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Predictive factors of the attitude of private and special education specialists towards the integration of educational software in speech therapy

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Abstract

Artificial intelligence has been used increasingly over the past decade in therapy programs for children with neurodevelopmental disorders such as intellectual disabilities and language disorders. In the present study, we propose to investigate the views of specialists in the field of special psychopedagogy regarding the integration of AI/educational software in speech therapy. To achieve this goal, we created a questionnaire, then identified potential predictors of these attitudes. The results revealed a positive attitude towards the integration of educational software in speech therapy among specialists with more than 10 years of experience.

Keywords: language, dyslalia, speech therapy, disability, soft, traditional

Introduction

Communication would seem to be confused with language. Things are not like that. Language also has other functions, aesthetics, for example, and communication can also take place outside of language. Mr. Radu (2000) studied the fact that the form and severity of the linguistic deficiency more or less affects the functions of communication, it becoming "labile, with moments of stagnation and with progressive, slow developments, a fact that correlates with the dominant personality traits through the exercise of mutual influences, then to be highlighted in global behaviors that tend to be objectified in a specific form for each subject depending on the overall condition of the entire psyche". According to C. Păunescu (1976), communication in this category of children is disturbed by language disorders, often profound, which require speech therapy treatment. The language of the mentally retarded child is not operational in the formal-logical plane, and it never becomes operational, because the amount of symbolization is below the limit of the reflection process. Children in that category present simplified, mutilated, disorganized verbal behavior, and the transport of information is incomplete both from the point of view of reception and from the point of view of production. The verbal communication of the mentally retarded child is distorted. He makes few comments, addresses a small number of requests to partners, asks few questions, shows limited

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possibilities in expressing his attitudes and feelings virtually, avoids commands. In addition to these theses, we will state that mental deficiencies compensate for the disability of expression by using gesture (pointing with the finger) as a tool to describe objects whose names they do not know or cannot sound clearly. Thus, the gesture becomes verbal behavior, the main means of expression.

Lubovsky V.I. (1978) mentions the idea that in the case of these children the regulatory function of speech is diminished. It is known that in the behavior of children with a normal course of development, this function begins to play a considerable role from an early age. In the process of forming skills and abilities, children with mental disabilities rely more on intuitive material than on verbal instruction. These peculiarities are the main causes of underdevelopment of speech. In these children, the development of verbal motor skills takes place in slow, undifferentiated rhythms; in the process of their speech, it is difficult for them to coordinate respiratory, phonatory and articulatory movements. They show serious deficiencies in auditory and kinesthetic control, imprecise and insufficiently formed. A catastrophic decrease in the ability to communicate verbally, which leads to the limitation of verbal contacts and, consequently, to an even greater slowing down of the process of acquiring speech.

D.V. Popovici (2000) mentions the fact that the current society of knowledge, governed by the emergence of information technologies, displays a new set of educational imperatives with which the school must permanently align its goals. This information society determines the emergence of a new type of student, the digital native, the young person born in an environment dominated by technology, who has an inherent understanding of digital technologies, these being integrated into his life since childhood.

Largely due to new technologies, the importance of skills and capabilities – application, critical thinking, creativity, problem solving, communication, collaboration – is increasingly being confirmed over verbal information.

The evolution of technological means not only requires the educational system to train the student's ability to use them, but, at the same time, makes available to all educational actors a set of resources, tools and didactic methods, indispensable today for training efficiency, in all fields transposed into educational subjects.

I.O. Pânișoara (2019) states that education in the spirit of integrating new technologies, as natural working tools for an increasingly wide range of activities, starts from a young age. The acceptance of technological tools is no longer a matter of option or opportunity ("if"/"what?"), but an adaptation, a repositioning and a natural situation in the current context. In this perspective, usefulness ("for what?"), relevance to the training objectives ("for what purpose?") and the efficiency of the integration of activities with technological support ("how do I optimally use the available resources?") become important.

Authors such as R. Foloștină and E. Simion (2020) fix the idea that the random use, without a specific purpose, at an inappropriate moment of the computer and the software during the lesson leads to boredom, monotony, to the inefficiency of learning through the non-participation of some students in the lesson, through the failure to achieve the objectives of the lesson and can produce repulsion towards this modern means of teaching - learning - evaluation. The excessive use of the computer and software can lead to the loss of practical skills, calculation and investigation of reality, to the deterioration of human relationships.

