

# Usability and acceptability of digital activities for voice teaching in Speech-Language Pathology and Audiology

## Usabilidade e aceitabilidade de atividades digitais para o ensino da voz em Fonoaudiologia

## Usabilidad y aceptabilidad de actividades digitales para la enseñanza de la voz en Fonoaudiologia

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### Abstract

**Introduction:** The use of Communication and Information Technologies is expanding in higher education. In health area, technological advances add new forms of learning. The ObservaVoz platform was created to disseminate information and offer strategies of voice teaching. Two digital activities from this virtual environment were evaluated. **Objective:** To describe the satisfaction of the usability of digital activities and to analyze its association with sociodemographic and acceptability data by Speech Therapy students. **Methods:** 122 Speech Therapy students of a Brazilian public university participated of the study. They were invited to use and evaluate two digital activities of voice teaching. An online questionnaire in a self-applicable Google Docs format was used for data collection and evaluation of the activities. It was divided into sociodemographic information, *System Usability Scale* and Activity Acceptability Questionnaire. Descriptive data were analyzed through the frequency distribution of categorical variables and analysis of measures of central tendency and dispersion of variables. **Results:** Most participants

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#### Authors' contributions:

MTS: participated in the literature review, collection, conception, design, data analysis and interpretation, writing of the article, and approval of the version to be published.

LCT: as supervisor participated in the conception, delineation, analysis and interpretation of data, critical review, and approval of the version to be published.

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rated the usability of the digital activities as good. Acceptability was considered satisfactory. There was an association between the *System Usability Scale* with the variables gender, contribution to learning, layout of the tools, positive appreciation and revising content possibility. **Conclusion:** The “ObserveVoz” digital activities “What is the Pathology?” and “Histolobby” present good characteristics of usability and acceptability according to the evaluation of Speech Therapy students.

**Keywords:** Higher education; Learning; Information technology; Students; Voice; Speech Language and Hearing Sciences.

## Resumo

**Introdução:** O uso das Tecnologias de Informação e Comunicação está em expansão na educação superior. Na área da saúde, os avanços tecnológicos agregam novas formas de aprendizado ao ensino. Uma plataforma, denominada ObserveVoz foi criada com objetivo de divulgar informação e oferecer estratégias para o ensino da voz, e, desse ambiente virtual, duas atividades digitais foram testadas.

**Objetivo:** Descrever a satisfação com a usabilidade de atividades digitais para o ensino da voz e analisar sua associação com dados sociodemográficos e de aceitabilidade por graduandos de Fonoaudiologia. **Método:** Participaram do estudo 122 alunos do curso de Fonoaudiologia de uma universidade pública brasileira. Eles foram convidados a utilizar e avaliar duas atividades digitais para o ensino da voz. Para a coleta de dados e avaliação das atividades, foi utilizado um questionário *on-line*, dividido em informações sociodemográficas, escala numérica de usabilidade *System Usability Scale* e Questionário de Aceitabilidade das Atividades. Os dados descritivos foram analisados por meio da distribuição de frequência das variáveis categóricas e análise das medidas de tendência central e de dispersão das variáveis. **Resultados:** A maioria dos participantes avaliou a usabilidade das atividades digitais como boa. A aceitabilidade foi considerada satisfatória. Houve associação entre a usabilidade com as variáveis sexo, contribuição para o aprendizado, *layout* das ferramentas, apreciação positiva e possibilidade de revisão de conteúdos. **Conclusão:** As atividades digitais “Qual é a Patologia?” e “Histolobby” apresentam boas características de usabilidade e aceitabilidade de acordo com a avaliação de graduandos de Fonoaudiologia.

**Palavras-chave:** Educação superior; Aprendizagem; Tecnologia da informação; Estudantes; Voz; Fonoaudiologia.

## Resumen

**Introduction:** El uso de tecnologías de la información y la comunicación se está expandiendo en la educación superior. En el área de la salud, los avances tecnológicos agregan nuevas formas de aprendizaje a la enseñanza. La plataforma ObserveVoz fue creada para difundir información y ofrecer estrategias para la enseñanza de la voz. Se evaluaron dos actividades digitales de este entorno virtual.

