English as a Foreign Language for Deaf and Hard-of-Hearing Persons

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Challenges and Strategies

Edited by

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Cambridge
Scholars
Publishing

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This book first published 2016

Cambridge Scholars Publishing

Lady Stephenson Library, Newcastle upon Tyne, NE6 2PA, UK

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INTRODUCTION

When teachers or researchers of deaf and hard-of-hearing language learners come together, one of the issues often discussed involves their feelings of isolation and the need to come together more frequently to share ideas and experiences. This is what happened at the 12th Conference of the European Society for the Study of English (ESSE) in Kosice in 2014. The initiative of Ewa Domagała-Zyśk to have a separate section on hearing impaired learners of English within this huge international event received eager support from all contacted colleagues, whether they were in France, Norway or Serbia. The special seminar entitled *English as a Foreign Language for Students with Special Educational Needs – Exceptional English for Exceptional Learners?* and convened by Ewa Domagała-Zyśk and Edit H. Kontra was a great success, and the enthusiasm of the participants spawned the idea of publishing their presented topics as fully-fledged articles in an edited book and making it accessible to the wider community of teachers and researchers working in the field. When teachers tell their stories to others it soon becomes clear that the challenges faced are the same or very similar, and this in itself can give support. Sharing the responses to challenges and the worked-out solutions to the problems leads not only to adding a few new items to each teacher's individual resource pack, but the process of discussing issues with other professionals may also give rise to further ideas and new initiatives.

The feelings of isolation experienced by those involved in teaching foreign languages to hearing impaired language learners, and by those who embark on investigating this process come from the special circumstances of hearing impaired persons and their education. Deaf and severely hard-of-hearing persons are not only special needs learners; they have a special history, they are special linguistically, culturally and socially. They need to use foreign languages just like their hearing peers if they want to enjoy the same benefits of the technical advancements and globalization of our times, yet they cannot take part in the same foreign language (FL) education: the approaches, methods and materials developed are inadequate, and teachers trained to teach hearing learners are ill-equipped.

In the past few years, English has undoubtedly become the most frequently learnt and used foreign language in Europe, and not without

reason. According to data published in the 2012 Special Eurobarometer 386 (http://ec.europa.eu/public_opinion/archives/ebs/ebs_386_en.pdf), English is the most widely spoken foreign language in most of the member states. What is more, 67% of the people asked in the countries of EU27 consider English the most useful language for their development and career, and 79% think that their children should learn it. Three quarters of all Europeans maintain that improvement in foreign language skills should be a policy priority. It is also important to note that an overwhelming majority (68%) voted the school as the best place to learn a foreign language, as opposed to taking classes at a language school (15%), learning from a private tutor (9%) or undertaking a self-study education (12%). These figures give strong support to the argument that teaching foreign languages, especially English, to hearing impaired students at various educational institutions should receive much more attention than before so that deaf and hard-of-hearing children, adolescents and adults can enjoy the same benefits of foreign language skills as their hearing peers.

According to the website of the World Federation of the Deaf (www.wfdeaf.org), there are currently around 70 million deaf people in the world, many of whom have fought long and hard for equal opportunities in every sphere of life, including education. Responses to their needs have come from two fundamentally different directions. One tendency has been to close the gap between deaf and hearing learners by reducing the effects of hearing loss with the application of highly developed technical devices and through intensive training in speech, thus fostering the integration of hearing impaired people into the majority society.

In the past few decades, however, there has been a body of research promoting the cultural view of deafness, according to which Deaf people with a capital *D* constitute a linguistic and cultural minority whose native or first language is their national sign language: a fully legitimate, natural, visual-gestural language which has its own extensive vocabulary and complex grammar. As a result, today more and more states officially recognize the right for Deaf and severely hard-of-hearing students to receive a bilingual-bicultural education, which many believe also provides a better base for foreign language learning.

This edited volume includes studies influenced by both traditions. Instead of reconciling the differences or establishing a neutral mean, each author presents their research and methodological suggestions based on the views about deafness that they identify with.

In Chapter One of this volume, Nuzha Moritz (France) presents the issue of oral communication and intelligibility of deaf speech. The paper is based on empirical research aimed at explaining the low intelligibility of deaf speech in terms of acoustic and articulatory deviations. The research took the form of a case study of two participants and resulted in a thorough description of typical (segmental and supra-segmental) errors in their speech production. The results confirm that on the segmental level consonant errors like substitution, omission and devoicing are more harmful to intelligibility than vowel errors. Supra-segmental analysis revealed that inappropriate intonation contours and speech rates are the main causes of unintelligibility. The research results have practical implications for FL teachers: understanding the characteristics of the speech of deaf and hard-of-hearing (D/HH) students might be a fruitful starting point for facilitating the process of learning a foreign language by this group of students.