The author A. Gherguț (2013) is of the opinion that specialized computer applications can lead to important progress of the child with deficiency.

The teacher's intervention cannot be replaced by the computer, but the teacher can, together with the computer, improve the reading ability of children and adults with learning difficulties. The computer more effectively keeps their attention awake; practices reading and correlates it with other aspects of language or intellectual activity. Obviously, there can be limits in the use of the computer for this curriculum area, especially those related to auditory discrimination and the correct distinction of groups of letters, poor oculo-motor coordination and limited control of eye movements from left to right of the page, in the case of reading I end up recognizing a limited number of whole words that have the same length, the same beginning, end letter or the same placement in the sentence.

In conclusion, communication and language are essential in the life of any child, and in the case of those with mental impairment, therapeutic intervention becomes indispensable for personal development and social integration. The use of technology in the therapeutic process represents a modern opportunity to adapt traditional methods to the real needs of children and achieve significant results in the development of communication.

Method

Objectives of the discovery experiment: Investigating the opinion of speech therapists in the field of special psychopedagogy (speech therapy) regarding the usefulness of using educational software in speech therapy intervention for students with mild and moderate mental retardation.

Research hypothesis: Personal factors (age, length of service) and environmental factors (type of school and degree of intellectual deficiency of the student being worked with) influence the attitude of speech therapists in the field of special psychopedagogy (speech therapy) towards the use of educational software in speech therapy.

Independent/predictor variables: age, length of service, but also the category of institution, the type of school where the speech therapist works and the degree of intellectual deficiency of the student being worked with.

Dependent variable/criterion: speech therapists' attitude towards the use of educational software in speech therapy.

The dependent variable of the study is the attitude of speech therapists towards the use of educational software in speech therapy, which, in the first hypothesis, will be analyzed in the form of an interval/ratio, and in the second hypothesis it will be analyzed categorically, according to the following independent variables: age (20–40 years, 41–60 years), seniority (a few months, 1 year, 1–10 years, over 10 years), category institution (such as special schools, resource centers, groups of integrated CES students, etc.), as well as the degree of intellectual deficiency of the students being worked with (from severe mental retardation to autism spectrum disorders), and the attitude towards educational software will be expressed through three levels: positive, neutral and negative.

Description of the instruments.

After studying the research of the authors Lin Y, Neuschaefer-Rube C. (2021), Dai M., Xu J, Lin J. (2017), Alazzam MB., Al-Radaideh AT., Alhamarnah RA. (2021), Abbasi R., Zare S., Ahmadian L. (2020), Saeedi S., Ghazisaeedi M., Ebrahimi M. (2023), Tadayon H., Abbasi R., Sadeqi

Jabali M. (2021) a questionnaire was created based on the specialized literature by analyzing several materials. This tool consists of two parts. The first part was related to the demographic information of the speech therapists in the field of special psychopedagogy, being made up of items tracking data such as age, gender, type of employment contract, type of institution, environment of origin, seniority, etc., and the second part was made to collect information related to the attitude towards the use of educational software in speech therapy.

The questionnaire had items with predefined answers on a five-point Likert scale, ranging from 5=total agreement to 1=total disagreement for items aimed at achieving some objectives in the speech therapy therapeutic process, on the one hand, but also a Likert scale from 1 to 10 for items aimed at satisfying some educational needs of students through the use of educational software in the therapeutic process.

To determine the validity and content of the questionnaire, a series of 23 items were translated and adapted to the specifics of the Romanian language. A psychopedagogue and a clinical psychologist, as well as a pediatric neurologist and a translator contributed to the adaptation of the tool. Following the instructions of the translator, the necessary changes were made and subsequently, the items were applied to a sample of 30 speech therapists in the field of special psychopedagogy (speech therapy). Thus, the Cronbach alpha internal consistency index had a value of 0.79, which leads us to conclude that the instrument measures what it intended, so we can use it in our research.

The total score can have values between 22 and 125, and the meaning of each is:

- Between 22 and 58 we can talk about a low score, i.e. the respondent has a negative attitude towards the use of software in speech therapy,
- Between 59 and 94 we can talk about an average score, that is, the respondent has a neutral attitude towards the use of software in speech therapy,
- Between 95 and 125 we can talk about a high score, that is, the respondent has a positive attitude towards the use of software in speech therapy.

