http://dx.doi.org/10.23925/2176-2724.2020v32i1p41-51

Interactional technology tools in tablets phonological intervention in children with speech disorders

Ferramentas tecnológicas de interação em *tablets* no atendimento fonoaudiológico de crianças com transtorno dos sons da fala

Herramientas tecnológicas de interacción en tabletas en la atención fonoaudiológica de niños con transtorno del habla

*Lygia Rondon de Mattos Noblat**
*Mabile Francine Ferreira Silva***
*Maria Claudia Cunha***

Abstract

INTRODUCTION: More and more, the use of technological communication tools is increasing. In this context, the theme of this research is the use of these technologies in speech therapy interventions in children with speech disorders (SD). OBJECTIVE: To describe the use of interactional technology tools with tablets in speech therapy of children with speech disorders. METHOD: Descriptive study with four children of both genders, aged 5.3 to 5.11 years old with SD. Individual assessment and reassessment were carried out through the ABFW test. Selected participants went to speech therapy weekly, for 30 minutes, in an adequate space. The tablet was used as an auxiliary tool. Statements were obtained from the teacher and the coordinator about the evolution of the cases. Data were analyzed quantitatively and qualitatively from categories defined later. RESULTS: The tablet was used in 92.68% of the sessions, and during 64.55% of the total time. Therapist / patient interaction games (43.57%) were the most used, followed by individual games (33.12%) and games with camera (23.29%). It was observed that the

* UNIPLAN - Centro Universitário Planalto do Distrito Federal, DF, Brazil
** Pontificia Universidade Católica de São Paulo, SP, Brazil.

Authors' contributions:
LRMN: Conception of the study project, data collection and interpretation, critical review of relevant intellectual content and final approval of the version to be submitted for publication.
MFFS: Critical review of relevant intellectual content and final approval of the version to be submitted for publication.
MCC: Conception of the study project, data interpretation, critical review of relevant intellectual content and final approval of the version to be submitted for publication.

Correspondence e-mail: Lygia Rondon de Mattos Noblat - lygia10@gmail.com
Received: 18/01/2019
Approved: 03/02/2020

tablet worked as a motivating tool for the therapeutic process, although in different degrees and it was not overriding ~~to~~ the progress of the subjects. CONCLUSION: With the study the use of interactional technology tools improved the therapeutic process, as it intensified the dialogic activity between patient and therapist and was configured as an effective playful resource for patient adherence to the treatment.

Keywords: Speech Disorders; Information Technology; Language; Speech Sound Disorder.

Resumo

INTRODUÇÃO: Cada vez mais, proliferam-se ferramentas tecnológicas de comunicação. Nesse contexto, o tema desta pesquisa é a utilização dessas tecnologias nas intervenções fonoaudiológicas com crianças com transtorno dos sons da fala. OBJETIVO: Descrever a utilização de ferramentas tecnológicas de interação em tablets no atendimento fonoaudiológico de crianças com transtorno dos sons da fala. MÉTODO: Pesquisa descritiva com quatro crianças de ambos os sexos, na faixa etária de 5,3 a 5,11 anos. Foram realizadas avaliação e reavaliação individual dos sujeitos selecionados por meio das provas de fonologia do teste de linguagem infantil - ABFW. Os indivíduos foram atendidos semanalmente, com duração de 30 minutos. O tablet foi utilizado como dispositivo auxiliar. Foram coletados depoimentos livres (da professora e da coordenadora) sobre a evolução dos casos. Os dados foram analisados quantitativa e qualitativamente a partir de categorias definidas a posteriori. RESULTADOS: O tablet foi usado em 92,68% das sessões, e em média por 64,55% do tempo total das sessões. Prevaleceram os jogos interativos terapeuta/paciente (43,57%), seguidos por aplicativos de jogos individuais (33,12%) e uso da câmera em (23,29%). Analisando o conjunto dos casos estudados, verificou-se a seguinte tendência: o tablet funcionou como recurso motivador para o processo terapêutico, embora em diferentes graus e de maneira não decisiva para evolução dos casos. CONCLUSÃO: Nos sujeitos aqui estudados a utilização de ferramentas tecnológicas de interação favoreceu os processos terapêuticos, na medida em que intensificou a atividade dialógica entre paciente e terapeuta e configurou-se como recurso lúdico efetivo para a adesão dos pacientes ao tratamento.

Palavras-chave: Distúrbios da Fala; Tecnologia da Informação; Linguagem; Transtorno Fonológico.

