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THE ROLE OF L1 ENGLISH SPEAKERS' FAMILIARITY WITH BRAZILIAN-ACCENTED ENGLISH (L2) IN THE INTELLIGIBILITY OF BRAZILIAN LEARNERS OF ENGLISH (L2): A DISCUSSION ON INTELLIGIBILITY FROM A COMPLEX DYNAMIC SYSTEMS PERSPECTIVE

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Abstract

The aim of this study is to investigate the effect of familiarity with Brazilian-accented English (L2) in the intelligibility of speech samples when judged by native English listeners. Speech samples were collected from five native Brazilian Portuguese individuals from Southern Brazil, with a pre-intermediate level of proficiency in English. Following a Complex Dynamic Systems account (De Bot *et al.*, 2007), this is a longitudinal study in which a group of four British listeners participated in weekly intelligibility transcription tasks, administered over the course of five weeks. This group was comprised of individuals who had recently arrived in Brazil. Results suggest that familiarity with a speaker's L1 and accented-L2 has an effect on the intelligibility of what is heard. From the perspective of Complex Dynamic Systems, we argue that there is an alteration of a listener's perception of his/her own language system due to exposure to it as an L2.

Key-words: intelligibility; familiarity; Complex Dynamic Systems.

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Introduction

An accent is "a particular pattern of pronunciation that is perceived to distinguish members of different speech communities" (Derwing & Munro, 2015, p. 5). The general belief underlying popular second language teaching approaches such as the Audio-lingual[1] method was that the closer to a native speaker a learner could speak, the better s/he would be understood. Over the last two decades, though, teaching foci have shifted from nativeness to intelligibility, that is, to being understood *per se* (Munro & Derwing, 2015; Levis, 2018).

In order for one to take intelligibility as a teaching goal, it is important to identify the factors that constitute such a construct. Some of the aspects that play a role in intelligibility have already been identified, and a listener's familiarity with a speaker's accent is one of them (Kenworthy, 1987). Smith and Bisazza (1982) pose that it is "active exposure" to a given accent that will define familiarity with it (apud Cruz & Pereira, 2006). However, neither accent nor familiarity is fixed in time. From a Complex Dynamic Systems point of view (Beckner *et al.*, 2009; De Bot *et al.*, 2007, 2013; De Bot, 2017; Lowie & Verspoor, 2015; Alves, 2018), speech production and perception are in constant movement, shifting their status depending on unpredictable attractor states.[2] That is to say that an array of social-cognitive experiences, both linguistic and otherwise, may promote changes in a person's production and perception over time.

Thus, the present study set out to investigate the extent to which a listener's familiarity with a speaker's (accented) second language (L2) – increased by longer active exposure – impacts speech perception and, in consequence, intelligibility test scores. This paper reports the longitudinal results of intelligibility tests taken by four British nationals when presented with English sentences produced by native speakers of Brazilian Portuguese (BP). We recorded elicited free speech samples from five Brazilian learners of English-L2 and selected 35 sentences – one target and 34 distractors. These sentences were used as stimuli to be transcribed in the intelligibility tests taken by the British listeners, who had been living in Brazil for an average of 30 days (range: 28-35 days; standard deviation[3]: 3.11 days). The listeners had little self-reported familiarity with Brazilian English other than their immersion period in Brazil. Intelligibility tests were administered weekly for a total of five weeks whereas a language history questionnaire was applied to the listeners prior to the first session and a qualitative interview was conducted after the last session.

Our motivation came from the understanding that it is important to take time – particularly development over time – into consideration when conducting intelligibility studies. Considering the dynamic framework, this study set out to investigate intelligibility longitudinally, which would allow us to evaluate change in different points of time (Larsen-Freeman, 2015; De Bot *et al.*, 2007; De Bot *et al.*, 2013). Particularly, our study aimed to analyze the effect of listener's familiarity with accented Brazilian English speech on intelligibility in a longitudinal fashion. The main goal was to test if increased familiarity, based on longer length of

residence in Brazil, would increase intelligibility scores. Our initial expectation was that the longer the British listeners stayed in the country and became more familiar with both Brazilian English and Brazilian Portuguese, the higher their intelligibility scores would be. From a dynamic perspective, this expectation is justified by the fact that experience with a given set of characteristics in the speech stream – both in a dialectical and in a foreign-accent sense – may lead to changes in the way speech sounds are perceived.

Additionally, from our theoretical perspective, we expected a dynamic change, in which scores would shift in a non-linear fashion. A longitudinal experiment design would allow us to observe such change in different points of time, perhaps even identifying movements that do not always head in the same direction as the average or as that of a single data collection. Also, because averages can be misleading under a complex view (Lowie & Verspoor, 2015, 2019), we set out to analyze individual results, in order to understand possible idiosyncrasies that the group data might not show. Individual experiences, in a complex view, might lead to changes in the language system that will be particular, rather than be reflected in group averages.

Our goals also included an attempt to pinpoint which aspects of language use might have had an effect on familiarity. Data from a language background questionnaire and from a qualitative interview aided this goal, as we pondered the interactive roles played by subsystems of a listener language system. Additionally, deviation patterns and examples were analyzed to try to identify which non-standard productions might have played a role. The samples underwent these analyses partially by the researchers, and partially by the listeners themselves, as will be detailed in the Method section.

Our experiment design was first inspired by Cruz and Pereira (2006), who conducted intelligibility tests with stimuli provided by BP speakers producing speech in English as an additional language[4] (Brazilian English). In their study, listeners were divided into two groups: one comprised BP native speakers at a high English proficiency level, and another was made up of native speakers of English. Cruz and Pereira (2006) conducted a single session of tests for each group and reported that native BP listeners had higher intelligibility rates than native English listeners. They also found that a higher familiarity with Brazilian English was positively correlated with higher intelligibility rates. It was further reported that familiarity with specific deviations in pronunciation in the stimuli enhanced intelligibility.

In line with a dynamic view of language, we understand that, by taking development over time as a factor in intelligibility research, it would be possible to deepen our understanding of the phenomenon. This is why this study opted for a longitudinal design, in order to try and observe different stages through which a language system may go during its development. By embracing a dynamic approach, we tried to bring to light change-over-time elements when looking at familiarity and its relation to intelligibility. We expected that, at each session, listeners' language systems would present a distinct stage of reorganization, likely

showcasing the effects of the language (and social) experience while living in Brazil. Those results would, thus, detail and reinforce the phenomenon reported by Cruz and Pereira (2006).

Since BP speakers had already been found by Cruz and Pereira (2006) to rank higher in intelligibility tests than English natives – because of the formers' greater familiarity with Brazilian English –, the present study was designed to focus on how intelligible Brazilian English sounds to English native speakers, and whether it might become more intelligible when listeners increase their familiarity with it. It is our understanding that experimental data on the role of familiarity in intelligibility is highly relevant to help guide pronunciation instruction of additional languages. When nativeness was the focus, instruction would simply aim at a given native standard. From an intelligibility point of view, however, variability and accented speech are taken as regular phenomena, both for native and for non-native speakers (cf. Levis, 2018). Successful communication does not require a native standard. Therefore, within an intelligibility framework, the goal of teaching is instructing a learner toward intelligible speech.