Chapter Two, prepared by Anna Podlewska (Poland), continues the theme of foreign language speech production and examines the unique potential of cued speech (CS) in the teaching of English as a foreign language (EFL). It presents the results of a case study of two prelingually deaf university students. They participated in a course designed to improve their spoken foreign language performance with the support of cued speech. Twelve speech samples of the participants, including oral readings, spontaneous speech and language elicited by the researcher were recorded and later assessed by native and non-native listener judges. The results show that both students demonstrated a statistically significant improvement in their ratings at the end of the course (after four years of using CS) in terms of content comprehension, pronunciation accuracy and word transcription. The results confirm that D/HH students who communicate orally in their national languages are capable of developing all language skills, including pronunciation and speaking. Moreover, simultaneous use of auditory and visual modalities contributed significantly to the increased FL speech intelligibility scores. The study calls for the integration of pronunciation practice in FL courses for D/HH students, which is highly profitable when performed along with the systematic use of CS.

Chapter Three covers the issue of using sign language in EFL classes for deaf pupils. The author, Patricia Pritchard, describes Norwegian experiences in this field. Norway is one of those countries in which Deaf students' rights for an education in sign language are fully respected. Moreover, similarly to their hearing peers, they have their own national curriculum in English, which leads to a national examination. The aim of

FL education is thus to achieve age-appropriate literacy and the ability of independent communication in a FL. Depending on the personal characteristics or the choice of the student, this communication may take the form of oral or written interaction, or communication in British Sign Language (BSL), Signed English or American Sign Language (ASL). The chapter presents the theory and methodology of EFL classes for deaf learners. It underlines the need for teachers to assess the students' actual educational needs and address them specifically, rather than purely following FL methodology. The author strongly supports the use of BSL as a highly motivating tool to develop communication and highlights the usefulness of Phonics Instruction for teaching English literacy skills.

Chapter Four partly continues the topic of using sign language for communication in FL classes for deaf students. Written by Joanna Falkowska from Poland, it describes her experience during one year of *action research* in a group of 25 deaf students. The author discusses various communication strategies and advocates the individualization of the class environment through adjustment to the particular communication needs of the given students. Thus, the FL class environment might be monolingual, bilingual or trilingual, and only then can it lead to high performances and satisfactory progress for each individual.

Chapter Five, prepared by Katalin Piniel, Edit H. Kontra and Kata Csizér introduces the issue of D/HH language learning from the perspective of the teachers. The study was conducted in Hungary and is based on class observations and individual interviews with 10 FL teachers in special needs schools. It reveals both the teachers' devotion and creativity, and the lack of appropriate methodology and teaching materials. Despite the overall positive attitudes of teachers towards the idea of teaching foreign languages to D/deaf students, the authors observed serious communication problems as Hungarian schools advocate mainly the auditive-verbal approach, and teachers without sign language skills have no means for barrier-free communication with their students. The chapter ends with a strong recommendation: in order to teach effectively, language teachers should complete training in special needs education (SEN) and learn Hungarian Sign Language (HSL) for better communication with their students. The authors also advise FL teachers in mainstream schools to learn from special school teachers' experiences as this may help them to be better prepared for teaching D/HH students in integrative settings.

Chapter Six comes from Serbia, where Iva Urdarević started pioneering work by both teaching and analyzing EFL classes for D/HH learners. Her study introduces the Serbian regulations concerning this

issue, which shows the international character of surdo-glottodidactics and its main problems: they are similar in different countries, meaning that there is a need for international cooperation. In the second part of the chapter the author shares her experience of using different teaching methods and strategies to make the teaching of English more effective, pointing out especially the significance of D/HH students' participation in international exchange programs. Such project-based learning is perceived as highly motivating and successful for the students.

Chapter Seven addresses the topic of deaf learners' reading skills development in English as a FL. The author, Jitka Sedláčková from the Czech Republic, first observes that reading in the deaf students' first language has been recognized as a challenge, and the problems are even more complicated in the process of foreign language acquisition. However, this should not discourage the teachers from promoting effective FL reading strategies. The chapter describes an example of a reading strategy instruction framework developed for the purpose of implementing a series of interventions in deaf university students' learning of English. The main features of the interventions are explicitness, the teacher's modelling of the strategies presented and the learners' repetitive, hands-on practice. The research adopted a qualitative approach with the analysis of multiple case studies. The author advocates the conscious use of such a reading strategy instruction practice and shows its beneficial outcomes for deaf students.

Chapter Eight depicts the issue of vocabulary teaching strategies in EFL classes for D/HH students. It was prepared by Ewa Domagała-Zyśk from Poland and is based on her several years of experience in teaching English to D/HH university students. In the years 2000-2014 she was teaching EFL to 40 D/HH students, introducing innovative strategies, communicative tools and techniques. The chapter presents first of all the D/HH students' difficulties in learning FL vocabulary and points to their chances of mastering a satisfactory repertoire of FL vocabulary, enabling them independent communication in this language during educational and everyday situations. The second part of the chapter is devoted to the presentation of a few teaching strategies: Vocabulary Personalization, Vocabulary Emotionalization, Word Semantic Analysis and Word Morphological Analysis, which proved to be effective and motivating for the students. The author argues that the most beneficial way to address surdo-glottodidactics is to augment and make accessible the existing FL teaching strategies by adjusting them to D/HH students' special needs.