Resumen

INTRODUCCIÓN: Cada vez más, se proliferan herramientas tecnológicas de comunicación. El tema de esta investigación es la utilización de esas tecnologías en las intervenciones fonoaudiológicas con niños trastorno del habla. OBJETIVO: Describir la utilización de herramientas tecnológicas de interacción en tabletas en la atención fonoaudiológica de niños con trastorno del habla. MÉTODO: investigación descriptiva con cuatro niños de ambos sexos, en el grupo de edad de 5,3 a 5,11 años. Se realizó una evaluación y reavaloración individual de los sujetos por medio de la prueba de fonología del examen de lenguaje infantil - ABFW. Atendimiento semanal, durante 30 minutos. La tableta, se utilizó como dispositivo auxiliar. Fueron recolectados testimonios libres sobre la evolución de los casos. Los datos fueron analizados cuantitativa y cualitativamente a partir de categorías definidas a posteriori. RESULTADOS: La tableta fue utilizada en el 92,68% de las sesiones, y en promedio por el 64,55% del tiempo total. Se prevalecían los juegos de interacción terapeuta / paciente (43,57%), seguidos por aplicaciones de juegos individuales (33,12%) y cámara en (23,29%). Al analizar el conjunto de los casos estudiados, se verificó la siguiente tendencia: la tableta funcionó como recurso motivador para el proceso terapéutico, aunque en diferentes grados y de manera no decisiva para la evolución de los casos. CONCLUSIÓN: En los sujetos aquí estudiados la utilización de herramientas tecnológicas de interacción favoreció los procesos terapéuticos, en la medida en que intensificó la actividad dialógica entre paciente y terapeuta y se configuró como recurso lúdico efectivo para la adhesión de los pacientes al tratamiento.

Palabras clave: Trastornos del Habla; Tecnología de la Información; Lenguaje; Trastorno Fonológico.

Introduction

The speech sound disorder is characterized by inadequacies in the sound production and in the use of the phonological rules of the language, which compromise the distinctive phonemic contrasts, potentially affecting the meaning of the sentences. These changes are caused by various reasons, and their severity, that is, the degree of impairment in speech, may be mild, moderate or severe[1-3].

It can be noted that, among the language disorders, speech sound disorders are more noticeable in children, considering that phonological development is gradual until around 7:0 years of age[4,5].

The period from 1:6 to 4:0 is the period of greatest expansion of the phonological system, including a significant growth in the phonetic inventory. More complex syllabic structures and polysyllable words are gradually produced, characterizing the occurrence of possible phoneme substitutions and omissions. And from 4:0 to 7:0 years old, children start to use short and long words properly[2].

However, it should be noted that children develop language in a unique way, although there is a certain pattern or trend. However, children who make inadequate use of phonological rules of the language may be diagnosed with a speech sound disorder. In these cases, the evaluation with a possible referral to speech-language pathology is indicated[2,6].

In order to reach the diagnosis of speech sounds disorder, it is required to map the phonetic inventory, analyze the syllabic structures, observe the distribution of sounds in these structures and in the words and indicate the phonological rules applied by the child[2].

There are three measures mentioned in the literature[7] for the classification of the severity of a speech sound disorder: Percentage of correct consonants (PCC), which checks the number of correct consonants from a spontaneous speech sample; Percentage of correct consonants revised (PCC-R), whose difference in relation to the PCC is that the distortions are not considered as error; and Process Density Index (PDI), which is based on the total phonological processes found, divided by the number of words in the speech sample analyzed.

In turn, the diversity of therapeutic procedures used in speech-language pathology for speech sound disorder and which have been replicated in Brazil should be highlighted: Modified Cycles, which suggests working from a target sound, aiming to raise awareness and remove inappropriate phonological processes[8]; Modified Maximal Opposition, which works with words that differ by a single phoneme, the minimum pairs, but with maximum distinction of features[6,9]; ABAB-Withdrawal and Multiple Probes, which proposes that treatment should begin with the most complex distinctive features, followed by the simplest[10].

However, it is worth noticing that technological communication devices (computer, tablet, smartphone) are increasingly proliferating, and that they have been used as auxiliary devices for these interventions. And this is the subject of this study, since it is possible to observe in clinical practice that interaction tools, such as applications (apps), especially developed for tablets, encourage and motivate children to produce and repeat words, typical speech-language pathology procedures, both for evaluation and for interventions in speech sounds disorder.

Currently, it is also observed that these tools have become more accessible to health care professionals and to children of different economic and socio-cultural classes, as they are living in a world full of technologies and, hence, these technologies are already part of children's everyday[11]. Thus, the use of software for therapeutic purposes intensifies in the various speech-language pathology specialties, as a complement to traditional clinical procedures in the area; although research on the topic is still scarce[3,12].

In the specific context of speech sounds disorder, it is worth mentioning the study that started in 2010 in the Centerville City School District (USA), using electronic games applications on a tablet, which showed results so effective that the researchers claimed that such a procedure constitutes a "revolution in contemporary phonological therapies"[13].

Given these considerations, this research assumes that the use of technological devices in speech-language pathology interventions should be investigated so that their clinical implications can be scientifically evaluated.

Purpose

To describe the use of technological interaction devices with tablets in speech-language pathology therapy for children with speech sound disorder.

Methods

A descriptive research that was conducted in accordance with the ethical standards established for research with human subjects. The guardians of all participants signed the "Free Prior Informed consent" (FPIC). The subjects' identity was preserved. This study was approved by the Research Ethics Committee (under the process no. 35021314.3.0000.5482).