In its turn, the field of phonological research may benefit from data on intelligibility, not only to better define this construct from an epistemological perspective, but also to acquire deeper insight into what is involved in language and communication. The concept of intelligibility, as will be further discussed, is relatively new and has been gaining importance as new perspectives of language development arise. With that in mind, we consider that a discussion on intelligibility grounded on the dynamics of language may contribute to the field of Applied Linguistics in general.

Method

This experiment was conducted in three stages: (a) recording of free speech from Brazilian learners of English; (b) testing stimuli intelligibility with native Bristish English speakers; and (c) data analysis. Two groups of participants were involved: Group 1 – Brazilian speakers, and Group 2 – British listeners. As will be detailed further in the sections that follow, the Brazilian group's free speech was elicited via a theme sheet and audio recorded. Researchers then segmented such speech into stand-alone sentences, analyzing and categorizing the main deviations in single word production. Some distractor sentences were also selected. A total of 36 stimuli, composed of sentences of deviant nature, were selected to be used in the intelligibility tests. The first of five sessions conducted with group 2, of British listeners, used 10 of such sentences. Data from session one on intelligibility and comprehensibility[5] were then used to choose the target-sentence of the following tests (sample number 11, "Ok, I chose the culture subject", produced as [oʊkei aj tʃoʊs (.) ʌ (.) di ˈkjutʃʊˑ (.) subiˈʒɛktə]). Two sentences were presented to listeners in all five sessions, with the initial intention of having two targets. In the last stage of the investigation, however, one of the two sentences presented (sample number 8, "She want to live on the both worlds" *(sic)*, produced as [ʃi wantə livonə

boot words]) showed a memory effect and was thus taken off the final results analysis. This led us to analyze one target sentence only (sentence number 11, "Ok, I chose the culture subject"). We now detail participants groups, materials and methodologies used in each stage of the experiment.

Participants

Group 1 – Brazilian speakers was comprised of five participants, two males and three females, native speakers of Brazilian Portuguese who were born in the south of Brazil. They were all undergraduate students of the Modern Languages (Letras) program at UFRGS and were enrolled in the Inglês II (English II) course, which should equate to a pre-intermediate (A2) level of proficiency in English. The group of potential participants was determined to guarantee more or less non-interrupted speech. Their proficiency in English had been fully developed in Brazil, with no self-reported immersion experiences. All participants were volunteers and did not receive any rewards for their role in this study. Upon arrival at the research site, participants were asked to fill in a questionnaire about their background in language learning (Scholl & Finger, 2013). All data were kept for posterior use.

Group 2 – British listeners was comprised of four female undergraduate students, native of England. On the day of the first session, before the task, the English-L1 participants were asked to fill in a form with personal information, such as sex, date and place of birth, and language background information. The form was created by the researchers and includes adapted questions and guidelines proposed in Scholl & Finger (2013). They were all 21 years old. All participants were speakers of other languages apart from English (Spanish and/or French, and Portuguese) at various self-reported proficiency levels (see Individual Analysis under Result for detailed information). Only one of the participants (#2) had never been to Brazil before. Participant #4 reported never having been exposed to Brazilian Portuguese for long stretches of time. Other participants reported having watched Brazilian TV shows, listened to music in Brazilian Portuguese and had BP speaking friends at University. Self-reported proficiency in BP averaged 5.75 (on a scale of 1 to 10, 1 being very low proficiency and 10 very high proficiency), with a SD of 1.0. One of the participants (#3) reported having had formal instruction in BP from a Brazilian professor before coming to Brazil. Self-reported difficulty in communicating to Brazilians in English at the time the questionnaire was filled in, prior to the first session, averaged 4.25 (on a scale of 1 to 10, 1 being very easy and 10 very hard; SD = 1.5). They were part of an exchange program in Brazil and were enrolled in a private university. They all resided, while in Brazil, in international student housing, having contact with speakers of multiple languages while there.

Materials and speech samples

Group 1 – Brazilian speakers was requested to choose two out of four themes extracted from Cruz and Pereira (2006) on which they should speak freely for up to five minutes. Themes were provided in written form in Brazilian Portuguese in order to lessen the influence of the researchers' own pronunciation on participants' speech, and also to ensure their understanding of the task. The four themes, as presented by Cruz and Pereira (2006), were: "(1) Describe a day (a situation) in your life you will never forget; (2) Describe a film/book you liked/didn't like; (3) Culture in Brazil: are there differences among the regions?; and (4) Describe a person you like/don't like.".[6] Participants sat alone in an isolated sound booth and their speech was recorded in a Sony IC Recorder ICD-P620 device. Recordings averaged 5 minutes and 25 seconds in length (SD: 3 minutes 33 seconds).

The researchers listened to all recordings looking for deviations from standard English pronunciation and selected extracts that: (1) characterized typical deviations in Brazilian English, (2) had the highest potential to affect intelligibility (cf. Gonçalves & Silveira, 2014; Schwarzhaupt, 2015) and (3) could be cut into stand-alone sentences, since the samples were extracted from free speech. A second selection included some samples (totaling 8) without remarkable deviations, both to include an equal number of samples from different speakers and to avoid listeners to infer the goal of the study (distractors). At the end of this process, 35[7] sentences had been selected, with an average of 11 words (SD: 4.4 words) and 6.2 seconds per sentence (SD: 2.9 seconds). The deviations appeared in different positions within the sentences; 1 was in the first word, 9 were in the last word, and the remaining 31 deviations were in other positions. The target sentence (sample number 11, "Ok, I chose the culture subject") had deviations in the two final words ('culture', produced as ['kjutʃʊr], and 'subject', produced as [subi'ʒɛktə]).

The most frequent deviations from standard pronunciation identified in the 35 singled out samples were placed in four groups: (a) inadequate consonant production; (b) inadequate vowel production; (c) misplaced stress; (d) vowel insertion. Groups and examples are shown in Chart 1, which includes examples that had a mean comprehensibility[8] rating below 5 (out of 9 in a Likert scale) in at least one session by the listeners.

Chart 1: four most frequent deviations found in speech samples, separated into groups, followed by examples. Pronunciation said to be standard was retrieved from the Online Cambridge Dictionary and is presented for reference purposes only, not as a prescription.