Chapter Nine was prepared by Beata Gulati and deals with the topic of visualizing as an effective way to teach EFL. She observes that for most

D/HH students, whilst their sense of hearing is compromised, their sense of sight is enhanced. This fact calls for the extensive use of visual aids, and a wider utilization of the students' visual perceptions. In the chapter the author shares with the readers her experience of an EFL course for 15 D/HH students, and explores the ways of visualizing the teaching of reading, writing and speaking by using sign languages, pictures, video clips, films, posters, mind maps etc., so as to cater for D/HH students' special needs. Concluding the chapter, the author encourages teachers to get acquainted with the unique opportunities and challenges that are brought into the classroom by D/HH students, to keep a record of that knowledge, and to share it with others.

Chapter Ten is devoted to the concept of immersion in the language in EFL classes for D/HH students. It was written by Anna Nabiałek from Poland, who shares in it her personal experiences and reflections. The author perceives immersion in the language to be one of the most effective ways of teaching, also for D/HH students. The paper presents the unique experiences of a group of five Polish D/HH students who were invited to improve their English in one of the British universities. Describing the steps of this experience, the author points to the necessity of social support for the students at this stage of FL learning, when they start to communicate in the target language with native speakers. She also claims that this experience can be very rewarding, motivating and worth repeating.

Chapter Eleven is concerned with lesson content modifications and the adaptation of regular EFL material to the special needs of D/HH students. Monika Malec from Poland initially describes her innovative modifications of lesson content so as to adjust those lessons to the target groups at elementary, pre-intermediate and intermediate levels. Her methods include using technology to visualize content, modifying the pronunciation exercises, using different communication means and individualizing the content according to the learners' needs. The author concludes that taking into consideration the huge diversity of the D/HH population, a *one size fits all* solution does not exist. This demands first of all a careful assessment of the students' needs, and also creativity from the teachers themselves when modifying the learning materials so as to make them more user-friendly, motivating and effective.

It is our pleasure to invite you to read this unique book. We are sure that you can learn a lot from it about the methodology of teaching foreign languages to deaf and hard-of-hearing students, or at least update your knowledge in this field. You will find here the present-day strategies for developing both D/HH learners' receptive and productive skills as we

share our experiences of teaching, reading and perceiving a foreign language via the amplified sense of hearing or vision (by listening and/or seeing the language), and also good practices of evoking language production – whether in writing, speech or cued speech. The strategies are described in the context of learning English as a foreign language but we are sure they can be effectively included in classes of any other languages. We wish you great success in your future teaching experiences with deaf and hard-of-hearing students.

CHAPTER ONE

ORAL COMMUNICATION AND INTELLIGIBILITY IN DEAF SPEECH

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1 Introduction and background

The aims of this pilot study are twofold: first, to shed further light on the intelligibility of the oral speech of deaf and hard-of-hearing speakers and the impact it could have on learning English as a foreign language. Second, the study will investigate in what way the speech of deaf and hard-of-hearing people (from here on: deaf speech) could be an obstacle to the integration of hearing impaired students in higher education. We believe that a better understanding of deaf speech in the academic sphere could be an encouraging aspect in the process of students' integration into higher education.

Communicating and socializing with people in everyday life is essential. This is also the case in a classroom where different activities, interactions and collaborations in pair or group work take place and lead to successful learning outcomes. Unfortunately this is not the case for deaf learners who face a wide variety of difficulties in the classroom, as described by Stinson and Antia (1999, cited in Herman & Morgan, 2011):

> They include: fast rate of discussion; rapid turn-taking; frequent changes of topic; inclusion of many speakers in discussions; and instances where several students speak concurrently leading to unmanageable levels of noise. Overcoming these barriers requires skilled and sensitive management (p. 108).

At university level in France, mainstream teachers' lack of awareness concerning deaf and hard-of-hearing learners is obvious, especially in teaching foreign languages. Managing a language classroom with hearing

and hearing impaired students is a real challenge. Misunderstanding and ineffectiveness of deaf and hard-of-hearing messages lead to communication failure and discouragement on both sides (Most, 2010). One of the major issues besides poor vocabulary and syntax is pronunciation. Deaf and hard-of-hearing students' production is judged as unintelligible because of the numerous errors produced on segmental and supra-segmental levels. Some examples include omissions, reductions, consonant devoicing, a high-pitch and so on. But other factors such as social integration, the impact on interpersonal functioning or others' perceptions might also come into play when communicating with hearing peers in class or in everyday situations (Most, 2010). This is also the case in academic contexts such as colleges or universities. This pilot investigation examines deviations in deaf and hard-of-hearing speakers' speech production and its perception in the context of learning English as a foreign language. The study will mainly focus on segmental errors within a phonetic and phonological analysis. Since from the point of view of the investigation no sharp distinction can be drawn between those who are deaf and hard-of-hearing, from here on the word *deaf* is going to be used as an overarching term.