Casuistry

Four children of both genders, aged from 5.3 to 5.11 years, with speech sound disorder.

Exclusion criteria: clinical signs of other oral language disorders, hearing impairment and/or neuropsychomotor disorders.

The study was conducted at the Instituto Jorge Saraiva, located in Freguesia do Ó in São Paulo. The institution, which has a philanthropic nature, serves children from 2.0 to 6.0 years old, full time, aiming at the development of physical, psychological, intellectual and social aspects, complementing the actions of the family and the community.

Procedure

Step 1.

- Submission of the project to obtain the Institution's approval
- Clarifications on the selection criteria for subjects provided to the Institution's Coordinator, in a previously scheduled meeting.
- After the subjects were selected by the Coordinator, they were observed in the classroom. The researcher had an informal participation in activities, games and classroom conversations, in order to validate the indications, based on the selection criteria.
- The FPIC was submitted by the Coordinator to the guardians of the children, who signed and returned it to the Institution.

Step 2.

- Individual evaluation of the selected subjects through the phonology tests of the children's language test - ABFW[14], in a room reserved for this activity.
- The instrument consists of two tests: imitation and naming. The imitation test comprises 39 words that the subject should repeat from the therapist. On the other hand, the nomination test comprises 34 figures.
- All evaluations were recorded with the camera placed on a tripod aimed at and close to the child to promote the phonetic transcription of the material.
- Evaluation of Orofacial Motricity using the MBGR[15] orofacial myofunctional assessment instrument, which was adapted by the researcher based on the selection of the following aspects: evaluation of mobility and tone of the tongue, lips, and cheeks; chewing, swallowing, breathing, speech and voice functions; observation of dentition.

Step 3.

- 30-minute weekly individual consultations in a suitable physical space. Although the initial proposal included 10 sessions, the consultations ranged from 8 to 9 sessions. Patients missed at least one session during the proposed data collection period.
- Different techniques were used based on the peculiarities of each clinical case. This practice is legitimate in order to expand the phonetic inventory of patients.
- The tablet with the applications (Chart 1) was used as an auxiliary device in the therapeutic

Chart 1. Apps used in the iPad 2

1.	Puzzles
2.	Angry birds
3.	Bike Race
4.	Tom Talking
5.	Ginger Talking
6.	Paint Sparkles draw
7.	Princess coloring book
8.	Smack gugl
9.	Car racing
10.	Pac-man
11.	Race penguin
12.	Dentist office
13.	Where's tappy
14.	*Pequeno pintor*
15.	*Quero ser Turma da Mônica*

process, and was available upon request (or not) by the child.
- All sessions were fully recorded.

Step 4.

- Reassessment of subjects using the same instrument as the initial assessment (ABFW/phonology tests)
- Collection of reports freely provided on the evolution of cases, which were prepared in writing by the teacher and the institution's coordinator, with the following question: Did you notice any changes in the speech of... after we started the speech-language pathology? Detail your observation, if possible.

Material

- An iPad produced by *Apple Inc*.
- Canon digital power shot camera 14.1 mega pixels;
- ABFW[14] phonology tests;
- MBGR[15] orofacial myofunctional assessment protocol.

Analysis of Results

Data were quantitatively and qualitatively analyzed according to categories defined *a posteriori* in the clinical material.

The categories that were analyzed quantitatively were: 1) frequency of use; and 2) type of application used (individual games, therapist-patient interaction games, and camera).

It is noteworthy that, in addition to recording it, after each session written notes were also taken on the content relevant to the research objective.

Results

As for the frequency, the tablet was requested and used in 41 of the 44 sessions with the subjects, thus resulting in an average of 92.68% of the 30-minute sessions. Therefore, it can be concluded that the device was used on average for 794 minutes/64.55% of the total time (1,230 minutes) of the sessions.

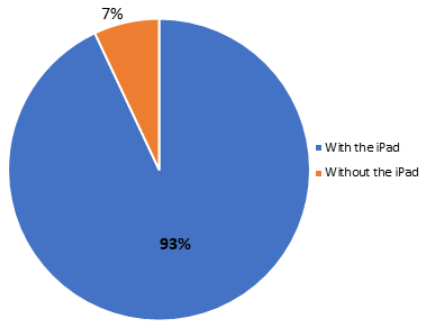

Figure 1. Frequency of tablet use

The therapist/patient interaction games (Memory game, Talking Tom, Talking Ginger and Paint Sparkle) prevailed in 43.57% of the average session time, followed by individual games (coloring games, Talking Tom, Talking Ginger, Talking Paul, Car racing, *Quero ser da Turma da Mônica* and Smack gugl) in 33.12%, and the camera in 23.29% of the time.