Group	# of instances	Examples		
		sample #	production	standard
A		5	[dɪs]	[ðɪs]
		8	[boʊt]	[boʊθ]
		11	['kjutʃʊr]	[ˈkʌlˑtʃər]

		17 20 31 33	[‘wɛter] [ʃoʊz] [faɪ’lɔzofɪ] [eg’sɪbɪʃãns]	[ˈweð·ər] [tʃoʊz] [fɪˈlɑ·sə·fi] [ˌek·sɪˈbɪʃ·ən]
B	**14**	**11** 11 15 20 31	**[‘kjutʃəʳ]** [sʊbɪ’ʒɛktə] [a’sent] [‘tɔpəkəʰ] [faɪ’lɔzofɪ]	**[ˈkʌl·tʃər]** [ˈsʌb·dʒəkt] [ˈæk·sent] [ˈtɑ·pɪk] [fɪˈlɑ·sə·fi]
C	7	5 11 15 33	[adole’sent] [sʊbɪ’ʒɛktə] [a’sent] [eg’sɪbɪʃãns]	[ˌæd·əlˈes·ənt] [ˈsʌb·dʒəkt] [ˈæk·sent] [ˌek·sɪˈbɪʃ·ən]
D	6	5 11 20	[‘naɪnɪtis] [sʊbɪ’ʒɛktə] [‘tɔpəkəʰ]	[ˈnɑɪn·ʈiz] [ˈsʌb·dʒəkt] [ˈtɑ·pɪk]

The experiment – which was conducted using the AEPI[9] software (Bondaruk, Albuquerque & Alves, 2018) – was crafted from these 35 samples (the ones with deviations and the distractors). For each of the five sessions, ten extracts were presented to the British English-L1 listeners.[10] The extracts were the same for all participants in each session, but presented in a randomized order to each listener. Some non-target samples were presented in more than one session[11] in order to complete 10 stimuli per session. One extract (target) was originally meant[12] to be present in all experiment sessions with the purpose of allowing us to compare intelligibility as it changed along the five weeks. All other samples were considered distractors in order to reduce possible memory effects on the results.

As we considered familiarity to play a relevant role in intelligibility, we questioned if the researchers' own familiarity with Brazilian English[13] might possibly skew the selection of samples. That factor seemed especially relevant when selecting a target sentence. On that account, the first session of this experiment was exploratory and had no determined target sentence. The data provided by the English speakers in the first sessions were used to single out the most deviant sample – the one with the lowest rates of accurate transcription and rated as the most difficult to understand in the comprehensibility task –, which then became our target in subsequent sessions.

Another factor taken into consideration in choosing a target sample was working memory effects, which is known as a limited capacity our brain has so as to hold information temporarily to perform other cognitive tasks (Ricker *et al,* 2010; Miyake & Shah, 1999). Longer samples would have made it difficult to determine if any problems in intelligibility detected in the task were a consequence of actual intelligibility issues or of simple working memory overload. The target sample chosen was number 11, in which the speaker intended to say "Ok, I chose the culture subject" to express her choice of topic. Her production was [oʊ’kei aj tʃoʊs (.) ʌ (.) di ‘kjutʃʊʳ (.) subi’ʒɛktə]. The

difficulty in understanding this production of the word 'culture' was expected, as previously shown by Cruz and Pereira (2006).

The final distribution of samples throughout sessions is available in Table 1. Only two samples were kept throughout the experiment and only one was considered target – sample 11 – which can be seen in all 4 groups in Chart 1. The final distribution of samples throughout sessions – target and distractors – is available in Table 1. The order in which the samples were presented to participants was automatically randomized by the software, and all stimuli were presented in a different order to each listener.

Table 1: distribution of samples throughout the sessions. As previously stated, two extra samples were unintentionally presented to participants in session 2. The target sample (11) is marked with an asterisk (*).

Samples in each session				
Session 1	**Session 2**	**Session 3**	**Session 4**	**Session 5**
5	2	1	3	4
6	8	7	8	6
8	11*	8	11*	8
10	13	9	12	11*
11*	15	11*	16	14
18	17	14	17	17
20	19	17	21	18
22	22	25	24	23
28	23	30	29	27
32	27	35	34	33
	31			
	33			

Intelligibility Data Collection

Five weekly intelligibility testing sessions were conducted with each listener in Group 2 over the course of a little more than a month (38 days), in addition to a qualitative open-ended interview (which was also audio-recorded) right after the fifth session.

Sessions were held weekly about seven days apart from each other, over the course of five weeks. For each session, participants were presented to the software on a laptop computer and used a C3Tech RAPTOR MI-2870 sound isolating headset. Instructions regarding software use, transcription and Likert scale were orally provided in English by the researchers. A familiarization half-session was performed to ensure participant comprehension of the task prior to the first session. Regarding the Likert scale, participants were given the following instructions: "mark, on a scale of 1 to 9, 1 being 'very difficult' and 9 being 'very easy', how difficult it was for you to understand the sentence you heard".[14] Each participant was allowed to listen to each sample only once before moving on to

the next one. Participants were also instructed to listen to the whole sentence before beginning to type its transcription.

In the AEPI software, the sessions started with the first speech sample being played. Participants had to type on the corresponding text box what they heard and select the comprehensibility result in the scale below the text box. After that, listeners had to click a button that read "Pronto" (Done), to signal they were done with that sample. To play the next sentence they clicked the button "Próximo" (Next), and the process began again. After the last sample, when English-L1 participants clicked "Pronto", they were taken to a screen thanking them for their participation and signaling the end of the collection on that occasion.

After the fifth session, listeners were interviewed individually and were allowed to express their perceptions on both the study and their linguistic experience in Brazil. All interviews were recorded using the same devices used for collection of speech samples with Group 1 speaker participants. In the next session, we describe the intelligibility data collected with listeners and go over how they were organized, in addition to group and individual analyses of results.

Results and Analysis

In agreement with a dynamic view on linguistic development, we chose to present our data both in terms of group results and in terms of individual results (Lowie & Verspoor, 2019). Group results highlight some of the phenomena already reported by Cruz and Pereira (2006), whereas individual results pinpoint some stages that our participants went through over time, before arriving at a more or less similar type of system reorganization.

Intelligibility rates were determined through correct word identification count and later transformed into percentages (the target sample consisted of six words in total, so six correctly transcribed words mean a 100% intelligibility rate). The transcriptions of the target sample "Ok, I chose the culture subject" (produced as [oʊkei aj tʃoʊs (.) ʌ (.) di 'kjutʃʊ^{r} (.) subi'ʒɛktə]) made by each participant in each session are also provided in the charts pertaining individual analysis.

In addition, language experience data are described in an attempt to offer some insight into individual performance. Therefore, those factors were given special attention to in the analysis of individual results, considering that they might have an effect on familiarity. All participants began contact with Portuguese as young adults, so immersion time (represented by the number of days since arrival in Brazil) and language use (provided in self-reported percentages) are especially important. As already mentioned, these data were self-reported in a language background questionnaire filled out prior to the first session of intelligibility tasks.

