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**Vowel pronunciation learning and technology:** a case study with Brazilian  
learners of English

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*“Language is, after all, a social tool that we use to develop and enhance our relationships with other humans”*

*(Derwing; Munro, 2015a, p. 122).*

## RESUMO

A maneira como as pessoas estudam e praticam línguas passou por muitas mudanças. Um dos avanços mais significativos foi a tecnologia digital, que permite estudo em qualquer lugar e a qualquer momento, com o uso de um telefone celular e a internet, por exemplo. Ao aprender um segundo idioma (L2), os aprendizes enfrentam diferentes desafios, entre eles a pronúncia. A fonética e a fonologia do inglês apresentam dificuldades para os aprendizes brasileiros, por exemplo, a produção da vogal frontal alta e tensa /i/ e da vogal frontal alta relaxada /ɪ/, sons sem contraste fonêmico no Português Brasileiro (PB). ELSA (English Language Speech Assistant) é um aplicativo que oferece lições sobre diferentes aspectos do Inglês Americano (AE) para auxiliar os aprendizes na pronúncia. Com isso em mente, a presente pesquisa teve como objetivo: (i) investigar as perspectivas dos aprendizes brasileiros sobre o papel da pronúncia ao aprender inglês; (ii) verificar se ELSA pode auxiliar os aprendizes na produção de pares mínimos contendo as vogais frontais altas (/i-ɪ/); e (iii) observar as percepções dos estudantes sobre as vantagens e limitações do aplicativo ELSA. Para atingir esses objetivos, sete aprendizes brasileiros de inglês (idade média de 36 anos) realizaram o Duolingo English Test (DET) para avaliar sua proficiência em inglês; responderam a dois questionários (Initial and Final Questionnaire) sobre suas perspectivas sobre pronúncia e ELSA; e gravaram o Pré-teste (T1) antes de usar o aplicativo, e o Pós-teste (T2) após a intervenção, que consistiu em um grupo de seis pares de frases contendo os pares mínimos. Para avaliar a inteligibilidade de suas produções de palavras contendo as vogais /i-ɪ/, a ferramenta de digitação por voz do Google Docs foi utilizada. Como a pesquisa foi conduzida remotamente, os participantes utilizaram seus telefones celulares e computadores para realizar cada etapa e puderam decidir quando e onde fazer as atividades do ELSA e foram instruídos a realizar a gravação em ambiente silencioso para evitar ruídos que pudessem prejudicar a transcrição de áudio. Os resultados revelam que os participantes veem a pronúncia como um aspecto fundamental, porém desafiador, da língua inglesa; no entanto, a maioria concorda que a fluência é mais importante do que obter um sotaque nativo. Além disso, de forma geral, as produções dos participantes dos sons /i-ɪ/ no T2 melhoraram em comparação com o T1, o que confirma que o ELSA pode ser usado para aprender e praticar os sons estudados como um recurso extra-classe. Por fim, os participantes acreditam que o ELSA é uma ferramenta útil para praticar os sons do inglês americano; no entanto, a maioria deles discorda que a tecnologia possa substituir o papel do professor.

**Palavras-chave:** fonética; ELSA; pares mínimos; tecnologia; inteligibilidade.

## ABSTRACT

The way people study and practice languages has undergone many changes. One of the most significant advances was digital technology, which allows for studying anywhere and anytime, with the use of a mobile phone and the Internet, for instance. When learning a second language (L2), learners face different obstacles, among them pronunciation. English phonetics and phonology pose challenges to Brazilian learners, namely, the production of the tense high-front vowel /i/ and the lax high-front vowel /ɪ/, sounds with no phonemic contrast in Brazilian Portuguese (BP). ELSA (English Language Speech Assistant) is an application that offers lessons on different aspects of American English (AE) to aid learners with pronunciation. With that in mind, the present research aimed at: (i) investigating the perspectives of Brazilian learners regarding the role of pronunciation when learning English; (ii) verifying whether ELSA can assist learners with the production of minimal pairs containing the high-front vowels (/i-ɪ/); and (iii) observing students' perceptions of the affordances and limitations of the ELSA app. To achieve those goals, seven Brazilian learners of English (average age of 36 years old) took the Duolingo English Test (DET) to evaluate their proficiency in English; answered two questionnaires (Initial and Final Questionnaire) regarding their perspectives on pronunciation and ELSA; and recorded a Pretest (T1) prior to using the app, and Posttest (T2) after the intervention, which consisted of a group of six pairs of sentences containing the minimal pairs. To evaluate the intelligibility of their productions of words containing the /i-ɪ/ vowels, Google Docs' voice typing tool was used. As the research was conducted remotely, participants used their cell phones and computers to take each step and were able to decide when and where to do the ELSA activities, and were instructed to carry out the recording in a quiet environment to avoid noise that could impair audio transcription. Results reveal that participants perceive pronunciation as a fundamental yet challenging aspect of the English language; however, most agree that fluency is more important than having a native-like accent. Furthermore, overall, participants' productions of /i-ɪ/ sounds in T2 improved compared to T1, which confirms that ELSA could be used to learn and practice the sounds studied as an extra-class resource. Finally, participants believe ELSA is a useful tool for practicing AE sounds; nonetheless, most of them do not agree that technology could replace the role of the teacher.

**Keywords:** phonetics; ELSA; minimal pairs; technology; intelligibility.



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## LIST OF ABBREVIATIONS

AE	American English
AI	Artificial Intelligence
ASR	Automatic Speech Recognition
BP	Brazilian Portuguese
CEFR	Common European Framework for Reference of Languages
DET	Duolingo English Test
EIL	English as an International Language
ESL	English as a Second Language
FONAPLI	Laboratório de Fonética Aplicada
GVT	Google Voice Typing
L2	Second Language
NNS	Non-Native Speakers
NS	Native Speakers
NUPFFALE	Núcleo de Pesquisa em Fonética e Fonologia Aplicada à Língua Estrangeira
P#	Participant Code
Q1	Initial Questionnaire
Q2	Final Questionnaire
RQ	Research Question
TCLE	Termo de Consentimento Livre e Esclarecido
TTS	Text to Speech

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## 1 INTRODUCTION

How people study and practice languages has changed significantly in recent years. One reason for this is the use of digital technology. Derwing and Munro (2015a, p. 129) corroborate this idea by stating that “the last decade has seen a radical shift in language teaching (and other types of instruction) toward increased use of online resources, in either blended or strictly online courses”. Today, with the help of the Internet and a cell phone, students can access various resources for studying English, whether it is online videos, access to news from around the world, or using specific apps for learning. ELSA (English Language Speech Assistant) is an example of an application for learning English, focusing on American English (AE) pronunciation.

Pronunciation is an essential aspect of language learning, and new ways of practicing it have emerged through digital technology. Brazilian learners of English face some challenges when learning and practicing the target language. One of these difficulties includes the production and perception of English sounds due to differences between Brazilian Portuguese (BP) and AE. For example, discriminating the high-front vowels /i-ɪ/ present in English words like ‘sheep’ and ‘ship’, respectively, may be quite challenging to Brazilian learners. As Gonçalves (2014, p. 35, my translation) explains, “English high-front vowels represent a challenge for Brazilians.” This contrast does not have a phonological status in Portuguese; therefore, Brazilian speakers tend to perceive and produce these sounds as the same. As a result, many students have questions concerning words that could cause some misunderstandings, even some inconveniences, such as the words ‘bitch’ (/bɪtʃ/) and ‘beach’ (/bi:tʃ/), which may lead to communication breakdowns. As Derwing and Munro (2015b, p. 2) observed, “Oral communication is such a fundamental part of everyday life that if pronunciation patterns get in the way, action is essential”; thus, this is a relevant pronunciation difficulty to improve among Brazilians.

This research investigates Brazilian learners’ perceptions of ELSA for learning English pronunciation, and its possible benefits for pronunciation learning. To collect data for the study, participants took an English proficiency test – the Duolingo English Test (DET), answered two questionnaires using Google Forms containing questions about their perceptions of studying English pronunciation, using apps to learn English, and, more specifically, about the ELSA app. To assess the possible benefit of pronunciation learning using the application, participants recorded a Pretest and

Posttest reading aloud a group of six pairs of sentences containing the minimal pair /ɪ-*i*/ before and after using the app to study the same sounds.

Previous research (Benzies, 2017; Ghafar *et al.*, 2023) revealed that technology is a profitable tool for language learning and teaching and could bring positive results. Besides, it was revealed that students regard ELSA as a positive resource to learn and practice AE sounds (Samad; Aminullah, 2019; Kholis, 2021; Anggraini, 2022; Pires, 2022). It is important to note, however, that this study is not interested in discussing the (myth of the) Native Speaker (NS) when it comes to pronunciation (Gonçalves *et al.*, 2021; Levis, 2020), but rather in understanding how the use of ELSA can benefit students in production. Nevertheless, this research aims to obtain data that can corroborate theories and studies that indicate the benefits of using apps for language learning, more specifically for pronunciation, by presenting Brazilian learners' perceptions of the ELSA app as a tool for learning English pronunciation. Based on the results of this research, it is intended to reflect on how apps such as ELSA could be used to implement pronunciation learning in formal English language learning contexts, such as private lessons and language courses.

## 1.1 OBJECTIVES

This research (I) investigates the perspectives of Brazilian learners regarding the role of pronunciation when learning English; (II) verifies whether the ELSA Speak app can help these same learners with the production of minimal pairs containing the high front vowel (/i-ɪ/); and (III) observes the students' perceptions of the affordances and limitations of the ELSA app.

## 1.2 RESEARCH QUESTIONS

1. Can Brazilian learners of English improve their ability to produce the minimal pair /i-ɪ/ in English words after having used ELSA to study those sounds?
2. What is the role of pronunciation in oral communication according to Brazilian learners of English?
3. What is the perception of adult learners when practicing pronunciation with the support of ELSA?

## 2 LITERATURE REVIEW

Before advancing in the study, it is pivotal to clarify some important concepts used hereinafter. Initially, intelligibility, comprehensibility, fluency, and proficiency will be presented, followed by some challenges Brazilian ESL learners face, technology in the field of language teaching, and, finally, studies on ELSA will be discussed.

First, according to Derwing and Munro (2015b), intelligibility is “the degree of match between a speaker’s intended message and the listener’s comprehension” (p. 5); this feature is considered “the most fundamental characteristic of successful oral communication” (p. 1). Therefore, intelligible utterances mean that “listeners can understand the speaker’s intended message” (p. 1). Additionally, according to them (p. 5), comprehensibility is “the ease or difficulty a listener experiences in understanding an utterance”, which could be affected in both L1 and L2 for distinct reasons. One of those reasons is due to how speakers produce speech sounds; these speakers may be quiet, which poses a challenge to listeners who cannot understand their utterances easily. According to the same authors, other reasons for low comprehensibility in the L2 are related to different factors, such as the production of segmentals, which are “the individual consonants and vowels in a language’s phonological inventory” (p. 3). This study focuses on the segmental level, specifically the minimal pair /i-ɪ/, which may represent difficulties for Brazilian speakers of English.

Moreover, the authors see fluency and proficiency as different features. To them, the former is “the rate and the degree of fluidity of speech, as signalled by the presence or absence of hesitation markers, self-repetitions, and filled in unfilled pauses” (p. 4), whilst the latter encompasses multiple facets, including good command of grammar and vocabulary, for example. They mention that fluency varies within the same language; thus, two native speakers, despite sharing the same mother tongue, do not necessarily have the same fluency levels. Naturally, the same observation can be extended to the L2. When analyzing L2, an accent is expected; however, “speakers with foreign accents do not necessarily fail to get their messages across effectively.” (p. 5). The authors also point out that accent and intelligibility are different phenomena.

In terms of the production of English vowels by nonnative speakers, Flege, Bohn, and Jang (1997) investigated the relation between proficiency and NNS’s production and perception of English vowels (/i ɪ ε æ/), with 20 speakers each of Spanish, German, Mandarin and Korean, plus ten native speakers. They found that

“The experienced non-native subjects produced and perceived English vowels more accurately than the relatively inexperienced non-native subjects” (p. 437). Furthermore, the accuracy of NNSs in production and perception of the target vowels are related. Therefore, according to their findings, proficiency is related to accuracy in articulating and producing the sounds. Flege, Bohn and Jang (1997) state that “Adult beginners typically interpret L2 vowels as instances of the closest L1 vowel, and produce them accordingly” (p. 440). That could indicate that Brazilian speakers with lower proficiency levels would face more difficulties producing /i-ɪ/ due to their similarity with the Brazilian Portuguese /i/.

