditions and short length of time available to develop my research, the results should be taken into account from a qualitative perspective. This study intends to be a preliminary approach to be developed in future studies.

For the analysis of their productions I have mainly followed Halliday's theory of intonation, as mentioned in the literature review.

The variables of my study are, therefore, the following:

- Dependent variable: the six 1ºESO participants
- Independent variable: the three subsystems of intonation (tonicity, tonality and tone)

Given the exploratory character of the present research, we have applied a broad analysis of intonation, being aware that in future studies further levels of analysis will be also considered.

2.5 *Questionnaires*

2.5.1 Student's assessment questionnaire

When the training sessions finished, I let each of the students listen to their productions so that they could assess and value their own evolution from the first to the last recording. Then, I gave them a short questionnaire consisting of six simple questions, which were the following:

- Did you know Audacity before the beginning of this training?
- Do you think it is easy to use?
- According to you, is it a useful program to learn English?
- Have you improved your intonation of the dialogue after using Audacity?
- What about the rhythm?
- Have you noticed an improvement in your pronunciation?

There were three possible answers: smiley, serious and sad face. I chose this design because I wanted it to be as visual and easy to fill in as possible. The questions were written in Spanish, and before starting filling them in I explained the students what "intonation" and "rhythm" referred to. I decided not to use the proper terminology (tonicity, tonality and tone) because I considered it to be too difficult for the students to understand. Therefore, I simplify the concepts by just mentioning "intonation" (referring to "tone") and "rhythm" (referring to "tonality" and "tonicity").

2.5.2 Teacher's assessment questionnaire

I also provided an assessment questionnaire to my tutor (the participants' English teacher). It consisted of the following six questions:

- Did you know about Audacity before the development of this activity?
- Do you think that the use of this tool along the Secondary education could improve the phonological awareness of the deaf students?
- Do you believe that deaf students would reach better speaking and listening skills by the end of the compulsory Secondary education if a special audiovisual teaching methodology was enhanced?
- Do you think an extra training on phonetics should be implemented when teaching deaf students?
- Do you agree that using captioned videos in the teaching methodology would be particularly beneficial for deaf students?
- Do you believe that the frequent use of audiovisual tools and speaking activities (eg. Flashcard-based) would eventually raise the communicative level of the deaf students?

All the questions except the first one received a Yes answer. That is, he did not know the computer program used in this study. In the remarks boxes, the fourth and fifth questions were completed with a "definitely" and a "sure" comment respectively. Nonetheless, he also remarked on the second question the need to have an appropriate equipment to meet the needs of all the different students. Finally, on the third question, he added that the deaf students would need more periods of English to reach all aims.

3 Results

3.1 *Individual results of the students' productions*

Subject A

Subject A general improvement was the least noticeable of all the participants. A low improvement was perceived as regards Tone and Pronunciation, but no improvement took place in the area of Tonicity and Tonality, probably because her first outcome was already correct. Therefore, although she scored the lowest improvement, she also presented the best performance of all.

Subject B

In this case, there was a high improvement at all levels, since the participant's first production was totally incomprehensible. Therefore, in comparison with his initial poor performance, the participant's final outcomes were extremely high.

Subject C

Subject C showed a low improvement in the areas of Tonicity, Tonality and Pronunciation. However, no improvement was registered at Tone level. It is important to remark that Subject C is not hard of hearing, but she presents a slight cognitive disorder, as commented in section 2.3.

Subject D

Subject D is the participant who reached the greatest improvements in both Tonicity and Tonality. Also the fluency of the utterances was clearly better in his last production. Although no significant changes took place regarding Tone and Pronunciation, his high improvement in the areas of Tonicity, Tonality and fluency enhanced the comprehensibility of the participant's production to a great extent.

Subject E

Subject E showed a low improvement in Tonicity, Tonality and Tone. Pronunciation, apart from the positive

changes obtained in the stress of some syllables, remained more or less the same.

Subject F

This participant presented a high improvement in Tonality, Tone and Pronunciation. Despite the fact that there was only a low improvement in Tonicity, the great betterment obtained in both Pronunciation and Tone led to a clearer discrimination of syllables and feet by the participant, thus increasing the quality of his Tonality too. It is very important to remind that this participant has a Specific Language Impairment associated to his deafness.

The following table shows the outcomes of the six participants in the four categories measured in this study: Tonicity, Tonality, Tone and Pronunciation. The possible results are High Improvement (HI), Low Improvement (LI) and No Improvement (NI).