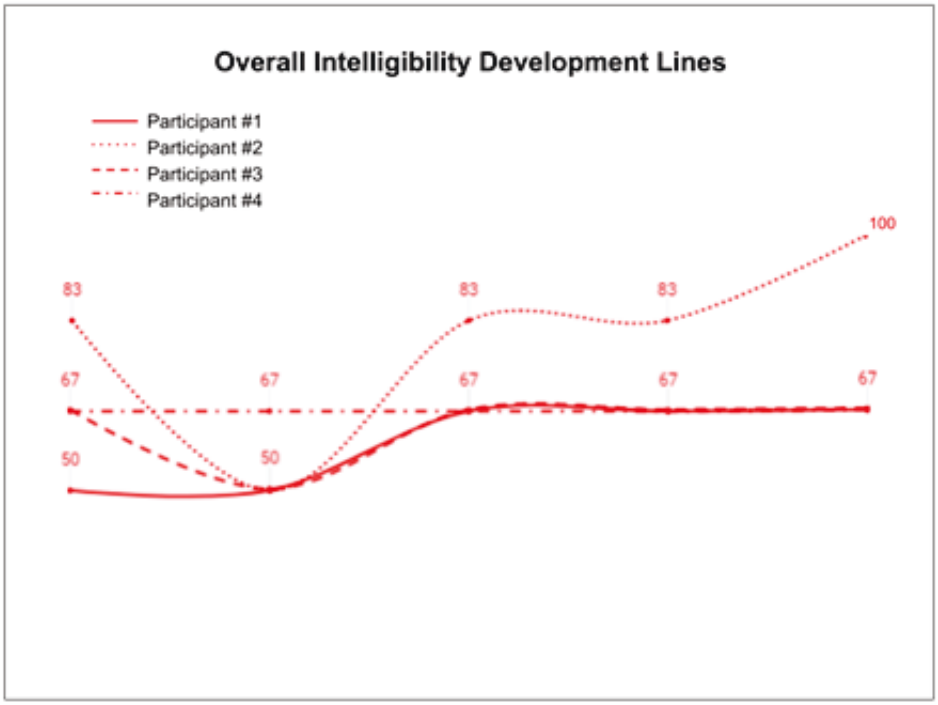
Group Results

Overall group results show higher intelligibility rates when comparing the first session and the last one, with the exception of participant[15] #4. The first set

of data showed an average of 67% of words accurately transcribed from the target sample (average of 4 words out of the total 6), whereas the last set presented a 75% accuracy (av. 4.25 words). If this study assumed a traditional linear methodology, with those results representing pre- and post-test scores, our study would seem to offer practically the same rates.

What a longitudinal experiment allows for, though, is the clear observation of fluctuations in the development of the language. As pointed out in the introduction, in a complex system the effect will not be proportional to a given cause, nor, indeed, will be the effect of any one single cause. The results, as can be seen in Figure 1, show that despite having higher rates at the time of the fifth session, most participants actually had lower scores at some point or another of the longitudinal study. They also showed plateaux, that is, points in which the systems seem to be stabilizing around a new attractor state.

Figure 1: Participants' intelligibility rates of target sample over time, juxtaposed.



All listeners reported interacting in English for about 55% of their time, even though they were living in Brazil. After 65 days in the country, by the last session, they reported no change in that pattern. As they were able to communicate in English with Brazilian learners, participants were in constant contact with particular patterns of Brazilian English. Thus, the amount of input (familiarity) with a particular set of characteristics that differed from those they were used to probably prompted a change in their L1 perception. Distinct acoustic samples had to be related to representations that were somewhat stable previous to their arrival in Brazil. This, as the results show, led to the emergence of a reorganized L1 perception, in order to accommodate acoustic-articulatory cues that were not part of their inventory before.

Listeners became familiar with the phonetic-phonological productions most commonly present in Brazilian English. Because the samples were random and presented over 30 deviations from Standard British English (SBE), we assume that language experience in the immersion context allowed for perceptual reconfigurations over time, rendering different samples, at different sessions, more intelligible than before.[16]

Target sample deviations

Firstly, it is important to remember that the target sample ("I chose the culture subject") did not have syntactic deviations. That allows us to assume that any evidence of intelligibility (or lack thereof) was indeed an effect of deviation in pronunciation. We will focus on three major aspects found: deviation in syllable structure (epenthesis), vowel production deviation, and word stress deviation.

As also verified in Cruz and Pereira (2006), the production [ˈkjutʃʊr] was mostly unintelligible for all listeners. Their results showed intelligibility in a single instance of time, whereas our study evidenced, further, that the same phenomenon endured through time. Though over the course of the five weeks general group intelligibility rates were higher, for the target "Ok, I chose the culture subject" this did not prove to be the case. Across the 20 instances of transcriptions, only four had the word "culture". It is important to highlight, furthermore, that they were all present in the tasks of listener #2 – who did reach full correction in transcribing the sample in session 5.

Moreover, with the exception of those four instances, all others[17] heard [ˈkjutʃʊr] as "character". In SBE, the word "character" would be transcribed [ˈkʰærəktə˞]. One possible explanation for the uniform perception of the three listeners may be a top-down interpretation, in which the weight of the stressed syllable, coupled with the rhotic coda, may have led participants to "fill in the syllable slot" that they could not make out. Another possible explanation could be that participants heard "character" the first time around and assumed it to be the right form, reproducing it throughout the sessions; however, in the interview data, the only sample mentioned by listeners was #8 – that is, listeners did not report remembering the target sample.

Another factor that might have hindered intelligibility in this instance may be more closely related to familiarity *per se*. As posed by Zimmer *et al* (2009), Brazilian English tends to either epenthesize or delete segments that do not fit into the BP syllable structure. If the listeners did familiarize themselves with the latter process, it is possible that they could have understood [ˈkjutʃʊr] as a Brazilian pronunciation for [ˈkʰærəktə˞] with the [rək] being deleted.

It is a limitation of this study that such detailed recollections were not voluntarily mentioned nor elicited by the researchers in the qualitative interview. In order to avoid turning participants' attention to the particular target, the experiment was designed to have the in-depth interview taking place only after the last session. We would suggest that further studies be conducted with more

than one target sample and with qualitative rounds taking place after each data collection session. That was not possible in the present study due to the limited number of standard and deviated samples available to make up for the necessary number of distractors.

The second deviation presented by the target sample was the production of "subject" as [subi'ʒɛktə]. The epenthetic schwa at the end of the word may be assumed to be the reason why most transcriptions (10 out of 15 that did attempt a transcription) perceived the word as "subjective". Again, one could hypothesize that familiarity led listeners to interpret the segment [v] as being deleted by Brazilian learners. Additionally, both deviations from "culture" and "subject" might have been collectively taken as corroborative of this impression – combining their presence in the target sample with possible other instances of linguistic experience that compose the listeners' familiarity with Brazilian English.

Out of the five different transcriptions, it is also worth mentioning that two of them, belonging to participant #2, were correctly perceived. In line with dynamic principles, these correct transcriptions appeared in the first session and in the last session. This result, as will be further discussed in the individual analyses, showcases how a system's state is not fixed in time, and development can seem to be swinging back and forth when one looks at task scores (Lowie & Verspoor, 2019; Larsen-Freeman, 2015; De Bot *et al.*, 2007).

Two other transcriptions, both by participant #1, read "subredacted" in both sessions 4 and 5. Previous to that, no attempt at transcribing the word had been made. A possible explanation may come from the articulation of [ʒ], which might have deviated from SBE. However, this cannot be confirmed because the present study did not include an acoustic analysis of samples. This analysis will be a future stage of this research project and will be reported in another study.

The last instance that deviated from the main perception transcribed the sample as "subjected" by participant #4. This transcription again showcases the dynamic dimension of language development, since all four other transcriptions by this participant read "subjective", as was the group average. This could be an effect of familiarity with the process of epenthesis discussed earlier. One can attempt to describe this unique instance, then, as evidence of an ongoing change in the system, which might have led to a higher score in future sessions, had the study been continued.

