

# The *Audio Language* Project

*Improvement of Auditory*

*Comprehension and Oral*

*Expression of a Foreign Language*

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## 1. INTRODUCTION

The goal of this article is to describe the *Audio Language* Project, an important experimental study in the context of the *Language Program* financed by the European Community. A later study will examine the scientific and theoretical bases of the experiment.<sup>1</sup>

The 2<sup>nd</sup> chapter (*The Project*) will present the goals and the setup of the project. The 3<sup>rd</sup> chapter (*Acoustic Perception Training with SPT*) will treat the practical and organizational aspects of the training process. The 4<sup>th</sup> chapter (*Setup of the Experiment*) will present the features of the participants and the organization of *Audio Language*. The 5<sup>th</sup> chapter (*Phonetic Exercises*) will present the acoustic material used in the phonetic exercises of the experiment. Chapter 6 (*Evaluation*) will give the criteria used in the evaluation of the results and the linguistic potential of the participants; it will also describe the setup of the tests and the procedure of evaluation. Chapter 7 (*Test Interpretation*) will present the test data. Chapter 8 will offer a conclusion. Chapter 10 contains the numeric tables used in the text.

### 1.1. The *Language Program*

*The Council of Ministers of the European Community established the Language Program on July 28, 1989 to promote language competencies in the member states. The Program most important goal is to assist the member states in the qualitative and quantitative improvement of foreign language teaching by giving support to exchange programs and innovative projects in the primary and continuing education of language teachers, in language training in the context of professional education, and in higher education, and in order to emphasize language training in the professional world.*<sup>2</sup>

The *Language Program* sets up subventions by the Community in five distinct domains of application called *Actions*. The *Audio Language* project falls into the fifth Action category called VB *Supplementary Steps: diversification of measures in foreign language teaching by creating and exchanging didactic material*. The VB Action takes as its goal to *promote the diversification of foreign language teaching in the context of the least spoken and taught languages of the Community. The Commission will allocate support for the creation of teaching and study material of these languages as foreign languages. The dispositions, given in the Action V, have as their goal to establish teaching material for a general usage.*<sup>3</sup>

While the *Audio Language* project was presented, the *Bureau De Langue – Task Force Human Resources, Brussels, managed the Language Program*. It is now managed by the *Bureau d'assistance technique Socrates*.

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<sup>1</sup> Kautzer, Ulrike A, forthcoming.

<sup>2</sup> Treated in the "Participant's Guide" published by the *Bureau de Langue, Bruxelles*, Task Force Human Resources.

<sup>3</sup> See note 2.

## 1.2. The Tomatis Method

Alfred A. Tomatis is a French ear, nose and throat specialist who studied, outside of the academic context, the mechanisms of acoustic perception. He develops at the end of the nineteen-fifties a method based on a technical instrument (called by Tomatis *The Electronic Ear*), which is designed to stimulate the capacity to perceive sounds. The enhancement of the perceptive capacity permits, among other things, to improve comprehension, expression and pronunciation of a foreign language, which leads to facilitate the learning of that language. Tomatis' work, which is mainly written for the wider public and without the support of statistic material, has encountered many objections from the side of scientists and specialists; he is thus rarely referred to in scientific literature. Tomatis has nevertheless become remarkably successful in the pedagogical and therapeutically domain. Lead by this fact, the University of Bologna (Department of Modern Languages for Interpreters and Translators - SSLIMIT) asked the European Community to finance the *Audio Language* project in order to test the Tomatis Method in the context of the *Language Program*.

## 2. THE PROJECT

### 2.1. The *Audio Language* Project

The project called *Audio Language – Acceleration and Improvement, with technical means, of the comprehension and oral expression in the second language acquisition* is part of the *Language Program*, Action VB. The project started in 1993 with the reference number 92-09/0775/I-VB, continued in 1994 with the number 93-09/1289/I-VB and finished in 1995 with the number 94-09/1768/I-VB.

Several universities besides the University of Bologna participated:

1. Bureau de Langue, Brussels, Belgium (called Bureau d'assistance technique Socrates since 1995)
2. Diapason srl. Milan
3. Katholieke Vlaamse Hogeschool, Antwerpen, Belgium
4. Gerhard-Mercator-Universität Duisburg, Germany
5. Universite La Sapienza, Rome, Italy

Successively the following institution entered the project:

1. Universite Cattolica del Sacro Cuore di Milano, Italy
2. Universita de Saragozza, Spain
3. CITO (National Institute for Educational Measurement), Arnheim, Netherlands

The academic institutions were in charge of the local organization, the preparation and the administration of the language tests, as well as the setup of the didactic material for the improvement of the pronunciation of the foreign language:

1. For German: University of Bologna, SSLIMIT
2. For Italian: Universita La Sapienza / University of Bologna, SSLIMIT
3. For Dutch: Katholieke Vlaamse Hogeschool / Gerhard-Mercator-Universität Duisburg
4. For Spanish: Universita de Saragozza

Two non-academic institutions contributed to the project:

- Diapason, because of its knowledge in systems of acoustic perception training and in particular with the Tomatis Method;
- CITO for the treatment of test data.

The mentioned universities tested groups of students in initial and final tests in order to verify the functioning of the Tomatis method.

## 2.2. Goal of the Project

The goals of the project, approved by the *Bureau de Langue*, are:

1. To evaluate the efficiency of the Tomatis method in the improvement of comprehension and expression (pronunciation – intonation) of a foreign language. This implies to verify if such a method, which is, till now almost exclusively used in private language instruction can be used under standardized conditions for groups.<sup>4</sup>
2. To develop the didactic material for the improvement of the pronunciation and the L2 (second language). The languages treated in this project are German, Italian, Dutch and Spanish.<sup>5</sup>

The project implied to work in five different universities with three test groups:

1. The SPT Group<sup>6</sup>: worked with the Tomatis method and the pronunciation material designed for the project and without teachers.
2. The Control Group: worked in an ordinary language laboratory with the pronunciation material designed for the project and with a teacher.
3. The Zero Group: worked without any specific exercises, taking traditional language lessons in the foreign language to be learned.