**Objetivo:** Describir la satisfacción con la usabilidad de las actividades digitales para la enseñanza de la voz y analizar su asociación con datos sociodemográficos y de aceptabilidad por parte de los estudiantes de Fonoaudiología. **Metodos:** En el estudio participaron 122 estudiante del curso de Fonoaudiología de una Universidad pública brasileña. Se les pidió que utilizaran y evaluaran dos actividades digitales para la enseñanza de la voz. Para la recogida de datos y evaluación de las actividades se utilizó un cuestionario online, con información sociodemográfica, *System Usability Scale* y Cuestionario de Aceptabilidad de Actividad. Los datos descriptivos se analizaron mediante distribución de frecuencia de variables categóricas y análisis de medidas de tendencia central y dispersión de variables. **Resultados:** La mayoría de los participantes calificaron la usabilidad de las actividades digitales como buena. La aceptabilidad se consideró satisfactoria. Hubo asociación entre la usabilidad de la *System Usability Scale* y las variables género, contribución al aprendizaje, disposición de las herramientas valoración positiva y posibilidad de revisión de contenidos. **Conclusión:** Las actividades digitales “Qual é a Patologia?” e “Histolobby” presentan buenas características de usabilidad y aceptabilidad según la evaluación de los estudiantes de Fonoaudiología.

**Palabras clave:** Educación superior; Aprendizaje; Tecnología de la información; Estudiantes; Voz; Fonoaudiología.

## Introduction

The use of information and communication technologies (ICTs) in higher education is growing in Brazil, adding new ways of learning to teaching<sup>1</sup>. The use of digital artifacts promotes access to learning content<sup>2</sup>, with audiovisual resources that stimulate the interest and motivate the students, besides offering the user the convenience of choosing the time and place to connect<sup>3</sup>.

In these virtual spaces, various digital activities, games or quizzes may be built<sup>4</sup>. It is important that the instruments used in teaching present clear pedagogical objectives and prioritize the quality of both the activities and the information they convey<sup>5</sup>.

In healthcare, scientific and technological advances broaden the landscape and add the use of technologies to clinical practice and teaching<sup>6</sup>. Following this line, the Speech Therapy area is beginning to follow the growing evolution of the use of these innovations in voice health promotion<sup>7-9</sup>. One of these initiatives is a virtual teaching-learning and information environment called *ObservaVoz*<sup>10</sup>. The platform, provided free of charge by a public Brazilian university, is an e-learning and e-health environment for the voice area. The virtual environment aims to make knowledge available to the community in general, and to strengthen the learning of university students about the human voice, its disorders and health promotion<sup>10</sup>, through digital activities for teaching and promoting vocal health.

However, for a digital activity or educational game to be accepted by the target audience, it must meet technical requirements and user opinion surveys regarding its use<sup>11</sup>. To achieve this goal, experts suggest thinking about possible bugs and interfaces, and consider the tool's usability, effectiveness, efficiency, and user satisfaction.

Usability is a concept that covers the interaction of humans and computers and emphasizes the concern with developing systems that are easy to learn and use<sup>11</sup>. One of the instruments that makes this evaluation possible is the *System Usability Scale* (SUS)<sup>12</sup>. SUS is a method of ascertaining the level of usability of a system by applying a questionnaire. It is scientifically accurate and not too extensive for the user or the researcher. It was developed by John Brooke in 1986 and can be used to evaluate products, services, hardware, software, websites, applications and any other type of inter-

face<sup>13</sup>. It is observed in the literature the occurrence of studies with wide use of the SUS as a measure to evaluate the usability of Web applications and products in the health field<sup>13-15</sup>.

Considering these facts, this study aimed to describe the satisfaction with the usability of digital activities for voice teaching and analyze their association with sociodemographic and acceptability data by Speech Language Therapy undergraduates.