Lastly, we will briefly address how word stress might have also had an effect in the intelligibility scores of the target sample. As shown by the 10 transcriptions of 'subjective' and the one of 'subjected', listeners seem to rely more on word stress as a cue, rather than on context – at least in cases in which context is minimal, as in our "Okay, I chose the culture subject" sample. Both 'subjective' and 'subjected' are stressed in the word-mid syllable, unlike the target 'subject', which is stressed in the first syllable. Moreover, the transcriptions show the perception of an additional morpheme at the end (-ive and -ed), which could be evidence of the perception of an extra sound. One can hypothesize, though prosody was

not the focus of the present work, that the listeners' experience with SBE led them to a top-down reasoning, in which factors such as (1) the recurrent word-stress change upon the addition of these morphemes, (2) their perception of both word-mid stress in the sample, and (3) an extra schwa after the plosive at word-final position seem to have shifted the transcription from the target to a "more suitable" match.

Individual analysis

In a complex dynamic perspective, we understand that the whole is not the sum of its parts. Language development, thus, is not a linear process, but a result of the interaction of multiple linguistic and social factors that render each individual trajectory a unique case. Though for research purposes descriptive and inferential analyses can still point to some general tendencies, within larger time frames, individual analyses allow the researcher to observe processes that might yield data which are otherwise hidden in group statistics (Lowie & Verspoor, 2019; Larsen-Freeman, 2015; De Bot *et al.*, 2007).

As previously stated, our study set out to look at the data collected from both group and individual result perspectives. We aimed to be able to detect some idiosyncrasies that might highlight developmental aspects of our participants' trajectories. We did indeed notice some individual processes that did not appear in average group results, which we will now detail.

Participant #1

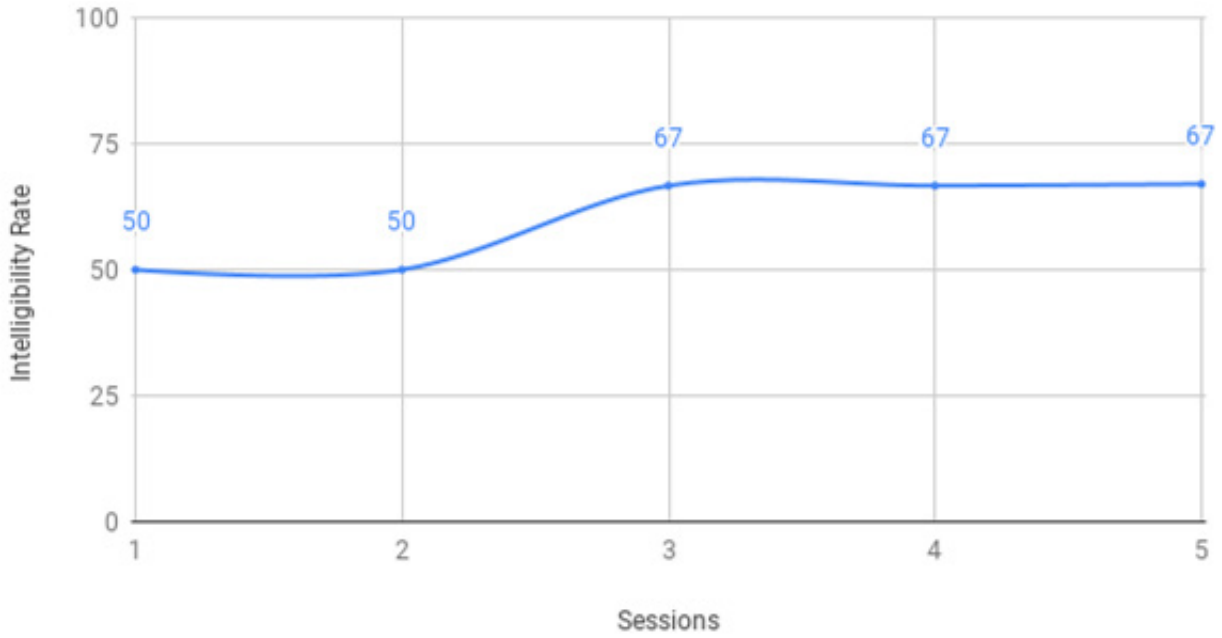
Participant 1 is a 21-year-old female undergraduate student from the North of England. She reports speaking French, Spanish and Portuguese[18], apart from English, having the highest proficiency in Spanish. She had never visited Brazil before and at the time of our first session she reported using Portuguese to communicate in Brazil in about 10%-20% of her day. She rated her difficulty in comprehending Brazilians speaking English as medium (6 on a scale of 1-10). In Chart 2, it is possible to see her transcriptions of the target sample.

Chart 2: Transcription of target sample by participant #1.

Participant #1	
Session 1	I chose the character
Session 2	I chose the character
Session 3	ok I chose the character
Session 4	ok I chose the character subredacted
Session 5	ok I chose the character subredacted?

As seen in Figure 2, participant #1 started out at a 50% intelligibility rate, plateauing until the last session, when she had been in Brazil for almost 60 days. The level of difficulty in understanding the stimulus, however, did not present any dramatic changes.

Figure 2: Participants #1's intelligibility values of target sample over time.



At the time of her final interview, she pointed out that the hardest part of the task was not exactly understanding the samples, but remembering them long enough to be able to write them down. She said it was easier when the samples were "relatively short". She reported that understanding the context of the samples – which she figured out on her own – made it easier to understand the words. At the end of the experiment, she reported that knowing more Portuguese had made it easier for her to understand Brazilians speaking English, not only during the task, but in her everyday life too.

Participant #2

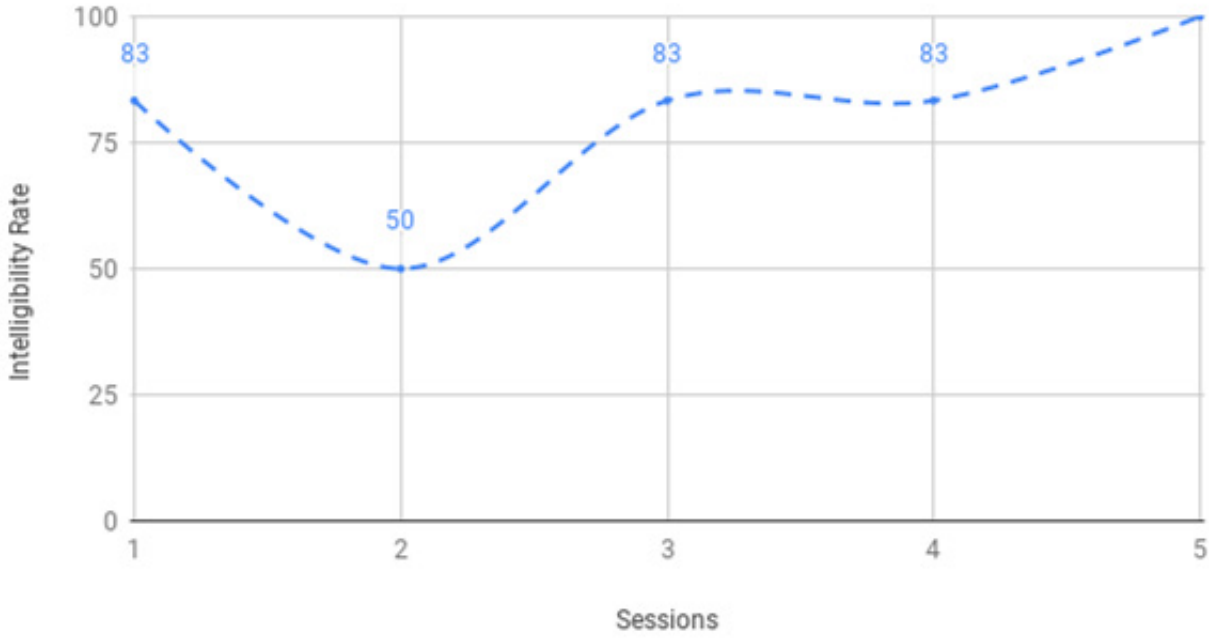
Participant 2 is a 21-year-old female undergraduate student from the North of England. She reports having visited Brazil before moving to the country. She also reports speaking English, Spanish and Portuguese – the latter being the one in which she has the lowest proficiency, having had no formal instruction in the language. Her only extended contact with BP had been through TV shows and music prior to coming to Brazil on an exchange program. At the start of the study, she rated her difficulty in comprehending BP speakers' English as low (3 on a scale of 1-10). She also reported using Portuguese in 10%-20% of her daily communications at the beginning of the study.