It is pivotal to understand what a minimal pair is. According to Yavas (2011), “Simply defined, minimal pairs are pairs of words that have exactly the same sounds in the same order except for a single difference in sounds, and have different meanings” (p. 32). An example of a minimal pair is ‘bitch’ (/bɪtʃ/) and ‘beach’ (/bi:tʃ/), which may lead to misunderstandings. In the matter of studies on the minimal pair /i-ɪ/, Gonçalves (2014) investigated the intelligibility of English high-front vowels, with a focus on how 20 Brazilians produced English vowels, including the minimal pair, considering the participants’ proficiency levels of English. Regarding the relationship between proficiency level and intelligibility, his study revealed that as listeners’ proficiency level increased, so did the level of token intelligibility, highlighting proficiency as a crucial personal attribute for speech clarity” (Gonçalves, 2014).

Pires (2022) investigated the effectiveness of ELSA on the intelligibility of the high-front vowels /i-ɪ/ with a group of 13 students from a Brazilian public school and had native speakers and nonnative speakers transcribe the target words produced by the participants. The author found that the “ASR-based mobile application can improve the intelligibility of English learners” (p. 139). According to the results, participants had gains in their production of the vowels; however, the intervention with the application was insufficient to improve the intelligibility of the words ‘bit’, ‘hit’, and ‘sheep’. The research also investigated participants’ perspectives on the application and revealed that, overall, they had positive perceptions of ELSA and the feedback provided. However, “participants perceived the lack of a teacher as the greatest disadvantage” (p. 140), which indicates that better results are achieved with the assistance of a teacher. This is in accordance with other studies (Derwing; Munro, 2015a; Baldissera; Tumolo, 2021).



Rauber (2006) adopted a correlational approach to investigate vowel learning. The author analyzed data from 18 Brazilian participants and found a positive correlation between perception and production of the vowel sounds [i-ɪ], [ɛ-æ], and [u-ʊ], which pose challenges for Brazilian speakers.

Silveira *et al.* (2017) stated that when studying a new language, students face challenges in acquiring new characteristics of the new language. One of these challenges includes sound contrast, which is valid for perception and production. For the case of Brazilian learners, this could be noticed with the minimal pair studied here /i-ɪ/, a change in the quality of the vowels; thus, 'sit' and 'seat' could both be produced by Brazilian learners of English as [sit]. They also point out that English is used as a lingua franca in many situations, and, therefore, teachers should not focus on teaching native-like pronunciation, which is nearly impossible for most ESL speakers, but rather on intelligible communication. Regarding studies investigating intelligibility in Brazil, the authors mentioned different possibilities, such as English NS analyzing the intelligibility of Brazilian speakers. Another possibility for research concerning intelligibility is the use of technological tools, presented below. The authors also mention that one of the challenges in the research of the pronunciation field is the "lack of clear criteria for establishing the level of proficiency of informants" (p. 266, our translation). Furthermore, the authors highlight the importance of pronunciation teaching, given that "[s]egmental aspects that result from the transfer of phonetic and phonological characteristics from the L1 make English spoken by Brazilians difficult to understand" (p. 267, our translation).

Additionally, it is vital to observe previous studies' contributions to the area of technology applied to language teaching. Kivistö-de Souza and Gottardi (2022) analyzed how two different ASR tools, present on VoiceNotebook (VN) and Microsoft Word (MW), dealt with L2 accented speech. The researchers investigated a group of five native speakers of English, a group of 15 Brazilian Portuguese speakers, and another group of 15 Spanish speakers, and used data from Speech Accent Archive (WEINBERGER, 2015), an online source, and confirmed that those tools had more difficulty understanding the utterances from NNS. The most common form adopted by the ASR tools to handle the problem with intelligibility was substitution, i.e., transcription of different words instead of the original, for instance, 'forms' for 'spoons'. The authors observed that MW obtained better results and transcribed words correctly more often than VN for Portuguese and Spanish native speakers. "On average, VN

correctly transcribed the EIL [English as an International Language] speech in 80% of the cases, and MW dictation correctly transcribed the EIL speech in 89% of the cases” (p. 775). The authors suggest that ASR tools could be used for minimal pair practice and facilitate autonomous learning; nonetheless, an instructor’s assistance may be necessary. On a final note, they mention some directions for future studies, which would compare human listeners and ASR tools to assess L2 accented intelligibility.

Also, Johnson *et al.* (2022) investigated the relationship between Google Docs’ voice-to-speech-rated scores and human-rated scores with audio recordings from 56 undergraduate students of different English proficiency levels. They found that Google Voice Typing (GVT) scores are highly correlated to humans’ scoring, which could enable the use of such tools in proficiency tests. Notwithstanding, they pointed out that human raters assess different aspects of pronunciation, such as prosody, which are important suprasegmental features. Johnson *et al.* (2022) also indicated limitations to the use of ASR tools in some instances: “Recordings were used rather than live speech, and at times, this may have affected the technology’s ability to correctly represent what was being said, negatively impacting the scores generated by GVT” (p. 206). Thus, despite some reliability, ASR tools are not fully prepared to be used as a rater in a conversational situation.

Despite all the possible benefits technology can offer, language teachers should be careful when selecting which tools to use with students. Derwing and Munro (2015a) state that “teachers are advised to read reviews and recommendations from authoritative sources and then to screen apps carefully before recommending them to students” (p. 124). Hence, technological teaching tools, such as websites and applications, should not be seen as a one-size-fits-all tool, but rather, in order to provide students with the most meaningful learning opportunities, they should be tailored to their needs and difficulties. All in all, technology is not fail-proof, yet it can be used to improve everyday life. Among the affordances technology can offer in pronunciation learning and teaching is interesting content, and, if done correctly, it can “facilitate individualized instruction with higher-quality feedback than has traditionally been possible” (p. 130). On the other hand, it “cannot replace teachers, nor is it *necessarily* better than, or even as good as, traditional method” (p. 130).

In terms of technological tools for language teaching, Yoshida (2018) developed research on how teachers could choose and select technological tools to teach and learn pronunciation, focusing on pedagogical tasks. The study examines different free

or inexpensive apps and websites to provide a model and type of feedback. Another research by Benzies (2017) investigated the benefits of teaching pronunciation with technology to improve learners' pronunciation in English. They also developed an empirical preliminary study on students who reported liking using such tools. Baldissera and Tumolo (2021) analyzed the content, features, and possibilities of four free apps for pronunciation practice: English Pronunciation Tutor, ELSA, English Pronunciation, and Juna. They found room for improvement in those apps; one of the reasons is that they tend to lack communicative practice. Nonetheless, they state that the apps could be used to assist learners' practice. It is vital to note that all aforementioned studies agree that technology could be used as a supplement in the classroom or extra activity but not as a replacement for teachers or instruction. In their literature review, Ghafar *et al.* (2023) examined the use of artificial intelligence (AI) in teaching and learning contexts and found it promising. The researchers briefly discussed various AI technologies, including Text to Speech (TTS) and language learning apps such as Duolingo and ELSA. They concluded that the use of AI in education is expected to expand further, empowering learners to develop enhanced language proficiency. As the authors noted, AI provides a positive learning environment that enables learners to become more capable in their language usage.

Finally, with respect to studies regarding users' perspectives on technological tools for language learning purposes, Samad and Aminullah (2019) conducted research with a group of 12 students to find their perception of ELSA, with a descriptive quantitative design. By administering a questionnaire, they found that students regard ELSA's ASR as positive for immediate feedback. In addition, upon interviewing ten English education students concerning their perspective on the application for practicing pronunciation, Kholis (2021, p. 10) found that "85% of the students said that they like using ELSA Speak for learning to pronounce, and 90% of the students felt motivated and improved during using it." However, the same author advises teachers to be careful when choosing what technological tools to use with students so that learning is "effective and efficient" (p. 11). In addition, Anggraini (2022) investigated the effectiveness of ELSA in enhancing the pronunciation skills of 30 students enrolled in the Easy English Course at the basic level. The researcher analyzed students' perspectives on the app, evaluated their pronunciation with a pre and posttest, and observed that ELSA significantly improved learners' pronunciation skills and can be a valuable tool for vocabulary acquisition. Additionally, it was found to be an engaging

resource for students. To verify if Brazilian learners of English have a similar opinion is one of the goals of the present study.

Having briefly reviewed the literature, the next step is to describe the method of the present study.

### 3 METHOD

This section presents information about the participants and recruitment, instruments and materials used, the proficiency measure (Duolingo English Test – DET), and, finally, ELSA.

#### 3.1 PARTICIPANTS AND RECRUITMENT

The seven participants of this research are Brazilian learners of English from different cities in Brazil (SP - 4, RJ - 1, PR - 2). They were three males and four females, with an average age of 36 years old (ages ranged from 25 to 52 years old,  $sd = 10.12$ ), and according to the DET which will fully reported in subsection 3.2.2 Duolingo English Test, have an intermediate proficiency level. Participants are referred to by the capital letter P (for participants) followed by a number from one to seven; for instance, P1 is participant number one, and so forth.

Participants had private online classes on the Google Meet video call platform with the researcher on different days and times. Six participants had two weekly classes at the time of the research, and one (P5) had a single weekly class with the researcher. Participants were recruited through an individualized invitation sent via WhatsApp by the researcher. The invitation explained the research in general terms and indicated that it would take place outside private lessons. Those who agreed to participate in the research received the Informed Consent Form (TCLE - Termo de Consentimento Livre e Esclarecido) (Appendix A) via an individualized WhatsApp message. After reading this document, they had to indicate whether they agreed to take part in the research by signing the document. If the students refused the invitation or withdrew from participating in the research after reading the ICF, they would not be penalized in any way. The data collection date varied according to the participants' availability (from June 2023 to September 2023), and all data collection procedures were conducted remotely, using the Google Forms platform for the questionnaires, and WhatsApp for communication and sending the other files. In addition to the initial approach, the researcher was available to answer any questions that arose during the process via WhatsApp. Initially, four other participants volunteered to also contribute with the study; however, they could not conclude all the steps in time, and therefore, their data were not used.

### 3.2 INSTRUMENTS, MATERIALS AND PROCEDURES

This section presents the instruments, materials, and procedures used in the research. The data were collected with the help of an online English proficiency test (Duolingo English Test), two questionnaires (Initial and Final Questionnaires), and two audio recordings (Pretest and Posttest). The data collection procedure was administered from June 2023 to September 2023, depending on each participant's availability. Table 1 summarizes the research instruments in the order of use, as well as their objectives and duration in minutes:

Table 1. List of stages, objectives, and collection time for each activity

Stage	Objective	Collection time
Proficiency Test (Duolingo English Test)	Verify the English language proficiency of the participants to confirm they all have the same level – intermediate	30 minutes
Initial Questionnaire	Gather data on the participants' profiles, pronunciation learning, and use of educational apps	10–20 minutes
Reading Pretest (Audio Recording)	Collect oral production data for the minimal pair (/i-ɪ/) before using ELSA	5–10 minutes
Intervention with ELSA	Practice the pronunciation of the examined vowel pair (/i-ɪ/)	120–150 minutes
Reading Posttest (Audio Recording)	Collect oral production data for the minimal pair (/i-ɪ/) after using ELSA	5–10 minutes
Final Questionnaire	Analyze the benefits and limitations of the app for learning the vowel pair, based on the participants' perception	10–20 minutes
Total time		180–240 minutes

Source: author

Before collecting the data, participants had to read and agree with the TCLE. The document briefly explained the research and important information, such as the confidentiality of their personal information.

