Task Effects in /t/ and /d/ Palatalization in Várzea Alegre Portuguese

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1. Introduction

The purpose of this study is to investigate the effects of task, in addition to other extralinguistic variables affecting the realization of /t/ and /d/, in the educated spoken Portuguese of Várzea Alegre, Ceará. Most varieties of Brazilian Portuguese exhibit a process whereby the categories /t/ and /d/ are realized in speech as [ʧ] and [ʤ], respectively, when they occur before [i]:

Orthography	Palatalizing Variety	Non-Palatalizing Variety
diferente	[ʤ]iferen[ʧ]e	[d]iferen[t]e

Although it is impossible to know precisely when the palato-alveolar variants began to emerge in Brazilian Portuguese, Noll (2008: 235) reports the existence of these variants by the beginning of the 19[th] century. The palato-alveolar variants are associated with certain urban centers of Brazil (Noll 2008: 66). The urban centers of the Brazilian Northeast exhibit variation with respect to /t/ and /d/. According to Abaurre & Pagotto (2002), while the overall rates of palato-alveolar use in the largest economic centers of the South and Southeast of the country were 73%, 100%, and 40% (São Paulo, Rio de Janeiro, and Porto Alegre, respectively), the rates in the urban centers of the Northeast of Brazil vary much more radically with Recife at the low end of palatalization (7%) and Salvador at the high end (85%). Noll (2008) reports a large expanse of the Northeast as exhibiting the dental variant, while Fortaleza, the capital of Ceará, in addition to Salvador, has a very high rate of palatalization (see Figure 1). Although Stravrou (1947) reported that at the time teachers still enforced the elimination of affrication in their students (cited in Noll 2008: 236), at present the *de facto* standard pronunciation has become the palato-alveolar variant and is used by the major television networks in the country and is also used in the education system, owing to the association of this variant with the major economic centers of the Southeast.

The city of Várzea Alegre, a municipality of approximately 40,000 inhabitants in the southern part of Ceará finds itself with competing urban models of pronunciation. While Várzea Alegre is in Ceará, a state whose capital city exhibits the palato-alveolar variant, the municipality along with the whole of the Cariri region of southern Ceará which it borders has always been identified as having the unpalatalized variant like neighboring Paraíba and Pernambuco with which it shares some cultural elements[1] (Seraine 1972). The recently released *Atlas lingüístico do estado do Ceará* does not address Várzea Alegre, but does present relatively current data from three municipalities close to Várzea Alegre (Bessa 2010). In Cedro, Caririaçu, and Farias Brito, there is evidence of variation in the production of /t/ and /d/, although the dental variant seems to predominate in all three cities. Moreover,

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1 It is worth noting that many residents of Várzea Alegre will identify the municipality as belonging to the Cariri region, even though it technically only borders the region. This, anecdotally, would seem to support a vision of Várzea Alegre having significant cultural ties with the Cariri region.

the two of these cities closest to Juazeiro do Norte (and farthest from Fortaleza) have the highest rate of the dental variant.

Due to these competing norms it is believed that the production of /t/ and /d/ on the part of the residents of Várzea Alegre should exhibit stylistic variation. Specifically, more controlled tasks where greater attention is paid to pronunciation will be shown to exhibit greater rates of palato-alveolar variant use due to greater pressure to conform to the *de facto* national linguistic standards. Additionally, it will be shown that younger speakers use this variant more often than older speakers, indicating a possible change in progress. Women will be shown to do so more than men, consistent with many studies of this variable in other regions of Brazil. Finally, prior residence in another area will be shown to have an effect on speakers' production of /t/ and /d/.

Figure 1. Distribution of variants of /t/ and /d/ in Brazil. The state of Ceará is shaded. (Adapted from Noll 2008: 68)
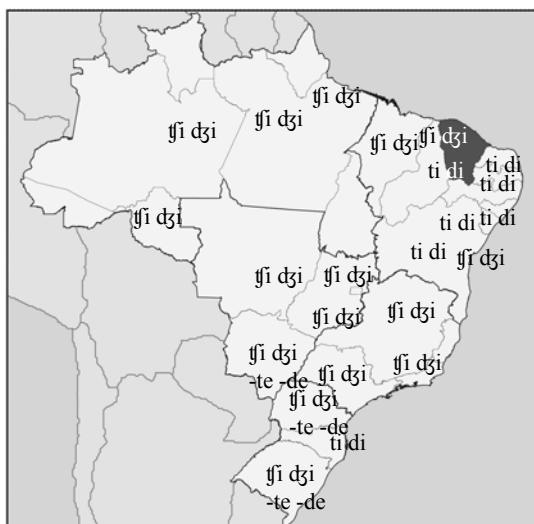
2. Previous studies of /t/ and /d/ in Brazilian Portuguese

As the production of /t/ and /d/ is among the most salient variables that distinguishes one variety of Brazilian Portuguese from another, the phenomenon has been the object of study by numerous investigators. Bisol (1991) studied the variable in four varieties of Brazilian Portuguese from the southern state of Rio Grande do Sul in four primary-school-educated populations: monolinguals from Porto Alegre, informants from the Uruguayan border[2], Portuguese-German bilinguals, and Portuguese-Italian bilinguals. The study used an additional university-educated sample from Porto Alegre. In general, there was no difference in the monolingual varieties of Porto Alegre on the basis of education level. The bilingual populations showed less palato-alveolar use than the monolingual populations with the least palato-alveolar use in the Portuguese-Italian bilinguals. The author also found that younger speakers exhibited more palato-alveolar use than the older speakers in the educated sample. This effect was not present in the uneducated monolingual sample, as the rate of palato-alveolar use was already quite high in the speech of the older uneducated speakers.