Chart 3: Transcription of target sample by participant #2.

Participant #2	
Session 1	okay i chose the future subject
Session 2	okay I chose the culture subjective
Session 3	okay I chose the culture subjective
Session 4	OKay I chose the culture subjective
Session 5	okay I chose the culture subject

If the results obtained in the first session were compared with the ones obtained in the last session alone, it could be assumed that intelligibility had risen and declined in a linear fashion. In this set of results shown in Figure 3, however, it is possible to observe a non-linear line of intelligibility rate, peaking at 100% in the final session. In congruence with a dynamic view of language development, which states that language development is a non-linear process (Larsen-Freeman, 2015; Beckner *et al.*, 2009; De Bot, Lowie & Verspoor, 2007; De Bot *et al.*, 2013), this participant's results in particular show a drop (50%) in the intelligibility rate of the second session, with a lower score then on the first (83%), before rising back to the starting point (83% on session three), plateauing (83% on session four) and, finally, peaking in the final session at 100%.

Figure 3: Participants #2's intelligibility values for target sample over time.



Participant #2 said that when people pause in the middle of their speech, it is harder to understand what they say. She also mentioned context as one of the most important factors that helped her understanding of the samples and BP rhythm as a factor that especially hindered her understanding of Brazilians' English. According to her comments, Brazilians "use the same rhythm when speaking English as they do when speaking Portuguese", which "goes up and down a lot," as opposed to English, which is more "monotone, flat". She said that she believes that in her everyday life the difficulty to understand Brazilians' English had remained the same, because she had been speaking to the same people.

Participant #3

Participant 3 is a 21-year-old female undergraduate student from the North of England who had never been to Brazil before, but had received formal instruction of Portuguese from a Brazilian professor at University. She reported

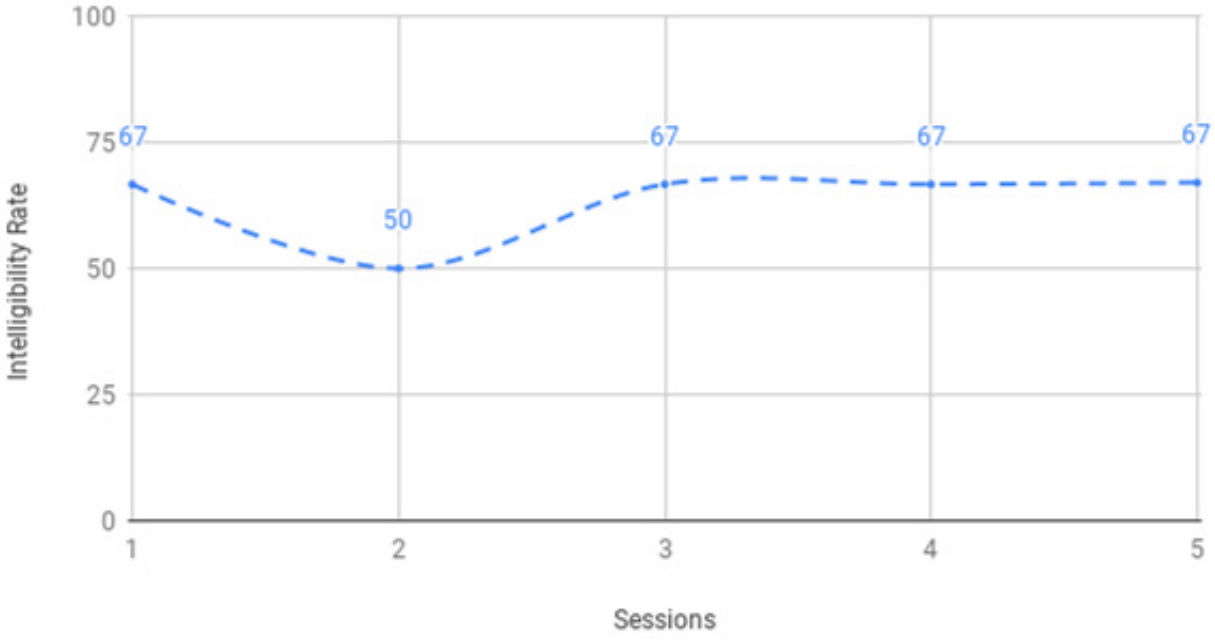
her proficiency in BP as 7 and that she spent 10%-20% of her day using the language at that point.

Chart 4: Transcription of target sample by participant #3.

Participant #3	
Session 1	Okay I chose the character...
Session 2	Okay I chose er[19]
Session 3	okay i chose erm the character subjective
Session 4	okay I chose erm the character subjective
Session 5	okay I chose erm the character subjective

Participant #3's intelligibility results show a drop in the second session, and a plateau stage between the third and fifth. Therefore, we wonder if more sessions would have shown a greater rate of intelligibility, as seen in participant #2.

Figure 4: Participants #3's intelligibility rates of target sample over time.



In her interview in the final session, participant #3 also pointed out that context helped her understanding of the samples as the weeks went by and that she had been making an effort to speak more Portuguese in her everyday life.