The following instrument was an English proficiency test – the Duolingo English Test (DET). It was a way of ensuring that all participants had a similar English level –

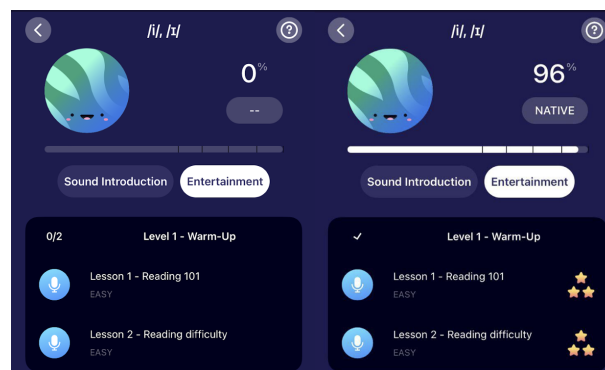
intermediate. The Duolingo English Test section presents more details about the test. DET was taken online by each participant asynchronously after receiving the proper instructions, and print screens of the results were sent to the researcher via WhatsApp.

The Initial Questionnaire (Q1) (Appendix B) aimed at collecting data on the participants' personal information, such as age, place of residence, how they learned English, what they thought about using technology to learn a language, and their views on the importance of pronunciation. Q1 was created using the Google Forms tool, taking ten to 20 minutes to complete, and included open and closed questions. Participants could answer it whenever and wherever it was convenient.

Next, participants completed the Reading Pretest (T1), which is described in subsection 3.2.1 Vowel Production Test. Upon having recorded the audio of the T1, they sent the audio file to the researcher's WhatsApp. After recording T1, participants were instructed to use the ELSA Speak app to complete the 38 lessons on /i-ɪ/ sounds. They could choose when and where to do the activities in the app. The application is available for iOS and Android mobile devices, with free and paid versions; however, the free version has usage restrictions and allows users to do a limited number of lessons (two lessons per level). For this research, participants used the one-week trial period that made all activities available, which was the time they had to finish all tasks. More information about ELSA will be presented under the ELSA section.

In order to ensure that the participants completed all the stages, they were asked to share screenshots of the app via WhatsApp. At the end of each activity, it is possible to see stars next to each lesson. Figure 1 shows screenshots of uncompleted lessons (on the left, with no stars) and completed lessons (on the right, with stars). Below, in the ELSA Speak subsection, more details about the application are provided.

Figure 1. Screenshot: uncompleted and completed lessons



Source: ELSA Speak

Right after having completed the ELSA app activities, participants were instructed to complete the Posttest (T2), which used the same instruments and procedures as T1, as described in subsection 3.2.1 Vowel Production Test. To check for possible affordances in the production of the vowels /i-ɪ/ with the use of the app. Again, it was at the discretion of the participants where and when to record the sentences, as well as which tools to use. However, the same recommendations were made regarding how to record the audio, such as a quiet environment and using a microphone. Once the recording was finished, participants sent the audio files to the researcher's WhatsApp.

Finally, participants answered the Final Questionnaire (Q2) (Appendix C) using Google Forms, which contained open and closed questions and aimed to understand participants' perceptions of the ELSA Speak app as a tool for learning English pronunciation. Q2 include questions such as: How was your experience using ELSA?, What are the benefits of the app?, What are the drawbacks of the app?, What did you think of the videos provided by the app demonstrating how to articulate the sounds?, and Do you believe the app helped you understand how to pronounce the minimal pair /ɪ/ and /i/ present in words such as 'sit' and 'seat'?

The data collected were stored on the researcher's personal computer and, after the research was completed, were deleted in order to guarantee the protection of the participants' data. Next, more details are presented concerning the DET and ELSA.

### 3.2.1 Vowel Production Test

The Pretest (T1) and Posttest (T2) sentences and the instructions to be recorded were shared with the participants via WhatsApp. T1 and T2 consisted of six pairs of sentences in English, each containing a target word, with the phonemes /i-ɪ/. Table 2 displays the sentences used. Each pair was similar, with only the minimal pairs changing (e.g., That was such a major **scene**, don't you think? and That was such a major **sin**, don't you think?). The objective was to minimize any sentence variation and maintain the target words in their original positions. The target words were chosen because they are common and easily used in everyday situations; furthermore, all target words were nouns, except for 'least'. Not all the target words were explored by ELSA, namely 'bitch' and 'shit', due to their negative connotation. However, it was expected that participants would be able to apply the rules from Level 3 – Spelling Patterns (see Table 3) and produce them as expected.



Table 2. Pretest and posttest sentences

Pairs	Pretest and Posttest Sentences (target words in bold)	Vowel
01	That was such a major <b>scene</b> , don't you think?	/i/
	That was such a major <b>sin</b> , don't you think?	/ɪ/
02	Do you know many <b>beaches</b> there?	/i/
	Do you know many <b>bitches</b> there?	/ɪ/
03	Can you see that <b>sheep</b> near the lighthouse?	/i/
	Can you see that <b>ship</b> near the lighthouse?	/ɪ/
04	I don't want that <b>sheet</b> ; you can keep it.	/i/
	I don't want that <b>shit</b> ; you can keep it.	/ɪ/
05	How do you spell ' <b>list</b> '?	/ɪ/
	How do you spell ' <b>least</b> '?	/i/
06	Where are the <b>beans</b> ? I couldn't find them.	/i/
	Where are the <b>bins</b> ? I couldn't find them.	/ɪ/

Source: author

As the study was carried out online and asynchronously, the tools used to record the audio may have varied, as each participant could choose how they preferred to record the sentences. However, participants probably used a computer, cell phone, and headphones. It was recommended that they recorded the sentences in a quiet place and with a microphone, if possible, to avoid external noise that could damage the audio quality.

Google Docs' voice typing tool was used to evaluate participants' productions of T1 and T2. This tool was chosen since it is free and is easily accessed by anyone with a computer or cellphone and internet connection, which is in accordance with the use of technology present in this study. Furthermore, as previously mentioned,

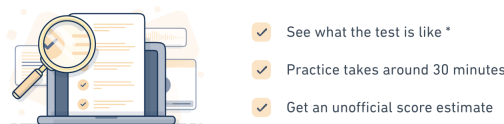
Johnson *et al.* (2022) found that Google Voice Typing (GVT) scores are highly correlated to humans' scoring, despite some limitations such as its difficulty to transcribe live speech. Since the study does not use live speech, Google Docs could be used to assess participants' productions.

### 3.2.2 Duolingo English Test

This section explains how the Duolingo English Test (DET) works and how it measures proficiency in English. DET is a web-based evaluation tool for English language competency, with outcomes applicable for demonstrating proficiency in diverse contexts, including university enrollment. Notably, it distinguishes itself from conventional proficiency assessments by affording examinees the convenience of home-based administration, eliminating the necessity for a physical testing center, and it became more popular during the pandemic caused by Coronavirus since many testing centers were closed. The official test requires approximately one hour for completion. In this study, participants undertook the Practice Test (Figure 2), a shorter variant with a duration of approximately 30 minutes, providing an unofficial score estimate. Once initiated, it requested completion, as interrupting the process results in loss of progress. After test completion, participants forwarded a screenshot of their scores to the researcher via WhatsApp.

Figure 2. DET: practice test

Take a free practice test and estimate your score



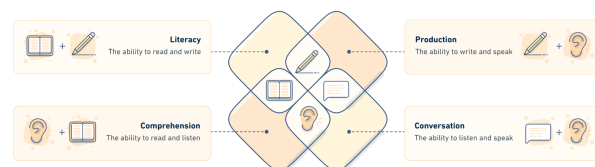
\* The practice test may include question types and reminders that do not appear on the certified test.

Source: Duolingo English Test

DET was selected due to its cost-free accessibility and online accessibility, besides its recognition by numerous institutions worldwide, including Yale University in the United States. Furthermore, the test comprehensively evaluates various facets of English language proficiency. Unlike comparable online proficiency assessments,

such as the Cambridge English Language Assessment, which predominantly feature reading, vocabulary, and grammar components, the DET exhibits a greater diversity of activities. As highlighted by DET, “While reading, writing, speaking, and listening are important language components, research shows that combined skills can better represent how language is used in real life. Effective language use requires people to employ multiple skills simultaneously” (Duolingo English Test, 2023). Figure 3 illustrates the activities and the corresponding skills they evaluate, categorized into literacy, production, conversation, and comprehension.

Figure 3. DET: areas



Source: Duolingo English Test

Despite agreeing with the benefits of DET, such as its accessibility, Wagner (2019) revealed that “the test has multiple shortcomings: the test tasks have little in common with the types of language tasks university students engage in; the test does not assess test takers’ academic language ability [...]” (p. 300), and therefore, its scores “cannot be recommended for university admissions purposes” (p. 300). That being said, for this study, DET scores are acceptable.

Additionally, DET provides a score of 10 to 160, with 10 denoting the lowest and 160 signifying the highest attainable score. Moreover, it aligns its scores with other recognized proficiency examinations (TOEFL iBT and IELTS Academics), as well as the Common European Framework of Reference (CEFR), as delineated in Figure 4. The data presented herein were collected as of September 2023.

Figure 4. DET: score comparison

TOEFL iBT	IELTS Academic	CEFR
140	160	160
155	155	155
150	150	150
145	145	145
140	140	140
135	135	135
130	130	130
125	125	125
120	120	120
115	115	115
110	110	110
105	105	105
100	100	100
95	95	95
90	90	90
85	85	85
80	80	80
75	75	75
70	70	70
65	65	65
10-40	10-40	10-40

Source: Duolingo English Test

### 3.2.3 ELSA Speak

This section aims to share some aspects of the ELSA, focusing on how it presents the minimal pair /i-ɪ/. According to its website, “ELSA, English Language Speech Assistant, is a fun and engaging app specially designed to help you improve your English pronunciation” (ELSA, 2023) and works with American English sounds. The screenshots presented here were taken using a mobile device, model iPhone 11, with version 4.13.9 of the app. Participants were instructed to download the app and complete all tasks regarding the high-front vowels /i-ɪ/ within the trial period; moreover, they were free to decide when and where to study the lessons. No further instructions were provided regarding the vowels during the data collection to avoid any interference with the study.

Souza and Neto (2023) analyzed pronunciation activities on ELSA, providing a typology of activities and reflecting on the integration of technology in pronunciation teaching. The authors assert that the app can be a valuable tool for pronunciation learning and highlight its potential applicability across diverse learner profiles, encompassing different age groups and proficiency levels. Nevertheless, they emphasize the app should not replace the role of the teacher and suggest that students should receive guidance and instruction from a teacher in order to fully profit from the app.

Figure 5 displays how the content is organized in skills in the form of a planet. Each skill represents different aspects of American English; the fourth planet, Skill 4, for example, deals with the sounds studied in this research, the high front vowels /i-ɪ/. Below each planet is a progress bar, and at the top right portion, in a green circle, the average score in percentage for each skill is presented. These visual resources show users their progress and outcome for each aspect of the language.

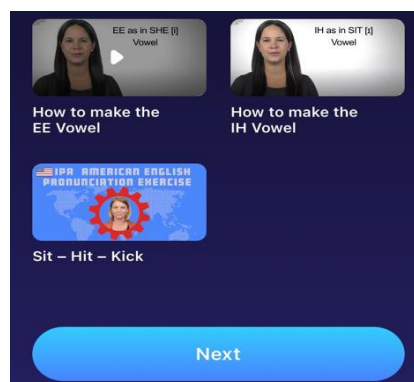
Figure 5. ELSA screenshot: skills



Source: ELSA, version 4.13.9

Upon selecting Skill 4 - /i/, /ɪ/, users are taken to the screen containing instructional videos about the minimal pair, shown below in Figure 6. These videos are not produced by the app, just made available by it. The first video is called 'How to make the EE Vowel', the second is called 'How to make the IH Vowel', and the third is called 'Sit - Hit - Kick'. The videos show how to produce the sounds with explicit explanations and the use of images for better visualization.

Figure 6. ELSA screenshot: videos



Source: ELSA, version 4.13.9

By clicking ‘Next’, users can access two categories for learning and practicing the content: ‘Sound Introduction’ and ‘Entertainment’. The first category, Sound Introduction, focuses on explaining the sounds /i-ɪ/, as in Lessons 2 and 3, or comparing and contrasting the two sounds, as in Lesson 4 of Level 1, presented in Table 3. The first section has a total of 14 lessons.