## Method

This is a cross-sectional observational study, approved by the Committee for Ethics in Research of the institution of origin, opinion n° 1.939.737. The speech therapy undergraduates agreed to participate in the study and signed the Informed Consent Form.

It used a convenience sample, composed of 122 undergraduate students, aged between 20 and 38 years, of which 100 were female and 22 male, attending from the 4th to the 10th period of the course. For analysis, the undergraduates were later grouped into those who had studied theoretical subjects from the 4th to 5th periods (38 students) and those who had started practical subjects from the 6th to the 10th periods (84 students).

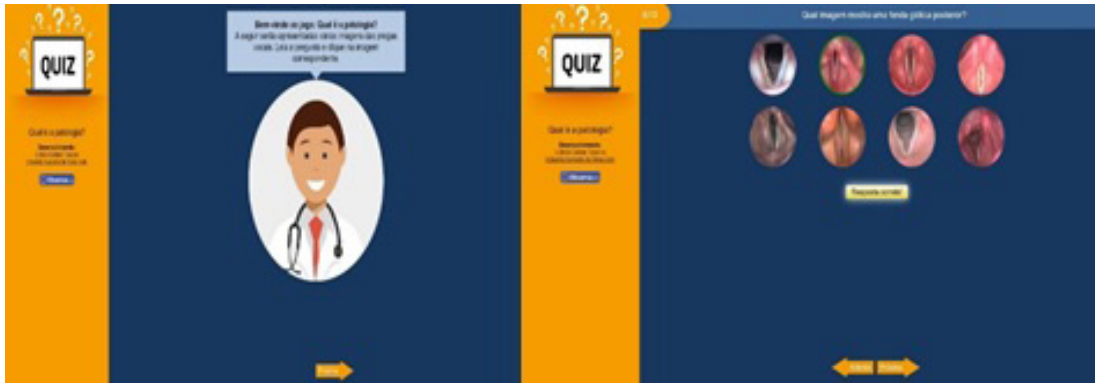
The inclusion criteria were: being a student of the Speech Therapy course at the University where the study was carried out, aged over 18 years, having studied Speech Therapy subjects that addressed the theme of the digital activities tested (vocal cords' histology and main pathologies of voice disorders), and having access to the internet. We excluded individuals with visual impairment that impaired the access to the activities and individuals who did not complete the questionnaire.

Participants were invited to use the digital activities, "What is Pathology?" and "Histolobby", belonging to the virtual learning environment "Observavoz" (<https://www.medicina.ufmg.br/observavoz>). Participation was voluntary and online. After using the activities, the participants had to complete an online questionnaire.

The "What is the Pathology?" activity has a quiz format and aims to familiarize the students with the images of the main laryngeal pathologies. The activity is composed of 13 questions about the pathologies, with eight image options each. The student must identify the pathology requested and click on the corresponding image; when this

is correct, an animation appears that allows the student to go on to the next item. At the end of the quiz, the overall result is presented, containing the number of corresponding errors for each question, in order for the student to review their answer. The