The effects of the acoustic perception training with the participation of Diapason were obtained with the acoustic material that was developed for German, but they are generalizable, not only for the other languages of the project but for any L2 no matter what the L1 is.

The same tests were used in all the universities, which participated in the *Audio Language* project: the participants show considerable differences. The result is that for the same period of time, the SPT Group reached a level of competence<sup>7</sup>, which is significantly higher than with the other groups.

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<sup>4</sup> The *Institut Magistrale d'Etat "Le Stefani" de Mestre* (VE), Via del Miglio 30, set up in 1991/82 and 1993/94 a test of the use of the Tomatis method for language integration with four classes of students. See the report by Anna Manao given at the IRRSAEV Conference – “Languages, Technologies, Experiments” in Castelfranco Veneto in March 1994, also published in the description of the experimental activities of the *Stefanini Institut*.

<sup>5</sup> Since the goal of the *Bureau de Langue* was to examine the possibility to improve the teaching of minor languages, it was asked to exclude French and English from the project. German, a major language, was an exception due to the fact that it is the researcher's native language.

<sup>6</sup> SPT abbreviate *Sound Perception Trainer*: The process will be described later in more detail.

<sup>7</sup> For the definition of competence, see chapter 7.

### 3. ACOUSTIC PERCEPTION TRAINING WITH SPT

#### 3.1. The Acoustic Perception Equipment

The acoustic perception training designed by Tomatis allows the ear to develop its function as an organ which is able to receive sound and transfer it unchanged to higher functions which allow the ear in turn to listen to rapidly changing information and give meaning to it. The training under the SPT (see note 7) stimulates the innate capacity of perception by increasing the quantity of perceived information: this allows to hear frequencies, which remain normally unperceived, and to reproduce correctly the perceived sounds. These improvements are visible in the everyday language practice, in tests by language instructors and possibly by regular testing.<sup>8</sup>

The proposed method is not based on the grammar, syntax or lexicon of a specific language: it is in fact based on the acoustic aspect of a language (rhythm, melody, intonation, and sound). The acoustic perception training can thus be integrated in any language instruction, no matter what the methodology is. It has to be noted that the training allows coming close to establish coincidence between the phonological reality of the student and the phonetic reality of the language.

Diapason uses equipment based on the original research by Alfred Tomatis:

The *Electronic Ear* here called SPT (*Sound Perception Trainer*). The SPT can be used either by a signal person or by homogenous groups. The parameters used in order to stimulate in a controlled manner the auditory system both on the level of the cochlea (sound selection) and on the level of the vestibule (motor control)<sup>9</sup> are the following:

- *Filters*: Programmable filters select high pitch sounds that train the student's sensibility to higher vocal frequencies and improving the perception the superior harmonics of sounds.<sup>10</sup>
  - *Transmissions of sound through two channels*: For the sound transmission to the student two channels are used (this does not mean that one channel is used for the right ear and another for the left ear; through the two channels, the sound is constantly, although not

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<sup>8</sup> Diapason and other institution, which apply the results of Tomatis', research use to a large extent listening tests, as described in chapter 6.2.

<sup>9</sup> The ear is anatomically divided into the outer ear, the middle ear and the inner ear. The outer ear extends from the pavilion to the eardrum, a fine membrane of 10 by 8 mm. The middle ear contains a chain of small bones: the hammer, the anvil and the stapes. This chain is fixed in a bone cavity between the eardrum and the oval window of the inner ear. Two small muscles are linked to the hammer and the anvil res.; this chain of bones controlled by muscles links the eardrum to the inner ear. The inner ear is also called labyrinth and contains two parts: the vestibule, which controls equilibrium, and the cochlea, which transforms the received vibrations into acoustic signals.

<sup>10</sup> A sound, which is not sinusoidal, is called complex: it can be periodical or a-periodical. A complex sound can be understood as the algebraic sum of several sinusoidal sounds (Fourier series and integral) according to their frequency and intensity...If the complex sound is periodical it can be decomposed into a certain number of sinusoidal signals whose frequencies are complete multiples of a frequency called fundamental frequency. In this case, the composing signals are called harmonics...For a musical signal, the distribution of different harmonics and their evolution (in pitch and intensity) in a given time determinate the timbre of the instrument which produces the signal. Ferrere et al. *Nozioni di fonetica acustica*. Torino: Ed Omega, 1979. 20-22.

Synchronously, modified on both sides). The sound structure of channel 1 (C1) enforces the lower frequencies

While toning down the higher frequencies. The contrary happens in channel 2 (C2). The passage from C1 to C2 and vice versa in a completely unpredictable manner stimulates constantly the ear and forces it to adapt to sound that are not familiar to it, due to either a loss of familiarity or to the fact of never having been exposed to them (see figure 1).

- *Output Intensity Differentiation:* The headphones of the SPT are equipped with an additional bone conductor, which is placed on the top of the skull in order to intensify the sound perception by emphasizing the direct transmission to the inner ear via bone conduction. The volume is different for all three outputs: left ear air conduction, right ear air conduction, bone conduction. The goal of this differentiation is to stimulate the correct perception and the correct control of sound through the left and the right ear,<sup>11</sup>
- *Transmission of asynchronous sound:* The sounds modified by the SPT reach the three outputs at different moments in time. The student receives thus the sounds at different stages, the goal of this being to intensify the effects of the sound treatment through the two channels C1 and C2.

