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The Value of Training Software Systems in Improving Dyslalia in Students with Intellectual Disabilities

Elena CRIȘAN[1]

ABSTRACT. The correction of speech and language disorders, in general, stimulates the psychic development of the individual, his integration in activity and life, leads to the affirmation of the personality on a social and cultural level. It must be taken into account that communication occurs through language, language being also a tool of thought.

Speech therapists are increasingly challenged in offering and performing high-quality speech therapy for the correction of people with language disorders. For this reason, an association of traditional methods with new logo-therapeutic computer technologies would support the student's motivation for involvement and active participation in the language correction process.

The computer can be an excellent game partner and a good "educator" and its intervention, depending on the variety of programs used and the involvement of special education factors, will be reflected in the shaping of the child's personality. The specialized literature indicates the existence of successful practices in the use of information and communication technologies in general and special education, thus modifying and diversifying the structure of the educational and recovery act.

In the special education units, a series of teaching aids, both classical and modern, are used in the remediation of language disorders, among which we can mention: educational and speech therapy software, accessible, attractive due to the intensity of the colors, the presence special effects, transitions, animation, sound background, which attract students to therapy and transform the speech therapy activity into an extremely pleasant and motivating moment.

Keywords: special education; educational software; language disorders; mental retardation; psychological age of language.

[1] Ovidius University of Constanța, Faculty of Psychology and Educational Sciences, Romania. Email: elena81crisan@gmail.com

ABSTRAKT. Die Korrektur von Sprech- und Sprachstörungen stimuliert im Allgemeinen die psychische Entwicklung des Einzelnen, seine Integration in Aktivität und Leben und führt zur Bestätigung der Persönlichkeit auf sozialer und kultureller Ebene. Es muss berücksichtigt werden, dass Kommunikation über Sprache erfolgt, da Sprache auch ein Werkzeug des Denkens ist.

Logopäden stehen zunehmend vor der Herausforderung, qualitativ hochwertige Logopädie zur Korrektur von Menschen mit Sprachstörungen anzubieten und durchzuführen. Aus diesem Grund würde eine Kombination traditioneller Methoden mit neuen logotherapeutischen Computertechnologien die Motivation des Schülers zur Beteiligung und aktiven Teilnahme am Sprachkorrekturprozess unterstützen.

Der Computer kann ein hervorragender Spielpartner und guter „Erzieher" sein und je nach Programmvielfalt und Einbeziehung sonderpädagogischer Faktoren seinen Einfluss auf die Persönlichkeitsentwicklung des Kindes auswirken. Die Fachliteratur weist auf erfolgreiche Praktiken beim Einsatz von Informations- und Kommunikationstechnologien in der allgemeinen und Sonderpädagogik hin, die die Struktur des Bildungs- und Genesungsgesetzes verändern und diversifizieren.

In den Sonderpädagogikeinheiten werden eine Reihe klassischer und moderner Lehrmittel zur Behebung von Sprachstörungen eingesetzt, darunter: pädagogische und sprachtherapeutische Software, zugänglich, attraktiv aufgrund der Intensität der Farben, die Präsenz-Spezialeffekte, Übergänge, Animationen, Tonhintergrund, die die Schüler zur Therapie anlocken und die logopädische Aktivität in einen äußerst angenehmen und motivierenden Moment verwandeln.

Schlüsselwörter: Sonderpädagogik; Lernsoftware; Sprachstörungen; geistige Behinderung; psychologisches Zeitalter der Sprache.

INTRODUCTION

Language research based on concrete or observable facts raises a number of theoretical and practical issues. It must be taken into account that communication occurs through language, language being also a tool of thought. Human thinking is formed based on language and is expressed through language.