Table 3. Skill 4 - /i/, /ɪ/: Sound Introduction

Level	Lesson
Level 1 – /i/ or /ɪ/?	Lesson 1 – Can you hear the difference?
	Lesson 2 – Words with /i/
	Lesson 3 – Words with /ɪ/
	Lesson 4 – Words with /i/ & /ɪ/
Level 2 – Words, Phrases, & Sentences	Lesson 1 – Longer words
	Lesson 2 – Stress these words: between, country, difference
	Lesson 3 – Phrases
	Lesson 4 – Sentences
	Lesson 5 – Any tips for making them different?
Level 3 – Spelling Patterns	Lesson 1 – Common ways to spell
	Lesson 2 – Other ways to spell /i/
	Lesson 3 – Rare patterns for /i/
	Lesson 4 – Common ways to spell /ɪ/
	Lesson 5 – Rare patterns for /ɪ/

Source: author

The second category, ‘Entertainment’, also covers the minimal pair, but from a more interesting perspective in terms of content, as it presents the minimal pair more contextualized, such as in movies, music, and sports. Table 4 shows the content organized into levels and lessons. The second section has a total of 24 lessons.

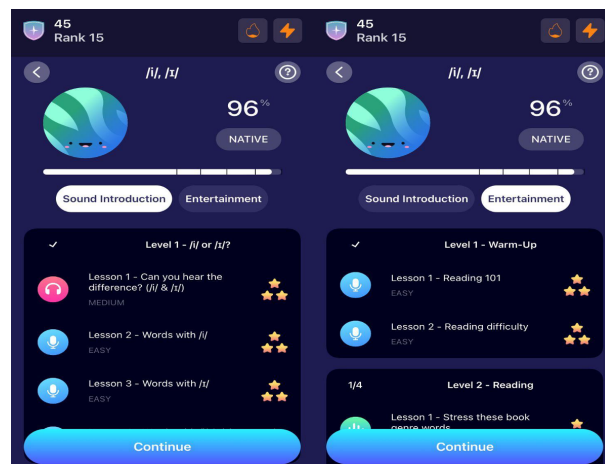
Table 4. Skill 4 - /i/, /ɪ/: Entertainment

Level	Lesson
Level 1 – Warm-up	Lesson 1 – Reading 101
	Lesson 2 – Reading difficulty
Level 2 – Reading	Lesson 1 – Stress these book genre words
	Lesson 2 – Personalities and book genres
	Lesson 3 – Movies based on books
	Lesson 4 – More movies based on books
Level 3 – Movies & TV Shows	Lesson 1 – Can you hear the difference between sin and scene?
	Lesson 2 – Movie terms
	Lesson 3 – More movie terms
	Lesson 4 – How was the movie?
	Lesson 5 – Word stress: describing movies
	Lesson 6 – TV show terms
	Lesson 7 – What kinds of TV shows do you like?
	Lesson 8 – Films and TV awards
	Lesson 9 – The movie “Limitless”
Level 4 – Music	Lesson 1 – Is it bit or beat?
	Lesson 2 – New album release
	Lesson 3 – Parts of a song
	Lesson 4 – Types of music
	Lesson 5 – Describing music
Level 5 – Sports	Lesson 1 – Don’t confuse words like lead & lid
	Lesson 2 – Sports terms
	Lesson 3 – Olympic sports
	Lesson 4 – What Olympic sports do you like?

Source: author

Figure 7 displays additional information, such as the level of difficulty of each lesson (easy, medium, or difficult) and the result based on the performance of each lesson represented with stars, which can vary from one (poor performance) to three (good performance). In addition, in percentage form, the app shows how close the user is to a Native American English speaker. As previously mentioned, the research will not address the issue of native speakers.

Figure 7. ELSA Screenshot: Sound Introduction and Entertainment



Source: ELSA, version 4.13.9

The screenshots presented here were collected from a device with the iOS operating system; devices with the Android system may differ in design, but the content should be the same.



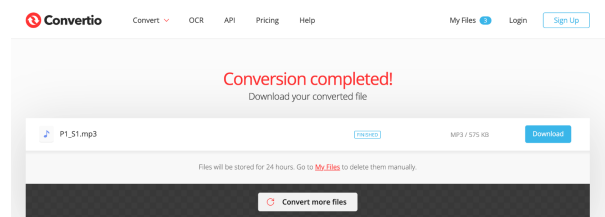
## 4 DATA ANALYSIS

This section presents the steps taken to prepare and analyze participants' data regarding the Pretest, Posttest, and questionnaires.

### 4.1 PRETEST AND POSTTEST

Participants sent their T1 and T2 audio files via WhatsApp, which were downloaded as OGG or ACC files onto the researcher's computer. They were named according to the code of each participant from P1 to P7 plus S1 or S2, which refer to the Pretest and Posttest, respectively, and added to a folder named 'Audio Files'. Then the files were converted into MP3 format so that it was possible to open and manipulate them using Audacity. Convertio (Figure 8), a free online tool, was used for this purpose. Then, the audio files were downloaded and added to the 'MP3 Files' folder.

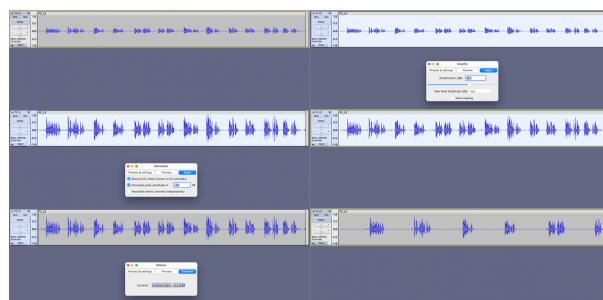
Figure 8. Convertio



Source: Convertio

Then, Audacity (version 3.3.3), audio editing and recording software, was used to add a five-second pause between each sentence to make it easier for Google Docs' voice typing tool to transcribe the sentences into text. Besides that, each audio file was amplified and normalized in an attempt to improve its quality. Figure 9 shows the steps.

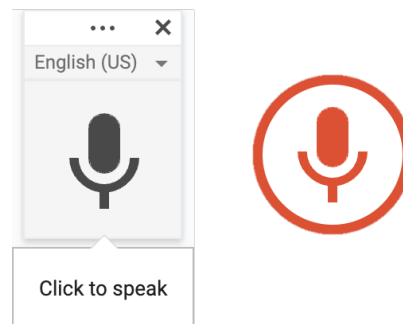
Figure 9. Audacity: editing audio files



Source: Author

Next, Google Docs was used to transcribe the audio files into written text, with the purpose of assessing the accuracy of production of the target words. This step was administered in a silent environment in an effort to reduce external noise as much as possible and have a more reliable transcription. However, it is important to emphasize that since this study used no professional equipment, the results may have been impacted by the lower audio quality and external noise. The transcription of each participant was done by clicking on the microphone icon and then playing the audio file, as seen in Figure 10. Because a five-second silent period interval was added between sentences, a new paragraph was inserted at the end of every sentence. Appendix D shows the full transcripts of all participants' recordings.

Figure 10. Google Docs' voice typing



Source: author

Although the complete sentences were transcribed, the emphasis was on the words containing the high-front English vowels /i-ɪ/. Table 5 was used to compare the production prior to and after the intervention with ELSA. Upon comparing columns 'T1: Word transcribed' and 'T2: Word transcribed', it was possible to determine whether those words' intelligibility had improved or not, which resulted in column 'Gain score'. The words were considered correct (i.e. intelligible) if it was fully transcribed as the intended target word by Google Docs.

Table 5. Participants' production on T1 and T2, and gain score

Pair	Target word	Vowel	T1: Word transcribed	T2: Word transcribed	Gain score
1	Scene	/i/			
	Sin	/ɪ/			
2	Beaches	/i/			

	Bitches	/ɪ/			
3	Sheep	/i/			
	Ship	/ɪ/			
4	Sheet	/i/			
	Shit	/ɪ/			
5	List	/ɪ/			
	Least	/i/			
6	Beans	/i/			
	Bins	/ɪ/			

Source: author

With this information on the production of each word and each participant, it was possible to answer the RQ1: Can Brazilian learners of English improve their ability to produce the minimal pair /i-ɪ/ in English words after having used ELSA to study those sounds?

#### 4.2 QUESTIONNAIRES

Google Forms, a free online survey administration website, was used to create the Initial and Final Questionnaires. Q1 contained open- and closed-ended questions and investigated participants' profiles and perspectives on English learning and pronunciation. The answers were analyzed as follows: open-ended questions were classified and then arranged in tables in order to obtain similarities and differences between the participants regarding their opinions on learning pronunciation and the use of apps for this purpose. The closed-ended answers had their data tabulated automatically by Google Forms. Q2 also contained open- and closed-ended questions and examined participant's perspectives when using ELSA. The closed-ended questions were used to generate graphs and tables, and the open-ended questions were read and then grouped according to their information, classifying the answers to identify whether there was a positive or negative perception of the app, besides the benefits of using the app and its limits for learning English pronunciation. Tables and graphs were generated using Google Sheets, a free online spreadsheet application.

With these results, it was possible to answer RQ3: What is the perception of adult learners when practicing pronunciation with the support of ELSA?

## 5 RESULTS AND DISCUSSION

This section presents the results obtained from the data analysis and discussion. Initially, the findings from the intervention with the ELSA app will be presented, followed by the results from the two questionnaires. The results are based on data collected from seven participants.

### 5.1 PRODUCTION OF MINIMAL PAIR

This section focuses on answering the RQ1: Can Brazilian learners of English improve their ability to produce the minimal pair /i-ɪ/ in English words after having used ELSA to study those sounds? The voice typing tool on Google Docs was used to assess participants' productions of investigated vowels embedded in target words.

Overall, it can be stated that the intervention of ELSA had a positive outcome in participants' productions of the minimal pair /i-ɪ/. As shown in Table 6, five out of seven participants had a higher number of words transcribed correctly by the voice typing tool in the posttest compared to the pretest; however, P1 and P5 obtained negative results. The table shows participants ranked from the highest outcome (P3) to the lowest outcome (P5) regarding results comparing T1 and T2. Despite having different results in the pretest and posttest, both P6 and P7 obtained the same gain score, both one point positive. P3 was the participant with the highest gain score (5); the number more than doubled, from three to eight. The second most positively impacted participant was P2, from five correct words to eight; this participant in particular revealed to be interested in pronunciation, which is further discussed in the subsection 5.2.

Table 6. Participants' results prior to and after ELSA intervention, and gain score

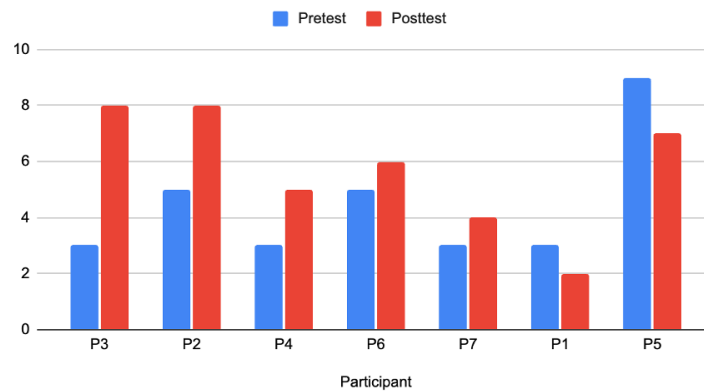
Rank	Participant	T1 Results	T2 Results	Gain Score
1	P3	3	8	+5
2	P2	5	8	+3
3	P4	3	5	+2
4	P6	5	6	+1

4	P7	3	4	+1
5	P1	3	2	-1
6	P5	9	7	-2

Source: author

Figure 11 shows the number of words correctly transcribed by the dictation tool for each participant, from the biggest positive gain score (P3) to the negative gain score (P5).

Figure 11. Pretest and posttest number of words correctly transcribed



Source: author

Another interesting aspect is that it is possible to relate is participant's proficiency scores to the number of accurate words produced by them. Table 7 displays the score ranges for each participant according to the results of the Duolingo English Test.

Table 7 also reproduces the gain scores for each participant, so as to allow examining the relation between proficiency and gain score in the production of the words containing the high front vowels. Overall, we can see that participants whose proficiency score were higher also obtained higher gain scores for vowel production. However, there is an important exception, P5, who obtained the highest rank in the DET test and the lowest gain score (-2). Therefore, it can be stated that participants with higher proficiency levels in the language are likely to benefit more from the use of ELSA for vowel pronunciation learning. Previous studies have shown that there a

tendency for pronunciation to improve as proficiency levels increase (Flege; Bohn; Jang, 1997; Gonçalves, 2014).