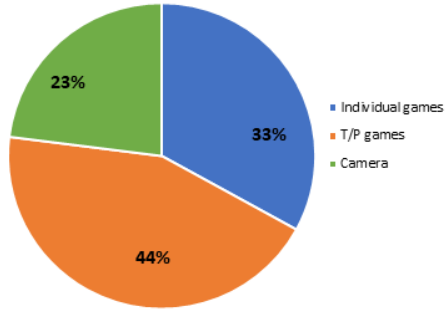

Figure 2. Type of application used on average in total sessions

None of these applications has been specially developed for speech-language pathology activities, so they are being adapted to the therapy in tasks of imitation/naming at the levels of syllables, words and phrases. The camera was adapted to mirror function in order to perform orofacial motricity exercises or as a camcorder to provide a feedback to the subjects with respect to their performance in these activities and in the imitation/verbal naming activities.

Case presentation

The material of each clinical case was presented according to the following structure: characterization of the subject, complaint as prepared by the Coordinator, assessment of orofacial motricity, initial and final results of the ABFW (phonology

tests), analysis of the peculiarities related to the use of technology, free testimonials provided by the coordinator and the teacher on the evolution of the subjects.

S1
D.O.B.: 04/03/2008
Age: 5 year and 11 months
Gender: Female
Complaint: "She has speech changes and a childish speech" (SIC – Coordinator)
Number of consultations: 09

Assessment of orofacial motricity

As for orofacial motricity: no changes were observed as to the tone and mobility, or in chewing, swallowing and breathing functions. She hasn't lost any teeth yet.

Results of ABFW/Phonology Test

Initial: Changes in the imitation and naming tests were: palatal fronting (e.g.: *bandeja* [bã'deza], *borracha* [bɔ'xasa], *zero* ['z ɛlu], *xícara* [si'cala], simplification of consonant cluster with /r/, (e.g.: *prego* ['pɛgu]) and unsystematic simplification of consonant cluster with /l/ (e.g.: *planta* [pã'ta], *bloco* ['bocɔ].

Final: The unsystematic simplification of the consonant cluster remained in the imitation and nomination tests. E.g.: *travessa* [tave'sa], *planta* [pã'ta]. The change of syllable position was also noted with consonant cluster. E.g.: *droga* ['dogɾə], *fraco* ['fakɾu], *trator* [ta'tɾo].

Use of technology

S1 is a very communicative girl and showed to be very interested in the therapy; she was very willing to speak correctly, and she said that people did not understand what she said and, therefore, she always had to repeat the words.

Her initial demand was the phoneme /r/, as she wanted to speak her own name correctly, so the introduction of that phoneme was prioritized during the therapeutic process.

The tablet was widely used, since the patient requested it in all sessions and looked for applications that were related to feminine themes (for example, a coloring game with princesses). When this application was used, she used to exclude the therapist from the activity and played alone with pleasure.

The therapist tried to participate in the game in order to work on the chosen target sound, often with success. Thus, a space was opened for dialogue and the therapist used the speech of the patient and encouraged her to narrate, highlighting the changes and promoting attempts for the proper phonological production.

The work with tongue vibration was stimulated, since although the participant was able to perform it, there was an unsystematic substitution of /r/ by /l/. The tablet's camera was used to record films in spontaneous conversations that were later watched. Therefore, the patient was able to identify the errors and the therapist reinforced her successes.

The *Paint sparkles draw* was one of the applications that were used in this activity, which simulates a blackboard on which you can draw, write and paint. A car and a house were drawn on the tablet screen, and then the patient drew a path linking both while vibrating her own tongue. Vowels were added at another time. This was an exciting activity for the patient, who always took the lead, then made the drawings and soon started to vibrate her tongue.

S1 used to spontaneously report facts from her daily life, particularly on learning in the classroom. She was in the literacy stage and used the application to write words that she had learned, with enthusiasm.

After learning to speak her own name correctly and having systematized the production of the phoneme /r/, the therapist proposed to work with the fricatives /ʃ/ and /ʒ/.

At that time, orofacial motricity exercises were performed focusing on the tone and mobility of tongue and lips. The tablet's camera was used as a mirror: patient and therapist positioned themselves in front of the tablet and performed the exercise sequence. This activity, followed by attempts of appropriate production, favored the acquisition of posterior fricatives.

The patient often took advantage of this context for the tongue vibration, introducing the consonant groups C/r/V and saying that she wanted to "speak properly."

Despite the phonological changes, which did not inhibit her, the patient was always an efficient interlocutor. However, the high voice combined with these changes characterized a childish speech. This childish speech improved during the therapeutic process.

In the reevaluation, both in the imitation and in the naming test, S1 continued to present the unsystematic simplification of the consonant cluster, and also presented metathesis in some words, which is a typical phonological process of the development process. E.g.: *Branco* by [‘bãkru], *Prato* by [pa’tro]. The c/l/v group, which was already an unsystematic change in the evaluation, was overcome.

In summary: the patient had a significant improvement, overcame the phonological changes regarding the palate and the C/l/V group; however, unsystematic changes regarding the consonant cluster C/r/V remain present. The childish speech was reduced. The use of the tablet motivated the patient but it was not essential, since there was a significant demand for the therapeutic process. This is supported by the quantitative data showing that the sessions were evenly mixed.