The correction of speech and language disorders, in general, stimulates the psychic development of the individual, his integration in activity and life, leads to the affirmation of the personality on a social and cultural level. It is a wish made by specialists in the field of human sciences, concerned with ensuring a harmonious and complex development of man today. Communication makes the human being able to develop, to evolve this by making possible its existence in communion. Human society depends to a great extent on the

development of the communication process, highlighting its importance. People converse with each other, respecting the opinions, ideas and principles of their peers, but keeping their personal arguments, thus supporting each other in their own evolving development and an improvement in behavior. [2]

Speech therapists are increasingly challenged in offering and performing high-quality speech therapy for the correction of people with language disorders. Thus, an increasing number of speech therapists have become interested in the potential therapeutic applications of computer programs. Every speech therapist or therapist has encountered the situation of repeating sustained to correct the pronunciation of sounds, syllables, words and deficient sentences, a fact that attracts a disinterest and a lack of motivation for practice, because a monotony, fatigue and regression sets in correction exercise. With the help of computerized technology, everything is transformed into a friendly, close relationship between the speech therapist and the child with language deficiency, leading to the elimination of the frustration activated by the monotonous repetitions of classical therapy, indirectly also increasing the students' self-esteem.. In an attempt to respond as professionally as possible to people with language disorders, speech therapists use a wide range of techniques. Of these, computerized techniques are considered the most flexible and advanced. For the use of logo-therapeutic technologies, the software must be clinically tested and adapted to the specifics of the various target populations.

As noted by D. Carantina and D.M. Totolan [3] the student with intellectual disability constantly uses a foreign language. Cognitive and motivational areas in the case of such children with intellectual disabilities are affected to a large extent, and fine motor skills are deficient. They show a low interest in learning, extrinsic motivation takes precedence, which will make it more difficult for them to adapt to school requirements. They show a lack of concentration for a longer period of time and fail to adapt to the demands made by the adult.

The research highlights a high potential of computerized technology to complement traditional speech therapy methods, procedures and techniques. In order for training software systems to be fully performing, the progress of these methods must be made in accordance with the needs of the users - software made according to the classic language problems encountered by students. The computer can be an excellent game partner and a good "educator" and its intervention, depending on the variety of programs used and the involvement of innate and environmental factors, will be reflected in the shaping of the child's personality.

According to Gherguț A. [5], the large number of language disorders associated with thinking deficiencies negatively influences language development in children with intellectual disabilities. Thus, its language takes on a confusing

character, which significantly complicates the process of receiving messages. From the perspective of expression, this fact is reflected in a simplified, rigid and unvaried verbal behavior.

The new orientations in the field of special psychopedagogy, in the view of some authors such as: R. Foloștină [4] , O. Istrate [6], A Roșan [10], A. Gherguț highlight the roles that the "computer" and its corresponding software have, that of mediator - supports and motivates the student by adapting learning to his level, a supporting role (the computer ensures the coordination of a faulty sensory or motor channel in another well-supervised one ; this category of applications is useful in working with children with different disabilities, adapting the proposed requirements and tasks to be solved.

The use of these training software systems and the relevant applications is an aspect and a need, and the therapy of such complex language disorders turns into the scene of three actors: the speech therapist - the student - the computer, a scene where each of these participants wants to ensure the success in correcting existing language disorders. The use of information technology is a great achievement for these children, touching to show an option, express wishes, needs by pressing a key. As the abilities of a student with learning disabilities develop, he will get more and more ways to use an information system to clarify, experiment or develop ideas. As a result of these points of view, it is recommended to introduce and use information and communication technology in the framework plans of the learning programs, with the reason to support the teaching and acquisition of knowledge in a motivating school environment and the use of this technology in the training and development of skills of learning [11]. Instructional software systems specifically designed for students with intellectual disabilities are important tools in mediating disabilities.

To live, learn and work successfully in an increasingly complex and information-filled society, students and teachers must use technology effectively. In a healthy educational environment, technology, in the view of authors such as: D. Banes [1], McNaughton [7], P.R. Petrescu [9], can help students: to be able to use a new environment of technology-based learning to learn, communicate, collaborate, produce and develop knowledge.