Table 7. Proficiency levels and gain score

<b>Participant</b>	<b>DET Score</b>	<b>Gain Score</b>
P5	110-145	-2
P3	90-135	+5
P6	90-135	+1
P2	80-130	+3
P4	80-130	+2
P7	65-125	+1
P1	55-120	-1

Source: author

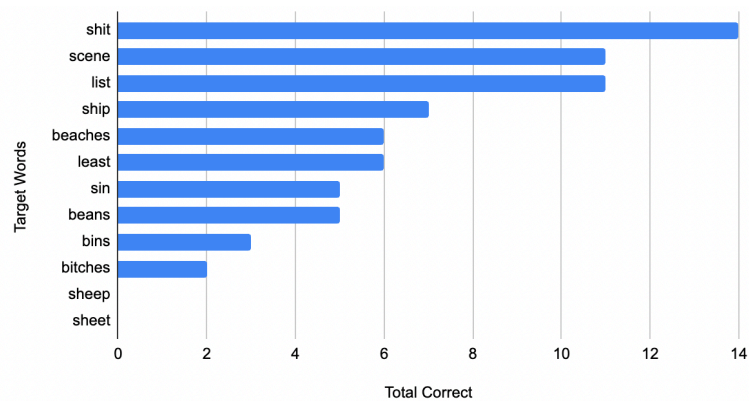
The total number of transcribed words in this study was 168 (12 target words x seven participants x two recordings), and they were the pairs scene-sin, beaches-bitches, sheep-ship, sheet-shit, least-list, and beans-bins. Each word was produced by the participants twice, resulting in 14 productions of every word. The words transcribed correctly more frequently by the voice typing tool available on Google Docs were 'shit' (14 out of 14 times, which is the result from two recordings times seven participants), followed by 'scene' and 'list' (both 11 times out of 14). On the other hand, the least recognized words are 'sheep' and 'sheet'. Not once have those words been transcribed correctly, as shown in Figure 12.

These results may be connected with the methodological decision of playing the entire sentence to the voice dictation tool, instead of isolated words. The word 'sheep', for example, appeared in the sentence 'Can you see that \_\_\_ near the lighthouse?', which could have led the typing tool to guess that the intended word was 'ship', given the fact that 'lighthouse' and ship seem to be more likely to appear together. When transcribing sentences, ASR tools rely not only on sounds but also on context. Since the words 'ship' and 'lighthouse' are closer in meaning than 'sheep' and the latter, that

could have had a negative impact even if participants pronounced the different words ('ship' and 'sheep').

For future research, it would be interesting to investigate if the voice typing tool available on Google Docs would also have the same results when transcribing the sentence spoken by native speakers and/or in isolation. As for the second case, the sentence ('I don't want that \_\_\_\_; you can keep it.') does not provide such a relevant connection between the words as in the previous case. Perhaps, due to the negative connection between the words as in the previous case. Perhaps, due to the negative structure 'I don't want', the negative connotation of 'shit' could have been considered more important than the 'sheet'.

Figure 12. Correct transcription of target-words by Google Docs' voice typing

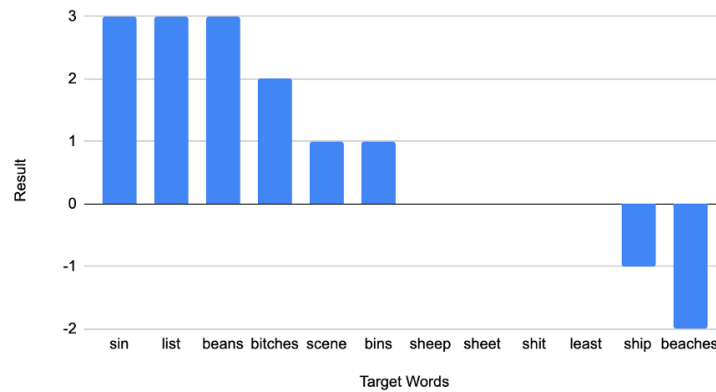


Source: author

Furthermore, it is also possible to notice that target words had a distinct result. Figure 13 shows that 'sin', 'list', and 'beans' had the most significant positive impact (three positive points each), followed by 'bitches' (two points), and 'scene' and 'bins' (both with one point). Four words had no change in the total number of accurate productions before and after the intervention with ELSA; they are 'sheep', 'sheet', 'shit', and 'least'. On the other hand, 'beach' and 'ship' were negatively impacted (two negative points and one negative point, respectively).



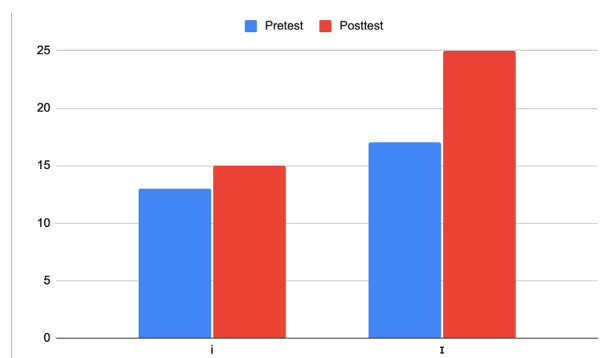
Figure 13. Gain scores of each word



Source: author

Upon further investigation, it was possible to track which vowel (/ɪ-i/) had a more relevant impact. Figure 14 reveals that the lax high-front vowel /ɪ/ had a significantly more pertinent result with the ELSA intervention than tense high-front vowel /i/. When comparing the number of accurate productions in the pretest, 13 target words containing the /i/ sounds were accurately produced, and 15 target words with the same vowel were accurately produced in the posttest – an increase of 15.38%. As for the /ɪ/ vowel, 17 words containing the sound were accurately produced in the pretest, and 25 target words with the same vowel were accurately produced in the posttest – an increase of 47.06%. This difference between those values represents a percentage difference of 31.68 percentage points, relevant as /ɪ/ represents a more significant challenge of production for Brazilian speakers. Figure 14 represents the total number of accurate productions of both vowel prior to and after the intervention of ELSA.

Figure 14. Accurate production of /i-ɪ/ in the pretest and posttest



Source: author

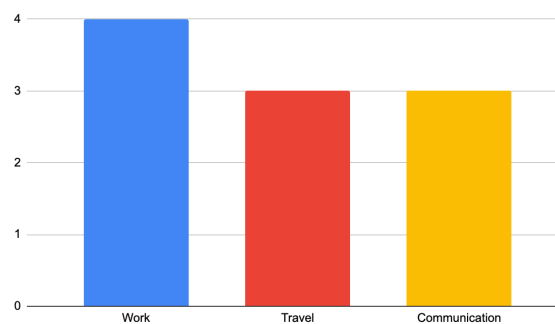
All in all, it is possible to affirm that overall, the intervention of ELSA speak had a positive impact on the production of the minimal pair by participants. However, as presented before, two participants (P2 and P5) had a negative gain score.

## 5.2 PARTICIPANTS' PERCEPTION ON ENGLISH PRONUNCIATION

The Initial Questionnaire (Q1) (Appendix B) was designed to obtain information about participants' profiles and their perspectives on English learning and the use of technology for this purpose. It contained five categories, and participants had to answer open and multiple-choice questions. When presenting excerpts of answers to open questions, minor grammar corrections were made in the participants' reports so as to facilitate reading. It aimed at answering RQ2: What is the role of pronunciation in oral communication according to Brazilian learners of English?

Initially, the participant's profile will be presented. Four participants have never lived or been to an English-speaking country, and three reported having lived or spent time in such countries (an average of 45 days). The reasons why they study English are related to work and career, traveling, and communication in general, as seen in Figure 15.

Figure 15. Participants' reasons to study English



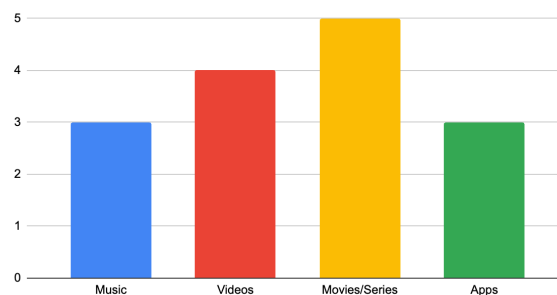
Source: author

In terms of the English language and what challenges they face when learning it, three participants mentioned pronunciation, two others mentioned oral skills as challenging factors, and English variations (different accents, for instance) were also referred to. Five out of seven participants reported that oral skills are challenging, which indicates that these Brazilian learners of English see pronunciation and speaking as

the most challenging aspects of English. Moreover, other problems include the lack of time and opportunity to practice the language daily in real-life situations.

When it comes to using technology to practice English, all participants answered using technology to practice the language. Figure 16 shows that learners have a preference for movies and series available on streaming services, followed by videos, and music and apps. In terms of their opinions regarding studying English online, participants were unanimous in their perception – they regarded it as positive, the main reason for that is time, followed by the possibility of having classes in different places. P6 said, “I love it [having online English classes]. I think it is effective and practical.” However, P5 pointed out, “If I were just starting learning English, I would miss having an in-person class with classmates.” It can be implied that online English classes may not be the best option for everybody or that different stages of the learning process may require different settings, e.g., in-person classes. This was the only caveat concerning online classes. The other participants mentioned only positive aspects. For instance, P1 believes online classes are “very good because you can study everywhere.” One important aspect to take into account here is that the research was conducted after the pandemic caused by Covid-19, in which work and study had to be adapted for the home environment. Therefore, participants could have had different perspectives had the research occurred before Coronavirus struck.

Figure 16. Resources used to study and practice English



Source: author

Still regarding technology, all participants informed using technology to study and practice the English language; however, only three out of seven affirmed using apps for this purpose. The applications mentioned by them were Duolingo and ABA English. They also reported having used apps at a certain point in their learning journey. Those who use apps for this purpose stated that they have specific pronunciation exercises. All participants believe that apps are helpful when learning

English. However, most disagreed when asked if they believed technology could replace teachers; only P4 agreed it would be possible. Thus, it can be inferred that, despite believing technology is helpful when learning an L2, most participants disbelieve that technological tools can replace the teacher's role.

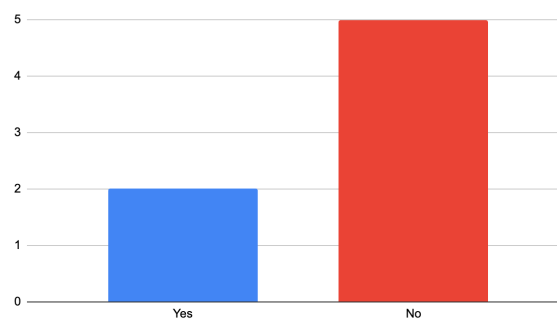
RQ2 (What is the role of pronunciation in oral communication according to Brazilian learners of English?) Concerned participants' perceptions of pronunciation. They all believe it is important, notwithstanding they revealed to be more concerned with being understood – intelligibility – rather than having a native-like accent. When answering the question, “Do you consider pronunciation an important factor? Explain” under the section about pronunciation, P3 answered, “Yes, because you need to be understood.” P4 said, “For sure. Although it is not the most important factor in communication, it helps a lot to keep a natural conversation. Besides, it avoids misunderstandings.” Furthermore, P7 replied: “Yes, because the wrong pronunciation can completely change a word and what should be said.” Their answers reveal that they know that pronunciation problems may lead to misunderstandings. Moreover, they believe that being fluent is more important for communication than having native-like pronunciation, which is also observable in the following answer from P6: “For sure. However, in my opinion, it comes after the student has a great speaking fluency”.