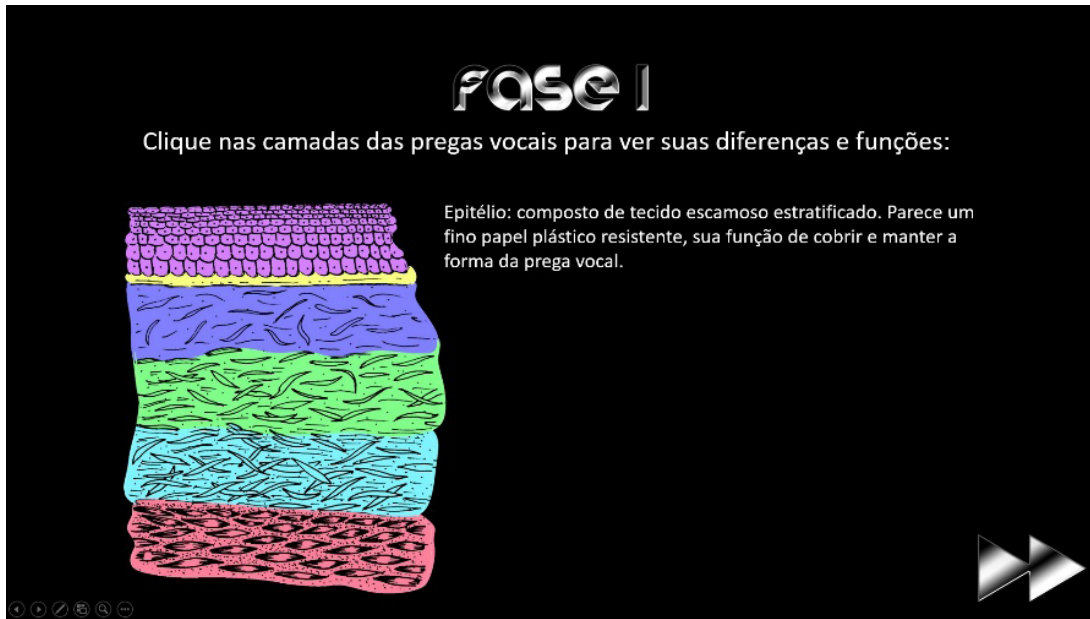
activity was developed in Javascript programming language using Vue (Vue.js) and was elaborated by the students, with the help of a digital programmer. It is interactive and similar to a game in terms of layout and how to play.



**Figure 1.** Sample image of the digital activity “What’s the Pathology?”

The other activity, “Histolobby”, is aimed at learning and fixating the content of vocal cords’ histology. This activity contains explanations of the subject, through texts and images, and has the purpose of helping the study mentioned above. The graduates recall laryngeal anatomy, composition and function of each histological layer of the vocal cords. They answer questions that reinforce

learning and correlate the images with the text, including histological images of the adult and child vocal fold. At the end, “Histolobby” displays trivia accompanied by histological images of the vocal cords. The contents and creation were developed by speech therapy students in PowerPoint (Microsoft), used for creating/editing and displaying graphic presentations.



**Figure 2.** Sample image from the digital activity "Histolobby".

The instrument for data collection that assessed the usability and acceptability of digital activities was an online self-administered questionnaire, in Google Docs format, divided into three blocks. The first block consisted of personal information (gender and age) and participation by undergraduate period (separated by exclusively theoretical classes, or theoretical and practical). The second block consisted of the Portuguese version of the System Usability Scale (SUS)<sup>13</sup>, which is composed of 10 statements, scored on a Likert-type scale ranging from [1] ("strongly disagree") to [5] ("strongly agree"). After obtaining the answers, the SUS score was calculated by subtracting 1 from the users' assessment for the odd-numbered questions and subtracting 5 from the score the users assigned for the even-numbered answers; subsequently, all the values obtained from the ten questions were summed up and multiplied by 2.5 to obtain the overall score, which may vary from 0 to 100. The cut-off point is 68 points, meaning that a score above this value is indicative of good usability. The third block consisted of the acceptability evaluation, which was used as an additional resource to separately evaluate the two digital activities, composed of 11 closed questions in which

we sought to understand the participants' evaluation of the layouts, quality of images, contribution to voice learning, degree of approval of the activities, possibility of reviewing and learning content, and clarity of instructions. The response options were presented on a Likert-type scale ranging from [1] ("strongly disagree") to [5] ("strongly agree"). There were two closed-ended questions to mark from 0 to 10 how much the participants would indicate the activities to a colleague, and one open-ended question for anyone to make suggestions.

The descriptive data were analyzed by means of frequency distribution of categorical variables and analysis of measures of central tendency and dispersion of the variables. For the association analyses, Pearson's chi-square and Mann-Whitney tests were used, the latter being chosen because the total score variables of the System Usability Scale and questions 12 and 13 of the acceptability questionnaire did not present a normal distribution, a choice that was confirmed by means of the Kolmogorov-Smirnov and Shapiro-Wilk tests. The results were considered significant when they had a value of  $p \leq 0.05$ . For this statistical analysis we used the SPSS software, version 25.0.