The use of multimedia in the educational system: - trains multiple senses, supports active learning and increases the value of lessons, adapts to the individual, allows the student to learn at his own pace, connects abstract knowledge to the real world, breaks the barriers between the classroom and real life, allows time migration and space [8].

The potential of information and communication technologies to improve instruction and to make learning more efficient is great, but its full exploitation in education depends on the degree to which the teaching staff is prepared to

integrate them, on the capacity and openness of the entire teaching staff as well as on the available technological resources. The impact of the educational software on the students is obvious: you can see the increase in interest in learning, the increase in class attendance, better school results. From a psychological and pedagogical point of view, they are in a direct causal relationship. Teaching-learning strategies of curricular content through educational software require a detailed study and a good knowledge of the educational reality. Modern IT means significantly increase the attractiveness of the educational process.

The child with intellectual disability can thus transpose mistakes from the oral language to the read-written language, based on the principle of similarity of appreciation and contagion. From a phonetic point of view, it is observed that the child with intellectual disability cannot correctly articulate all the sounds, thus making frequent substitutions, omissions, inversions as a result of the lack of development of the ability to differentiate sounds, the reduced development of phonemic hearing. Verbal communication is distorted in the child with intellectual disability, he does not have equal opportunities to initiate and continue such a speech or dialogue. Thus, the spontaneity of speech of the child with mental decision-making is lower than that of communication partners with mental psychic development.

For individuals who do not have any mental impairment, training software systems make it much easier to solve tasks, whereas for individuals with mental impairment, these training software systems make things doable.

RESEARCH ORGANIZATION AND METHODOLOGY

Purpose: To investigate the results of the application of an intervention program in the speech therapy of students with mental deficiencies, based on the use of the educational software Logopedix compared to the results obtained in the classical speech therapy.

OBJECTIVES

1. Detection, complex evaluation and diagnosis of the most frequent language disorders of students with mental deficiencies from the groups proposed for research;
2. Development and application in speech therapy practice of an Intervention Program for the correction of language disorders of the students included in the study, based on the use of the educational software Logopedix.

3. Comparative study (by statistical methods) of the results obtained in speech therapy carried out with the help of the computer program and in classical speech therapy in order to determine the effectiveness of the Logopedix educational software.

4. Quantitative and qualitative analysis of the progress achieved in correcting the pronunciation disorders of the subjects from the 2 groups (experimental - in which the educational software was used; control - in which classical methods were used in correction).

Assumptions

1. It is assumed that, in students with mental deficiency, the group of sigmatisms and parasigmatisms represents the most common disorder of the dyslalic type.

2. It is assumed that, by integrating the educational software Logopedix in the mediation of language disorders in children with intellectual disabilities, results significantly superior to those obtained through classical speech therapy are obtained.

3. It is assumed that a mediating and necessary factor in the use of computer programs and techniques in the mediation of language disorders is the degree of deficiency of the children.

The research was carried out during one school year in the "Constantin Păunescu" Special Secondary School, Tecuci, county. Galatians, and included the following stages:

1. The initial stage - September - November - had as milestones:

- theoretical documentation related to the research topic, by studying and analyzing Romanian and foreign specialized works mentioned in the bibliography (books, articles, legislative documents in classic and electronic format);
- establishing objectives and formulating research hypotheses;
- the correlation of the proposed objectives with the research topic, with a working methodology suitable for verifying the hypotheses and the particularities of the subjects studied;
- establishing, preparing and applying the test battery for the complex initial speech therapy assessment, collecting the results, recording and analyzing them;
- establishing the structure of the groups of subjects (experimental and control), based on the results obtained at the initial assessment tests;

- designing and drafting the intervention program, based on the Logopedix speech therapy software.

2. The experimental stage - December - April - consisted of a formative experiment that sought to influence the subjects, by applying a program to correct language disorders based on the use of the Logopedix software in the case of the experimental group, and on classical speech therapy, in the case of the control group.