Still concerning pronunciation, the next question is regarding their perspectives on “good” pronunciation. Most participants agree that good pronunciation means effective communication – being intelligible, as well as demanding little effort from listeners (high comprehensibility level) as observed in the following answers. P7 revealed, “I consider ‘good’ pronunciation when people understand what is said naturally, without having to make a lot of effort to understand the words and context of what is said.” Also, P4 reported that good pronunciation is “Pronouncing the words in a way that they are easily understood.” Only P2 had a divergent opinion; this participant thinks that good pronunciation is “Close to a native pronunciation”, which indicates that, even though only one participant held this belief, there persists an idea that associates good pronunciation with a native-like accent. Regardless of different opinions, upon being asked if they would like to improve their pronunciation, they all agreed that the most important reason was the need to be more intelligible and facilitate oral communication. According to them, the <th> sequence (mentioned by three participants) is the most challenging pronunciation aspect, which could be produced as the /θ-ð/ phonemes, both nonexistent in Brazilian Portuguese. They also mentioned

having different consonant sounds in sequence, e.g., /s/ clusters, as in ‘street’, as a difficult aspect of English pronunciation.

When asked about their perspectives on accents, participants answered the question, “Do you consider having an accent a problem? Explain.” The majority (five participants) believes that having an accent does not represent a problem, as seen in Figure 17. For example, P6 stated, “In my case no, because using English at work, my intention is to be understandable, not necessarily have perfect English.” However, despite having answered no to the question, P2 stated, “It’s not a problem, but in my opinion, it’s important to try to reduce the accent.” On the other hand, two participants answered that they perceive accents as an issue. P7 declared, “Yes, because the accent makes it difficult for people to understand what I say.” According to this participant, the hindrance with having an accent is in terms of communication, which could lead to a less intelligible conversation, for instance. Overall, participants understand that accents may pose difficulties for comprehension; however, most of them do not regard it as negative.

Figure 17. Participants consider having an accent a problem



Source: author

The final section investigated whether participants were acquainted with the ELSA app and if they had used it before the present study. Only P7 revealed to know it and stated, “I have used it a few times, and I think it really works.”

Overall, according to what has been reported above, it can be stated that participants have a positive perspective on the possibility of having online English classes, see technology as an important resource to practice the language, believe that pronunciation is key for communication, and would like to improve it. Moreover, most of them regard fluency as more relevant than accuracy regarding pronunciation. The following subsection presents the results from the Final Questionnaire.

### 5.3 AFFORDANCES AND LIMITATIONS OF ELSA

The Final Questionnaire (Q2) (Appendix C) aimed at understanding participants' perspectives on the affordances of ELSA, and answered the RQ3: "What is the perception of adult learners when practicing pronunciation with the support of ELSA?"

Initially, participants were asked about their general opinions concerning the app; they all provided positive feedback for this question. For instance, P5 said, "I really liked it. ELSA Speak is great for practicing at any time of the day. It's interactive, and the exercises are very interesting. I also liked the layout of the app." P4 revealed a positive surprise: "Before using the app, I didn't think it would be so useful. Now I think it is very helpful."

The second question was, "How was your experience using ELSA?" there were only positive answers once again. P5 explained: "My experience was very good. The app really helped me with my pronunciation. I liked how it would tell me to 'try again' several times until I got the pronunciation right in every word", and P6 stated that it "was very good and helped me to find a better pronunciation of similar words." The second response is related to practicing the minimal pairs. Therefore, it is possible to affirm that participants had a positive experience with the application.

The following two questions sought to obtain participants' views on the positive and negative features of the application. First, some positive features mentioned by the participants were mainly practicing pronunciation and the possibility of practicing at different places and time. P2 observed that "there are many exercises to help us to pronounce correctly the words, like a native, and the exercises are very interesting too, with different subjects." As mentioned before, in the subsection 5.2, the same participant revealed to tend to try to reach a native-like pronunciation. Another interesting response to this question is that, according to P3, more advanced students would benefit more from the app.

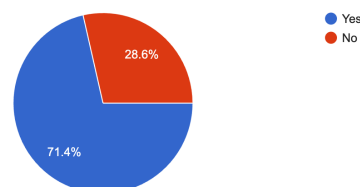
Concerning the negative aspects of the app, the need to pay was the preponderant response, reported by P1, P2, and P6. Another drawback includes inaccurate feedback, according to P4. However, P4 did not specify the answer, they simply stated: "Sometimes the feedback on the pronunciations is not precise." Furthermore, the same participant complained about the lack of contact with an instructor: "In my own experience, the drawback is not having a human teacher guiding me. Although the app is interactive, the experience is not comparable with having a

live class with a teacher”. This piece of information is interesting to reflect upon; even though ELSA is helpful to practice and improve pronunciation, according to this participant, the presence or instruction of a teacher is indispensable. This could indicate that ELSA could be used as an additional tool outside the classroom rather than a stand-alone tool for pronunciation training. P7 considered going through all phases and obtaining a high score challenging, which could be related to either the difficulty of the app in understanding accented pronunciation or the participant’s difficulty in producing the minimal pair /i-ɪ/ in English.

The next two questions investigate whether participants would continue using the application after the research or not and why. As Figure 18 displays, five out of seven revealed they would use it afterward due to the benefits ELSA provided. P2 stated: “I don’t know many apps like this, but probably ELSA is one of the best apps about pronunciation.” As discussed before, P2 showed interest in practicing this aspect of the language and focusing on having a more native-like accent. P2 explained the reasons to continue using the app: “Because I believe I improved my pronunciation using the app.” On the other hand, those who answered they would not continue the use of ELSA disclosed that this is due to the need to pay for the app (P6), and P3 said, “Not now because I already have other apps to study English and a private teacher who can help me to improve my pronunciation. But if you want to learn alone, it’s a good tool”. This is an interesting reason; just like P4 had previously stated, the role of a teacher is important for language practice and, more specifically, in this case, to work on pronunciation.

Figure 18. Participants’ willingness to continue using ELSA

Would you continue using the app to practice other aspects of your pronunciation?  
7 responses



Source: author

The next question investigated participants’ perspectives on the videos provided by ELSA. As remarked in subsection 3.2.3 ELSA, the videos are not produced by the application but instead selected and presented by it. Overall, participants had a positive

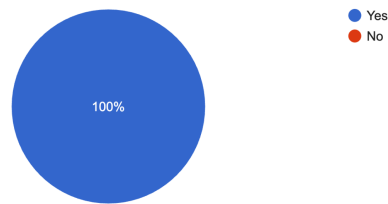
experience with the videos, stating that they helped them understand the position of articulators, for instance, the lips. According to P7, videos are better than pictures when visualizing and understanding the position and movements of the articulatory system to produce minimal pairs. However, P5 stated: “I thought it was hard to notice the difference between the movement of the mouth to articulate each sound, even with the videos. So, for me, they were more useful to learn the different sounds [ɪ-i/] than to learn the actual movement of the mouth.” This extract could show that videos may not be the best resource for all learners, indicating that additional resources could also be used.

The following questions concerned the effectiveness of using ELSA to improve their pronunciation on the minimal pair investigated. All participants were positive when answering the question, “Do you believe the app helped you understand how to pronounce the minimal pair /ɪ/ and /i/ present in words such as ‘sit’ and ‘seat’?”. P2 replied, “Sure, I used to have difficulties trying to pronounce this kind of word. And now it’s clear and easy”, which reveals that ELSA was effective in its goal – teaching the pronunciation of the /i-ɪ/ sounds, according to this participant’s perception. Although there were generally positive answers, two participants raised important comments. For instance, P1 said, “More or less, I need to practice more”, and P7 answered: “Yes, but I am not sure if I will change my mistakes because I have been using wrong sounds for a long time.” According to them, ELSA could be helpful if used for a more extended period. Furthermore, because they had been pronouncing the minimal pair possibly as the same sound for a long time, changing that would require more effort and time. Thus, using ELSA for a short time could not mean a relevant improvement in pronunciation. When asked about the feedback, they all agreed it was relevant. For instance, P6 said: “Yes, in general, the feedback was correct.”

Finally, as Figure 19 displays, all seven participants would recommend using the app as an extra-class tool for practicing pronunciation. When asked why, they revealed that ELSA is effective at practicing this aspect of the language, and it could be used in varied locations and times. P2 declared: “It helps us a lot. For me, the most difficult thing in learning English is how to pronounce the words correctly, so, in this case, ELSA is very useful.”



Figure 19. Participants would recommend ELSA



Source: author

In conclusion, participants had a favorable view of using ELSA to practice the minimal pair /i-ɪ/ and possibly other aspects of English. Through Q2, it was possible to answer the RQ3: What is the students' perception of learning pronunciation with the support of the ELSA app? They had a positive opinion concerning the app and provided valuable feedback regarding some points that could indicate improvement for the application. They would recommend using the app for pronunciation learning, especially for autonomous learning or extra practice. Additionally, overall, they believed that it does not replace the teachers' role, which is in accordance with Derwing and Munro (2015a). Furthermore, their perspectives are in agreement with other studies mentioned (Samad; Aminullah, 2019; Kholis, 2021; Anggraini, 2022).

## 6 CONCLUSIONS

This investigation was carried out remotely with a group of seven Brazilian learners of English and aimed at (i) investigating the perspectives of Brazilian learners regarding the role of pronunciation when learning English; (ii) verifying whether the ELSA Speak app can help these same learners with the production of minimal pairs containing the high front vowel (/i/) and the medium-high front vowel (/ɪ/); and (iii) observing the students' perceptions of the affordances and limitations of the ELSA app.

The Initial Questionnaire investigated participants' profiles and perceptions of English learning and technology. Participants believe that pronunciation is an important and challenging feature in communication. They see "good" pronunciation as intelligible communication and, in general, believe that having an accent is not a problem as long as communication is effective. Nonetheless, they were interested in improving their pronunciation. Moreover, participants use technology to study and practice English, and believe these tools are relevant for this purpose.

Participants recorded the Pretest prior to using ELSA and the Posttest afterward, which consisted of a group of six pairs of sentences with the high-front vowels /i-ɪ/. Their audio files were edited to improve quality with the software Audacity. Then, the voice typing tool on Google Docs was used to transcribe their utterances. Upon comparing their productions of the target words before and after the intervention with ELSA, it was possible to answer the RQ3: Can Brazilian learners of English improve their ability to produce the minimal pair /ɪ-i/ in English words after using ELSA to study those sounds? It could be stated that using ELSA to practice the AE high-front vowels /i-ɪ/ was effective. Five out of the seven participants improved their intelligibility of the sounds, whilst two had a worse result in the posttest. Also, proficiency was generally related to accuracy in the production of the minimal pair, which is in accordance with the studies mentioned (Flege; Bohn; Jang, 1997) except for P5, who had the highest proficiency score but the lowest gain score.

The Final Questionnaire was administered to answer the RQ3: What is the perception of adult learners when practicing pronunciation with the support of ELSA? All seven participants had a positive perception of ELSA, similar to what was reported in previous studies (Samad; Aminullah, 2019; Kholis, 2021; Anggraini, 2022). Among the affordances mentioned were the possibility of using it in different locations and times and the number of exercises to practice the sounds studied. On the other hand,

the participants mentioned occasional incorrect feedback and not having a teacher as a guide (Derwing; Munro, 2015b; Kholis, 2021) as drawbacks. This could reveal that ELSA should be used as an additional tool outside the classroom instead of a stand-alone tool for pronunciation training, which is in conformity with Pires (2022) findings. Nonetheless, five out of seven participants said they would continue using ELSA to practice pronunciation; however, the price would be an impediment.

In summary, participants regarded pronunciation as an essential feature, most of them had their production of the high-front vowels improved with the use of ELSA, and had a positive perception of the app. Next, some limitations of the study and possibilities for future research are presented.

The results of this research suggest that a longitudinal study with longer duration and continued pronunciation instructions may have a positive impact on pronunciation learning. As discussed in the section 5. Results and Discussion, some participants felt that using ELSA for a short period may not be as effective as using it over a longer period or in conjunction with teacher instruction, which is in line with Pires (2022). The participants also highlighted important issues such as using ELSA as an extra-class tool and the need for extended practice to improve the production of the vowel pair investigated in this study. Possible future research areas could include studying the effects of a longer ELSA usage period and investigating other pronunciation features, such as minimal pairs and intonation.