Surek-Clark (2000) studied two female populations from Curitiba, capital of the southern state of Paraná. The two populations included a control group of individuals from the capital and a migrant

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2   Bisol (1991) treats these informants with the monolingual speakers of Portuguese in her discussions, but does not refer to them as being bilingual or monolingual. There has been a certain amount of disagreement in the literature regarding the language variety spoken in this region (Santana do Livramento, RS, Brazil and Rivera, Uruguay). Some authors (Lipski 1994, Penny 2000) seem to take the position that this variety is neither Spanish nor Portuguese, but rather a sort of contact variety known as Fronteiriço. Other researchers (Carvalho 2004; Waltermire 2006) study these varieties as bilingual varieties of Spanish and Portuguese.

group of individuals that had moved from Rio de Janeiro, another area of Brazil, or the western part of Paraná state. Since Curitiba, unlike other varieties of Brazilian Portuguese, only variably raises the final front vowel to [i], the object of study was the combination of raising plus palatalization. The investigator found a correlation between place of origin and raising/palatalization. Individuals from Rio de Janeiro, other areas of Brazil, and the interior of Paraná raised/palatalized more than individuals from Curitiba, in that order. Additionally, the author found that parental influence was important in determining if an individual would palatalize, although it is not clear that the author separated effects of individual origin and parental origin.

Carvalho (2004) presents a study of /t/ and /d/ in Uruguayan Portuguese. Carvalho found that the palato-alveolar variant occurred 32% of the time in her data, a rate considerably less than that found by Bisol (1991), but more than previous descriptions of Portuguese from Rivera, Uruguay seemed to suggest. Carvalho related this shift from previous accounts to the greater influence of the mass media, due to the limited direct contact with speakers of urban Brazilian Portuguese and the fact that Uruguayan Portuguese is largely an in-group language. Carvalho found an effect for age in which younger speakers used palato-alveolar /t/ and /d/ considerably more than the older two age groups (61% versus 13% and 2%, respectively). Additionally, she found that higher social classes used palato-alveolar /t/ and /d/ more often than lower social classes and females did so more than males. Indeed, she finds a nearly complete polar shift from the working class members of the oldest age group (0% palato-alveolar) to the middle class members of the youngest age group (89% palato-alveolar).

Paula (2006) reports on a study of /t/ and /d/ in the municipalities of Taquara and Panambi in Rio Grande do Sul. In her study, she found that although the youngest group showed the greatest rate of use of the palato-alveolar variant (43%), the middle group showed the least (30%), leading her to conclude that in those communities the palatalization of /t/ and /d/ constituted a stable variable. As in Carvalho (2004), women favored palatalization.

Battisti, Dornelles Filho, Pires Lucas, & Bovo (2007) studied /t/ and /d/ in the Portuguese of the municipality of Antônio Prado, Rio Grande do Sul. The authors find that the younger age groups favor palato-alveolar variant, while the older generations disfavor said variant. Individuals from the urban zone of the municipality showed more palato-alveolar use than individuals from the rural zone. Using a social network model the authors argue that the social ties of the urban zone, greater in quantity but lesser in intimacy, lead speakers in the urban zone to use the more innovative, palatalized variant.

3. Overview of Várzea Alegre, Ceará

The municipality of Várzea Alegre[3] is located in the southern part of Ceará in the microregion of Várzea Alegre, which itself is located in the center-south mesoregion. Figure 2 shows the location of Várzea Alegre within the state of Ceará. As we can see, while it is in the center-south mesoregion, it borders the south mesoregion, which contains the Cariri microregion. In discussions with the residents, it seems that despite an official classification to the contrary, the local wisdom is that Várzea Alegre is part of the Cariri region. Várzea Alegre is approximately 467 km from Fortaleza, capital of the state of Ceará. It is approximately 85 km from Juazeiro do Norte, principal city of the Cariri metropolitan area. As a result of its proximity, the Cariri region traditionally has exerted a stronger cultural influence over Várzea Alegre. Indeed, SERFHAU (1972) reported that at the time of the writing there were two weekly buses to Fortaleza, while there were daily buses to Crato (city in the Cariri metropolitan area) and to Iguatu (another important city about 80 km to the north). In contrast, at the present, the Guanabara bus company (which dominates the Várzea Alegre market) has ten daily buses to Fortaleza, fourteen buses to Crato, and thirteen to Iguatu. As such, we can safely say that over the past 37 years, the amount of contact that the municipality of Várzea Alegre has had with Fortaleza (along with anywhere else) has increased dramatically.

According to the municipal government, the present population of Várzea Alegre is 37,740, 58.29% of which is urban. Figure 3 shows the growth of Várzea Alegre according to data provided by

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3   A municipality is the smallest political subdivision in Brazil. In cases of large cities the municipality is all urban, but in the case of smaller cities, the municipality usually includes the surrounding rural territory since all land in Brazil must be a part of some municipality.

the municipal government. From 1940 to the present day, the municipal population has grown from 20,383 to 37,740 (an 85.2% increase). Since 1960 the rural population has in fact declined and the urban population has grown from 20% to constitute 58% of the population of the municipality. As such, we can say that Várzea Alegre, while still nearly half rural, has seen a major increase in urbanization since 1960. With the greater urbanization and the greater integration with other areas of Brazil has certainly also come greater access to education and the mass media, which in turn increase access to and influence of the national linguistic standards.