## Results

The results of this study are presented in Tables 1 to 5.

The analysis of descriptive measures of the variables age and total score of the System Usability Scale (SUS) is observed. The average age of the participants was 23.26 years and the average SUS score was 86.35 (Table 1).

**Table 1.** Descriptive measures of age and total variable of the System Usability Scale

Variables	N	Average	S.D.	Mean	Minimum	1° Q	3° Q	Maximum
Age	122	23,26	3,45	23	20	21	24	38
Total System Usability Scale	122	86,35	12,45	90	45	80	95	100

Legend: N= number of individuals; S.D. = standard deviation; Q= quartile

In Table 2 it can be seen that most of the participants totally agreed that they would use the presented product frequently (41.8%) and most totally agreed that it was easy to use (62.3%), and its functionality was well integrated (52.5%), they were quick to learn how to play (66.4%) and confident to use the material (58.3%). Most completely

disagreed that the product presented was complex, that they needed a technician to use it, that it had inconsistencies, was complicated to use, or that they needed to learn a lot to use it (63.1%, 81.1%, 68%, 76.2%, and 72%, respectively), and most evaluated the product as having good usability (88.5%).

**Table 2.** Frequency of questions and total score of the System Usability Scale (SUS)

Variables	N	%
<b>1- I think I would like to use this product frequently.</b>		
Totally Disagree	2	1,6
Disagree	4	3,2
Neither agree nor Disagree	25	20,4
Agree	40	32,7
Totally agree	51	41,8
Total	122	100
<b>2- I considered the product more complex than necessary.</b>		
Totally Disagree	77	63,1
Disagree	27	22,1
Neither agree nor Disagree	10	8,2
Agree	5	4,1
Totally agree	3	2,5
Total	122	100
<b>3- I found the product easy to use.</b>		
Totally Disagree	2	1,6
Disagree	4	3,3
Neither agree nor Disagree	7	5,7
Agree	33	27
Totally agree	76	62,3
Total	122	100

<b>Variables</b>	<b>N</b>	<b>%</b>
<b>4- I thought I would need help from a technician to be able to use this product.</b>		
Totally Disagree	99	81,1
Disagree	13	10,7
Neither agree nor Disagree	2	1,6
Agree	7	5,7
Totally agree	1	0,8
Total	122	100
<b>5- I felt that the various features of this product were well integrated.</b>		
Totally Disagree	2	1,6
Disagree	5	4,1
Neither agree nor Disagree	10	8,2
Agree	41	33,6
Totally agree	64	52,5
Total	122	100
<b>6- I thought this product had a lot of inconsistencies.</b>		
Totally Disagree	83	68
Disagree	24	19,7
Neither agree nor Disagree	12	9,8
Agree	3	2,5
Totally agree	0	0
Total	122	100
<b>7- I suppose most people would learn to use this product quickly.</b>		
Totally Disagree	0	0
Disagree	4	3,3
Neither agree nor Disagree	5	4,1
Agree	32	26,2
Totally agree	81	66,4
Total	122	100
<b>8- I found the product very complicated to use.</b>		
Totally Disagree	93	76,2
Disagree	21	17,2
Neither agree nor Disagree	5	4,1
Agree	3	2,5
Totally agree	0	0
Total	122	100
<b>9- I felt very confident using this product.</b>		
Totally Disagree	2	1,6
Disagree	4	3,3
Neither agree nor Disagree	12	10
Agree	34	28,3
Totally agree	70	58,3
Total	122	100
<b>10- I had to learn a lot before I could handle this product.</b>		
Totally Disagree	88	72
Disagree	16	13,1
Neither agree nor Disagree	12	9,8
Agree	5	4,1
Totally agree	1	0,8
Total	122	100
<b>Total SUS Classification</b>		
Good Usability	14	11,5
Bad Usability	108	88,5
Total	122	100

Legend: N=number of participants; %=percentage

The description of the acceptability responses is presented in Table 3. For “What is the Pathology?” it can be seen that the majority agreed that the layout of the activity was interesting (88.6%), contributed to learning in voice (95.1%), enjoyed playing (97.5%), and found the instructions clear and easy to understand (97.5%). The majority

also agreed with these requisites for “Histolobby” (55.7%, 82.8%, 76.2%, 86.9% respectively). Most participants agreed that there is quality in the images presented, that there is content review and acquisition of important information with the use of the material (90.2%, 96.7% and 95.1% respectively).

