Evaluating a Speech-Language Pathology Technology

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Abstract

Background: The creation of new educational strategies based on technology is the essence of telehealth. This innovative learning is an alternative to promote integration and improve the professional practices in speech-language pathology (SLP). The objective of this study was to evaluate an SLP technology designed for distance learning. **Materials and Methods:** The survey selected fourth-year SLP students ($n=60$) from three public universities in the state of São Paulo, Brazil. The experimental group (EG) contained 10 students from each university ($n=30$), and the remaining students formed the control group (CG). Initially, both groups answered a preprotocol questionnaire, and the EG students received the technology, the recommendations, and the deadline to explore the material. In the second stage all students answered the postprotocol questionnaire in order to evaluate the validity and the learning of the technology contents. **Results:** The comparison between the CG students showed that their performance worsened in the majority in comparison with the EG students, who showed an improved performance. **Conclusions:** Therefore, this study concluded that the technology instrument actually responded to the population studied and is recommended to complement traditional teaching.

Key words: telehealth, distance learning, cost-minimizations

Introduction

Brazil covers a large land area and has an irregular distribution of speech-language pathology (SLP) professionals and for this reason is a favorable site to implement new technologies for professional qualification. The majority of undergraduate courses in this field are located in the southeast and south of the country.¹ Therefore, the state of São Paulo (southeast) has the largest number of SLP professionals, whereas the state of Roraima (north) has the lowest number.²

Given those conditions, the use of technological resources may minimize inequalities and support the teaching of SLP. The principles

and advantages of telehealth are (a) to access remote locations by promoting data sources, through Web sites, instructional videos, and other teaching tools, (b) to minimize costs, including the low-income population, and (c) to optimize time, once the students have the flexibility and independence to study.³

An interactive and virtual learning environment can assist, promote, and conduct education, as long as the procedures guarantee the same effectiveness if conducted personally, with trained human resources and materials adapted to the target population without a decrease in the education quality.

Several audiology studies have evaluated the acceptance, satisfaction, and effectiveness toward telehealth, highlighting that the use of a computerized and self-instructed instrument provided the best learning content.⁴⁻⁶ However, only a few SLP studies have been conducted, which invites new research in this area.

The current study is an extension of a previous Spinardi research that described the development of an SLP CD-ROM titled "Therapeutic Procedures in Phonological Disorder."⁷ The material creation process occurred in four stages: analysis and planning, conceptual modeling, navigation and interface, and implementation and evaluation. The CD-ROM content was judged appropriate to the intended audience, yielding positive responses in most items evaluated. Therefore, the authors proposed the use of the technology as a complementary tool for distance education—that is, telehealth.⁷

In this context, the objective of this study was to evaluate the technology previously prepared to complement traditional education.

Materials and Methods

All participants signed an informed consent, and the research was approved by the Ethics Committee with protocol number 016/2008/2009.

The survey selected 60 fourth-year SLP students of three public universities in the state of São Paulo, Brazil, in the cities of Bauru, Marília, and Ribeirão Preto. They were questioned about identification (name, age, and gender), university, area of interest, and if they had a computer, used Internet dial-up or broadband, and interest in receiving and using technology.

The participants were all females (mean age, 23 years) and had computers with broadband Internet, except two students who had dial-up Internet and one without computer or Internet. The students who had a computer and also the interest in receiving the technology were selected for the experimental group (EG), with 10 students from each university ($n=30$). The remaining students formed the control group (CG) ($n=30$). Only the EG students participated in the telehealth study with the technology, a previously prepared SLP CD-ROM.⁷

The evaluation process was conducted in two stages. Initially, both groups answered a preprotocol questionnaire, and the EG students

Table 1. Mean Performance on the Students' Pre- and Postprotocol Questionnaires

	CG			EG		
	PRE	POST	DIFFERENCE	PRE	POST	DIFFERENCE
Mean	5.17	5.07	−0.10	4.40	5.37	0.87
Median	5.00	5.00	−0.25	4.50	5.50	1.00
Standard deviation	1.50	1.13	1.63	0.87	1.26	1.05

CG, control group; EG, experimental group.

received the technology, the recommendations, and the deadline to explore the material—1 month. The specific goals of the study were self-learning and to determine how many students would complete the process; therefore the students were free to choose the method, to complete the study, or to withdraw. The preprotocol questionnaire validated in the previous study⁷ consisted of nine multiple-choice questions and two essay questions, all based across the content provided by the technology. Correct answers received a score of 1.0 except for Question 2, which counted for 0.5 or 1.0, and the essay questions counted for 0.5 each. Thereby the maximum score was 10.0, and the minimum score was 0. In the second stage all students answered the postprotocol questionnaire—containing the same questions as the preprotocol questionnaire—in order to evaluate the validity and the learning of the technology contents. The study was conducted at the end of the fourth year; therefore, all students had attended the theoretical lecture that corresponds to the content offered in the technology. The CG students continued to attend face-to-face lectures without other intervention. The EG students, in addition to the same face-to-face lectures, participated the study with the technology.