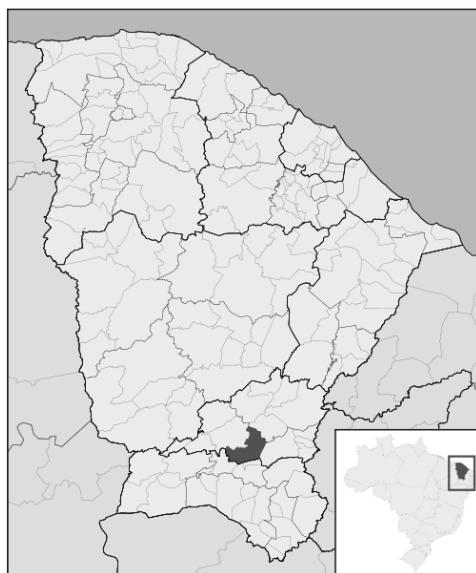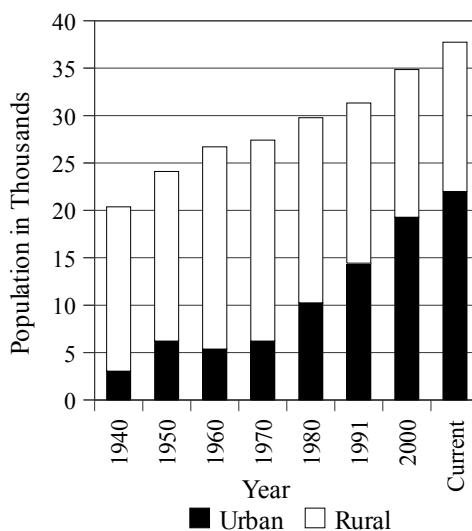**Figure 2**. Location of the municipality of Várzea Alegre within Ceará.

Figure 3. Population growth of Várzea Alegre, Ceará.

No linguistic study that we are aware of has specifically addressed Várzea Alegre. As we have already established, the pronunciation in this region should be expected to be conservative with respect to this variable, with a predominance of dental productions of /t/ and /d/.

4. Methodology

This study makes use of recorded speech data from participants from Várzea Alegre, Ceará. In the following sub-sections, the participants, tasks, coding, and analysis procedure are discussed.

4.1. Participants

The participants in this study include sixteen native speakers of Portuguese born and raised in the municipality of Várzea Alegre, Ceará. All participants have at least a high school education[4]. Some

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4   A reviewer has asked about the representativity of limiting the sample to participants with at least a high school education. According to data supplied by the government of the state of Ceará, in 2007, 68.7% of the population of Várzea Alegre possessed a high school education. Although the author has been unable to locate supporting data, given what locals have to say about the subject, there is likely age grading in the rate of education, like that found by Díaz-Campos, Fafulas, & Gradoville (2011) for Caracas Spanish: recent generations have enjoyed greater access to education. The decision was taken to limit the sample to high school-educated participants on the following grounds: (1) the sampling procedure was loosely based on that of the *Corpus Português Oral Culto de Fortaleza* (Monteiro 1993), which included only university-educated participants; (2) including participants of all education levels would have increased the population size, which would have increased the required sample size; (3) uneducated speakers from this region are known to be unintelligible to speakers of other varieties of Brazilian Portuguese, which could be problematic given that the

participants have lived outside of the municipality of Várzea Alegre, usually to pursue higher education or employment opportunities, but at the time of the recordings all participants lived in Várzea Alegre. The sample is stratified socially in four age groups with males and females in each age group. The investigator attempted to include both high school- and college-educated individuals for each combination of gender and age group; however, some gaps exist in the participants with only a high school education.

4.2. Tasks

Each individual participated in multiple tasks designed to elicit various styles from each participant. The participant (1) engaged in a conversation with a native speaker of Portuguese who had lived in Várzea Alegre until adolescence; (2) engaged in a conversation with the principal investigator, a non-native speaker of Portuguese; (3) narrated two wordless children's picture books; (4) read aloud a paragraph; and (5) read aloud a list of carrier phrases. This paper reports on the results from tasks (3), (4), and (5).

The wordless children's picture books used in task (3) had been selected after a pilot study for their ability to elicit fricatives in Portuguese. The first book, *Buenos días* (*Sunshine*; Ormerod 2006), relates the morning routine of a little girl from waking up to leaving for school. The second book, *Rainstorm* (Lehman 2007), tells the story of a little boy who, on a day when it is raining outside and he has no friends with which to play, finds a key which opens a secret passage that leads him to an island where he meets new friends. This task was designed to elicit relatively free speech as compared to the reading tasks that followed it.

The paragraph used in task (4) had been specifically designed to elicit Portuguese fricatives. The paragraph was designed to tell a story that would elicit a natural reading style, where less attention might be paid to pronunciation than in the case of the carrier phrases.

The carrier phrases used in task (5) were of the structure *Eu digo X para você* 'I say X to you', where the target word replaced *X*. In total 84 words were used in the carrier phrases, of which 24 are relevant to the current study of /t/ and /d/.