The charts below show the quantitative data:

Category 1

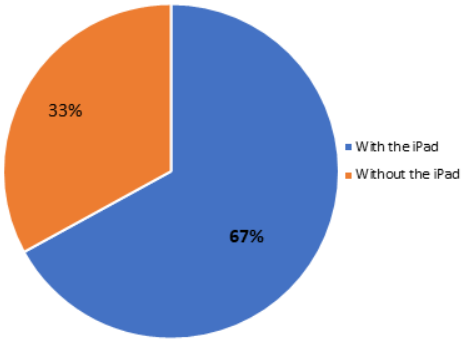

Figure 3. Frequency of tablet use

Category 2

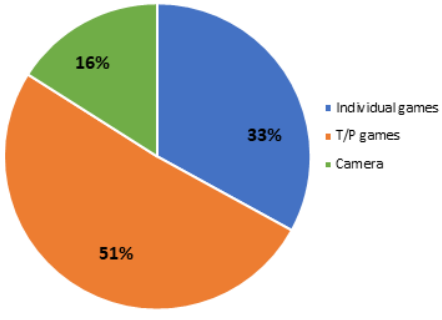

Figure 4. Type of application used on average in total sessions

Teacher evaluation: “S1 has always been a very communicative girl, but her speech was very childish, showing difficulties in pronouncing some words with /l/ and /r/. After the treatment today, it was possible to notice a significant improvement in the pronunciation of the words, but she still has a childish speech.”

Coordinator evaluation: “At first, S1 had a very childish speech, frequently changing the phoneme /r/ by /l/ in words. Today, she changes phonemes less frequently, as she easily pronounces the words “*parabéns*,” “*barata*,” and “*barulho*,” for example. “

S2
D.O.B.: 08/18/2008
Age: 5 year and 7 months
Gender: Male
Complaint: “He has speech changes” (SIC – Coordinator)
Number of consultations: 07

Assessment of orofacial motricity

No changes were observed. And he hasn’t lost any teeth yet.

Results of ABFW/Phonology Test

Initial: A palatal frontalization was found in the imitation and naming tests. E.g.: *bandeja* - [’bãdeza], *jacaré* - [zaka‘ɾɛ], *borracha* - [bɔ’xasa], *xícara* - [’sikaɾa].

Final: The patient has an unsystematic palatal frontalization in the naming test and no changes in the imitation test.

Use of technology:

At first, S2 was shy, but he felt more confident throughout the sessions and became very participative in therapy. He was the patient who missed more sessions, with only seven consultations being possible.

S2 rarely realized his speech changes, which suggests difficulty in the auditory discrimination in the involved system (articulation point).

This use of the tablet was highly requested by this patient, and the Talking Ginger app (a cat that repeats the subject’s speech) proved to be effective. In activities in which the therapist asked the patient to repeat a phoneme or a word, he used to wait for the cat to repeat and only then he would try alone. It was as if the cat was an interlocutor in the therapeutic setting: sometimes, when he realized he had said something wrong, he was even “ashamed of the cat.” This feedback significantly favored the auditory discrimination.

S2 explored all the applications and, when he liked one, he would spend some time playing it, mostly alone. He only asked for the therapist's participation when he needed some explanation on how to play it.

Once, he arrived at therapy telling the story of Little Blue Riding Hood (*chapeuzinho azul*). He was excited, as he realized that the character's name had the phoneme /ʃ/ and he struggled to speak it correctly during the report, which shows a progress related to the auditory discrimination.

In summary: he is a very shy patient, which compromised the interaction with the therapist at the beginning of the process. However, this limitation was overcome, and this was significant for the evolution of the condition, especially regarding the clarity in the articulation and vocal intensity/intonation. The phonemes that initially had changes started to be produced, although unsystematically. The tablet was a motivating factor, as the patient always requested it and performed the proposed activity with more enthusiasm in this context. The auditory discrimination of the minimal pairs of phonemes with changes was effectively favored by the Talking Ginger application.

The charts below show the quantitative data:

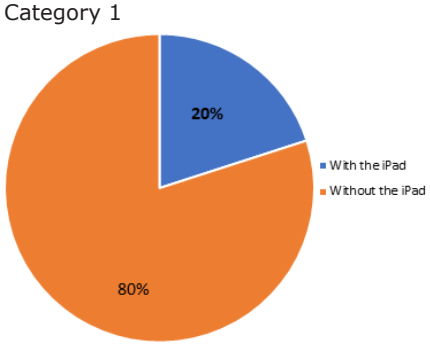

Figure 5. Frequency of tablet use

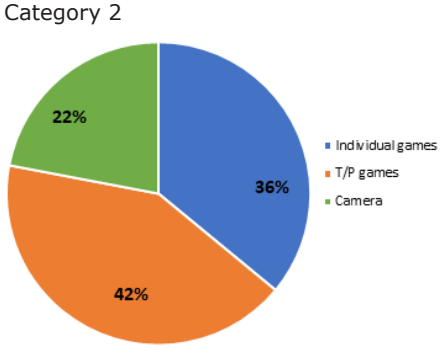

Figure 6. Type of application used on average in total sessions

Coordinator evaluation: "S2 has always shown to be a shy child; however, according to the teacher's reports, now he is more communicative, and pronouncing the words more clearly."