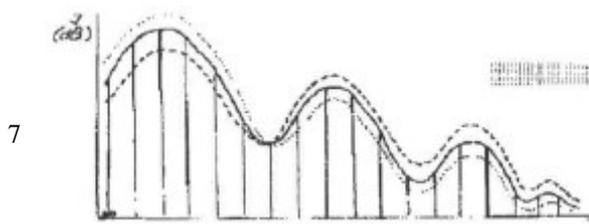


Figure 1 – Schema of the passage in Channel 1 (C1) and Channel 2 (C2)

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<sup>11</sup> The goal is to activate neural pathways which are probably more efficient for speech control. A number of studies (see Critchley. *Music and Brain*. London: Heineman, 1987) show non-conclusive data on the possible predominance of one brain hemisphere over the other in relation to musical talent: neither the left nor the right hemisphere show explicit cerebral specialization for all the elements of musical competence. On the other hand, there is a parallel between complete observation of musical competence and the observation of speech perception. It can be concluded that a dominance of the left hemisphere for speech perception exists (see Eccles. *Evolution of the Brain*. London: Routledge, 1989); it is evident that human language has developed because of the hemispheric asymmetry (see Eccles 1989). Linked to the concept of hemispheric dominance one finds the same lateral dominance in organs. It is well known that the visual pathways, somatosensorial pathways and acoustic pathways are principally contralaterally laid out. This means in particular those acoustic signals pertaining to language and speech perception follow mainly the right auditory channel (see Eccles 1989).

### 3.2. The Acoustic Material and the Program

Two types of material were used: the material that was specially designed for the *Audio Language* project and the material used by Diapason for acoustic perception training. The acoustic material used is described in table 3.1.

**Table 3.1 the used acoustic material**

<b>Abr.</b>	<b>Type</b>	<b>Use</b>	<b>Features</b>
DM	Densified Music	Receptive Phase Productive Phase	Pieces by Mozart in which the frequencies above 1500Hz are intensified, due to a succession of equalisations
FM	Filtered Music	Productive Phase	Pieces by Mozart in which the frequencies below 1500Hz are toned down by a filter
FB	Frequency band	Receptive Phase Productive Phase	Pieces by Mozart in which both the low and high pitch sounds are toned down in relation to a given frequency band of a filter.
CT	Continuous Text	Receptive Phase Productive Phase	Texts spoken by native speakers, recorded without interruption
PE	Pronunciation Exercise	Productive Phase	Pronunciation exercises with segmental and supersegmental elements, spoken by native speakers, recorded in order to allow self-correction.
RT	Pronunciation Exercise: texts And sentences	Productive Phase	Short texts (five minutes) to listen to and then to repeat to allow for self listening with headphones

The program for every phase of the experiment was set up in relation to the features of the participants (their competence in the language and in acoustic perception). It was modified in its structure but not in methodological contents in relation to the necessities of each phase and given organizational frameworks. This setup was made possible by the extreme flexibility of the conic perception training, within, of course, the limits of the adopted methodology and the physiological response of the human ear.

### 3.3. Conditions of the Training

The development of the acoustic perception a condition of relaxation and concentration and has to be followed with regularity. The temporal frames for the participants vary between 60 and 120 minutes of training per session. The time effectively spent by the participant in the context of *Audio Language* was 120 minutes per day in the test phase in Forli and 90 minutes per day in the other test groups. The sessions were interrupted by short breaks. Despite the fact that students were engaged in academic and private life the calendar was followed with regularity.

The training is composed by two phases: a *receptive phase* during which the participants receives sounds but does not reproduce them, and a *productive phase* during which the participant receives and produces words and phrases (repetition and reading). The training is completely self-managed by the participants. It had been decided, however, to keep the presence of one or several assistants in the *Audio Language* tests. The task of the assistants was to answer to questions by the participants, to

report to the supervisor of the project the development of the phases of the test, and to supervise the participants in order to maximize the effects of the training. The operational instructions given to the participant's concerned posture, position of the headphones, and activities allowed during the training. During the listening session of RT and PE tapes (productive phase) the participants were asked to repeat short sentences or single words without trying to understand these words or phrases; the exercise is based exclusively on repetition. The PE exercise demand concentration on listening without paying attention to anything else but that which is listened to. In the course of the study, thus, the PE texts were not given previously in the repetition and listening phases.<sup>12</sup>

In the productive phase, when the participants are asked to read out aloud while listening to them, filtered background music is given over the headphones. The scheme for this setup is the following:

Ø 10 minutes reading      Ø 5 minutes break      Ø 10 minutes reading Ø 5 break

The participants are reminded in every phase of the training that a better vocal emission is established when a proper posture is maintained in order to avoid muscular contractions, which, besides influencing respiration, might make the training tiring. The participants were helped with tips based on the professional experience by Diapason in the fields of singing and diction.

#### **4. SETUP OF THE EXPERIMENT**

##### 4.1. Distribution of the participants

The experiment was conducted with a total of 203 participants in 5 different universities. The participants were distributed into three groups: 1) the SPT group, which received training of acoustic perception with the material by *Audio Language* without instructors and with the assistance, described in chapter 3.3. 2) The Control group which received instruction in phonetics classes with the *Audio Language* material in language and with the active and permanent presence of an instructor; 3) a Zero group which did not receive any instruction. The instruction given by CITO, an institution specialized in the conception and analysis of tests, where followed in the distribution of the groups and in the evaluation of the material.

203 individuals were enrolled in the *Audio Language* program. 186 individuals participated in the two listening tests, at the beginning and at the end of the experiment, and 188 gave information by responding to a questionnaire at the beginning of the experiment, 158 of which participated in an initial and a terminal language test. The total number of participants whose data were analyzed was reduced to 128 by CITO, for this group was statistically significant.<sup>13</sup>

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<sup>12</sup> In the course of the experiment we wanted to follow the logic set up by Tomatis and not give the participants the opportunity to eliminate uncertainties and doubts concerning the lexicon or the syntax by previous listening. On the other hand, such a hypothesis can be interpreted differently, which will be done in a forthcoming study on the theoretical bases of the study presented here.