4.3. Coding

The dependent variable for this study is whether or not the token of /t/ or /d/ was palato-alveolar producing [tʃ] or [dʒ], respectively. Conventional descriptions of /t/ and /d/ in Brazilian Portuguese assert that /t/ and /d/ may palatalize before [i]. However, in the data it is evident that this interacts with other processes.

First, some speakers may produce certain words with an [i] sound, while others may produce that same word with a different sound (e.g. *d*[e~i]*scansar*, *fut*[e~i]*bol*). Tokens produced with [e] must be excluded since /t/ and /d/ never are produced as palato-alveolar in this case. Second, there is a process of final unstressed vowel reduction that intersects /t/ and /d/ palatalization, so for example we may have the following variation in the word *gente*:

Non-local forms: [ˈʒẽtʃi] > [ˈʒẽtʃ]
Local forms: [ˈʒẽti] > [ˈʒẽt] > [ˈʒẽtˀ] > [ˈʒẽ][5]

Third, normally, the palato-alveolar variants above can be coded as the non-local pronunciation and the dental variants can be coded as the local pronunciation. However, when the next consonant is palato-alveolar, as in *a gente chegou*, the deleted vowel may render ambiguous whether a word-final [t] plus

[ʃ] or a word-final [ʧ] plus [ʃ] has been produced. These tokens must be excluded. Additionally, in this variety of Portuguese, two dental sounds may join to form a long dental stop, as in *junto de*, when the word-final [u] is absent. In these cases, the first of the two dental stops is excluded, although in this particular example the first would not even be in the variable context.

The dependent variable was defined using a binary dental [t,d] versus palato-alveolar [ʧ,ʤ] distinction. The determination was made auditorily with the help of a spectrogram in Praat (Boersma & Weenink 2009). The spectrograms in Figure 4 represent more canonical examples of the dental and palato-alveolar variants. In the case of particularly troublesome tokens a native speaker was asked to make a judgment on what had been produced. If the native speaker was also unclear, the token was excluded. Figure 5 shows three problematic examples that were excluded. In the first, there was no evidence that the syllable -te was even uttered. In the second, the syllable -te may very well have had acoustic consequence if it merely blended with the preceding [ʃ], but there also could have been an inaudible closure for [t] prior to the following [d]. In the third, the syllable *de* clearly occurred given the following vowel; however, the first sound of the syllable was clearly blended with the previous [ʒ] and impossible to discretely delimit.

Figure 4. Spectrograms of canonical examples of the dental variant (left) in *tinha* (0.051 s highlighted) and the palato-alveolar variant (right) in *cheque-mate* (0.090 s highlighted).
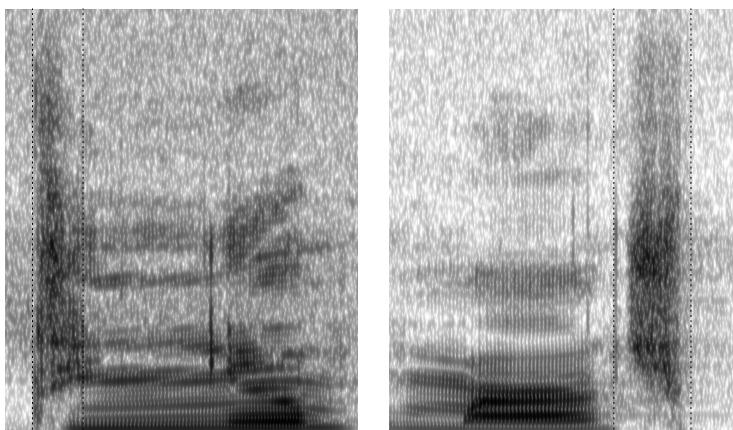
Figure 5. Spectrograms of problematic examples from *refrigerante* (left), *noroeste do* (center), and *fins de* (right).
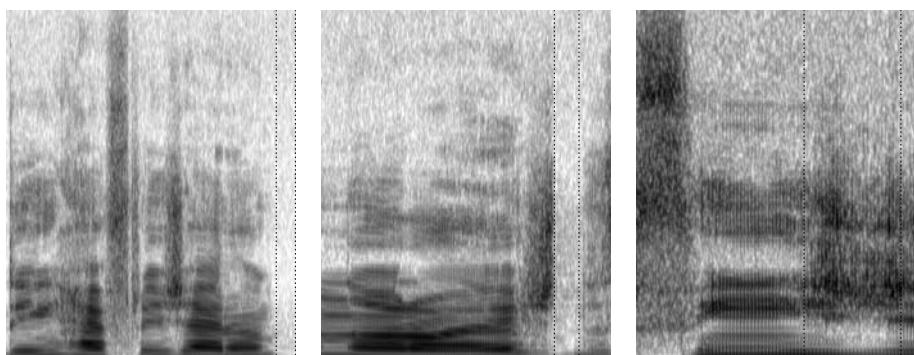
Several extralinguistic variables were coded to determine what explains the social element in the variation in /t/ and /d/ palatalization in Várzea Alegre. First, the age group was coded with four possible values: 18-35 years, 36-55 years, 56+ years. Since it is believed that the speech of Várzea Alegre is changing with respect to the production of /t/ and /d/, the prediction is that younger

generations will show greater rates of palato-alveolar variant use, given the apparent time construct (Bailey 2002). Such a result would be consistent with most previous studies of this variable that have addressed age (Battisti et al 2007, Bisol 1991, Carvalho 2004), though not all (Paula 2006).