2 Context

This qualitative pilot study is incorporated within the framework of a future project at the University of Strasbourg, entitled *Phonological Assessment of Deaf Students' Production* (PADSP). Disabled students (i.e. those who are deaf, blind or use a wheelchair) who enrol at the University of Strasbourg commonly drop out after one year of study. We admit that the number of hearing impaired students is very limited in the first place, being only two or three each year; most of them attend a special educational program for people with hearing loss. Unfortunately none of them has reached graduation so far. There are no adapted structures for deaf students at the University, as opposed to blind students who receive the benefit of some special aids, for example documents written in Braille, extra time during assessments and sometimes special assessment sessions. They also have tutors to guide them around and take notes for them. Regrettably, deaf students do not have any kind of assistance. They do manage with handouts and documents online, but face serious difficulties when it comes to oral communication. The first step of the PADSP project is to investigate and describe deaf students' oral production so as to understand their speech characteristics. Understanding deaf speech could help teachers to understand their students' oral communication better so

they could adapt their class activities in a way that would allow deaf students to take an active part in class. The analysis of the reception and perception of deaf speech is based on two levels: phonetic, that is to say the articulatory aspect of speech, and a phonological one, which concerns the contrast of meaning. Its objective is to describe deaf students' production of English as a foreign language and to establish the type of errors that prevent their speech from being understood. Deviations or errors are classified according to segmental and supra-segmental categories. The phonetic test used in the project consisted of the reading of a set of sentences by deaf students. More details about the method and the analysis are given in section 4. We believe that the proper description of oral deaf speech can raise teachers' awareness, which is considered an essential step to improve the integration of deaf students at university in general and to help them move onward toward a more interactive goal.

3 Oral communication and intelligibility

In oral communication speaking and listening skills are needed to have a conversation, and to exchange thoughts and information with an interlocutor. In most cases the speaker and the listener share the same language and culture, which allows them to understand each other's intentions and the implicit aspects of their conversation. This process, however, is impeded in the case of *communication disorders*. A communication disorder is defined by the American Speech-Language-Hearing Association (1993) as:

> An impairment in the ability to receive, send, process, and comprehend concepts or verbal, nonverbal and graphic symbol systems. A communication disorder may be evident in the processes of hearing, language, and/or speech.

This disorder could affect different aspects of speech communication and thus make it unintelligible. But what do we mean by speech intelligibility? Carney (1986) defines the term speech intelligibility as an "oral speech-language output that allows a listener to understand what a speaker is saying" (p. 47). In interactions involving hearing people and people with special needs, such as deaf children or young adults, an ongoing conversation may be interrupted due to misunderstanding or a complete lack of understanding, which leads most of the time to speech intelligibility issues. This chapter considers one of the main issues concerning a speech deficit in oral communication: intelligibility. In oral communication between hearing and deaf individuals, various factors

affect the success of the oral exchange due to certain features of deaf people's speech. These common features have been identified by many scholars and classified in different categories: segmental and supra-segmental features, and voice quality. According to Ertemer (2010), intelligibility of severe to profound deaf speakers' speech is on average only about 20%. As pointed out by Povel (1974), this low score can be explained by the fact that in the absence of the norms a hearing child is trying to imitate during the process of speech acquisition in terms of the production and perception of sounds, deaf children have no norms with which to match their own acoustic production. As a result, acquiring verbal communication skills is a challenge of great difficulty. Fletcher, Dagenais, & Critz-Crosby (1991) confirm that perception precedes production; consequently sounds which are hard to hear are also difficult to produce. In his study, Povel, (1974) explains that production and auditory norms should be explicitly described to deaf children through tactile, kinaesthetic and visual feedback. However, the outcome of this shift in modality leads to confusion between sounds, and typical errors are produced by deaf speakers. These errors are deemed to have a negative effect on intelligibility, thus hearing people have considerable difficulty in communicating with deaf people in everyday life situations. Deaf people have problems in making themselves understood, but they also face comprehension difficulties of their own. For example in the case of learning a foreign language, understanding problems seem to be severe due to several factors such as the unknown vocabulary, difficulty of pronunciation, oral comprehension issues, and so on. When deaf learners attend mixed language classes with hearing peers for instance, they cannot handle the normal speech rate in a foreign language, so it is hard for them to take part in ongoing debates in a foreign language where several students speak concurrently in a rather noisy atmosphere. Their lower level of knowledge and lower functional communicative skills in English as a foreign language represent serious obstacles. Another difficulty is the fact that deaf speech is often not understood by hearing students, and unfortunately therefore the oral activity that deaf students have with their hearing peers most of the time comes to an end before it is completed.