One of the challenges for the research was the equipment. As mentioned in the 'Methodology' section, the study was conducted online; hence, participants did not use proper resources, such as a high-quality microphone or acoustic hubs. This possibly impacted the research negatively. Despite using the software Audacity to amplify and normalize the audio recordings, the quality was not as good as it could have been had the research been conducted in person using a phonetics lab. For further studies, FONAPLI (Laboratório de Fonética Aplicada), the Applied Phonetics Laboratory at the Federal University, could be used to ensure higher-quality recordings, improving the sample quality. Another point that could be improved was the pair of sentences used in the Pretest and Posttest. Those sentences aimed to investigate how participants pronounced the minimal pair /i-ɪ/; however, they were presented in sequence, which could have influenced how they pronounced each word containing the minimal pair. For future studies, it is relevant to increase the number of target words and add distractors to hinder the identification patterns and obtain more reliable results.

Another aspect of the research that could be improved is how the sentences were evaluated. Instead of using ASR tools to transcribe the fool sentences, future studies could rely on human raters (native and nonnative speakers of English) with experience in phonetics to assess their pronunciation before and after the ELSA intervention. Alternatively, even a comparison between the transcriptions provided by ASR and human raters would be interesting.

Besides, it is important to note that this study has no delayed posttest, neither a control group. Observing if the gains would be present in participants' production in the long run would be interesting, and having data from a control group would also help to be more confident that pronunciation learning is being promoted by the pronunciation teaching intervention. For that, another study is necessary. Another possibility for further study would be analyzing the acoustic data collected in software like Praat (Boersma; Weenink, 2023); this way, observing the differences in production in T1 and T2 with visual resources would be possible.

The results of the study corroborate the integration of technology as a supplementary tool in online teaching settings. Based on the responses of the participants, it was suggested that ELSA would be more effective if it was accompanied by teacher instruction. This would allow the teachers to assist the students in identifying their individual challenges and selecting appropriate lessons to overcome their difficulties. Moreover, ELSA could be used in both group and individual lessons, where the combination of teacher instruction and technology could enhance the learning experience for students.

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## APPENDIX A — TERMO DE CONSENTIMENTO LIVRE E ESCLARECIDO

Prezado(a) participante,

Meu nome é Crystoffer Emílio Zanchet, estudante de Bacharelado em Letras Inglês da UFSC e faço pesquisa na área de Aprendizagem de Pronúncia em Inglês com Auxílio de Ferramentas Tecnológicas, sob a orientação da professora Rosane Silveira.

Convido você para ser participante na minha pesquisa: ***“Bitch or beach? Brazilian students’ views on ELSA as an extra-class tool for practicing pronunciation”***.

### **Por que realizo essa pesquisa?**

Algumas pesquisas mostram que o uso de tecnologia, como aplicativos, pode auxiliar na aprendizagem da pronúncia em inglês, o que pode ser um desafio para alguns estudantes brasileiros. O objetivo desta pesquisa é entender qual é a percepção de alunos de inglês em relação ao uso de um aplicativo (ELSA Speak) para este fim, além de avaliar se seu uso pode trazer benefícios para aprender a pronúncia de sons parecidos em inglês (/I/ e /i/) para os participantes.

### **O que vai acontecer?**

Toda a pesquisa ocorrerá online, então você poderá escolher qual o momento mais conveniente para contribuir com a pesquisa. Se você aceitar participar do estudo, será solicitado a (1) realizar um teste online de proficiência em inglês (Duolingo English Test) (15-20 minutos); (2) responder um questionário inicial contendo perguntas, como nome, idade, profissão, como aprende e pratica inglês (10-20 minutos); (3) gravar áudio lendo 12 frases (5-10 minutos); (4) usar o aplicativo ELSA Speak para praticar a pronúncia de vogais por alguns minutos por dia durante uma semana (120-150 minutos); (5) gravar novamente mais 12 frases (5-10 minutos) e, por fim, (6) responder o questionário final que busca investigar sua percepção em relação ao uso do aplicativo usado anteriormente (10-20 minutos). Ambos questionários serão disponibilizados pelo Google Forms. No total, todas as etapas da pesquisa devem levar entre 165 e 230 minutos. Quando e onde gravar os áudios fica a seu critério, contudo, para uma melhor avaliação, é importante gravar as frases em um ambiente silencioso e, se possível, com um microfone, a fim de evitar ruídos externos que possam comprometer a qualidade do áudio. Todas as etapas da pesquisa devem ser concluídas preferencialmente antes de 15 de junho de 2023.

Essas atividades foram autorizadas pela Instituição e pelo comitê de ética da UFSC, órgão responsável por garantir seus direitos como participante dessa pesquisa.

Todas as etapas supracitadas serão feitas de forma assíncrona, dessa forma, o estudo não terá impacto em suas aulas de inglês. Você sempre poderá entrar em contato com o pesquisador caso tenha qualquer dúvida ou problema durante qualquer etapa da pesquisa.



**Caso você decida não participar** da pesquisa, os dados obtidos **não serão utilizados** por mim **na pesquisa**, sem prejuízo algum para você.

### **Haverá algum risco na realização das atividades dessa pesquisa?**

Os riscos são mínimos, porém toda pesquisa envolve algum grau de risco, nesse caso, o que pode acontecer é que você fique ansioso(a) ou cansado ao realizar as etapas. Para deixar você mais à vontade, desenvolvi ambos os questionários de forma direta para que não tomem muito o seu tempo. Em relação ao teste de proficiência, o resultado não deve ser encarado de forma negativa, haja vista que não impactará em suas aulas de inglês. A leitura que você fará para esse estudo são parecidas com uma leitura em voz alta em sala de aula, por exemplo. Para ajudar a deixar você mais à vontade, as instruções serão dadas da forma mais clara possível. Além disso, pode haver cansaço ou aborrecimento ao realizar as gravações. Por esse motivo, farei o possível para que elas ocorram da forma mais breve possível.

### **Haverá algum benefício?**

Não há um benefício direto para os participantes. Dúvidas sobre desempenho individual poderão ser requisitadas por e-mail. Esta pesquisa contribuirá para a compreensão do impacto do uso de tecnologia para o aprendizado de pronúncia em inglês e entender como estudantes de inglês veem o uso do aplicativo para a prática da pronúncia. Ao participar deste estudo, você estará contribuindo para o desenvolvimento da ciência no Brasil.

### **A minha identidade será revelada?**

Não, os dados serão confidenciais, ou seja, nomes não aparecerão na pesquisa. Os participantes serão identificados por números, por exemplo: participante 1. Infelizmente, em toda pesquisa pode correr o risco de quebra de sigilo; entretanto, me comprometo a fazer tudo que está ao meu alcance para que isso não aconteça durante todas as fases da pesquisa. Como usarei meios eletrônicos para a coleta de dados, me comprometo a armazenar suas informações sob contas sigilosas, com uso de senhas de acesso fortes e que, uma vez concluída a coleta de dados, farei o download dos dados coletados para dispositivos eletrônicos locais, apagando todo e qualquer registro de qualquer plataforma virtual, ambiente compartilhado ou “nuvem”. Porém, reforço a importância de você salvar nossa troca de e-mails e contatos, por exemplo, ao longo de toda a coleta de dados para referência posterior e garantia de seus direitos como participante desta pesquisa.

### **Haverá acompanhamento de alguém?**

Sim. A pesquisa possibilita autonomia, dessa forma, você poderá realizar todas as etapas conforme a sua disposição. Entretanto, caso tenha dúvidas ou problemas com a pesquisa, poderemos entrar em chama de vídeo no Google Meet ou conversarmos por WhatsApp.

### **A participação nesta pesquisa é obrigatória?**

Não. A participação é totalmente voluntária. Esse documento é um convite. Caso haja a recusa na participação, em qualquer etapa do processo de coleta de dados, você não será prejudicado de maneira nenhuma.

**Haverá alguma despesa?**

Não. A pesquisa vai acontecer de forma assíncrona. Portanto, não há necessidade de deslocamento exclusivo para participação na pesquisa, nem de ausência no seu trabalho, por exemplo, uma vez que você poderá decidir quando realizar as etapas. Todos os aplicativos e/ou materiais utilizados para a coleta de dados serão gratuitos e/ou fornecidos a você pelo pesquisador.

**Haverá benefício financeiro?**

A resolução não permite compensação financeira pela sua participação, porém, os seguintes direitos lhe são assegurados: ressarcimento de quaisquer gastos oriundos da participação na pesquisa; e indenização por possíveis danos resultantes da participação na pesquisa.

**É possível desistir de participar ou cancelar essa autorização?**

Sim. É possível cancelar a participação a qualquer momento da pesquisa. Caso haja o cancelamento, não haverá prejuízo algum para você, participante. Você poderá entrar em contato comigo, Crystoffer Emílio Zanchet, pesquisador, a qualquer momento da pesquisa através do meu telefone (49) 98403-8414 e/ou, e-mail: [crystoffer.zanchet@gmail.com](mailto:crystoffer.zanchet@gmail.com), e no endereço R. Cap. Romualdo de Barros, 965 – Carvoeira, Florianópolis – SC, 88040-600, apto. 404, bloco D.

**Como faço o contato para esclarecer dúvidas?**

Eu responderei prontamente no telefone e e-mail acima.

O e-mail da orientadora desse projeto é [rosanesilveira@hotmail.com](mailto:rosanesilveira@hotmail.com), e seu endereço profissional é:

Universidade Federal de Santa Catarina – Centro de Comunicação e Expressão – CCE “B” – Sala 111 – Campus Universitário – Trindade – Florianópolis – SC – CEP 88.040-900

Caso você queira entrar em contato com o Comitê de Ética em Pesquisas com Seres Humanos da UFSC, o órgão que aprova esse tipo de pesquisa, use uma dessas formas de contato:

- Presencialmente no Prédio Reitoria II, 7º andar, sala 701, localizado na Rua Desembargador Vitor Lima, nº 222, Trindade, CEP 88.040-400
- Telefone para contato: (48) 3721-6094
- E-mail: [cep.propesq@contato.ufsc.br](mailto:cep.propesq@contato.ufsc.br)

Esta pesquisa cumpre os termos da resolução CNS 466/12 e 510/16 e complementares, além do Ofício Circular Nº 2/2021/CONEP/SECNS/MS que são os documentos que normatizam pesquisas como essa no Brasil.

A assinatura deste documento em formato de formulário virtual nos permite usar os dados coletados da(o) participante.

Muito obrigado!

#### DECLARAÇÃO DE CONSENTIMENTO PÓS-INFORMAÇÃO

Eu, \_\_\_\_\_, declaro que li as informações do presente Formulário de Consentimento Livre e Esclarecido, referente à pesquisa intitulada ***Bitch or beach? Brazilian students' views on ELSA as an extra-class tool for practicing pronunciation***, e concordo em participar da presente pesquisa por livre e espontânea vontade, bem como autorizo a divulgação e a publicação de toda informação por mim transmitida. Além disso, declaro que quando necessário, fiz perguntas e recebi esclarecimentos.

## APPENDIX B — INITIAL QUESTIONNAIRE

### PROFILE OF PARTICIPANTS

Name

Age

Nationality

Occupation

Place of residence

Have you lived or spent time in a country where the official language is English?

(Yes/No)

If so, where and how long?

### LEARNING ENGLISH

Why do you study English?

Do you need English for work? (Yes/No)

What is the most challenging aspect of learning/studying English?

How many hours per week do you study English with your teacher?

How many hours do you study English on your own?

What resources do you use to practice English?

What is your opinion on studying English online?

### PRONUNCIATION

Do you consider pronunciation an important factor? Explain.

Do you consider having an accent a problem? Explain.

What do you consider “good” pronunciation?

Would you like to improve your English pronunciation skills? (Yes/No)

If so, why?

Which aspects or sounds of pronunciation do you find most difficult to produce?

### TECHNOLOGY

Do you use technology for studying/practicing English?

If so, what resources do you use (e.g., movies, TV series, videos, apps)?

Do you use any app for studying/practicing English?

If so, which one?

Related to the previous question: Does the app you use offer pronunciation exercises?  
(Yes/No/Partially/Other)

Do you believe that apps can help with language learning? (Yes/No/Other)

Do you believe that technology can replace the teacher? (Yes/No/Other)

#### ELSA SPEAK APP

Have you heard of the ELSA Speak app? (Yes/No)

If so, what do you know about the ELSA app? Have you used it before?