Second, the gender of the speaker was coded as either male or female. Since this is being viewed as a change in progress toward the linguistic standard of the country, more palato-alveolar use would be expected amongst the females in the sample (Cheshire 2002). This prediction is consistent with what has been found in previous studies on the variable (Carvalho 2004, Paula 2006).

Third, the education level of the participant was coded as either high school or college. College-educated participants should be expected to exhibit more of the palato-alveolar variant due to their increased exposure to 'standard' Brazilian Portuguese. Increased education level has been shown to correspond with increased use of 'standard' variants (Díaz-Campos, Fafulas, & Gradoville 2011). On the other hand, due to their status of having a college education, these individuals may exhibit less linguistic insecurity and thus may use the variant less than otherwise expected.

Fourth, the task in which the token was produced was coded with the following values: paragraph reading, carrier phrase, carrier phrase *digo*. In general, as attention to speech increases, it is expected that the 'standard' variant will represent a larger proportion of use due to attention given to speech (Schilling-Estes 2002). The reading tasks should yield the highest rate of palato-alveolar variant use since there is greater pressure to conform to the linguistic standard in this context and more attention paid to pronunciation in general. Within the reading tasks, however, we should still expect stylistic differences, with more of the palato-alveolar variant in the more controlled, less communicative carrier phrases.

Finally, three variables were coded to account for residence in different locations. They could not be operationalized as a single variable since some participants had resided in multiple locations outside of Várzea Alegre. True-false variables for residence in the Cariri region, Paraíba or Pernambuco states, and anywhere else were coded. Residence in the Cariri region and Pernambuco state should have no effect since in both the Cariri and Pernambuco /t/ and /d/ are generally dental (Abaurre & Pagotto 2002, Noll 2008, Seraine 1972). Residence in another region, namely Fortaleza or São Paulo, should favor the palato-alveolar variant since in those regions generally /t/ and /d/ are palato-alveolar (Abaurre & Pagotto 2002, Noll 2008).

4.4. Data Analysis

The data were submitted to a binary logistic regression analysis using GoldVarb X (Sankoff, Tagliamonte, & Smith 2005). The program accounts for the interactions that may occur between different independent variables supposed to predict the dependent variable and selects the variables that contribute statistically significant effects to the variation with corrected probabilities describing the effect of each value on the data. In general, the order of selection in the stepwise process indicates the relative importance of each variable. Factor weights closer to 1.00 are considered to favor the application value, whereas factor weights closer to .00 are considered to disfavor the application value relative to the other factors in the factor group (Tagliamonte 2006: 145). The difference between the greatest and the least factor weights is called the range and indicates the magnitude of effect of the variable. This analysis was complemented with an analysis based on percentages.

5. Results

During the analysis process, it was determined that inclusion of the 84 tokens of *digo* from the carrier phrases from each speaker predictably caused unresolvable interactions in the data set. As a result, these tokens were not included in the final regression analyses. Also, there was an interaction in the data between the age variable and the residence in the Cariri variable. As such, these two variables were combined in the final regression analysis.

The results of the final regression analysis are available in Table 1. As we can observe, the combined age/residence in Cariri variable, gender, and style were selected as significant in the analysis. Table 1 has been arranged in order of the ranges of each variable, but the order of selection

was the same in this case. The overall rate of palato-alveolar variant use in the story narrations, the paragraph reading, and the carrier phrase reading (minus the tokens of *digo*) is 43.7%, effectively debunking any claim that might be made that in this region palato-alveolar variants are not present[6]. The rate of palato-alveolar use in the narrations is lower; however, it is clearly not appropriate any longer to say that the variable is not subject to variation in this region.

As we said previously, the combined age/residence in the Cariri variable was selected as significant and with a range of 81 is the most important factor. In earlier runs these two variables were independently selected as significant, but with an interaction caused by asymmetries in the data. While the data gathering procedure was designed to balance for age group, gender, and education, no such procedure was operationalized for residence in other locations. This lack of control for residence yielded an interaction for which it was decided to combine the groups to resolve.

We can see that with a factor weight of .87, individuals that have not resided in the Cariri region between 18 and 35 years of age show a very high favoring of the palato-alveolar variant. On the other hand, individuals in the same age group that have resided in the Cariri region have a behavior that is in the median between those that have not resided in the Cariri younger than 55 and those older than 55 (factor weight = .50). This suggests that, at least for the 18 to 35 year age group, whether or not a person has resided in the Cariri region has an important role in distinguishing people's speech in Várzea Alegre.

Table 1. Factors contributing statistically significant effects to the use of the palato-alveolar variant of /t/ and /d/ in the Portuguese of Várzea Alegre, Ceará.