	Tonicity	Tonality	Tone	Pronunciation
Subject A	NI	NI	LI	LI
Subject B	HI	HI	HI	HI
Subject C	LI	LI	NI	LI
Subject D	HI	HI	LI	HI
Subject E	LI	LI	LI	NI
Subject F	LI	HI	HI	HI

3.2 *Global quantitative results*

As the graphic shows, the categories with higher scores are Tonality and Pronunciation, where 50% of the participants presented a high improvement, 33% a low improvement and only 16% (one participant) did not show any improvement. They are followed by Tonicity and Tone, which both obtain a 33% of high improvement, 50% of low improvement and, again, only 16% of no improvement.
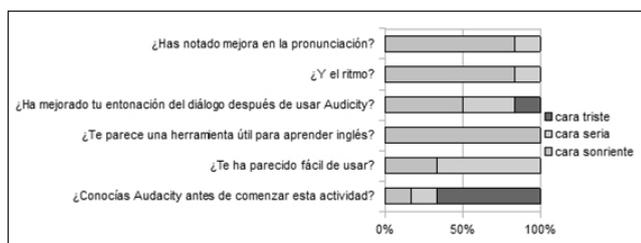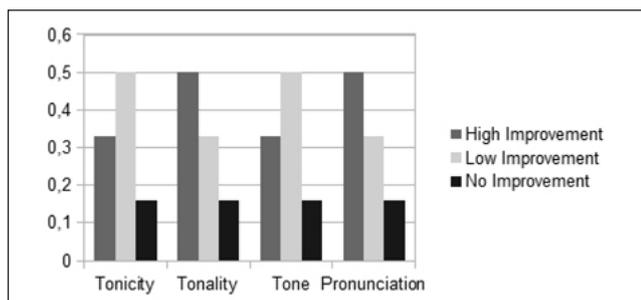
3.3 *Students self-assessment questionnaires*

- When the participants where asked if they knew about Audacity before starting the activity, 4 of them answered "No", 1 said he had heard about it but did not know how to use it, and 1 participant said he knew the program.
- To the question of the user-friendliness of the program, 4 participants marked the serious face and 2 the smiley face, so none of them thought Audacity was difficult to use.
- With regard to the third question, all the participants thought Audacity was a useful tool to learn English.
- The fourth question obtained, as shown in the graphic, all kinds of opinion: 3 participants marked the smiley face, 2 the serious face and 1 the sad face.
- When asked about the rhythm, 2 of the participants marked the smiley face and 4 marked the serious face. Judging by some of their comments about the dialogue in the course of the sessions ("They speak too fast!") I suspect that some of the participants were unable to do a clear distinction between "rhythm" and "speed". For instance, Subject A who was the most proficient participant, commented in the remarks box that it had been hard for her to follow the "rhythm" of the dialogue.
- About their improvement in pronunciation, 5 participants marked the smiley face and 1 the serious face.

4 Discussion and Conclusion

I believe that these experimental sessions with Audacity have been an interesting, innovative experience for all the persons involved in this research. The participants feedback has been quite positive with regard to their awareness raising and their feeling of improvement. Their English teacher, who actively helped me with the development of the activity, has provided us with a very positive assessment, opinions and comments in the questionnaire he filled in at the end of the experiment.

From my point of view, due to the limitations in terms of time and number of participants, these findings cannot be generalized at this stage. However, even though these results cannot be regarded as statistically significant from a quantitative perspective, the outcomes of the study are at least both revealing and promising for the future. In this respect, I consider particularly rewarding the fact that the participants with lower initial outcomes have been

the ones to reach greater improvements by the end of the training.

The outcomes of Subjects C and F should not be left unnoticed. Subject C, who is not deaf but has a slight cognitive disorder, did not show significant improvements at any of the four categories. However Subject F, who apart from a profound deafness has a Specific Language Impairment, achieved a high improvement as regards Tonality and Tone subsystems of intonation, as well as Pronunciation. This fact might follow the line of the outcomes derived from other studies, such as *Computerized Phonological Awareness Training in Kindergarten Students with Speech-Language Impairment* by Patricia Tillman. In her study, Tillman proved that computerized phonological awareness training may be an efficient method to improve the rhyming, segmentation and blending ability of kindergarten students with speech-language impairments. The results obtained in this experiment are also in line with those obtained by Ramírez Verdugo (2006); Motohashi-Saigo and Hardison (2009); Hincks and Edlund (2009) with EFL learners.

This exploratory study intends to open a new door towards the research area of phonological awareness in deaf students of English as a foreign language, by means of computer-based programs and other audiovisual complementary materials. Further studies should be carried out in order to obtain more significant and conclusive results, which would require a greater number of participants, as well as a higher investment in time and resources. If all these requirements were met, the oral deaf community might finally have the same options towards the learning of EFL than the hearing community.

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Links

Colegio Tres Olivos: <http://colegiotresolivos.org/>.

Clarke Schools for Hearing and Speech: <http://www.clarkeschools.org/about/welcome>.

Oral Deaf Education: <http://www.oraldeafed.org/>.

LD OnLine: <http://www.ldonline.org/>.

MedicineNet: <http://www.medicinenet.com/script/main/hp.asp>.