3. The final stage - May - June consisted of:

- reapplying the battery of tests;
- analysis and interpretation of the results, comparing and correlating the final results with the initial ones;
- creation of tables and graphs;
- establishing conclusions and drafting the paper.

Subject batches

The initial batch of subjects included in the study consisted of 93 students of the "Constantin Păunescu" Special Secondary School, Tecuci, county. Galatians, characterized by:

- gender: 65 boys / 28 girls;
- chronological age: between 9 - 18 years;
- classes: I - VIII:
- degree of mental deficiency:
    - 42 subjects - severe mental deficiency: QI = 25 – 35;
    - 51 subjects - moderate and mild mental impairment: QI = 35 – 70.

Note: the level of intellectual development of the subjects (the value of the intelligence coefficients) was not calculated but was extracted from the personal files of the children submitted to the school administrative office).

Following the testing in the initial stage, based on the detection of the most frequent pronunciation disorders, the subjects who were subsequently introduced to the complex speech therapy program were selected, divided into two groups, as follows:

- The experimental group – 30 students with pronunciation disorders - who participated in speech therapy using the educational software Logopedix.
- The control group - 30 students with pronunciation disorders - who participated in speech therapy using classical (traditional) methods in correcting the affected sounds.

The distribution of students into the two groups was carried out taking into account the respect (as far as possible) of the homogeneity criterion, depending on the results obtained at the initial assessment, along with other criteria:

a. Criterion of the degree of mental deficiency:
- severe mental deficiency: 3 students in each group;
- moderate mental deficiency: 6 students in each batch;
- mild mental deficiency: 16 students in each batch;
- borderline intellect: 5 students in each batch.

b. The criterion for the presence of dyslalia:
- students without pronunciation disorders: 20% in the experimental group and 13% in the control group;
- simple dyslalia, affecting a sound: 20% in the experimental group and 7% in the control group;
- dyslalia, affecting two sounds: 20% in the experimental group and 20% in the control group;
- dyslalia, affecting three sounds: 13% in the experimental group and 13% in the control group;
- dyslalia, affecting more than three sounds: 27% in the experimental group and 47% in the control group.In the formation of the two groups, the possible influence of some random variables was also taken into account, such as: the motivational level of the subjects, the anatomical-physiological characteristics of the phono-articulatory apparatus, the level of development of phonemic hearing, the experience in using the computer (the majority of students who use the computer at home were assigned to the experimental group).

Description of the tests applied

The following methods were used in the scientific investigation process:

- theoretical:
  - analysis, synthesis and interpretation of information from specialized literature;
  - the hypothetical-deductive method of interpretation and explanation of the results obtained.
- empirical:
  - individual anamnesis;
  - individual and group observation;
  - sets of tests for knowledge of some aspects of the language (psychological age of the language, lexia examination test).

- statistical data processing (through the S.P.S.S. software):
  - descriptive statistics: calculation of average results, by batches, and their graphic representation;
  - inferential statistics (t-test): establishing the difference between two means in the case of independent samples; establishing correlations between variables.

To these methods were added a wide variety of speech therapy methods and procedures used in activities with students.

RESULTS

A diverse range of methods was used for data analysis and interpretation, with the aim of highlighting as clearly as possible the results of the integration of the Logopedix educational software in speech therapy, compared to classical therapy. Thus:

- in the Initial Stage, the application of tests was aimed at detecting language disorders, in relation to the psychological age of language and lexical difficulties; depending on the results obtained by the subjects in the initial tests, the composition of the two groups (experimental and control), the speech therapy groups and the objectives of the intervention program were established.