In the case of our sample of 214 participants, the Cronbach alpha index was 0.86, which leads us to conclude that this instrument measured what it intended.

Data collection procedure

To achieve the objective of the study and to test its hypotheses, a questionnaire aimed at investigating the attitude of speech therapists regarding the use of software in speech therapy in the communication process was created. The scale was disseminated online via the Google Forms platform to all speech therapists in special schools and other forms of professional practice.

Before completing the questionnaire, the participants signed the informed consent. Participation was voluntary, and participants were told that there were no good or bad answers, only answers consistent with each person's reality.

From February 2023 to May 2023 respondents could complete the questionnaire.

The data collection procedure involved the use of CSV data extraction modules from Google Forms in RStudio, version 4.3.0, for PC, then they were processed by applying the Multinomial Regression Model was applied to highlight the relationships between the research variables. To apply the multinomial regression model, all variables were transformed into categorical variables.

Description of participants

214 speech therapists from the field of special psychopedagogy participated in the study, 82 male and 132 female, 84 between the ages of 20 and 40, and 130 between the ages of 41 and 60 (M=37.51, SD=2.6) (Figure 1-2).

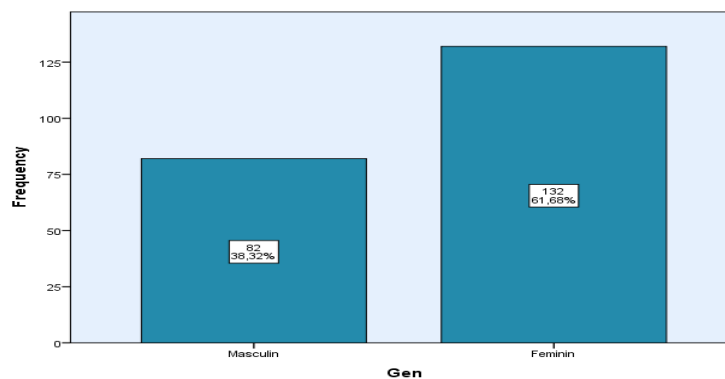


Figure 1. Demographic characteristics – Gen variable

This chart shows the distribution of participants by gender. Out of the total of 214 speech therapists, 132 are female and 82 are male. The distribution reflects a known trend in the field of special psychopedagogy, in which female teachers predominate. This distribution may influence attitudes toward technology use, depending on differences in professional socialization and familiarity with digital tools.

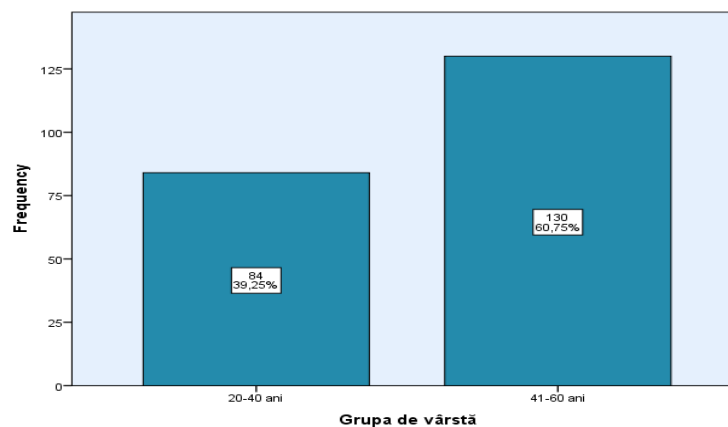


Figure 2. Demographic characteristics – the Age variable

The graph shows that 84 speech therapists are between 20-40 years old, and 130 between 41-60 years old. The mean age is $M = 37.51$ years ($SD = 2.6$). This distribution suggests an intergenerationally balanced sample, but with a slight predominance of older speech therapists. Considering the subsequent results, age was found to be an important predictor of attitude towards the use of educational software, implying generational differences in technology acceptance.

According to the figures below, 164 speech therapists work in inclusive centers and schools. 96 of the speech therapists work with students with mild mental impairment, and 56 with students with language impairment with/without expressive disorders, in a neurological context, clinically and paraclinically objectified (Figure 3-4).