<sup>13</sup> John De Jong, Director of the Language testing unit of CITO, forthcoming.

## 4.2. Features of the participants

The participants were volunteers, which enrolled after a presentation of the project by their language instructors. The participants indicated clearly that their goal was in the phonetic domain. This was important in order to reduce hopes or expectation, which could have, falsify the analysis of the data.

The participants were asked to answer to a questionnaire to collect in schematic manner indications of their personal features and their linguistic competence. According to the instruction given by CITO the three groups were formed completely at random, in relation to the time constraints of the participants. The CITO guidelines did not give any statistic value to specific features of the participants.

The following scheme will present certain results from the initial questioning of the participants: the distribution according to gender, age groups, years of previous language instruction, academic ranking and their self evaluation in language competence before the experiment.

### 4.2.1 Gender

14 % of the participants were male, 86% female. The participants were distributed into the three groups in relation to this ratio.

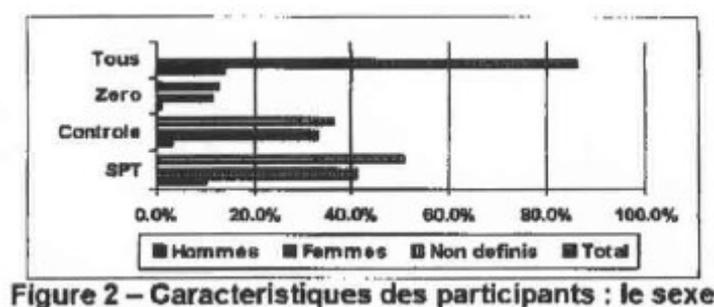


Figure 2 – Caracteristiques des participants : le sexe

Figure 2 – gender of participants

The higher number of female participants is due to the fact that the majority of the participants enrolled in Forti and Anvers, i.e. in to schools for interpreters and translators. In these schools the gender ration is 1/9: male/female.

### 4.2.2. Age

Of 181 participants who answered the questionnaire, 155, i.e. 86%, were between 21 and 25 years old. Figure 3 shows the distribution of the age groups.

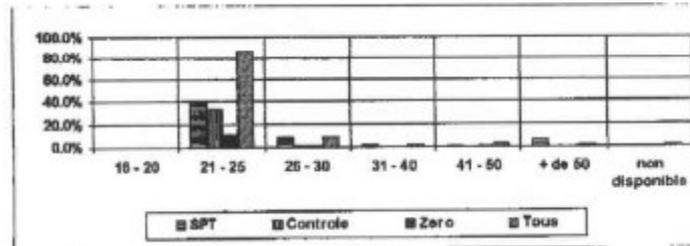


Figure 3 – age of participants

Since the experiment took place in an academic environment, it was natural to find the strongest age group between 21 and 25 years. Only in Saragozza the experiment was conducted with older people, because the test was not set up in the university but in a public language center.

#### 4.2.3. Years of Previous German Language Study

152 of the 181 participants had 4 years of language learning in German, and only a very small group of 3% (6 participants) could be called real beginners.

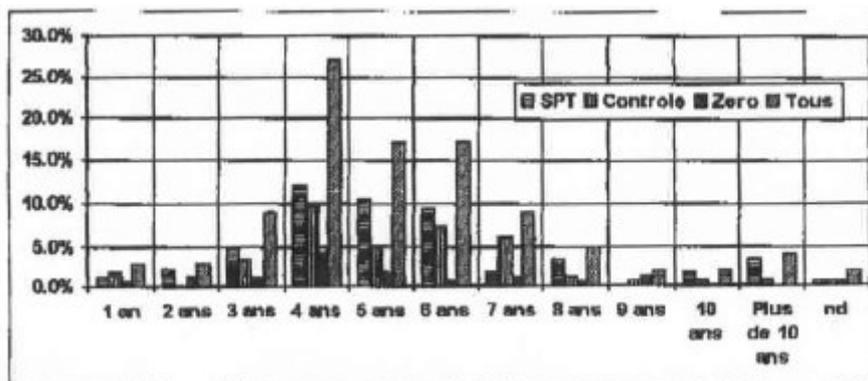


Figure 4 – years of previous German language study

This distribution is normal for an academic body of students in languages.

#### 4.2.4. Academic Evaluation

The main group of students is situated around the intermediate level of competence (2.7 to 3.4)

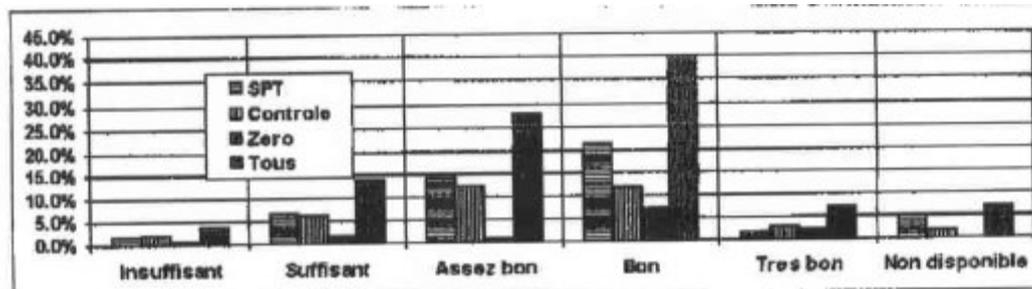


Figure 5 – academic evaluation

This is, however, not a very strict academic evaluation. A further determination of linguistic competence would thus be necessary, particularly in Forli, Anvers and Saragozza. The reasons for this are explained in chapter 7.