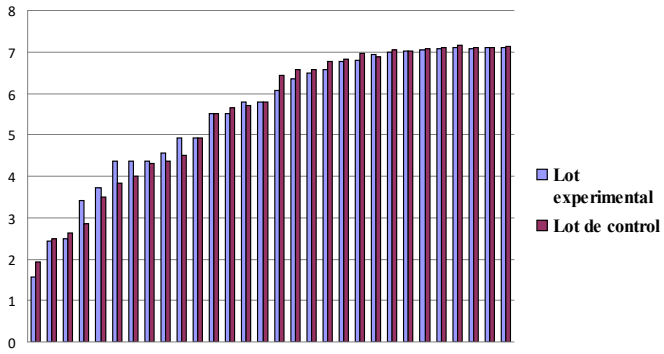
- in the Final Stage, the application of the tests and the interpretation of the results had the purpose of comparing the initial results obtained by the students with the final results, but also to check the efficiency of the speech therapy intervention program made with the help of the computer, in comparison with the speech therapy program applied by classical methods, as well as the validation of research hypotheses; the comparison aimed at the initial and final results obtained by students from the same batch, as well as establishing the differences between the results obtained by the two batches.

INITIAL STAGE

Tests for knowing the psychological age of language. (Source: Vrăsmaş E., Stănică C., 2003)

The psychological age of the language is an important parameter according to which the composition of the experimental groups and speech therapy groups was determined.

The test is an objective tool for determining language delay and a rigorous criterion for assessing the progress registered following the application of the speech therapy program.



Graphic 1. *VPL - initial - both lots*

From the comparative graphic presentation of the initial results obtained in this sample, we can see the very balanced distribution of the subjects regarding the psychological age of the language.

The quantitative and qualitative analysis of the initial results obtained as a whole in this language test, leads to the conclusion that the examined students with mental deficiencies have a significantly reduced oral communication capacity, located far below the normal limits for their chronological age, as a result of the characteristic features of this type of deficiency (genetic viscosity, inertia, heterochrony, etc.). Thus:

- the average obtained initially by the students from the experimental group is 4,795, compared to the average of the chronological age, which is 8.15; therefore, the initial delay in language development in this group is 3.35 years, so quite large;

- the average obtained initially by the students from the control group is 4.785, compared to the average chronological age, which is at the level of the value of 8.25 years; therefore, the initial gap in language development in this group is 3.46 years, similar to that of the experimental group.

Table 1. *Means / differences - VPL - both batches – initial*

Subject	*Chronological age (average)*	*Psychological age of language (media)*	*VC - VPL (difference)*
Experimental batch	8.15	4.795	**3.35**
Control lot	8.25	4.785	**3.46**

Analyzing the results from the point of view of the correlation between the level of mental development and the initial results obtained in the test of the psychological age of language, it is noted that the gap is the greater the lower the intelligence quotient and vice versa.

Test for the examination of lexia. (source: C. Paunescu, 2003)

1. Examining conscious reading at word level

In this sample, the initial testing, the two batches subjected to the research obtained the following results:

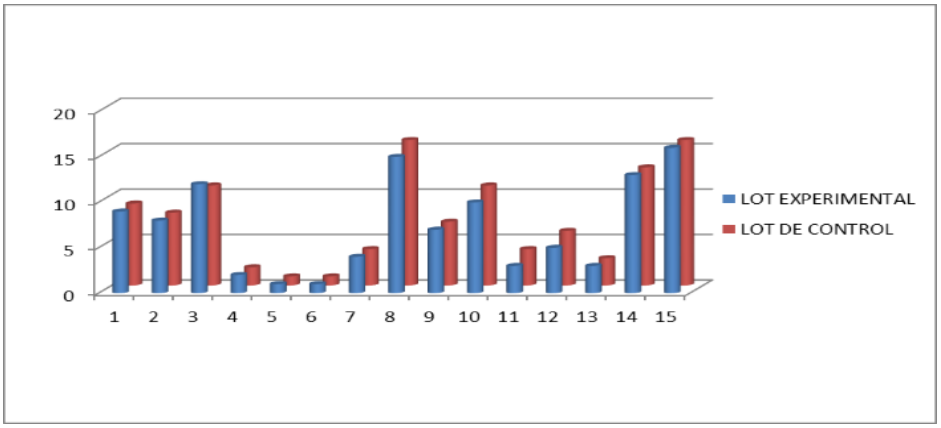


Figure 1. *Conscious reading at the word level - comparative - both groups – initially*