The interaction between the researcher and the students during the study also occurred through the Internet (chats and e-mails), regarding the conditions of the study, evaluation dates, and doubts about the technology.

The paired *t* test was used to analyze statistically the performance of CG students in the two stages and also to determine the outcome of the EG separately, adopting the significance level of 5%. The analysis that compared the two groups was performed using the Mann–Whitney test

for two independent samples (difference in median values) because the distribution was abnormal.

Results

Only three students from the EG withdrew from the study by the second stage because they had other commitments: 5% of all participants and 10% of the EG. In the qualitative analysis of the sample, 11 students from the CG (*n*=30) and 19 students from the EG (*n*=27) improved their final grades, 15 CG students and 3 EG students had worse final grades, and 4 CG students and 5 EG students maintained the

same performance. The CG average in the preprotocol questionnaire was higher than the EG average. In the postprotocol questionnaire, the EG average was higher than their average in the preprotocol questionnaire and the CG postprotocol questionnaire average. The qualitative difference was observed in the performance of EG participants, as shown in *Table 1*.

The statistical treatment within the CG revealed a weak change to exclude the possibility that the difference is due to chance, meaning that the CG students performed similarly on both protocols, as demonstrated in *Table 2*. The statistical analysis within the EG showed a significant difference (*Table 3*), meaning that the students improved their performance considerably on the postprotocol questionnaire after application of the technology.

Table 4 gives the performance on the pre- and postprotocol questionnaires compared between groups, and the statistical analysis showed a statistically significant difference, meaning the EG median was the highest. Questions 6–10 of the preprotocol questionnaire of both groups indicated a low rate of correct answers, as shown in *Table 5*.

Discussion

This study used the technology and followed the principles of telehealth, complementing the education, using technologies such as computers and Internet, and complementing the relationship between student and teacher.

The choice of the technology was consistent with the purpose of the study, once the content of SLP was extended to the students with an easy access and low cost. Other studies have demonstrated that a CD-

Table 2. Comparison of the Control Group's Performance on the Pre- and Postprotocol Questionnaires

TREATMENT NAME	N	MISSING	MEAN	STANDARD DEVIATION
CG Pre	30	0	5.167	1.505
CG Post	30	0	5.067	1.128
Difference	30	0	0.1	1.632

t=0.336, *p*=0.740.

CG Pre, control group preprotocol; CG Post, control group postprotocol.

Table 3. Comparison of the Experimental Group's Performance in the Pre- and Postprotocol Questionnaires

TREATMENT NAME	N	MISSING	MEAN	STANDARD DEVIATION
EG Pre	30	0	4.4	0.875
EG Post	30	3	5.37	1.26
Difference	30	3	−0.87	1.052

t=−4.297, *p*≤0.001.

EG Pre, experimental group preprotocol; EG Post, experimental group postprotocol.

Table 4. Comparison Between Control Group and Experimental Group Performances in the Pre- and Postprotocol Questionnaires

GROUP	N	MISSING	MEDIAN	25%	75%
CG	30	0	-0.25	-1.5	1
EG	27	0	1	0	1.375

$p=0.008$.

CG, control group; EG, experimental group.

ROM is more accepted by students compared with other methods of telehealth and confirmed better results in relation to the process.⁸⁻¹⁰

The comparison between the CG students showed that their performance worsened in the majority. In contrast, the comparison between the EG students revealed an improved performance—in terms of one to three questions—and only three students had a worsen performance. These differences between groups were confirmed when their pre- and postprotocol questionnaires were compared, and the EG presented the highest median.

Questions 6–10 are related to the therapeutic models in the SLP treatment referred to in the technology. The results of the preprotocol questionnaires for all students demonstrated that they have a gap on the subject of therapeutic models. The EG improved their results of those questions in the postprotocol questionnaire, unlike the CG. Therefore, the material can be recommended to complement and assist the traditional teaching of therapeutic procedures.

Some issues appeared: the protocol actually evaluated concisely the study of the technology; the period of the course was short; and the course should be conducted in another school year period. Future studies may revise the topic of the material in accordance with the students' needs, as well conducting a longer examination and starting in the first half-year in order to optimize the results.

Table 5. Number of Correct Answers in the Pre- and Postprotocol Questionnaires

QUESTION	PRE/CG	POST/CG	PRE/EG	POST/EG
1	28	30	28	27
2	21	23	22	23
3	25	23	19	23
4	23	20	21	21
5	16	18	17	19
6	15	11	10	6
7	1	1	2	3
8	6	5	2	8
9	7	14	1	11
10	6	5	4	11

CG, control group; EG, experimental group.

Other studies found satisfactory results in post-test performance while using the CD-ROM, with similar duration and populations, highlighting the advantages of using a computerized and self-instructed instrument that provides the best learning content.⁴⁻¹¹ Therefore this study concluded that the instrument actually respond to the population studied and can be recommended to complement traditional teaching.

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Disclosure Statement

No competing financial interests exist.

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