**Table 3.** Grouped description of the Acceptability Questionnaire questions

Variables	N	%
<b>1- The layout of the activity “What is the pathology?” is interesting:</b>		
Disagree	7	5,7
Neither agree nor Disagree	7	5,7
Agree	108	88,6
Total	122	100
<b>2- The activity “What is the pathology?” contributed to your learning about voice</b>		
Disagree	1	0,8
Neither agree nor Disagree	5	4,1
Agree	116	95,1
Total	122	100
<b>3- Did you enjoy using the activity “What is the pathology?”</b>		
Disagree	0	0
Neither agree nor Disagree	3	2,5
Agree	119	97,5
Total	122	100
<b>4- The instructions before the “What is the pathology?” activity are clear and easy to understand:</b>		
Disagree	2	1,6
Neither agree nor Disagree	1	0,8
Agree	119	97,5
Total	122	100
<b>5- The layout of the “Histolobby” activity is interesting:</b>		
Disagree	28	23
Neither agree nor Disagree	26	21,3
Agree	68	55,7
Total	122	100
<b>6- The “Histolobby” activity contributed to your learning about voice</b>		
Disagree	4	3,3
Neither agree nor Disagree	17	13,9
Agree	101	82,8
Total	122	100
<b>7- Did you enjoy using the “Histolobby” activity</b>		
Disagree	9	7,4
Neither agree nor Disagree	20	16,4
Agree	93	76,2
Total	122	100
<b>8- The instructions before the “Histolobby” activity are clear and easy to understand:</b>		
Disagree	5	4,1
Neither agree nor Disagree	11	9
Agree	106	86,9
Total	122	100



Variables	N	%
<b>9- The images presented in the activities are of good quality:</b>		
Disagree	0	0
Neither agree nor Disagree	12	9,8
Agree	110	90,2
Total	122	100
<b>10- Through the activities it was possible to review content:</b>		
Disagree	1	0,8
Neither agree nor Disagree	3	2,5
Agree	118	96,7
Total	122	100
<b>11- Do you believe that the activities brought you important information:</b>		
Disagree	0	0
Neither agree nor Disagree	6	4,9
Agree	116	95,1
Total	122	100

Legend: N=number of participants; %=percentage

It is possible to visualize the association between SUS classification and sociodemographic data in Table 4. It is observed that there was an

association between SUS usability and gender ( $p=0.001$ ), the other variables had no association with SUS.

**Table 4.** Association between classification in the System Usability Scale (SUS) and sociodemographic data

Variables	Total SUS Classification		p-value
	Poor usability	Good usability	
	N (%)	N (%)	
<b>Sex</b>			
Male	7 (50,0)	15 (13,9)	0,001*
Female	7 (50,0)	93 (86,1)	
Total	14 (100,0)	108 (100,0)	
<b>Age</b>			
Up to 23 years old	8 (57,1)	79 (73,1)	0,213
24 years and older	6 (42,9)	29 (26,9)	
Total	14 (100,0)	108 (100,0)	
<b>Course length per class</b>			
Exclusively theoretical 4th to 5th	5 (35,7)	33 (30,6)	0,762
Theoretical and practical 6th to 10th	9 (64,3)	75 (69,4)	
Total	14 (100,0)	108 (100,0)	

Pearson's chi-square

Legend: N=number of individuals; %=percentage; SUS= System Usability Scale; \*= p value $\leq$ 0.05

One can verify the association between the total SUS rating and all product acceptability questions, except in the question whether the activities brought important information (Table 5). It can be seen that in all significant results there was a predominance of “I agree” responses for good usability of the activity. Regarding the questions

about the score with which the participant would indicate the activities, it was observed that there was an association for both activities. All these results point to a higher average and median for both the activity “What is the Pathology?” ( $p=0.002$ ) and for “Histolobby” ( $p=0.001$ ) for the SUS good usability option.