#### 4.2.5. Self Evaluation of the Participants before the *Audio Language Project*

The participants were asked two questions: 1) they were asked to evaluate their level of competence in German; 2) they were asked whether they had been satisfied with the instruction they had received previously.

In Forli, 47.83% of the participants estimated their knowledge of German to be good or very good, and 50.42% were content with the instruction they had had. In Saragozza, we obtained 50% for the first question and 85.71% for the second question.

The similar ratio in the answers to the first question is due to the fact that the distribution of different levels of competence is homogenous in this type of institution.

The answers to the second question – about the satisfaction with the instruction – are equally telling. The satisfaction with the instruction is an indicator for the extent to which the students feel comfortable in the use of the foreign language – in contexts like conversation or the media – and thus are competent. This hypothesis places the participants in the following order: first, with the highest level of competence, the students in Forli, then those in Anvers, and finally the students in Saragozza. This is supported by the fact that Anvers and Forli are schools for interpreters and translators where students are not only more motivated but also better prepared, whereas the students in Saragozza probably don't have a professional motivation and where the instruction is open to the public. In addition to this, the students in Anvers are mostly native speakers of Flemish, a Germanic language.

## 5. THE PHONETIC EXERCICES

### 5.1. The Phonetic material

As already mentioned, it was part of the project to produce material for the exercises, for all chosen languages: German, Italian, Dutch and Spanish. This material was used for the work in the language lab and for the SPT. The participants took thus advantage of the guidelines set up by the University of Bologna (SSLIMIT) for the phonetic material in German. This concerns the CT, TS and PE tapes. The tapes are described in this chapter, and the German is taken as example. Yet the same principles were applied for all languages: Italian, Dutch, Spanish, and German.

#### 5.1.1. CT tapes (continuous texts)

The CT tapes are designed to sensitize the audition for the intonation and the sound of the foreign language. Several speakers, both feminine and masculine therefore read the texts, which is

Important: several different accents were used too – without, however, introducing pronunciation rules, which differ from the standard L2.

The texts are technical and literary – from various periods – in nature (in total 20 texts). Themes were not chosen according to any thematic guideline.

#### 5.1.2 RT tapes (repetition texts and sentences)

These tapes contain short texts, which were presented to the student a first time as a whole (5-minute length aprox.) and for a second with the possibility to repeat (10 minutes). Then the students read the whole text during 10 minutes and then either listens to it again or reads it aloud as an additional control. This procedure can be spread out over thirty minutes or depending on the length of the tape in the following manner:

Ø 5 minutes listening      Ø 5 minutes repetition      Ø 10 minutes loud reading Ø 5 reading/listening

The tapes were divided into three groups of difficulty (8 tapes for each level), and these levels vary in the length of the listening sequences. Level A has sequences of aprox. 7 syllable; level B 9-10 and level C 13-14. The participants can chose the level of difficulty they want to work with.

#### 6.1.3. PE tapes (pronunciation exercises)

Not so long ago, pronunciation courses for learners of a foreign language concentrated on the correct pronunciation of sounds and words. Only in rare exception one paid attention to intonation and different pronunciation styles. Those are, however, very important: casual conversation is very different in intonation from read texts or isolated words. For this reason, the PE courses concentrated on the contextual aspects of pronunciation. The end of every session is devoted to a theoretical

Introduction and to a series of exercises which did not only contain material on the sound and the words, but also complete texts and short dialogues where the sound in question is presented in several dialogues.

The material that was designed for the pronunciation exercises was primarily targeted to learners of an intermediate competence. This choice made possible for beginners to follow the exercises with the help of an instructor and for more advanced students to improve exclusively their pronunciation by using the same material.

The major part of the tapes consisted of PE tapes. Based on the pronunciation problems of the students a special phonetics course was designed which helped the students as well as the instructor to follow the whole program and to choose particular phonetic exercises.

For German the material contained the following chapters:

1. Vowels (E, I, Ü, U, A, O, Ö)
2. Diphthongs
3. Stops
4. Non-accented vowels ("schwa")
5. Consonants (plosives, fricatives, nasals, vibrates)
6. Voicing
7. Word endings and beginnings
8. Accentuation of words
9. Accentuation of phrases

The order of elements in each exercise was set up in accordance with the following consideration:

- In order to satisfy the communicative aspect, exercises on particular sound were placed in a general context. Simple repetition exercises were thus avoided, if, for example, the student with the intonation of an answer could repeat the elements of a question.

As an example, an exercise on the vowel E [e:]: a closed, long sound.

Wer war das?	Jemand aus Dresden?	Who was it?	Someone from Dresden?
Ø	Jemand aus Dresden.	Ø	Someone from Dresden.
	Evas Kollege.		Eva's colleague.
	Frau Lehmann.		Mrs. Lehmann

(The arrow indicates that a question was asked and the student had to repeat it with the intonation of an answer.)

- A unit consists of the following elements: a word, which is, if possible, placed in a context. This is followed by exercises with short sentences or phrases (for example, an adjective with a noun). Then follows a pair of almost identical words (minimal pairs) or opposition of acoustically similar sounds. Then, the sound in question is placed in an exercise or a short text.

- The construction of is such that it is possible to go back to the preceding unit or sound. Vowels are dealt with in predetermined order: /o/ is opposed /e/, then /ü/ is opposed to the two preceding sound, then /ö/ is opposed to these three sounds
- The sound the exercise is devoted to be always pronounced in an amplified manner. This is important for the phenomena of co-articulation.
- The material was built with the intention to reflect the basic vocabulary. Less common expressions were used in order to avoid nonsense words. These expressions were given in an accompanying booklet with the Italian translation. In the other languages, they were explained with synonyms or description.
  - The speakers were asked to pronounce naturally and without articulating clearly, which is unnatural and often found in pronunciation exercises.