4 Method

Deaf speech is described in the literature as incomprehensible due to some segmental and supra-segmental characteristics. Deaf speakers' errors are deemed to jeopardize comprehensibility and have negative consequences on intelligibility in ordinary communication contexts and

particularly within the framework of a foreign language. To evaluate the intelligibility of deaf students' speech production in English as a foreign language on a phonetic and phonological level, a qualitative study was conducted involving deaf university students who were enrolled at the Applied Modern Language Department. In order to understand the deviant segmental and supra-segmental features in deaf students' productions, perception and production tests were carried out involving two deaf students and three inexperienced listeners. This qualitative study aimed to give an account of the main segmental and supra-segmental issues of deaf students learning English at university level. In this respect, it is to be noted that despite the fact that the two participating students could communicate orally, they mainly used sign language for communication.

4.1 Participants

Due to the limited number of hearing impaired students at our university only two students took part in this research project. Both of them were French native speakers enrolled in the first year and majoring in English as a foreign language. One was 19 years old and the other 20. They had been learning English as a foreign language for seven years at school. Up to this point in the study their hearing loss or pure-tone averages had not been measured, as they were enrolled at the university/department of Applied Modern Language as disabled students with significant hearing loss. Three listeners were asked to evaluate the intelligibility of their sentences: two of them were non-native English teachers at the University of Strasbourg and the third was a non-native Master's degree student majoring in English. The research team chose them because they were all considered as inexperienced or naïve listeners, that is to say listeners who were not familiar with deaf speech.

4.2 Recording procedures

The two students were asked to read the following set of ten sentences with declarative or interrogative intonation twice. A printed index card of the sentences was made available to the participants:

1. My mother had a fur coat.
2. There was nothing to say but thanks.
3. She guarded the child from danger.
4. The rail track is overgrown?
5. She loved that dress?
6. Three blind mice see how they run.

7. This street is crowded
8. She gave a prize for the best one?
9. He never gave it another thought?
10. She put the car in the garage?

The sentences were taken from a study by Corrigan (2010), and this choice was motivated by the fact that they were designed to incorporate Wells' (1982, cited in Corrigan, 2010, p. 22) English *lexical set*. It includes all the vowels, consonants and diphthongs of the English language. Corrigan (2010) gives a clear description of this lexical set:

> It aimed to establish patterns of regional variation in the phonologies of English dialects globally and has come to be viewed as a standard model (…) His strategy was to devise a collection of headwords/keywords that would potentially discriminate between varieties without the need for the concomitant complexities of IPA (International Phonetic Alphabet) (p. 30).

Before the recording session, the two participants were given clear instructions and explanations on the goal of the experiment and how the recording test in a sound-treated booth would proceed. The participants' productions were first recorded individually on an audio-tape and then evaluated by the three listeners. The panel of listeners were allowed to listen to the recordings as many times as they wished, and were asked to write down the sentences and rate their intelligibility as: intelligible, quite intelligible, poor or very poor. They were also asked to underline the words or parts of words (syllables, vowels, diphthongs or consonants) which they considered unintelligible and thought may be liable to hinder the understanding of the sentences. Based on their subjective impressions, the listeners were also asked to rate the adequacy of intonation patterns for each sentence by simply stating if it corresponded to a statement or to a question. This judgement was used for supra-segmental analysis and provided valuable information on the intonation contours of the students' production. According to the simple definition given in the online version of the Collins English Dictionary, *intonation pattern* or *intonation contour* refers to "a characteristic series of musical pitch levels that serves to distinguish between questions, statements, and other types of utterance in a language." The sentences deaf students were asked to read for the test had simple intonation patterns, either declarative with a falling intonation contour or interrogative with final rising contours. In their judgement the listeners had to rely on pitch-movement variations. A member of the research team made a phonetic transcription of the audio-tape using Wells' 'lexical set' symbols and some additional diacritics to transcribe

unintelligible sounds. Vowels and consonants which were judged unintelligible by the panel were analyzed acoustically and compared to reference values using Praat (Dutch word for "talk" or "speak") software, a free scientific computer software package for the analysis of speech designed and continuously developed by Paul Boersma and David Weenink of the University of Amsterdam (Boersma & Weenink, 2011).

5 Acoustic analyses

Acoustic analyses yield precious information on speech properties and qualities. They show deviations from reference values which are associated with reduced intelligibility (Monsen, 1978). In this research, we probed into the impact of deaf students' errors on oral communication by measuring some acoustic characteristics. This allowed us to gain insight into how deaf students articulated some sounds in English and what impact this pronunciation had on intelligibility. We selected some acoustic measurements which had been used previously in studying the speech of deaf children (Goldhor, 1995; Monsen, 1974, 1976b, 1976c) and compared our results with reference values. The analysis also aided the clarification of a number of acoustic attributes which we think characterize deaf speech, and which largely contributed to the incomprehensibility of the two deaf participants' productions.