Teacher evaluation: "After treatment, S2 is more communicative and confident when speaking. The student had difficulties in speech, "stuttering" when speaking; however, his speech is clearer today and he is able to pronounce the words more slowly."

S3
D.O.B.: 11/12/2008
Age: 5 year and 3 months
Gender: Male
Complaint: "He has speech changes" (SIC – Coordinator)
Number of consultations: 09

Assessment of orofacial motricity

As for tongue tone and mobility, he just doesn't vibrate the tip of the tongue. He has a habit of biting his own lips during activities. No changes were noticed in chewing, swallowing and breathing functions. The lower incisors are missing.

Results of ABFW/Phonology Test

Initial: He systematically replaces the {R} archiphoneme by /y/. E.g.: *cortina* [koy' tina], *porco* ['p ɔyku], *trator* [tra'tɔy] and *garfo* ['gayfu].

Final: No changes were found.

Use of technology

S3 is a shy boy, his voice is low in intensity, he showed no initiative and showed to be passive, waiting for proposals from the therapist. However, he changed his attitude when he was offered the option of using the tablet; he made this choice constantly in the sessions, seeming much more comfortable in the setting when the interaction with the therapist was mediated by this device.

Talking Ginger was an application frequently chosen by the patient. S3 always laughed when he heard the cat speak wrong, then he repeated the word, thus trying to "teach" the cat to speak correctly.

This auditory feedback was essential to the progression of the case: S3 struggled to speak properly, as he knew that the cat would imitate him.

Gradually, the patient was feeling more and more confident and the difficulties were decreasing. In order to stimulate this behavior, the therapist

asked him to produce words that he was able to produce correctly, that is, those with the {R} in a final position.

The tablet's camera was another commonly used feature. The patient liked to record a video and then watched it, paying attention to his (appropriate or inappropriate) speech, being very pleased when noticing his own successes.

As the sessions progressed, the patient began to provide several reports about his daily life, spontaneously and with stronger vocal intensity. Proper production of {R} was also mobilized in this context.

In summary: he was very participative in the therapeutic process; he did not show any changes in the ABFW evaluation, but it was possible to notice that the unsystematic substitution of {R} by /y/ persisted in spontaneous speech. The articulation became more precise, which promoted greater speech intelligibility. The use of the tablet motivated the patient and was important for the therapeutic process, since he felt motivated to watch the videos and to correct himself, especially when using the Talking Ginger app.

The charts below show the quantitative data:

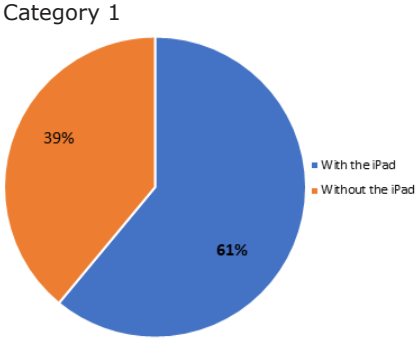

Figure 7. Frequency of tablet use

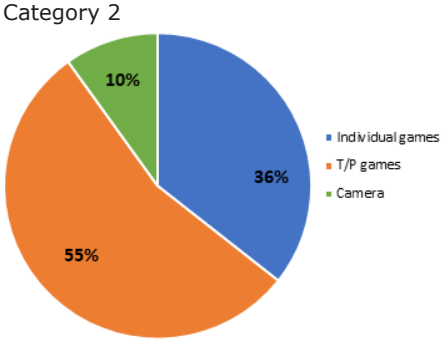

Figure 8. Type of application used on average in total sessions

Teacher evaluation: "Some changes were noticed, but they were not so clear. He started to express himself better, and became more talkative; although he still has a childish speech and a very low tone that is difficult to understand."

Coordinator evaluation: "My relationship with him does not allow me to make an assessment in that sense, but I am based on the report of the teachers and family members. So, according to his mother, he is more confident and, even before saying a few words, he seems to be cautious, trying to pronounce them correctly, and showing significant improvement after treatment."

S4
D.O.B.: 10/19/2008
Age: 5 year and 4 months
Gender: Male
Complaint: "He changes some words in the speech and sticks his tongue out when speaking" (SIC – Coordinator)
Number of consultations: 08

Assessment of orofacial motricity

Tongue hypotonia was found, which prevents the patient from touching the tongue on the upper lip, only managing to move it to the sides. He does not vibrate the tip of his tongue and does not hold the tongue out of the mouth without touching the lower lip. He has a mixed breathing, tending to oral breathing. He also has good lip mobility. He chews properly, but has interposition of the tongue when swallowing. He hasn't lost any teeth yet.