As guideline for pronunciation norms, German standard pronunciation was used. Even for regional accents and regional expressions, the speakers were asked to use *Hochdeutsch* (the German standard pronunciation).

The accompanying booklet contained in each chapter a short theoretical introduction to the German pronunciation system and a description of the sound and the phonetic problems dealt with. In this way, the student was informed before beginning the training with SPT.

## 6. EVALUATION

### 6.1. The criteria for Evaluation

The features of the participants were evaluated at the beginning and the end of the project by a listening test (10 items) and a language test (459 items). The interpretation of these 469 items followed the statistic guidelines given by CITO. Items that were not significant, because they were either too simple or too difficult were excluded from the statistically valid material; the same procedure was applied to items for which the number of responses was not sufficient. A third reason for exclusion of an item was fluctuation in attendance of the students. The data were interpreted according to the Item Response Theory (IRT). This model specifies the relation between a performance observable by a competence test and the non-observable features, which underlie the test performance.

A short description of the test follows.

### 6.2. The listening test

The listening test was designed by Tomatis in order to analyze the listening capacity of a person and to supervise the development during a training period. The test takes approx. 20 minute and evaluate for each individual the mode of perception and the range of frequency. It allows to either follow the

evolution of these features during a given period or to supervise other aspects of listening in general or those pertaining to language. The following items are analyzed:

- the listening threshold for different frequencies in the air and the bone conduction
- the frequency zone in which the ear is able to differentiate sounds
- the laterality: the determination of the ear that dominates and controls the voice

The general underlying hypothesis is that certain elements of the test can be linked to aspects of the mode of perception and reproduction of acoustic signals. This hypothesis is applied in every activity pertaining to the development of acoustic perception based on the Tomatis method, and the hypothesis is supported by the results of these applications. It was possible to show for instance that an improvement of the features tested in the listening test corresponded to a partial or total improvement of certain features of listening, varying in different persons.

### 6.3. The language tests

The language tests were developed in close collaboration with CITO. Two branches of linguistic competencies were tested:

1. Auditory comprehension (collective test in a language lab)
2. Oral reproduction (individual tests)

The results of the experiment were evaluated for all participants in all three groups. In accordance with the CITO guidelines, the results discussed in this paper refer only to the participants who took part in all tests in the beginning and the end and whose answers were statistically significant.

The simpler test is presented in the following together with the criteria used in the evaluation of their results.

#### 6.3.1. Tests of Receptive Competence

Three tests were used to evaluate the auditory comprehension of the participants before and after the training. The test material was given on audiotapes. These are the three tests:

- Differentiation of sounds (two parts)
- Localization of a word accent
- Receptive competence

##### Differentiation of sounds

The sound differentiation test (presented to the participant by an audio tape) was divided into two parts: the first part is devoted to the recognition of a word that is differentiated into two identical words similar to it; the second part asks for the recognition of a phrase given in the context of two phrases. The participants had to indicate the answer in a questionnaire: they had to write down the right word for the first part and the right phrase in the second part. The participants knew all the words and the possible contexts.

Example of the first part of the test:

- |            |                  |               |
|------------|------------------|---------------|
| 1. Balken  | Balken           | <u>balgen</u> |
| 2. welche  | <u>welke</u>     | welche        |
| 3. schlank | <u>schlanker</u> | schlank       |
| 4. und     | und              | <u>Hund</u>   |

Example of the second part consisted of phrase like the following ones (the phrase in bold characters was the one given on the tape):

1. Was hat er / **hatte er?**
2. **Auf dem Bild ist ein Sähmann** / Seemann
3. **Ich gehe tauchen** / tauschen
4. Er wollte die Weichen stehlen / **stellen**

#### Localization of word accents

In order to test the localization of accents in a word, the participants listened to a series of word (every word twice), and then they had to determinate the accent. They were given the syllables and had to mark with a cross the one carrying the accent according to their judgment. In the following example, the word listened to be given on the right.

1. x. (fertig)
2. .x. (Politiker)
3. x.. (Musiker)
4. ..x (Rektorat)

#### Receptive competence

As to additive comprehension, texts were taken from the media about which questions were and multiple-choice answers were given.

All the texts mentioned in receptive competence were evaluated with the terms "false" and "correct". This made the evaluation of the questionnaire more transparent.

#### 6.3.2. Tests of Oral Production

In order to evaluate the oral expression, a tape was prepared for each participant and each test with the following recordings:

- Reading exercise
- Exercise in conversational speech
- Repetition exercise

### Reading exercise

For this exercise, the participants were asked to read to brief texts, a dialogue and a prose text; they were allowed to study the texts briefly beforehand. The evaluation of this exercise was based on the following three elements:

1. Correctness in articulation (segment level)
2. Intonation (supersegmental level)
3. General impression and fluidity

In order to evaluate the correctness of articulation, 30 words were picked from a prose text and from each of them a part was selected (for example the "schwa" sound or the aspiration at the beginning of the word). These words were examined based on the recording and evaluation with the categories "completely correct", "wrong", "non existing/unintelligible".

Intonation was controlled throughout the whole dialogue. The spectrum of correctness was here very wide. It was, however, possible to define wrong accents in sentences, so that the intonation was classified into "correct" and "wrong".

For example, the following underlined words were judged wrong from the point of view of intonation if the participant simple placed an accent on it:

"Hallo, wie gehts?"

"Danke, ganz gut."

"Kommst Du aus Frankreich?"

"Nein, aus Italian. Ich bin hier, weil ich studieren will Physik."

Independent judges who listened to the recordings of all initial and final readings evaluated the general impression of fluidity of reading by all participants. The judges gave their evaluation based on a questionnaire and marked possible improvements. For every item, the judges used the following categories:

No improvement

Little improvement

Considerable improvement

Strong Improvement

### Exercise in conversational speech

This exercise was based on the description of images and responses to general questions. The discussions were taped. The evaluation was based on the same criteria, which were used in the evaluation of general fluidity. The same system of classification was used for every item.