N	1848		
% Palato-Alveolar	43.7%		
Corrected Mean	.38		
	Weight	**% Palatal.**	**% of data**
Age / Residence in Cariri			
18-35 years / Did Not Live in Cariri	.87	75.0%	19.7%
36-55 years / Did Not Live in Cariri	.68	63.8%	23.0%
18-35 years / Lived in Cariri	.50	38.9%	29.1%
56+ years / Lived in Cariri	.17	13.4%	20.1%
56+ years / Did Not Live in Cariri	.06	2.7%	8.1%
Range	*81*		
Gender			
Female	.64	54.6%	47.6%
Male	.37	33.7%	52.4%
Range	*27*		
Style			
Carrier phrase	.61	49.9%	20.4%
Paragraph	.50	42.9%	41.8%
Story Narration	.44	41.2%	37.8%
Range	*17*		

Log-likelihood = -956.348; χ^2/cell = 2.2985; $p \leq 0.001$

Factors not selected as significant: residence in Paraíba or Pernambuco. Factors not included: education, residence elsewhere

The 36 to 55 year group favors the palato-alveolar variant with a factor weight of .68. Recall that no one from this group had resided in the Cariri region, so we cannot see what effect this has in this age group. However, their position favoring the palato-alveolar variant less than the younger age group not having resided in the Cariri region and more than the oldest age group falls in line with a model

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6   I consulted with a linguistic researcher who herself originated in this region. She did not seem to acknowledge the presence of the palatalization in the speech of this region.

suggesting that language change is occurring.

Finally, as has been stated above, both 56+ year age groups strongly disfavor palato-alveolar variant. This is the effect that we would expect since lack of the palato-alveolar variant is what has traditionally characterized the speech of this region. Within this age group, the residence in the Cariri variable has the opposite effect to what we see in the 18 to 35 year group.

The second most important factor in the variation with a range of 27 is that of gender. As we can observe, females favor the palato-alveolar variant with a weight of .64, while males disfavor palatalization with a weight of .37. This result is consistent with previous studies in other areas of Brazil that find that women exhibit higher rates of the palato-alveolar variant than men (Carvalho 2004, Paula 2006). This may be a result of this being a language change in progress toward the national standard variant, in which women generally have higher rates of the standard variant than men. A larger sample of speakers would be necessary to confirm this result.

The last factor selected as significant in the variation with a range of 17 is that of style. The fact that the range is only 17 indicates that while individuals do vary their speech in a statistically significant manner, the differences between individuals are much greater. However, the effect we find for this variable is what we would expect. The carrier phrase favored the palato-alveolar variant (weight = .61) relative to the paragraph (weight = .50). The paragraph, since it was written in an informal style for written language and itself had some communicative value, was expected to elicit a more informal style in pronunciation. If we interpret the national standard pronunciation as being the more formal style for this community, this is true. The carrier phrases have no communicative value, whatsoever, and as such no attention was being paid to meaning. All attention was focused on the pronunciation of the phrases and, since students are taught to read using the national standard pronunciation, the carrier phrases elicited a higher rate of the palato-alveolar variant.

Likewise, the story narration yielded the least amount of the palato-alveolar variant overall and thus disfavored the palato-alveolar variant in the statistical analysis (weight = .44). This is what we would expect, since the least amount of attention should have been given to pronunciation in this case. It is worthy to note that, even for this task, the palato-alveolar variant occurred for all but three speakers in the sample.

We can observe in Figure 6 the behavior of each individual with respect to style. The speakers have been ordered based on the rate of the palato-alveolar variant in the tokens of the story narration from high rate of palatalization to low rate, except the last two participants for whom there is no story narration data. The speakers are identified by characteristics in the following order: age (1 = youngest, 3 = oldest), gender ([M]ale, [F]emale), education ([H]igh school, [U]niversity), prior residence in Cariri ([T]rue, meaning the person lived in the Cariri; [F]alse, meaning the person did not live in the Cariri). As we can see, the first three speakers with the greatest overall rate of the palato-alveolar variant generally do not vary their use very much. At the other end of the spectrum, there is a wide variety of behavior with some speakers varying their speech little and some quite a lot.

Of the fourteen participants with story narrations, ten had higher rates of use of the palato-alveolar variant in the paragraph reading than in the story narration (average difference = 15.3%). Although for three participants this difference amounted to less than 5%, two participants had a difference of 23% and one had an astonishing difference of 62%. The four participants with higher rates of palatal use in the story narrations had an average difference of 13.3%, with the maximum difference of 26%.

Of the sixteen participants, eleven had a higher rate of use of the palato-alveolar variant in the carrier phrase than in the paragraph reading, although it must be noted that this difference was not very large for some participants (average difference = 15.5%). The five participants for whom this was not true did not vary their speech as much (average difference = 10.4%).

The carrier phrase *digo* tokens tend to show highly categorical behavior with respect to the other categories. If we look at the average categoricity for each task[7], the carrier phrase *digo* tokens have a value of 10.63%, whereas the story narrations had an average categoricity of 18.50%, the paragraph tokens have an average categoricity of 18.56% and the carrier phrase word tokens have an average

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7   This is being calculated by taking the absolute value of the difference between the nearest categorical value (0% or 100%) and the observed value (e.g. categoricity of 20% would be 20% and categoricity of 86% would be 14%). Values closer to 0% thus indicate more categoricity.

categoricity of 19.44%. The value of 10.63% is a fairly strong indication that the participants vary their production of the sound considerably less in the carrier *digo* than in other contexts.