5.1 Segmental analyses

Segmental analyses in general include different measurements of speech for vowels and consonants and depend on what the objective of the research is. Vowel analyses in the present study mainly involve vowel duration, which is measured in milliseconds, and *vowel formant* analysis, measured in Hertz. Vowel formants are the resonant frequencies of our vocal tract when we pronounce a vowel. We perceive a vowel and its quality according to its formant values F1 and F2, which are represented by dark bands of frequencies or energy peaks in the spectrum of the sound. Precise vowel formant values can be obtained using the Praat software.

Relative vowel duration helps to distinguish between long and short vowels and provides an evaluation of speech rates. Since speech rate influences the perception and understanding of oral speech (Monsen, 1974) the present research study has looked for elements that could shed light on deaf speech rates. Vowel, word and sentence duration were measured in the two deaf students' production. Vowel quality was also measured by analyzing the first and second formants. The Acoustical

Society of America (1994) defines formants as "a range of frequencies in which there is an absolute or relative maximum in the sound spectrum." Relations between formant frequencies, first, second and third formants (termed F1, F2 and F3) were examined in the deaf students' productions since different scholars have demonstrated that formants are the principle cue for the perception of vowel quality. Formant measurements give valuable information about the vocal tract movements like tongue movements, to what extent the tongue could stretch forwards or backwards for example, and to which height it is raised. The F2 axis represents front-back movement of the tongue, whereas F1 refers to the degree of tongue and jaw height variation. Vowel formant analysis gives valuable information on vowel realization and may reflect the capacity of a deaf speaker to control his tongue movements (Monsen, 1976b). The study also inspected the vowel neutralization phenomenon since it is strongly linked to tongue movements. The phonological space for vowels, that is to say the minimum and the maximum values of F1 and F2, are particularly reduced in a case of the vowel neutralization phenomenon and this may affect intelligibility. Many scholars, among others Levitt & Smith (1972), Monsen (1976b), and Smith (1975) proved that neutralization is considered to be one of the most important errors in hearing impaired speech. We believe that vowel neutralization plays a significant role in vowel perception, acoustic input and intelligibility.

The performed segmental analysis also included consonant investigations. English consonant description is generally based on three features: voicing, place of articulation and manner of articulation. For example the difference between a /v/ and a /p/ sound is that /v/ is described as a voiced, labiodental, fricative consonant whereas /p/ is a voiceless, bilabial, plosive consonant. Thus our deaf participants' consonant productions were examined for any distortions in the intrinsic characteristics of the three features: voicing, manner and place of articulation.

5.2 Supra-segmental analyses

At this stage of the research, supra-segmental analyses were limited to pitch movements and speech rate analyses. The study has not yet included word or sentence stress analysis. According to Levitt, Smith, & Stromberg (1976), intonation contours in deaf and hard-of-hearing speech are monotonic pitch contours. This is because due to the obvious lack of the speakers' ability to control their vocal folds, their pitch variations are often limited and the outcome of restricted pitch variations is monotonous and unnatural speech. These restricted pitch variations are most of the time

associated with high pitch (Calvert, 1961; Smith, 1975). High pitch use by deaf speakers is likely due to the fact that they use further vocal efforts when speaking, which gives them an awareness of the onset of the voicing process (Willemain & Lee, 1971).

Perception of intonation is strongly linked to temporal structure, that is, phoneme, syllable, word and sentence duration. Up to now, we have concentrated the analysis of speech rate on word and sentence duration as well as listeners' evaluations of intonation patterns. This allows us to identify the degree of deviation in the temporal domain and to what extent this deviation influences oral comprehension and intelligibility.

6 Results and discussion

Students' productions were rated by two scorers as poor for one student and very poor for the other one. The third scorer on the panel considered both productions to be very poor and difficult to understand. Hereafter the results for both students will be discussed together.

Regarding the segmental errors, the results show that the words and parts of words which were underlined by the three listeners and deemed to be unintelligible were related to confusion and mispronunciation of several consonant and vowel sounds. The most striking aspect was the consonant substitutions: voiced plosives like /b/, /d/, /g/ were replaced by their voiceless cognates /p/, /t/, /k/. For example in sentence number 3; "She guarded the child from danger," the consonants /g/ and /d/ were devoiced and pronounced /k/ and /t/ instead. The same substitution was found in sentence 4; "The rail track is overgrown," where /g/ became /k/. Voiced fricatives /ð/, /v/, /z/ were replaced by voiceless /Ө/, /f/, /s/. In sentence 6; "Three blind mice see how they run", the /ð/ consonant was substituted for the voiceless /Ө/ in *they*. Examples in sentences 8 and 9; "He never gave it another thought" and "She gave a prize for the best one" confirmed this tendency and illustrated the substitution of /v/ and /z/ for voiceless consonants /f/ and /s/ as well as a devoicing of /ð/ in *another* and *the*, and of */b/* in *best*. The same sentence sometimes included more than one consonant substitution; in sentence 5; "She loved that dress," for example, there were several consonant substitutions, and voiced fricatives and plosives were devoiced; for example the /v/ consonant in the word *loved* and /ð/ in the word *that,* which became /f/ and /Ө/ respectively. The /d/ in both *loved* and *dress* became a /t/ consonant. So instead of hearing /ˈʃiː lʌvd ðæt dres/ the listeners heard /ˈʃiː lʌft Өæt tres/. Consonant substitution is probably due to temporal distortion, as explained by Monsen (1976c, 1978); voiceless consonants are produced for a longer duration than their