The questionnaire for the subjective evaluation of the judges had questions for the following three capacities:

1. Correctness in articulation (segment level)
2. Intonation (suprasegmental level)
3. General impression and fluidity (for example, the number of words or sounds that are superfluous, breaks, grammatical richness, etc.)

#### Repetition exercise

This exercise consisted of listening to and repeating the first part of phrases out of context and the second part of phrase in an emotional context (anger). The phrases were taped. The participants had to repeat them, and this repetition too was taped. The following capacities were thus evaluated:

1. Phonetic memory
2. Intonation (supersegmental level)

Here some examples of phrases that were recorded:

- Erklären sie die Regel!
- Die Küche ist kühl.
- Wo ist die Waldstraße?
- Er ging ohne Stock.

The phonetic memory and the correctness in articulation was evaluated with the following three categories:

Correct

One mistake

Two or more mistakes

Not repeated or repeated in an unintelligible manner

The evaluation of intonation in the repetition exercise was based on a monologue, listened to and that recorded.

Here several phrases; the word in bold characters indicates where the accent should fall:

- Das darf doch nicht **wahr** sein!
- **Damit** habe ich nicht gerechnet!
- Es soll **keinen** Platz mehr geben.

The evaluation used the following three categories:

Correct

Wrong

Not repeated

#### 6.3.3. Evaluation of the Language Tests

It was tried to be as objective as possible in the evaluation of the recordings. Since electronic evaluation was not possible, the evaluation was based on the following criteria:

1. Two individuals (always the same) were asked to listen to and to analyze the tapes for the test in order to reduce the risk of subjective interpretation (little diversity was noted).
2. The evaluators were picked among people who had a large experience in the evaluation of linguistic competence (linguists, students at the University of Regensburg, Department of Linguistics and Linguistic Pedagogy).
3. The judges, of course, did not know to which group (SPT, Control, or Zero) the participants belonged. They only knew their native language and the university they came from.
4. The list of items (459 items per person for the language test at the university of Bologna and 10 items for the listening test) was designed by CITO.

The "judges" who were asked to give the general impression of the reading capacity and the conversational speech belonged to the following groups:

1. German instructors (native speakers of German)
2. German instructors (native speakers of another language than German)
3. Individuals whose native language was German (no instructors)
4. Linguists (specialized in speech production and native speakers of German)

## 7. TEST TREATMENT

CITO treated the test data in such a way that it was possible to measure a common parameter called *skillfulness*. Skillfulness is linked to the linguistic competence of the participants: the more skillful, the higher the competence. At the time of the composition of this paper, CITO is still working on the final report of the test. However, the data that will be published in the report are available. They are summarized in figure 6 (see Appendix for more details).

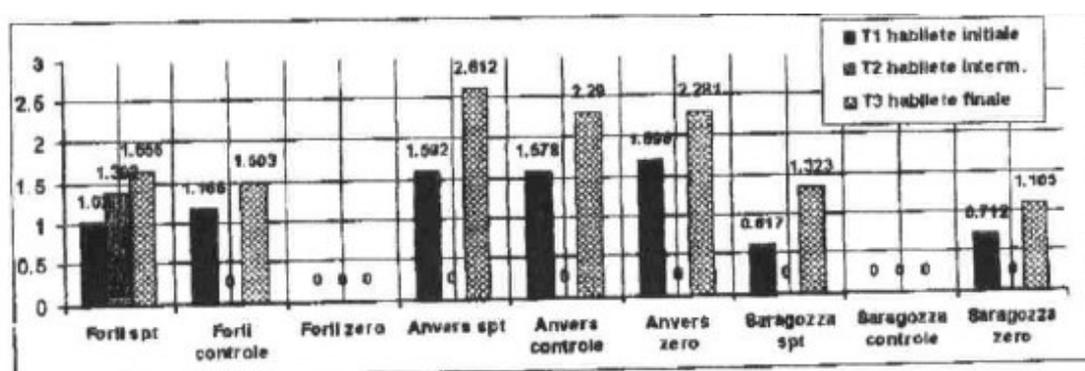


Figure 6 – Evolution of linguistic skills of participants

The result is that for every experiment conducted in the partner universities for the project, the acoustic perception training allowed for a strong and statistically significant improvement of skills in comparison to the improvement in the Control and Zero groups.

In detail:

- Forli: improvement was 62.53% for the SPT group and 28.90% for the Control group
- Anvers: the improvement was 64.07% for the SPT group, 45.12% for the Control group and 34.49% for the Zero groups.
- Saragozza: the improvement was 114.42% for the SPT group, 45.12% for the Control group and 34.49% for the Zero group. (Here the higher improvement in the SPT and Zero groups is probably due to the lower level of competence in the beginning which allowed for a more rapid improvement in skills compared to Forli and Anvers, schools for interpreters and translators, where the participants started at a higher level of competence)

It is interesting to note that the SPT group in Forli continued to improve its skills significantly even after the end of the test session (improvement rate which evolved from 35.57% to 62.35% in approx. three month). This confirms thus that a reactivation of the capacity of acoustic perception indeed allows for an improvement, in the long run, in the skill of comprehension and expression.

The data provided by CITO were grouped according to the different universities and the mean was established for all participants for the moment of the final test which took place three-month after the Initial test. It has to be noted that this comparison is particularly significant from a general point of view, even if the data can be, in accordance with the CITO guidelines, statistically opposed within the framework of a homogenous group and, thus, belonging to the same university.

The data give evidence for a global improvement of the SPT groups by 70.95% in contrast an improvement of 36.52% of the Control group. See figure 7.