2. Examining conscious reading at the sentence level

In this sample, the initial testing, the two batches subjected to the research obtained the following results:

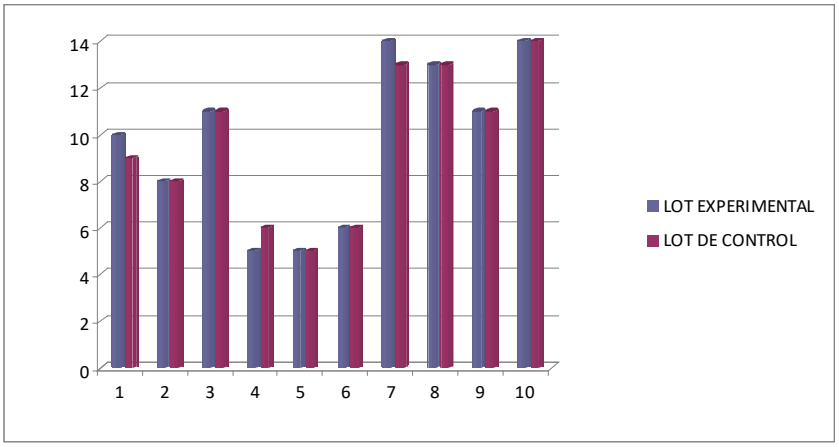


Figure 2. *Conscious reading at the level of sentences - comparative - both groups – initially*

Statistical analysis (post - initial stage) - lexia examination samples

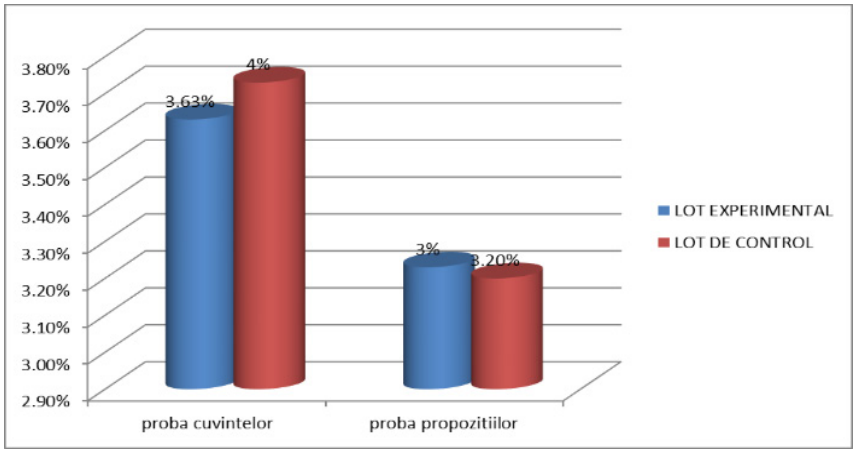


Figure 3. *Lexia test samples - BOTH BATCHES - comparative – initial*

Observations: subjects who failed the reading test had difficulty in:

- polysyllabic words: comb, sprinkler, scissors;
- the words containing the groups of letters ge,ci,ghe;
- words containing consonant combinations gr, bl, etc.;

FINAL STAGE

The evaluation that took place in the final stage was aimed at highlighting the evolution of the subjects from each group in terms of language characteristics, as a result of the speech therapy intervention carried out on the basis of the intervention program, as well as highlighting the differences between the results obtained by the students from the experimental group (who have benefited from computer-assisted speech therapy, through the Logopedix educational software) and the results obtained by students from the control group, who benefited from speech therapy classic.

It should be emphasized that the speech therapy intervention programs were similar and that the initial and final evaluations were performed with the same battery of tests, under identical conditions for all subjects.