voiced counterparts, which makes them easier for deaf learners to pronounce. We believe that consonant substitution in deaf speech could simply be the consequence of the participants not hearing their own voices properly.

Compound consonant omission was also found in both of our deaf students' productions. In sentence 7; "This <u>street</u> is too crowded", for instance, /str/ in the word *street* became /st/ for one speaker and was pronounced separately as /s t r/ by the other one. Compound consonant omission may be misleading either because the word is pronounced differently, as in the example *steet* instead of *street* by dropping the */r/* consonant, or because word consonants are produced separately, most of the time at a slow speech rate, which affects intelligibility.

A large amount of nasalization can be noticed in the participants' production, but this aspect seemed to have a lower impact on intelligibility as no listener mentioned this feature. A different type of consonant substitution linked to the manner of articulation occurred when the nasal consonant /m/ was surprisingly pronounced as a /p/ by one of the deaf students (in sentence 1).

Concerning vowels, values of formants F1 and F2 showed clear limitations of both the horizontal and vertical degree of tongue movements. If represented in a vowel diagram, the stretch of the tongue movements would be rather centred in the middle of the vocal tract. This limitation implies insufficient variation especially at F2, and leads to the vowel neutralization phenomenon. In vowel neutralization the tongue does not reach the front and the back areas in the vocal tract as it should when pronounced by a hearing speaker, consequently the pronunciation of some front vowels like the long /i:/ in the word *street* in sentence 7, and /e/ in the word *best* in sentence 8 were neutralized by both speakers. We observed the same phenomenon in sentences 2 and 8. Back vowels /ɔ:/ and /ɒ/ in *for* and *was* were substituted by the central vowel /ə/. Levitt & Smith (1972), Monsen (1976a) and Monsen & Shaughnessy (1978) proved that F2 variation is more significant for intelligibility than F1 variation, as F1 variation is both visually and auditorily more accessible to deaf speakers. According to the ratings of the three listeners, vowel neutralization was found to be a very confusing aspect for intelligibility.

Finally, concerning segmental errors, two diphthongs were found to be monophthongized: in sentence 6 the diphthong /ai/ in *blind,* and in sentence 7 /aʊ/ in *crowded*.

Regarding supra-segmental investigation, as mentioned in the recording procedure section above, the evaluation was based on the three listeners' subjective impressions and involved speech rate and intonation

patterns. This choice was motivated by the fact that, contrary to segmental errors, supra-segmental errors are very complex to evaluate. Regarding speech rate, the listeners judged the two participants' production as slow and containing too many pauses between words and even within words, giving their speech almost a 'staccato' character (Gold, 1980). Measurements confirmed this judgement; the participants' sentences had a longer duration than the reference sentences. Although the test sentences were very short, pauses were numerous, and as a consequence, word and sentence duration were stretched giving the sentence an odd rhythm that strongly affected intelligibility. Prosodic deviation observed in deaf speech intonation contours included inappropriate variations of pitch and loudness. They were described by the three listeners as inadequate most of the time, or unnatural as they did not always reflect the expected meaning of the sentence. The recurring expressions the three listeners used to describe the two deaf students' intonation contours were either 'monotonous contours' or 'representing excessive pitch variations'.

Pitch analysis of the two students' intonation contours using Praat confirmed the listeners' evaluation. Pitch lines did not show significant variations, very shallow rises and falls were noticed and almost no peaks appeared on pitch movements. Interrogative sentences showed only a slight rise at the end of the utterance. These preliminary results show that deaf students' production could constitute a serious obstacle in oral communication intelligibility due to both segmental and supra-segmental aspects. One can surely understand how difficult it is for both deaf students and their hearing peers to communicate in English in class or in any other academic situation.