Figure 6. Individual rates of use of the palato-alveolar variant with respect to style.
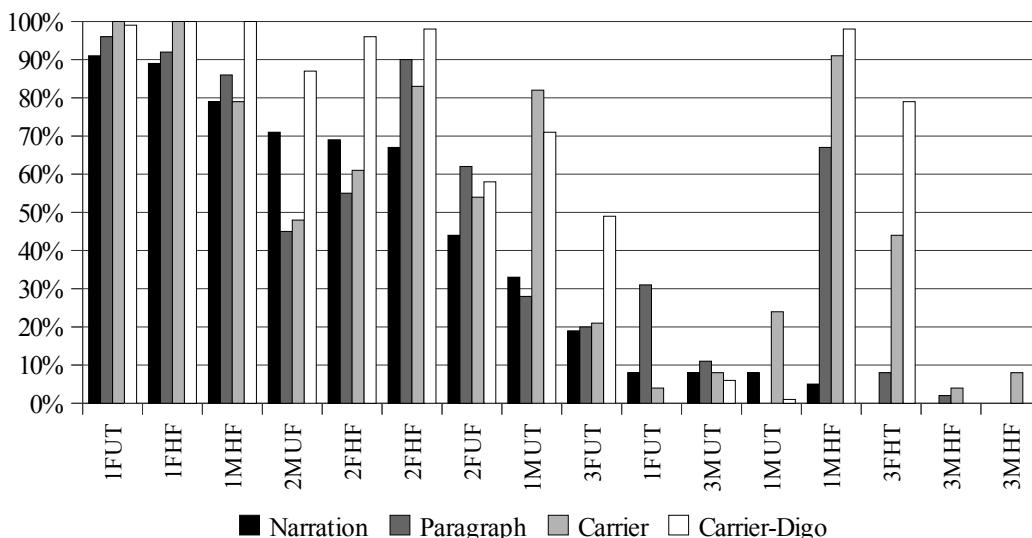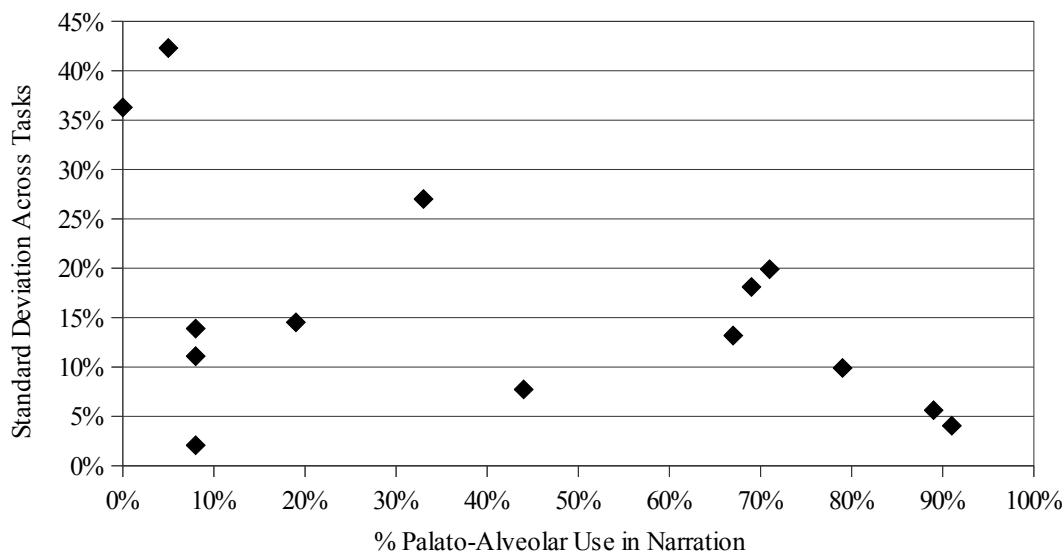

Figure 7. Scatterplot of rate of use of the palato-alveolar variant in the narration task of each individual compared to the standard deviation between the four styles.

Another hypothesis that we might be tempted to entertain, since the national norm variant is the palato-alveolar variant, is that speakers with a low rate of palato-alveolar variant use in their informal speech exhibit more stylistic variation than speakers whose speech already more or less conforms to the national norm. In Figure 7 we can observe a scatterplot of rate of palato-alveolar variant use against the standard deviation of their rates in each style. For the speakers with high rates, there certainly seems to be some truth to this hypothesis as these speakers show less variation from task to task, while speakers with a medium rate show moderate rates of variation from task to task. Speakers with a low rate show a range of behaviors. While there are two speakers in this category that vary their speech considerably from task to task, there are also speakers that show nearly as little stylistic variation as the speakers that use the palato-alveolar variant at a high rate.

Another way to evaluate individual stylistic variation is in the form of chi-squared tests. Table 2 shows chi-squared tests of the stylistic variation of each participant in the sample. Those participants who demonstrate a considerable amount of stylistic variation should have statistically significant differences between the styles represented, whereas those participants that do not should not see statistically significant differences in their styles. Table 2 shows us that eight of the sixteen participants show statistically significant differences between the tasks. Of the remaining eight participants, two demonstrate task differences insufficient to reject the null hypothesis. The last six participants have either very high or very low rates of use of the palato-alveolar variant across all tasks and, as a result, their data do not even meet the assumptions about expected frequencies of the chi-squared test.

Table 2.   Chi-squared tests of the task variation for each participant with rates of palato-alveolar use for the story narration and overall.