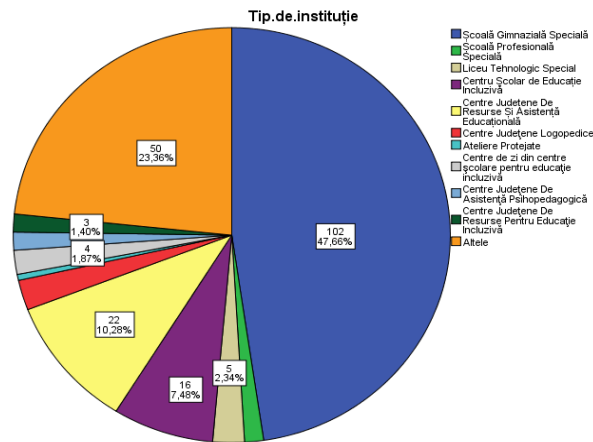


Figure 3. Distribution of the variable Type of institution

This diagram shows the distribution of speech therapists according to **the type of institution** where they work. It is noted that **164 respondents work in school centers and inclusive education institutions**, which reflects the tendency to integrate children with CES into the general education system. Institutional diversity indicates that the implementation of speech therapy technology is influenced by the available resources and organizational culture specific to each institution.

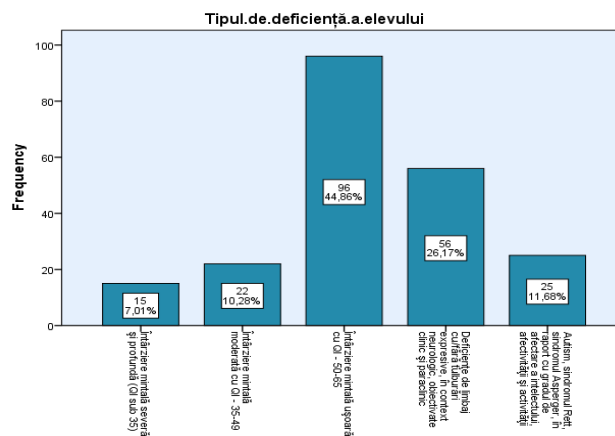


Figure 4. Distribution of the variable Type/Degree of the student's impairment

The chart illustrates the types of student impairments speech therapists work with. Most of the respondents, **96**, work with students **with mild mental retardation**, and **56** with students **with language impairments**, including expressive disorders in a neurological context. This distribution emphasizes the need for adaptable educational software that can respond to a variety of cognitive and linguistic needs.

Findings

In this study, we tested the personal (gender, age) and environmental factors (type of institution, type of school and degree of intellectual deficiency of the student with whom we work) that would influence the attitude of speech therapists in the field of special psychopedagogy towards the use of educational software in speech therapy.

Table 1. Fit model

Exemplary	Deviance	AIC	BIC	R ² _{McF}	Overall Model Test		
					χ^2	df	p
1	280	304	344	0.222	79.9	10	<.001

This table presents a general assessment of the quality of the applied statistical model. The chi-square value ($\chi^2 = 79.9$, $p < .001$) indicates that the model is significant. The coefficient R²_{McF} = **0.222** suggests that approximately 22% of the variation in attitude towards the use of educational software is explained by the model. **The AIC (304) and BIC (344) values** are acceptable, which supports the appropriateness of the model. In conclusion, the model is robust and statistically relevant.

The table below shows that all the variables included in the model are robust predictors for the criterion variable, $p < 0.05$.

Table 2. Omnibus Likelihood Ratio

Predictable	χ^2	df	p
Seniority in work	14.00	2	0.002
Age	5.34	2	0.032
The.type.of.the.student's.impairment	12.58	2	0.002
The.type.of.school	7.23	2	0.027
Type.of.institution	19.21	2	<.001

This table shows that all variables entered into the model are significant predictors of attitude towards educational software:

Seniority at work ($\chi^2 = 14.00$, $p = 0.002$) – professional experience influences the attitude towards technology, probably depending on the familiarity or routine created in the speech therapy activity.

Age ($\chi^2 = 5.34$, $p = 0.032$) – correlates with the level of openness to digitalization.

The student's type of deficiency ($\chi^2 = 12.58$, $p = 0.002$) – suggests that the specific needs of the students influence the choice of the therapeutic method.

The type of school ($\chi^2 = 7.23$, $p = 0.027$) and the type of institution ($\chi^2 = 19.21$, $p < .001$) – confirm the influence of the institutional environment on methodological decisions.

Going further with the analysis, for the neutral attitude, but also for the negative one, only age would be a robust predictor, $p < 0.05$, $p = 0.036$, and for the positive attitude, robust predictors would be: seniority, the age of speech therapists and the degree of intellectual deficiency of the student (Table 3).