Participant #4

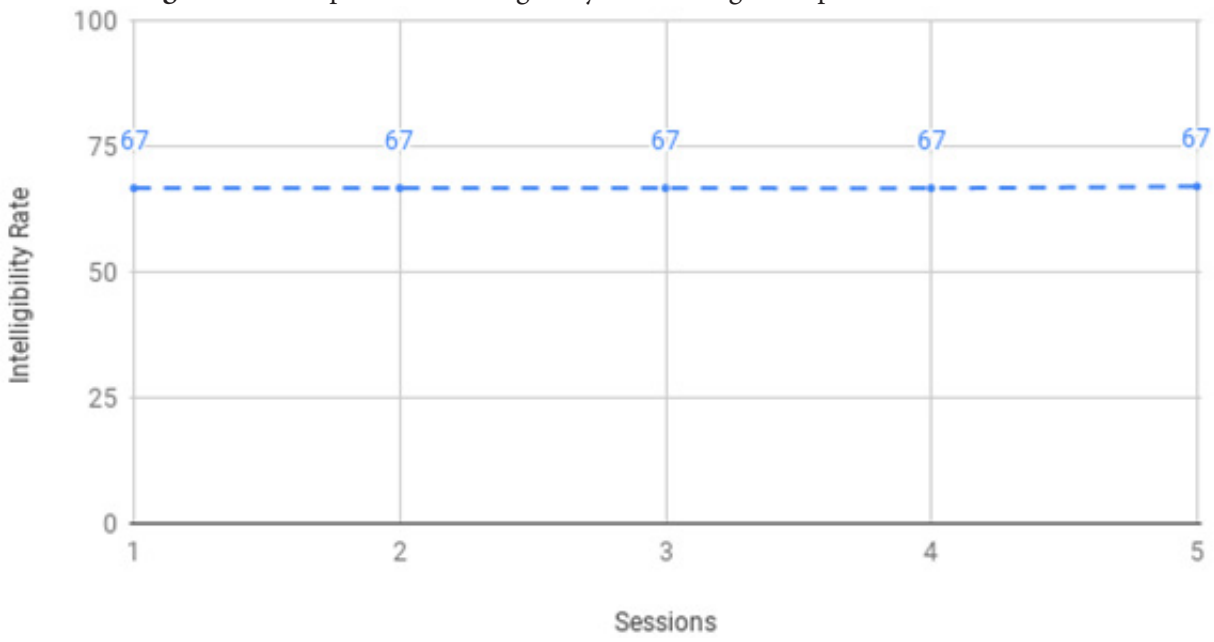
Participant 4 is a 21-year-old female undergraduate student from the North of England. She is familiar with Romance languages, as other participants are, and reports proficiency in French, Spanish and Portuguese. She rated her proficiency in BP as medium (5, on a scale of 1-10). At the beginning of this study, her difficulty in understanding Brazilian English was also rated at 5. She reported spending about 50%-60% of her day using Portuguese at the beginning of the study.

Chart 5: Transcription of target sample by participant #4.

Participant #4	
Session 1	Ok I chose the character subjective
Session 2	ok I chose the character subjective
Session 3	Ok I chose the character subjective
Session 4	Ok I chose the character subjected
Session 5	Ok I chose the character subjective

This participant shows little difference in the intelligibility rates of the target sample over the course of the study. Though the line shows no change, we do observe that in session 4 one of the transcriptions was different from other instances, which may be an indication that the system was going through some change – despite the fact that the transcription still did not match the target after the last session.

Figure 5: Participants #4's intelligibility rates of target sample over time.



During the interview in the final session, this participant revealed her sincere efforts to speak Portuguese as much as possible in the hope of better developing it as an additional language. As for the other participants, she pointed out context as a major factor in understanding the samples, mentioning that increased familiarity with speakers' voices and accents also helped. She reported that her growing familiarity with Brazilian Portuguese had made it easier for her to understand the accent of Brazilians when speaking English with them.

Final Considerations

Our data do support the original expectation that the listeners' growing familiarity with Brazilian English would have an effect on their intelligibility

scores. The rise by about 8% in group scores seems to point to a reorganization of a perceptual system, in which the listeners learned to link Brazilian-accented productions that deviated from Standard British English to their mental referents. This apparent reshaping of borders that place speech sounds in contrastive spaces – allowing for word recognition along the speech stream – can be a result of the developmental process in which deviated productions are taken as possible, rather than wrong or unintelligible. A dynamic perspective also allows us to assume that experience threw the system out of balance, with the presence of recurrent, deviated productions, thus suggesting that the system has evolved to a new state after a period of time.

The longitudinal character of our study also aimed to analyze language development in different stages. Indeed, it showed us that this change was not linear: though group scores in the last session show higher intelligibility rates, sessions 2, 3 and 4 show that there were falls and plateaux during the process. From a dynamic point of view, non-linearity is expected and is evidence that the interaction among the parts of the system is constantly affecting and being affected by one another. The plateaux, for instance, can be further studied in order to explain (and help teachers understand) some learning stages that an L2 learner goes through. They can also, upon further research, demonstrate that individual differences in language experience may have a lesser/greater impact on the developmental process. The fall on scores can, in its own turn, be looked at as evidence of the system being out of balance, or shifting from one stable state to the next.

The complex framework also inclined us to look at both group and individual results. The expectation with individual analyses was to find data that would reflect each person's process that might have been hidden in the descriptive group data. From group data, we did, as previously mentioned, find evidence that a higher familiarity had the effect of higher intelligibility scores. However, individual analyses show that this was not true, for instance, for one of the participants, since listener #4 recorded the same score in all five sessions. This participant, on the other hand, had two different transcriptions of the deviated stimuli from the target sentence, which might indicate that there was a developmental process taking place and that perhaps further data collections would be able to show. Individual analyses also allowed us to notice that participant #1, the only one that had a 100% score, was also the one with the larger score range. In a pretest/posttest design, for instance, her development would have seemed linear (and smaller). Participant #3, in turn, had the same score in the first and final sessions, which would have been interpreted as a no-change scenario in other experiment designs. By presenting longitudinal data, we are able to see that, regardless of not transcribing the target correctly, the listener managed to transcribe a larger number of words, which may be an indication of system reorganization. All individual data can be used by teachers, for example, to customize trainings and lessons towards specific processes or contexts of a given student. They can also be used with data from future research to identify processes that, though happening within a different time frame, can be expected for individual learners in particular cases.

Our data are, thus, suggestive of the non-linear shift that intelligibility goes through when there are changes in the familiarity a listener has with the speaker's accented L2 (and even L1, as is the case in the present study). We point out that some of the limitations of this study are the small number of participants (both speakers and listeners) and the reduced number of data collection sessions. As has been experienced by many researchers in Brazil, it is difficult to attain a number of volunteers that provides statistically significant results, and especially when looking for participants of such a specific profile (native English speakers having recently arrived in Brazil), it becomes even harder. However, the descriptive results yielded by the experiment suggest that there is indeed some connection between familiarity and intelligibility – our starting assumption.

We also highlight that we only had a small number of sentences, and an uneven number of standard *vs.* deviated samples due to the sampling method used, based on Cruz and Pereira (2006), which extracted samples from larger free speech and thus showed the benefit of allowing for more natural communication contexts. On the other hand, it reduces control over aspects that are methodologically relevant – time length, number of words, target-word position –, which in turn must entail that a large chunk of material is left out since it is not fit for the study design. Our results, thus, can be further enhanced by studies that use other types of speech samples to test for effects on intelligibility (or other elements of the listeners' language system).