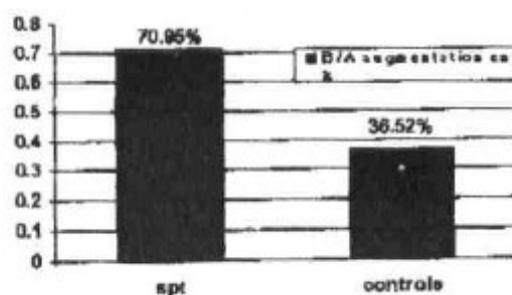


Figure 7 – Improvement of skills in the SPT and the Control groups

The data can equally be read in terms of time by reversal and taking as fix point the result of the Control group (see figure 8). The result is particularly significant: for based on this statistic operation, the periods of time needed to obtain a particular result, measured in terms of linguistic skills (level of capacity of auditory reception and oral production) are in the relation of 100 – for the Control group – to 51.44 – for the SPT group. One can thus hypothesize that groups which participate in acoustic perception training, added to a regular course, can reduce the needed learning time by fifty percent, as well as the factor of tiredness which is linked to reaching the same level of competence in relation to groups which follow only traditional instruction without acoustic perception training.

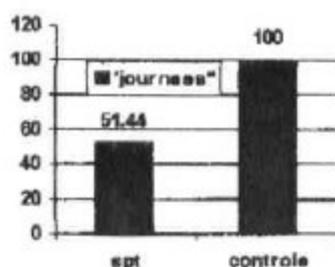


Figure 8 – Time needed to obtain the same result

## 8. CONCLUSION

The realization of the *Audio Language* project allowed reaching the pre-established goals in all the universities in which the project was conducted to the end. The training of acoustic perception proved to be a valid instrument in language didactic. Thanks to its usage – targeted to the perceptive aspects and the capacity to analyze and to differentiate sounds – this training allows to reduce the learning time and thus the investment and the tiredness factor. The results of the project also show how the perceptive aspect (the SPT) can be integrated into the cognitive aspects (the phonetic material and the courses taken by the participants) when applied in practice.

It is important to underline that the results of the SPT group were obtained without invention of a teacher who could have corrected errors of pronunciation or intonation, as it was the case in the Control group.

The acoustic perception training is thus a valid support to the didactic methods, which are currently used in the Universities in which the *Audio Language* experiment was conducted. Given its evident role in obtaining the results in modes of learning and in the capacities of comprehension and acoustic expression, it has to be noted that it can incorporate as successfully elements of other didactic methods. This is especially the case where the absence of an instructor who is a native speaker makes the correct acquisition of pronunciation and intonation of the L2 more difficult. This is the case in the elementary schools, the secondary education, and the high schools of most European countries. Individuals in a private setup but also in a structure cannot only apply the training where a number of students follow the same program. The acoustic perception training can thus be integrated into the didactic program of any educational structure.

The results obtained with the phonetic material used in the *Audio Language* project suggests furthermore to include in the didactic itinerary a learning step which contains the development of phonetic skills linked to the L2; the material should be set up as it is fitting to the competence and the features of the student. The use of technology, which allowed self-management of the participants to a large extent, has certainly contributed to the positive results of the experiment.

It has also to be noted what extend the perceptive faculties, once they are reactivated, continue to evolve even after the end of the training, allowing thus to influence the perceptive aspects of learning with either periodical or occasional SPT sessions.

## APPENDIX

### Results of Data Treatment

		T1 abilita' iniziale	T2 abilita' intern.	T3 abilita' finale	T2-T1 variazione	T2.T1 Incremento %	T3-T1 variazione	T3.T1 Incremento %	numero dati
Forlì	spt	1,020	1,393	1,656	0,373	36,57%	0,636	62,35%	32
	controllo	1,166		1,503			0,337	28,90%	29
	zero								
Anversa	spt	1,592		2,612			1,020	64,07%	18
	controllo	1,578		2,280			0,712	45,12%	19
	zero	1,696		2,281			0,585	34,49%	9
Saragozza	spt	0,617		1,323			0,706	114,42%	17
	controllo								
	zero	0,712		1,106			0,393	55,20%	8

This figure needs some explanation; a forthcoming report by CITO will give all the parameters.

- T1 gives the evaluation of competence of the participants at the moment of the first test series
- T2 gives the evaluation of competence directly after the end of the training (SPT) session
- T3 gives the evaluation of competence three-month after the acoustic perception training session
- T2-T1 and T2.T1 give res. the improvement and the improvement in percentage in relation to T2 and T1
- T3-T1 and T3.T1 give res. the improvement and the improvement in percentage in relation to T3 and t1
- The last column gives the number of participants for each university. For Brescia and Milan the number was zero.
- Only data with statistic significance were given; the data from Brescia and Milan were excluded in accordance with the CITO guidelines (number of participants, organization, etc.)

### Synthesis of final competence

		A abilita' iniziale	B abilita' finale	B - A variazione	B/A incremento %	tempo necessario per stesso risultato	numero dati
forli'	spt	1,020	1,956	0,936	82,35%		32
	controllo	1,168	1,503	0,337	28,80%		29
anversa	spt	1,562	2,612	1,020	64,07%		16
	controllo	1,578	2,290	0,712	45,12%		16
saragozza	spt	0,817	1,323	0,706	114,42%		17
	controllo						0
totale (media pesata)	spt	1,055		0,749	70,85%	51,48	65
	controllo	1,329		0,485	36,52%	100,00	48

The following data are given in this figure:

- Column A: the initial competence at the moment in time T1 in Forli, Anvers, and Saragozza.
- Column B: competence tested in the last test at T2 or T3 depending on the test group (see figure 7), also in all three places.
- Column B-A: the differences between the two preceding columns.
- Column B/A: the improvement in percentage of B in relation to A
- The raw "total" gives the weighed index of the means in the columns A and B-A.

## FOR MORE INFORMATION

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