And in this case, a possible explanation of the result would be that the educational software still has limitations in adapting the interface and the types of exercises to the type of basic language disorder that the speech-language pathologist has.

Table 3. Model Coefficient – total score

Total score	Predictable	Estimate	SE	Z	p
neutral attitude - negative attitude	Interception	6.2073	2.3513	2.640	0.008
	Seniority in work	-0.4720	0.8555	0.552	0.581
	Age	-1.4636	0.6992	2.093	0.036
	The.type.of.the.student's.impairment	-0.2960	0.3354	0.883	0.377
	The.type.of.school	-0.2920	0.2074	1.408	0.159
positive attitude - negative attitude	Interception	10.4494	2.3028	4.538	< .001
	Seniority in work	-1.7108	0.7986	2.142	0.032
	Age	-1.2681	0.6987	1.815	0.047
	The.type.of.the.student's.impairment	-0.8523	0.3345	2.548	0.011
	The.type.of.school	0.0949	0.2249	0.422	0.673

This table details the impact of the predictors on each type of attitude:

Neutral attitude vs. negative: the only significant predictor is age ($p = 0.036$), which indicates that younger speech therapists tend more often towards a neutral attitude, compared to those who show resistance to using the software.

Positive attitude vs. negative: there are three significant predictors:

Seniority ($p = 0.032$) – speech therapists with less experience are more open to using software.

Age ($p = 0.047$) – younger speech therapists are more prone to positive attitudes.

The type of student's impairment ($p = 0.011$) – the use of software is influenced by the complexity of the student's disorder.

Nonsignificant predictors (eg, school type on positive attitude) suggest that certain institutional dimensions have less impact on individual attitudes than personal or student characteristics.

From the tables above, it can be seen that the hypothesis is supported, $R^2 = 0.22$, $p < .001$, AIC and BIC indices are within the norms accepted for research.

Conclusions

Most speech therapists in our sample support the use of educational software in making speech therapy more efficient. Thus, 139 of the participants have a positive attitude towards the use of educational software in speech therapy, 57 have a neutral attitude, and 18 have a negative attitude.

In addition, 83 of the participants aged between 41 and 60 support the integration of technology in speech therapy, as well as 56 speech therapists whose age is between 20 and 40. 88 of the participants with a master's degree and with more than 10 years of experience in education have a positive attitude towards the use of software in speech therapy, and the fewest, 5 bachelor's and 2 PhD graduates, have a negative attitude. Most of those who have a neutral attitude have completed master's studies, 40.

We tested the hypothesis according to which it is assumed that personal factors (age, length of service) and environmental factors (type of school and degree of intellectual deficiency of the student being worked with) influence the attitude of speech therapists in the field of special psychopedagogy towards the use of educational software in speech therapy. This hypothesis is supported by the data collected.

For the neutral attitude, but also for the negative one, the robust predictor would be only age, and for the positive attitude the robust predictors would be: the gender, the age of the speech therapists and the degree of intellectual deficiency of the student.

A possible explanation of these results would be that the educational software still has limitations in adapting the interface and the types of exercises to the type of basic disorder that the speech-language pathologist has. In addition, if we are talking about speech therapists trained in the classical approach, the introduction of technology into educational activities should be done through training programs. One of the possible limitations of the present study is the unequal number of participants in each group.

A future direction in the research would be to expand the sample to other speech therapists in education, and to conduct a longitudinal study to concretely see the effectiveness of these applications in speech therapy.

Recommendations

Technology is a wonderful thing, and we are seeing it used more and more in speech language pathology practices. Speech therapists use computers, tablets, smart phones, smart boards, and more in speech therapy for a variety of purposes. Therefore, it is necessary for specialists in the fields related to language disorders to inform themselves about the usefulness of using educational software in this form of therapy. Thus, some recommendations are highlighted regarding the use of educational software in the correction of language disorders in students with intellectual disabilities: information on the advantages and disadvantages of using educational software in the therapeutic process; testing the targeted software before use, familiarizing the speech therapist with the interface proposed by the manufacturers of educational platforms, choosing the most suitable platforms for the specificity of the child's problems to be worked with, several platforms can be used to achieve a therapeutic goal, depending on the goals of the therapy certain exercises are chosen from a platform.

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