The purpose of this final evaluation was to verify the degree of achievement of the objectives and the validation of the hypotheses.

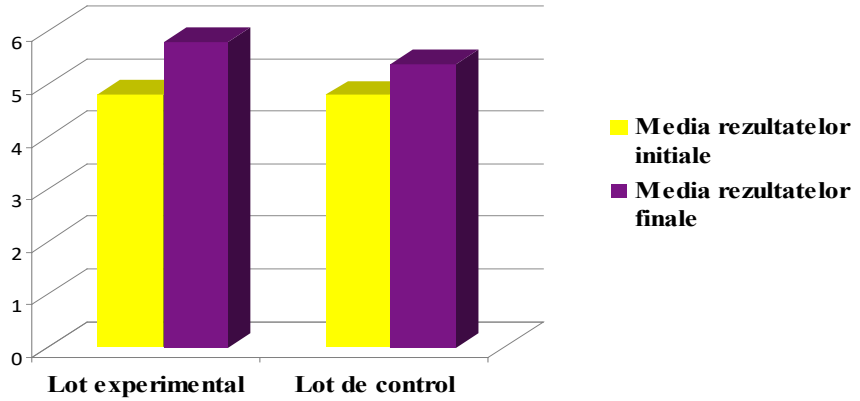
Tests for knowing the psychological age of language

The comparative analysis of the results obtained following the application of the speech therapy intervention program, by the two groups of subjects in this set of samples, highlights a slightly superior performance of the students in the experimental group. Thus, in the final stage:

- the students in the experimental group obtained an average of 5.8085 years, compared to the initial average of 4.7955 years;
- the students in the control group obtained a final score of 5.3950 years, compared to the initial score of 4.7855 years.

From the comparative graphic representation of the averages obtained by the two batches, in the two stages of application of the set of samples, we can see the favorable evolution that both batches had, as a result of the application of the program, as well as the slightly superior difference in favor of the batch experimental, in the case of which we worked with the Logopedix educational programs.

At the beginning of the intervention program, the initial results were similar, and after its application, the averages became slightly different.



Graphic 2. *VPL - comparative - initial / final - both lots*

The results, calculated by the SPSS 19.0 program, showed that:

- the students in the experimental group, who benefited from the language development program using the Logopedix software, compared to those in the control group, who benefited from speech therapy through classical methods, achieved a slightly higher performance (m = 1.0895 growth years, standard deviation = 1.2726);

- students in the control group also achieved a slightly higher performance compared to the initial results (m = 0.6095 months of growth, standard deviation = 1.66203);

Statistical data (t = 0.883, p = 0.383; Cohen's d index = 0.28) show a small effect size. Therefore, **there are no significant differences between the experimental and the control group regarding the development of the psychological age of language**.

The explanation of these results is, among others, that the psychological age of language is a development parameter that does not have a spectacular evolution in children with mental deficiencies of small school age. Experience shows that results are seen four years after the start of schooling, when it is found that the psychological age of language increases, on average, by approximately 3 years, with particular differences depending on the degree of mental deficiency.

In conclusion, it can be considered that the development obtained on this level, as a result of the application of the speech therapy program, is a good one, especially in the case of the experimental group, although the differences are not significant from a statistical point of view. These increases reflect the

global results of the speech therapy program applied in the experimental stage, but also the positive influences of the language development didactic programs in the student classes.

CONCLUSION

Within the modern means used in speech therapy activity, an important place is occupied by the use of computers and educational-therapeutic software. These modern means create a special learning environment and cause a considerable increase in interest in correct pronunciation.

In the conception and use of audio-visual techniques in the therapy of different disabilities, not only the specifics of the disorder must be taken into account, but also the particularities of speech, age and personality of the subjects, the level of mental processes and language development, the particularities of representations, the spirit of observation, the possibilities of generality and abstraction, the ability of children to receive and interpret auditory and visual stimuli. If these particularities are ignored in the development and use of audio-visual techniques, some limits and shortcomings may appear - the determination of intellectual and affective apathy, the risk of passivity, the standardization of behavior. We believe that in order to avoid these shortcomings, the use of audio-visual techniques must be done with discernment, so that they find justification each time within a clearly expressed psycho-pedagogical strategy.