Results of ABFW/Phonology Test

Initial: In addition to the previous lisp in the labiodental fricative /s/ and /z/ in the naming and imitation test, the consonant cluster C/r/V was replaced by C/l/V, only with the phonemes /p/ and /b/; e.g.: *prato* ['platu] and *zebra* [zɛ'bla].

Final: The patient showed an improvement in the production of the consonant cluster in both tests; however, he maintained the previous lisp although in an unsystematic manner.

Use of technology:

Language strengthening exercises were performed, and the tablet's camera was also widely used in this context as a mirror and for making videos. The improvements were noted, and it motivated him to overcome the difficulties.

The work with this patient focused on orofacial motricity, in addition to phonological production. The first phoneme was /s/. The "snake sound" was reproduced using the *Paint sparkles draw* application, which simulates a blackboard. However, the camera was the most effective feature, which allowed visual and auditory feedback. The patient liked to observe himself and also noticed when he failed. He started to worry about the lisp, trying to avoid it. However, this improvement was not noticed in spontaneous speech: the change remained systematic.

When the tongue posture/tone progressed, the therapy began to focus on the consonant cluster C/v/V, involving the phonemes /p/ and /b/ that should be automated. The work followed this order: syllables, words, phrases and narratives. The tablet was always present in the sessions, either with the blackboard application or with the camera.

The tablet was used in all sessions, with preference for the camera feature (as a mirror and to record videos). This feature was essential for the evolution of the case: S4 carefully watched his own flaws in the video and tried to correct them. In the end, he wanted to watch all the videos in chronological order, as he was excited to see his progress.

In summary: the patient showed significant improvement, especially regarding the proprioception lisp and the subsequent attempts to avoid it. In this way, the tablet's camera was relevant for auditory and visual feedback. The difficulty in producing the consonant cluster C/r/V was overcome: in the final evaluation, the patient did not show changes in the naming and imitation tests. However, he still had anterior lisp in the labiodental fricatives in an unsystematic way in spontaneous speech.

The charts below show the quantitative data:

Category 1

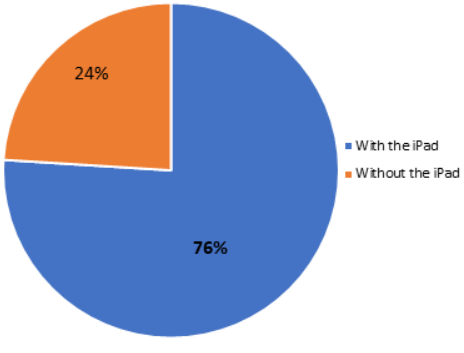

Figure 9. Frequency of tablet use

Category 2

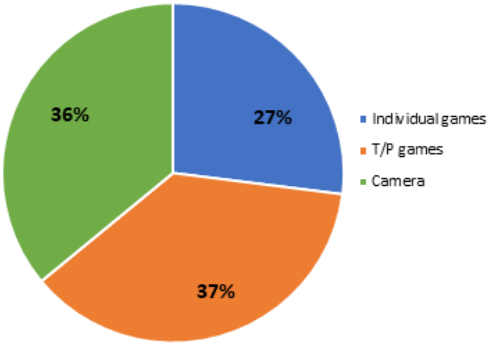

Figure 10. Type of application used on average in total sessions

Coordinator evaluation: "Although he doesn't have a tied tongue, S4 is a child who pronounced the words as if he had. According to his mother's reports, he now pronounces most of the words with the phoneme /s/ more easily."

Teacher evaluation: "S4 had few changes, but he still has a 'tied' speech in the pronunciations of word with the sound of the 's' letter, although it is infrequently now."

Discussion

All participants requested the tablet with significant frequency during the sessions, with the choice of interactive games between patient and therapist prevailing in the group average. This context favored the therapeutic processes by intensifying the dialogical activity between the patient and the therapist.

It should be noted that the camera, when used as a mirror, was particularly favorable for the proprioception processes of patients related to the phonological production, and favoring self-correction; in addition to providing the auditory discrimination.

The following trend can be observed by analyzing the set of cases studied: the tablet worked as a driver for the therapeutic process, although in different degrees and in a non-decisive way to the evolution of the cases. It should be noted that access to a tablet was not usual in this population on a daily basis, which generated greater interest and curiosity.

This result corroborates the findings of the literature[16,17]: the effectiveness of traditional therapeutic intervention techniques cannot be denied

(handling materials, children's books, games, drawing supplies). That is, these resources have not become obsolete in the face of new technologies. In this sense, the author reports that a single tool will never be enough to achieve a set of therapeutic goals. Thus, technology should be regarded as an additional tool, among the available resources.

It is also worth mentioning that no statistically significant difference was found in relation to the progress between the group that used the technology and the group that did not use in a study with children aged 4:0 to 8:0 years with speech sound disorder[18].

The use of the tablet did not replace traditional practices in the field of occupational therapy[19], but complemented them, providing innovation to treatment. The same occurred with the patients studied here.

Also in this perspective, it is also suggested that the therapist-patient interaction was a key factor for the clinical outcome of the cases, although the electronic devices have provided a favorable playful context for it.