Additionally, a memory effect is also taken as a limitation of our study. In spite of our best efforts to minimize the possibility of having listeners remembering a sentence from the previous week and using a memorized transcription – instead of trying to understand it as a new stimulus –, sample number 8 (which also had initially been meant to work as a target sentence) stood out to the listeners. As was already reported, in the interview after the final session, the listeners pointed out remembering this one sample. Therefore, as already mentioned, sample number 8 was rejected as a target. This memory effect is also likely due to a small number of sentences in the whole experiment. It is possible that participants memorized a response to the sample and repeated it in each session. That is always a problem with longitudinal studies that have sessions so close to each other – though spacing them out would, perhaps, result in less detailed data, considering how fast some changes may occur.

Moreover, memory is a limitation when it comes to the qualitative interview. In order to avoid drawing our listeners' attention to our target sample, we only interviewed participants after the last session. This might mean that some impressions about the stimuli were no longer in their memory and thus were not mentioned. For future research, it might be useful to conduct interviews after each data collection session. We also believe that having more than one target sentence might allow for an interview that gathers information without skewing scores due to unwanted highlights of a given stimulus.

Lastly, we point out that familiarity is not only composed of a phonetic-phonological aspect, as a dynamic view will place all elements of a system in touch

with all other components. Beyond individual experiences of "active exposure", other linguistic and social factors may play a role during this process, so future studies may experiment on how other variables will interact to make up familiarity.

The results presented here reinforce the effect of familiarity in intelligibility. In an immersion context, listeners were able to perceive deviant samples as the intended messages of the speakers. Both group and individual results showed dynamic development, instead of a linear trajectory. This evidence came from the longitudinal character of the study, which allowed for fine-grained detailed information that linear approaches do not. We hope that this study may motivate future research on the development of intelligibility in longer periods of time.

Notes

1. For more information on the 'audiolingual method' and other language teaching methodologies, see Larsen-Freeman; Anderson (2011).
2. An attractor state is the one in which the system has the tendency to settle, when reorganizing after being destabilized (cf. De Bot *et al.*, 2007; Lowie & Verspoor, 2015).
3. We will abbreviate 'standard deviation' to SD.
4. This paper will use 'Additional', 'Second' and 'Foreign Language' notations interchangeably, though the authors are aware that such denominations may have different meanings in other research approaches.
5. Derwing and Munro (2015) define comprehensibility as "[t]he ease of difficulty a listener experiences in understanding an utterance" (p.5). Comprehensibility data collected in this experiment are still under review and will be reported in a future study.
6. Prompts were provided in Brazilian Portuguese as follows: "(1) Descreva um dia (uma situação) na sua vida que você nunca vai esquecer; (2) Descreva um filme/livro de que você gostou/não gostou; (3) Cultura no Brasil: há diferenças entre as regiões?; (4) Descreva uma pessoa de quem você gosta/não gosta."
7. Sample 26 (cf. Appendix) was not present in any session because of a human error.
8. Comprehensibility is represented by a value provided by each participant at the time of listening. They were requested to mark on a 1-9 Likert scale how hard it was to understand the sample, 1 being the hardest and 9 being the easiest; those values translate as 1 being low comprehensibility and 9 being high comprehensibility. The analysis of these comprehensibility data is still under review and will be reported in a future study.
9. AEPI – Aplicativo para Estudos em Percepção e Inteligibilidade, open source software for intelligibility tasks that allows researchers to collect transcription, Likert scale and response time data. Available for downloading at: http://aepi.e-pi.co/.
10. In session 2, two extra samples were unintentionally presented to the listeners, in a total of 12 samples.
11. Samples 6, 14, 23, 27 and 33 in the Appendix were presented in two of the five sessions. Sample 17 was presented in four of the five sessions. Only samples 8 and 11 (target) were present in all five of the five sessions.
12. As a matter of fact, as already mentioned, there was a second sentence (sample number 8, "She want to live on the both worlds" *(sic)*) which also had been meant

to be a target. Therefore, sample number 8 in the Appendix was also presented in all the sessions because it had a very low intelligibility rate in session 1 and was originally intended to be a target sample. However, it was not analyzed as a target sample because it was pointed out by Group 2 participants (listeners) as a sample that stood out from the group, probably suffering from a greater memory effect (which could, in turn, skew the intelligibility scores) than sample 11. Therefore, though it was rated for intelligibility and comprehensibility in all five sessions by all four participants, sample number 8 was not analyzed further for the Results section of this paper.

13. All researchers in this study are Brazilian Portuguese native speakers born in the South of Brazil. They have had formal and informal instruction in English, immersion experiences in English speaking communities, phonological training and L2 teaching experience.

14. Assignment of 1 to 'very difficult' and 9 to 'very easy' is the default in the AEPI software, and is meant to facilitate later translation of values into comprehensibility levels. We understand assigning 1 as the most difficult might be confusing to participants. Munro and Derwing (2006) use a scale from 1 as very easy to 9 as very hard to understand. Comprehensibility will not be addressed in this paper, but data were collected for future studies.

15. All participants referred to in this section are listeners, except when expressly mentioned otherwise.

16. We highlight that though perception is not the only aspect of intelligibility; it is one of the elements that compose it.

17. One of the results did not contain an attempt to transcribe this item.

18. In her written report, Participant 1 did not specify what variety of Portuguese (European, Brazilian, or other) she spoke.

19. Hesitations were not taken into account, neither in accounting for the number of words in the target sample, nor in the transcriptions.

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APPENDIX I

List Of Stimuli Used In The Intelligibility Tasks

1. We were like super laughing nervously.
2. I'm never gonna forget that day, it was so much fun.
3. I'm gonna talk about a movie that I watched in 2016.
4. I could really relate to what the movie was bringing.
5. The TV show doesn't have all this adolescent vibe of the ninet... nineties.
6. Is like a metaphor of the catholic church.
7. Her birthday is coming.
8. She want to live on the both worlds.
9. He's just a human, I mean, a witch, a wizard that is on Sabrina's house and he cannot leave.
10. Maybe is related bec... with the fact that our state have a different weather from the re... from the rest of Brazil.
11. Ok, I chose the culture subject.
12. And a lot of sun, and, you know, this why we're famous by, our beaches and things like that.
13. In the winter is really cold, and the summer is kind of warm.
14. They say that we not so friendly like them.
15. And *core or accent and/or slangs, things like that.
16. they just have this stereotypes of people from the South.
17. To me is all related to the weather.
18. The characters are lovely and charming.
19. She does inspire a lot of people and this include me.
20. I, I chose the topic called the book I, I gonna talk about.
21. I don't remember exactly wha... which career he, he studied in college, but I, I think is something to do with laws.
22. He didn't want to live one day like exactly the other.
23. Objective in this journey was go to Alaska.
24. He just took control of his life.
25. He many... many times he find other people who had this same point of view he had.
26. I was inspired by this book.
27. Was a couple, a couple of hippies, and they were fighting.
28. Tell them to fight for continuing this, this, this relationship.
29. He go to some, some government authority and he ask.
30. Many other vary important characters of Brazilian culture, and specially Brazilian literary, literary culture.
31. He knows anatomy, philosophy, literature, geography, every... every... everything.
32. Takes off their organs and draws them.

33. He shows them in exhibitions around town and around the country.
34. There are very good reasons for him to be doing that.
35. I think there are many differences, mainly, mainly between North and South.