Audio-visual techniques can lead to a kind of verbalism of the image, when they only favor associations unrelated to authentic activities. Preventing the shortcomings that may appear in the inappropriate use of audio-visual techniques, the therapist, through his knowledge and inventiveness, can acquire a valuable help in the therapy activity. Modern audio-visual techniques present superior modes of perception compared to traditional ones, because they contain data, information, phenomena, richer, better selected objects, which can be reproduced in their natural ambience and dynamics.

An effective integration of communication technologies in the educational process is achieved when the teacher changes his teaching strategies and moves from teacher-centered activities to learning-centered activities. The results of the effect of the use of technology in schools are beneficial for students, a statement reinforced by the improvement of school results. It is confirmed that students change their attitude towards themselves and towards learning, they feel more motivated to learn, their self-esteem and confidence in their own strength increases when they use IT tools in school.

Instructional software systems provide students with learning disabilities with the necessary support to adapt to mainstream schools and to attend general curriculum classes. They help the student to transform the tasks from the classic format to the software format, allow detailed observation, organization and editing of the writing requirements, thus motivating the students to participate with confidence in their own forces in the achievement of speaking, reading and writing tasks.

The teacher's action cannot be substituted by the computer, instead he, the teacher, can enhance the reading skills of children and adults with intellectual disabilities together with the computer. Instructional software systems better keep their attention, train reading, and correlate it with other aspects of language or intellectual activity. There are also limits in using the computer with regard to this curriculum area, especially those related to auditory distinction and the correct distinction of groups of letters, poor eye-motor coordination and limited tracking of eye movements from left to right of the page, in the case of reading coming to identify a limited number of whole words that have the same length, the same beginning, ending letter or the same placement in the sentence.

It is necessary to train teachers in the field of electronic didactic design, computer-assisted training through initial and continuous training courses. It is also necessary to promote educational software within national and international conferences and symposium or by creating web pages.

All the factors involved in education must be aware that the integration of computer-assisted instruction in the instructional-educational process of students with learning difficulties is a necessity. It is necessary to develop educational software of the type "lesson generators", which are easy to use in order to allow all teachers to develop their own electronic lessons according to the particularities of the group of students or according to the particularities of a single student. In order to exploit the real potential of each student with intellectual disabilities, an appropriate assessment and the development of a personalized individual plan, which includes the use of software training systems and computer-assisted training according to the particularities and needs of each student with intellectual disabilities. Information and communication technology together with training software systems do not exclude traditional teaching-learning methods, but complete them so that the entire educational process integrates with the needs of students with special needs.

The therapy that involves the use of speech therapy software determines the activation of motivational impulses in the participants. The use of the computer as a support for learning cultivates children's interests for the therapeutic activity. By systematically presenting and offering new, rich, well-selected

information that can be reproduced in its natural ambience and dynamics, the computer maintains the child's curiosity for continuous knowledge and increases the motivation to learn.

Both classical therapy and therapy involving the use of speech therapy software determine the activation of motivational impulses in the participants. The cognitive complexity of the computer is counterbalanced, in the case of classical therapy, by the relational stimulation that engages the children's psychic energy. The use of speech therapy software developed in this sense allows a better focus of the child's attention on the therapeutic activity and creates a psycho-stimulating context for language development.

Using training software systems can help people with disabilities compensate for their impairment, become less dependent, and enrich their repertoire of skills and capabilities. But research conducted over time has shown that these favorable effects were not possible in all situations. This highlights the consistent problem between the needs of the beneficiaries and the strictness of the technology, a concordance that was omitted when government or quality organizations decided to provide software to educational units that integrate children with special educational needs.

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