Finally, according to the evaluation of the teachers and the coordinator, it is noteworthy that all children had a positive improvement in the difficulties related to oral language. However, potential improvements in the behavior of S2 have also been reported. Technology is seen to help the cognitive and emotional performance of children in the extent that it promotes the development of their potential and skills; beyond the focus on difficulties and limitations[3]. Although the topic generates a scientific curiosity, the findings described in this study do not allow corroborating these claims.

Final considerations

The use of technological interaction devices, as tablets, favored the therapeutic processes in the cases studied, since it intensified the dialogical activity between patient and therapist, and became an effective playful resource for patients' adherence to treatment.

References

1. Hashimoto PT, Pagan-Neves LO, Jesus LMT, Wertzner HF. Medidas aerodinâmicas, eletroglotográficas e acústicas na produção da fricativa pós-alveolar vozeada. CoDAS. 2018; 30(3): 1-8.

2. Wertzner HF, Amaro L, Teramoto SS. Gravidade do distúrbio fonológico: julgamento perceptivo e porcentagem de consoantes corretas. Pró-Fono. 2005; 17(2)185-94.

3. Sotero LKB, Pagliarin KC. Intervenção fonoaudiológica com a utilização de software em casos de distúrbios dos sons da fala. CoDAS. 2018; 30(6): 1-8.

4. Melo RM, Mota HB, Berti LC. Parâmetros acústicos e articulatórios durante a produção do contraste entre oclusivas alveolares e velares: dados típicos e de desvio fonológico. Audiol Commun Res. 2017; 22: 1-10.

5. Ortega JLG, Perez IAG, Blanco MFA. Avaliação de um programa escolar para o desenvolvimento de habilidades fonológicas em crianças espanholas. Rev. Bras. Educ. 2017; 22(71): 1-27.

6. Pereira LF, Mota HB. Tratamento fonoaudiológico baseado nos contrastes de oposições máximas. Pró-Fono. 2002; 14(2): 165-74.

7. Wertzner HF, Pagan-Neves LO. Avaliação e Diagnóstico do Distúrbio Fonológico. In: Tratado de Especialidades em Fonoaudiologia. São Paulo: Ed. Guanabara Koogan; 2014. P. 593-9.

8. Melo RM, Wiethan FM, Mota HB. Tempo médio para a alta fonoaudiológica a partir de três modelos com base fonoaudiológica. Rev. CEFAC. 2012; 14(2): 243-8.

9. Ceron MI, Keske-Soares M. Análise do progresso terapêutico de crianças com desvio fonológico após aplicação do Modelo de Oposições Múltiplas. J. Soc. Bras. Fonoaudiol. 2012; 24(1): 91-5.

10. Barberena LS, Keske-Soares M, Mota HB. Generalização baseada nas relações implicacionais obtida pelo modelo "ABAB-Retirada e Provas Múltiplas". Rev Soc Bras Fonoaudiol. 2008; 13(2): 143-53.

11. Martins JS, Pinheiro MMC, Blasi HF. A utilização de um software infantil na terapia fonoaudiológica de Distúrbio do Processamento Auditivo Central. Rev Soc Bras Fonoaudiol. 2008; 13(4): 398-404.

12. Pereira LL, Brancalioni AR, Keske-Soares M. Terapia fonológica com uso de computador: relato de caso. Rev CEFAC. 2013; 15(3): 681-8.

13. Sherrard B. 2011. Tablet computer technology transforming speech therapy. [acesso 2013 jan 15]. Disponível em: <http://www.dailyiowegian.com/local/x1666053504/Tablet-computer-technology-transforming-speech-therapy#sthash.rE2yPab9.dpuf>.

14. Andrade CRF, Béfi-Lopes DM, Fernandes FDM, Wertzner HF. ABFW: teste de linguagem infantil nas áreas de fonologia, vocabulário, fluência e pragmática. Carapicuíba, São Paulo: Ed. Pró-fono; 2004.

15. Genaro KF, Berretin-Felix G, Rehder MIBC, Marchesan IQ. Avaliação Miofuncional Orofacial – Protocolo MBGR. Rev CEFAC. 2009; 11(2): 237-55.

16. Wiethan FM, Mota HB. Propostas terapêuticas para os desvios fonológicos: diferentes soluções para o mesmo problema. Rev. CEFAC. 2011; 13(3): 541-51.

17. Mumy AP. 2012. One-Dimensional Speech-Language Therapy: Is the iPad Alone Enough?. [acesso 2014 jun 08]. Disponível em: <http://blog.asha.org/2012/06/05/one-dimensional-speech-language-therapy-is-the-ipad-alone-enough/>.

18. Wren Y, Roulstone S. A comparison between computer and tabletop delivery of phonology therapy. Int J Speech Lang Pathol. 2008; 10(5): 346-63.

19. Duarte JS. O uso do tablet e seus aplicativos como recurso terapêutico ocupacional com crianças hospitalizadas [Monografia]. Brasília: Faculdade de Ceilândia - Universidade de Brasília; 2013.