**APPENDIX C — FINAL QUESTIONNAIRE**

Name

**ELSA SPEAK APP**

What did you think of the ELSA Speak app?

How was your experience using ELSA?

What are the benefits of the app?

What are the drawbacks of the app?

Would you continue using the app to practice other aspects of your pronunciation?

(Yes/No)

Why?

What did you think of the videos provided by the app demonstrating how to articulate the sounds?

Do you believe the app helped you understand how to pronounce the minimal pair /ɪ/ and /i/ present in words such as 'sit' and 'seat'?

Do you think the app was able to provide valuable feedback on your pronunciation?

Did you do all the task under Skill '/ɪ/ and /i/'? (Yes/No)

How long do you think you took to do all the steps using ELSA?

Would you recommend it as an extra-class tool for practicing pronunciation? (Yes/No)

Why?

You can use this space to share any additional information, if you'd like:

## APPENDIX D — PRETEST AND POSTTEST ASR TRANSCRIPTIONS

Participant 1		
Target Sentences	Pretest	Posttest
That was such a major <b>scene</b> , don't you think? That was such a major <b>sin</b> , don't you think?	That was circumenger measure <b>since</b> don't you think that was a circumcision don't you think	That was a second measure <b>sand</b> don't you think that was a commercial <b>thing</b> don't you think
Do you know many <b>beaches</b> there? Do you know many <b>bitches</b> there?	do you know how many <b>beats</b> there do you know how many <b>weeks</b> there	do you know how many <b>beats</b> there you know how many <b>beats</b> there
Can you see that <b>sheep</b> near the lighthouse? Can you see that <b>ship</b> near the lighthouse?	can you see that <b>s***</b> near the lighthouse can you see the <b>ship</b> near the lighthouse	can you see that <b>shipping</b> near the lighthouse can you see that <b>s***</b> in your garage house
I don't want that <b>sheet</b> ; you can keep it. I don't want that <b>shit</b> ; you can keep it.	I don't want you that <b>s***</b> you can keep it I don't want that <b>s***</b> you can keep it	I don't want that <b>s***</b> I can you can keep it I don't want that <b>s***</b> you can keep it
How do you spell ' <b>list</b> '? How do you spell ' <b>least</b> '?	how do you spell <b>listen</b> how do you spell <b>least</b>	how do you spell <b>list</b> how do you spell <b>list</b>
Where are the <b>beans</b> ? I couldn't find them. Where are the <b>bins</b> ? I couldn't find them.	where the <b>things</b> I can find them where's that <b>means</b> I can find it	when are the <b>things</b> I couldn't find them where the <b>beans</b> I couldn't find them

Participant 2		
Target Sentences	Pretest	Posttest
That was such a major <b>scene</b> , don't you think? That was such a major <b>sin</b> , don't you think?	That was such a major <b>scene</b> don't you think that was such a major <b>scene</b> don't you think	Which was such a major <b>scene</b> don't you think that was a major <b>sin</b> don't you think
Do you know many <b>beaches</b> there? Do you know many <b>bitches</b> there?	you know many <b>beaches</b> there do you know many <b>beaches</b> there	do you know many <b>beaches</b> there <b>beaches</b> there
Can you see that <b>sheep</b> near the lighthouse? Can you see that <b>ship</b> near the lighthouse?	can I see that <b>s***</b> near the lighthouse can you see that <b>s***</b> near the lighthouse	can you see that <b>s***</b> near the lighthouse can you see that <b>s***</b> near the lighthouse
I don't want that <b>sheet</b> ; you can keep it. I don't want that <b>shit</b> ; you can keep it.	I don't want that <b>s***</b> you can keep it I don't want that <b>s***</b> you can keep it	I don't want that <b>s***</b> you can keep it I don't want that <b>s***</b> you can keep it
How do you spell ' <b>list</b> '? How do you spell ' <b>least</b> '?	how do you spell <b>list</b> how do you spell <b>least</b>	how do you spell <b>list</b> how do you spell <b>least</b>
Where are the <b>beans</b> ? I couldn't find them. Where are the <b>bins</b> ? I couldn't find them.	what are the <b>means</b> I couldn't find them where are the <b>beans</b> I could find them	what are the <b>beans</b> I couldn't find them what are the <b>bins</b> I couldn't find them



<b>Participant 3</b>		
Target Sentences	Pretest	Posttest
That was such a major <b>scene</b> , don't you think? That was such a major <b>sin</b> , don't you think?	That was such a major <b>scene</b> don't you think that was such a major <b>thing</b> don't you think	That was such a major <b>scene</b> don't you think that was such a major <b>sin</b> don't you think
Do you know many <b>beaches</b> there? Do you know many <b>bitches</b> there?	do you know many <b>beaches</b> there do you know many <b>beaches</b> there	do you know many <b>b*****</b> there do you know many <b>pictures</b> there
Can you see that <b>sheep</b> near the lighthouse? Can you see that <b>ship</b> near the lighthouse?	can you see the <b>ship</b> near the lighthouse can you see that <b>chip</b> near the lighthouse	can you see the <b>ship</b> near the lighthouse can you see the <b>ship</b> near the lighthouse
I don't want that <b>sheet</b> ; you can keep it. I don't want that <b>shit</b> ; you can keep it.	I don't want that <b>s***</b> you can keep it I don't want that <b>s***</b> you can keep it	I don't want that <b>s***</b> you can keep it I don't want that <b>s***</b> you can keep it
How do you spell ' <b>list</b> '? How do you spell ' <b>least</b> '?	how do you spell <b>least</b> how do you spell <b>list</b>	how do you spell <b>list</b> how do you spell <b>least</b>
Where are the <b>beans</b> ? I couldn't find them. Where are the <b>bins</b> ? I couldn't find them.	where are the <b>things</b> I couldn't find them where are the <b>base</b> I couldn't find them	where are the <b>beans</b> I could find them where are the <b>bins</b> I couldn't find them

<b>Participant 4</b>		
Target Sentences	Pretest	Posttest
That was such a major <b>scene</b> , don't you think?	There was such a major <b>scene</b> don't think	That was such a major <b>scene</b> don't you think
That was such a major <b>sin</b> , don't you think?	there was such a <b>medicine</b> don't you think	there was such a major <b>sin</b> don't you think
Do you know many <b>beaches</b> there?	do you know many <b>beats</b> there	do you know many <b>beats</b> there
Do you know many <b>bitches</b> there?	do you know many <b>bits</b> there	do you know women <b>b****</b> there
Can you see that <b>sheep</b> near the lighthouse?	can you see that <b>ship</b> near the lighthouse	Can you see that <b>s****</b> near the lighthouse
Can you see that <b>ship</b> near the lighthouse?	can you see that <b>s****</b>	can you see that <b>s****</b> near the lighthouse
I don't want that <b>sheet</b> ; you can keep it.	I don't want that <b>s****</b> you can keep it	I don't want that <b>s****</b> you can keep it
I don't want that <b>shit</b> ; you can keep it.	I don't want that <b>s****</b> you can keep it	I don't want that <b>s****</b> you can kick it
How do you spell ' <b>list</b> '?	how do you spell <b>list</b>	How do you spell <b>list</b>
How do you spell ' <b>least</b> '?	how do you spell <b>list</b>	how do you spell <b>list</b>
Where are the <b>beans</b> ? I couldn't find them.	where are the <b>things</b> I couldn't find them	where are the <b>things</b> I couldn't find them
Where are the <b>bins</b> ? I couldn't find them.	Where are the <b>best</b> I could not fight them	Where are the <b>fence</b> I couldn't find them

<b>Participant 5</b>		
Target Sentences	Pretest	Posttest
That was such a major <b>scene</b> , don't you think? That was such a major <b>sin</b> , don't you think?	That was such a major <b>scene</b> don't you think that was such a major <b>sin</b> don't you think	That was such a major <b>scene</b> don't you think that was such a major <b>sin</b> don't you think
Do you know many <b>beaches</b> there? Do you know many <b>bitches</b> there?	do you know many <b>beaches</b> there <b>beaches</b> there	do you know many <b>b*****</b> there there
Can you see that <b>sheep</b> near the lighthouse? Can you see that <b>ship</b> near the lighthouse?	can you see that <b>ship</b> near the lighthouse can you see that <b>ship</b> near the lighthouse	can you see that <b>ship</b> near the lighthouse can you see that <b>ship</b> near the lighthouse
I don't want that <b>sheet</b> ; you can keep it. I don't want that <b>shit</b> ; you can keep it.	I don't want that <b>s***</b> you can keep it I don't want that <b>s***</b> you can keep it	I don't want that <b>s***</b> you can keep it I don't want that <b>s***</b> you can keep it
How do you spell ' <b>list</b> '? How do you spell ' <b>least</b> '?	how do you spell <b>list</b> how do you spell <b>least</b>	How do you spell <b>list</b> how do you spell <b>least</b>
Where are the <b>beans</b> ? I couldn't find them. Where are the <b>bins</b> ? I couldn't find them.	where are the <b>beans</b> I couldn't find them where are the <b>bins</b> I couldn't find them	where are the <b>bins</b> I couldn't find them where are the <b>bands</b> I couldn't find them

Participant 6		
Target Sentences	Pretest	Posttest
That was such a major <b>scene</b> , don't you think? That was such a major <b>sin</b> , don't you think?	That was such a major <b>scene</b> don't you think that was such a major <b>scene</b> don't you think	That was such a major <b>scene</b> don't you think that was such a major <b>scene</b> don't you think
Do you know many <b>beaches</b> there? Do you know many <b>bitches</b> there?	do you know many <b>beaches</b> there do you know many <b>pictures</b> there	do how many <b>beaches</b> there don't know any <b>pictures</b> there
Can you see that <b>sheep</b> near the lighthouse? Can you see that <b>ship</b> near the lighthouse?	can you see that s*** near their lighthouse Can you see that <b>ship</b> near the lighthouse	can you see that s*** near the lighthouse Can you see that <b>ship</b> near the lighthouse
I don't want that <b>sheet</b> ; you can keep it. I don't want that <b>shit</b> ; you can keep it.	don't want that s*** you can keep it I don't want that s*** you can keep it	I don't want that s*** you can keep it I don't want that s*** you can keep it
How do you spell ' <b>list</b> '? How do you spell ' <b>least</b> '?	how do you spell <b>list</b> how to spell <b>list</b>	how do you spell <b>list</b> how do you spell <b>list</b>
Where are the <b>beans</b> ? I couldn't find them. Where are the <b>bins</b> ? I couldn't find them.	where are the <b>beings</b> I couldn't find them where are the <b>things</b> I couldn't find them	where are the <b>beans</b> I couldn't find them Where are the <b>beans</b> I couldn't find them

<b>Participant 7</b>		
Target Sentences	Pretest	Posttest
That was such a major <b>scene</b> , don't you think? That was such a major <b>sin</b> , don't you think?	Such a major <b>thing</b> on to think that was such a major <b>scene</b> going to think	Bench was such a major <b>scene</b> don't you think That was such a major <b>scene</b> don't you think
Do you know many <b>beaches</b> there? Do you know many <b>bitches</b> there?	do you know many <b>bits</b> there do you know means <b>speech</b> that	do you know many <b>beats</b> there do you know many <b>misses</b> there
Can you see that <b>sheep</b> near the lighthouse? Can you see that <b>ship</b> near the lighthouse?	can you see that <b>s***</b> near the lighthouse can you see the <b>ship</b> near the lighthouse	can you see that <b>s***</b> near the lighthouse can you see that <b>chick</b> near the lighthouse
I don't want that <b>sheet</b> ; you can keep it. I don't want that <b>shit</b> ; you can keep it.	I don't want that <b>s***</b> you can keep it I don't want that <b>s***</b> you can keep it	I don't want <b>s***</b> you can keep it I don't want that <b>s***</b> you can keep it
How do you spell ' <b>list</b> '? How do you spell ' <b>least</b> '?	how do you spell <b>list</b> how do you spell <b>please</b>	how do you spell <b>list</b> how do you spell <b>list</b>
Where are the <b>beans</b> ? I couldn't find them. Where are the <b>bins</b> ? I couldn't find them.	where are the <b>things</b> I couldn't find them where are the <b>beans</b> I couldn't find them	where are the <b>beans</b> I couldn't find them where are the <b>things</b> I couldn't find them