**Table 5.** Association between total rating on the System Usability Scale (SUS) and activity acceptability questions

Variables	Total SUS Classification		p-value
	Poor usability	Good usability	
	N (%)	N (%)	
<b>“What is the pathology” contributed to voice learning</b>			
Disagree	1 (7,1)	0 (0,0)	0,0021*
Neither agree nor Disagree	2 (14,3)	3 (2,8)	
Agree	11 (78,6)	105 (97,2)	
Total	14 (100,0)	108 (100,0)	
<b>“Histolobby” contributed to voice learning</b>			
Disagree	4 (28,6)	0 (0,0)	0,0011*
Neither agree nor Disagree	4 (28,6)	13 (12,0)	
Agree	6 (42,9)	95 (88,0)	
Total	14 (100,0)	108 (100,0)	
<b>Did you enjoy the “What is the pathology” activity?</b>			
Disagree	0 (0,0)	0 (0,0)	0,0021*
Neither agree nor Disagree	2 (14,3)	1 (0,9)	
Agree	12 (85,7)	107 (99,1)	
Total	14 (100,0)	108 (100,0)	
<b>Did you like the “Histolobby” activity?</b>			
Disagree	5 (35,7)	4 (3,7)	0,0011*
Neither agree nor Disagree	1 (7,1)	19 (17,6)	
Agree	8 (57,2)	85 (78,7)	
Total	14 (100,0)	108 (100,0)	
<b>Did the activities allow you to review content?</b>			
Disagree	1 (7,1)	0 (0,0)	0,0011*
Neither agree nor Disagree	1 (7,1)	2 (1,9)	
Agree	12 (85,8)	106 (98,1)	
Total	14 (100,0)	108 (100,0)	
<b>The activities brought important information</b>			
Disagree	0 (0,0)	0 (0,0)	0,0851
Neither agree nor Disagree	2 (14,3)	4 (3,7)	
Agree	12 (85,7)	104 (96,3)	
Total	14 (100,0)	108 (100,0)	
<b>How much would you indicate the “What is the pathology” activity?</b>			
Average	7,86	9,33	0,0022*
Median	7	10	
Standard Deviation	2,11	1,09	
<b>How much would you indicate the activity “Histolobby”?</b>			
Average	5,64	8,37	0,0012*
Median	5	9	
Standard Deviation	3,1	1,99	

<sup>1</sup>Pearson’s chi-square; <sup>2</sup>Mann-Whitney

Legend: N=number of individuals; %=percentage; SUS= System Usability Scale; \*= p value $\leq$ 0.05

## Discussion

The SUS instrument applied to evaluate the digital teaching activities “What is the Pathology?” and “Histolobby” of the ObservaVoz virtual platform was efficient to assess usability through the perception of Speech Language Pathology undergraduates, and by most of them the tools were rated with good usability characteristics (88.5%), with a high average SUS score (86.35 points).

The majority of the participants fully agreed that the digital activities were user-friendly, with the functionality well integrated, with ease and confidence to use the products, not considering them complex, too technical, inconsistent or complicated to use. A large proportion of the participants agreed that they would use the products again. The demographic information of the participants did not influence the evaluation of the activities, suggesting that they can be applied to other undergraduates. It is observed that the activities meet the usability requirements and the SUS proved to be an excellent instrument for evaluating digital activities/games, as observed in other studies that used it<sup>17-18</sup>.