7 Conclusion

The preliminary results of this pilot study clearly exposed the unintelligibility of deaf learners' speech. The question of intelligibility in oral communication was approached from two different aspects: segmental and supra-segmental. Acoustic analysis of a production and perception test led to the following observations: segmental errors, such as consonant substitution, omission and devoicing seem to play a great part in deaf speech intelligibility. Vowel errors were mainly due to the presence of the neutralization phenomenon, in which deaf tongue movements are found to be limited in the vocal tract, preventing deaf speakers from fully pronouncing the different vowels and diphthongs, hence reducing intelligibility. Another segmental issue in deaf speech is the poor quality of vowel production which plays a great role in the unintelligibility of deaf

speech. Supra-segmental deviations of intonation contours and speech rate are also viewed as significant in speech intelligibility. Intonation contours were judged to be monotonous and lacking variations, whilst the speech rate was described as being slow, but having a lesser overall impact on intelligibility. If results suggest that deaf speakers experience difficulties with some segmental and supra-segmental features of English as a foreign language, adapted solutions must be found to help hearing impaired learners and their hearing teachers to understand each other and facilitate deaf integration in foreign language classes. We believe that a first step to helping English teachers understand deaf speech is an advanced knowledge of the segmental and supra-segmental characteristics of deaf speech. This could be achieved with the help of specialist educators and phoneticians. We are aware of the fact that comprehending these characteristics will not be a satisfying response to deaf speech unintelligibility, but it could be a good starting point. Finding more relevant solutions will be the second step of the project, as we still require more data and the help of educators and specialists in the field. These preliminary results cannot be generalized as the number of participants was limited, and we need to gather more information about the participants' degree of hearing loss or their pure-tone, their social status and educational background.

We are aware of the fact that this pilot study is only the first step in the project but we do believe that more research should investigate deaf learners' difficulties and needs in learning oral communication in a foreign language, including speech production and comprehension, (Kontra, Csizér, & Piniel, 2014). Deaf students' opinions about learning English as a foreign language and the difficulties they meet could shed more light on the issue and help us to improve their learning conditions.

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CHAPTER TWO

THE USE OF CUED SPEECH TO SUPPORT
THE DEVELOPMENT OF VERBAL LANGUAGE
SKILLS IN ENGLISH LANGUAGE INSTRUCTION
FOR DEAF AND HARD-OF-HEARING STUDENTS

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1 Introduction

Speech perception and production are both learned skills that are expected to change over time. As newborn infants all hearing individuals have the same potential for producing the sounds of all of the world's languages, however, as the system of sounds is formed on the basis of language experience, babies gradually stop paying attention to those sounds or aspects of sounds that are not frequent or have no contrastive function in the language(s) spoken around them. Kuhl (1991), for example, suggests that exposure to native speech sounds changes the way perceptual dimensions are partitioned and that perceptual sharpening that occurs during development may reflect this reorganization. Although the ability to perceive and articulate the sounds of a new language/new languages fades away, it is not completely lost even in late adulthood. That is to say, noticing, processing, and articulating contrasts other than those present in the native language(s) spoken by hearing adult learners becomes more difficult, but not impossible.

Any degree of hearing loss can prove a serious obstacle to speech development and effective verbal communication in both national and foreign languages. This obstacle, however, does not have to be insurmountable. The spread of universal hearing screening and early intervention programs, advances in technological devices which supplement the impoverished acoustic signal or offer alternatives to it,

advances in teaching and learning approaches and methods as well as improved knowledge of the role of hearing in language learning have all contributed to the development of near-normal speech skills among the hearing impaired in their national languages.

The information currently available about the speech skills development of deaf or hard-of-hearing (henceforth D/HH) foreign language learners is scarce and is mostly based on English as a foreign language (EFL) classroom-in-action reports (cf. Gulati, 2013; Nabiałek, 2013; Ochse, 2001; Podlewska, 2013) and pilot studies (cf. Domagała-Zyśk & Podlewska, 2012), with the exception of research into the correlation between speech production skills in national and foreign languages among Polish students with hearing loss conducted by Domagała-Zyśk (2013). The present investigation is based on the premise that D/HH EFL learners who managed to develop near-normal speech skills in their national language both receptively and expressively want to and, if properly guided and given visual access to the EFL curriculum via cued speech (CS), are capable of achieving highly intelligible speech in the target language. The research presented in the following pages seeks to verify this hypothesis.

2 Fundamental principles of cued speech

Cued speech was devised and developed in 1966 by R. Orin Cornett, Ph.D. while he was the vice-president of long range planning (from 1965 to 1975) at Gallaudet College (now University), Washington, D.C. Early in his tenure Dr. Cornett learnt that deaf students struggled with the written form of English. He became convinced that limited access to the phonology of a spoken language inhibited the development of literacy within that language. Therefore, his chief preoccupation was to provide deaf students with information about the phonological structure of English through the visual channel (Cornett, 1967; Cornett & Daisey, 2001). Cornett worked on the assumption that the linguistic development of deaf children would be similar to that of hearing children if the former could clearly perceive every sound-based unit of language as it is spoken. Accurate perception of the natural speech patterns of hearing people would enable deaf receivers to acquire an understanding of spoken language through the eyes instead of through the ears. After he had studied fingerspelling and the Dutch Mouth/Hand system, Cornett devised what he called cued speech. His creation was to become a mode of communication which uses manually supplemented visual information seen on the lips in the same way as spoken languages use acoustic information. In other