The acceptability was good for both activities and it is possible to infer that the content of the digital activities for voice teaching is able to complement the content of the two themes of the voice area. It was verified that such activities motivated the students, who felt relaxed about the operationalization of the activities. Authors point out that digital games/activities must be attractive and interactive environments that capture the player’s attention<sup>19</sup> and that are able to entertain and amuse people while encouraging learning, through interaction and dynamism<sup>20</sup>. From this basis, we suggest that digital activities be included in teaching, as they can be well accepted by students in higher education and the activities prove to be a good way of learning and retaining content.

It was evident that most participants agreed that the layout of both activities was interesting, and observing the frequency of answers for this item, the activity “What is the Pathology?” had a higher frequency of evaluation than “Histolobby”. We believe that this acceptability is related to the construction and layout of each game.

The activity “What is the Pathology?” is closer to a game in terms of layout and gameplay. The “Histolobby” activity presents less interactivity, inherent to the limitations of PowerPoint software

in which it was developed. A Speech Therapy website<sup>21</sup> shows the widespread use of PowerPoint to build online games to stimulate auditory, visual, and memory processing skills. However, it was possible to observe that the site added audios dichotomically edited through the use of EarMix software (CTSInformática) and, subsequently, the developers made adaptations with the help of a team of web designers and observed that most volunteers who adhered to the use of the portal considered that the experience was positive<sup>21</sup>.

We believe that although the digital activity “Histolobby” is dynamic, the development and layout did not rely on a programmer or a game designer. Studies point out that educational games must meet pedagogical requirements, but we must be careful not to transform the game solely in a didactic product, making it lose its pleasurable and spontaneous character<sup>22</sup>, and it is necessary to find synergy between pedagogy and fun in educational games<sup>23</sup>.

As for the associations, we observed that there was an association of gender with usability and a predominance of female responses, which was to be expected due to the majority of female undergraduates in the course and which portrays the prevalence of women in the speech therapy profession in Brazil<sup>24,25</sup>. Regarding the association between the total SUS rating and the acceptability questions, we observed that there was a relevant satisfaction of the digital activities, with a predominance of “I agree” answers for a good usability and acceptability of the activities. The issues regarding the grade with which the participant would indicate each activity to a course colleague and the positive desire to disseminate the digital activities to colleagues reinforce the good acceptability and usability of the tools by Speech-Language and Hearing Therapy undergraduates.

We highlight that the construction of educational games or digital activities by students are innovative learning practices in which game strategies integrated with a specific educational goal play an important role for student development. The activity promotes personal and group initiative, solidarity, mutual respect, and the formation of social attitudes, and is a powerful motivator in the learning environment. Students who develop games develop creativity, emotion, work with the elaboration of rules, deepen theoretical knowledge, develop socialization and teamwork, which pro-

vides the student with a dynamic and challenging learning environment<sup>26</sup>.

To this end, we encourage the implementation of subjects with IT notions for undergraduate courses in Speech Therapy, so that students can expand their knowledge and creativity towards the technological universe, as observed in a study that portrays the importance of IT in the educational process in general<sup>27</sup>. The involvement of a multidisciplinary team in projects is also encouraged, since they maximize the elaboration of products with the contribution of other areas of knowledge<sup>28</sup>. In terms of benefits, the activities demonstrate potential to reinforce the content learned in the classroom in a pleasant and enjoyable way. We believe that the development of new digital tools can be a stimulus to teaching and a challenge for teachers and students, not only in the area of voice, but for Speech Therapy as a whole.

Among the limitations of the study, it is worth mentioning that the activities did not have connectivity with smartphones, and the improvement regarding this interface is key and may facilitate the access of users. The technologies, when integrated into smartphones and connected to the internet are more accessible, since most students report constant use of this equipment, associated with internet use<sup>16</sup>.

## Conclusion

The digital activities “What is the Pathology?” and “Histolobby”, available on the ObservaVoz platform, have good usability and acceptability characteristics.

Digital activities for teaching voice education represent an accessible additional tool, with great pedagogical potential to motivate and reinforce learning in Speech-Language Pathology and Audiology university education. These activities may be used as support materials, helping teachers and students and contributing with a larger repertoire of possibilities of activities and interactions.

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