Participant	χ^2_c	df	p-value	Overall	Narration
1FUT	---			96%	91%
1FHF	---			97%	89%
1MHF	19.32	3	0 ***	88%	79%
2MUF	29.98	3	0 ***	68%	71%
2FHF	34.09	3	1.90E-007 ***	78%	69%
2FHF	29.41	3	0 ***	85%	67%
2FUF	1.86	3	0.6	58%	44%
1MUT	39.12	3	2.00E-008 ***	53%	33%
3FUT	16.62	3	0 ***	34%	19%
3MUT	1.26	3	0.74	8%	8%
1MUT	---			6%	8%
1FUT	---			10%	8%
1MHF	111.94	3	0 ***	71%	5%
3FHT	90.23	3	0 ***	43%	0%
3MHF	---			1%	---
3MHF	---			1%	---

6. Conclusion

In this study, we have empirically shown that speakers of the Portuguese of Várzea Alegre, Ceará, firstly, do exhibit variation with respect to their use of /t/ and /d/, which is contrary to prior descriptions of the region (Noll 2008, Seraine 1972). This reflects a shift in language use in the town and, judging by the results of the *Atlas Lingüístico do Estado do Ceará*, in the region.

The data that we have suggest that there is a change in progress in /t/ and /d/ in this sample of Várzea Alegre speech if we examine the age variable. In general, younger speakers exhibit more use of the palato-alveolar variant. The exception to this trend is found in those individuals that have resided in the Cariri region. Since, for the most part, individuals that lived in the Cariri region did so to attend college, their experience there, in a larger city where the dental variant is the norm, might seem to validate their use of the dental variant. Such individuals show much less use of the palato-alveolar variant.

From the data in this study we can also confirm that the speech of Várzea Alegre exhibits stylistic variation with respect to the production of /t/ and /d/. The results of the regression analysis show that this trend is for more palato-alveolar use in more mechanical tasks like paragraph reading and the carrier phrase[8]. This offers some insight as to how the palato-alveolar variant has been introduced,

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8   A reviewer has speculated that the more frequently palato-alveolar carrier phrase *digo* might yield a structural priming effect in the carrier phrase reading task, since the embedded word was immediately after *digo* in the carrier phrase. This would be difficult to demonstrate definitively, however, without data from a carrier phrase without *digo* for purposes of comparison. To provide a preliminary answer to this, however, data were analyzed from the five participants whose rates of use of the palato-alveolar variant in the carrier phrase *digo*

since it is taught in school for reading style.

This study has methodological implications. An analysis of individual variation shows the trend uncovered using the regression analysis is not consistent. This lack of consistency probably accounts for the fact that the trend is the weakest of the statistically significant effects, although the directionality of the result is consistent with expectations, with more use of the national standard in a more formal context where greater attention is given to pronunciation. For some participants stylistic variation seems to be of marginal importance, while for others the results would be entirely different depending on the task. Because of these participants, reading tasks cannot be considered a substitute for semi-spontaneous data in the study of socially indexical variables.

Surprisingly, the behavior of the participants in the paragraph reading seems to be closer to the story narrations than the carrier phrase reading. This suggests that the utterly meaningless carrier phrases draw a lot of attention to pronunciation on the part of the participants, yielding results that vary drastically from less controlled tasks. Likewise, it suggests that a carefully designed paragraph reading task may not be a bad supplement to semi-spontaneous data.

The carrier phrase *digo* tokens showed more categorical behavior than the words in the carrier phrase and the words in the paragraph. We can account for this fact in two ways, both of which probably have a role[9]. First, it is the same word in the same context, so in general we would not expect it to vary much. Second, the speaker is repeating the same phrase eighty-four times and so the production probably becomes automatic. This would explain the behavior of eleven or twelve of the speakers. What is not very clear, and what is probably a more interesting question, is why the other four or five speakers' productions do not become automatic. One possibility is that these speakers are paying much more attention to their speech in the carrier phrases than the other speakers are; however, only two of the four or five speakers with non-categorical production of *digo* actually show a lot of stylistic difference between the carrier phrase and the paragraph, an indicator that they are more conscious of their production in the carrier phrase. In any respect, it is clear that the behavior elicited by the carrier phrases is not consistent with that elicited by more open-ended tasks.

This study contributes to our understanding of the effects of the Brazilian national standards on the speech patterns of the rural Northeast. Future studies should examine this variable in other varieties of Brazilian Portuguese from the Northeast. Likewise, future studies should examine variation in the rural Brazilian Northeast associated with other linguistic variables to see the effect of standardization pressures. Finally, the results of this study exemplify the importance of the type of data used in representing the speech of a particular community, since stylistic variation does not manifest in all individuals in the same way and some individuals may exhibit more extreme stylistic variation than others.

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were between 10% and 90%. Results indicate that, of the tokens in embedded words where the preceding carrier phrase *digo* token had been realized as dental, 47.2% (17/36) were palato-alveolar, while those following a palato-alveolar carrier phrase *digo* were 50.0% (41/82) palato-alveolar. Although tokens following a palato-alveolar carrier *digo* are more likely to also be palato-alveolar, this difference is small and is not statistically significant ($\chi^2 = 0.077$; df = 1; p = 0.781), suggesting that there is no priming effect of this type.

9 A reviewer has pointed out that the high rate of palatalization in the tokens of carrier phrase *digo* (58.8%, which is higher than any of the other tasks) might be due to the word's high frequency of use in a frequency-influenced lexical diffusion pattern, such as that found by Bybee (2002), Phillips (2006), and many others. Given the central role of frequency of use in my own research projects (Díaz-Campos & Gradoville 2011; Díaz-Campos, Fafulas, & Gradoville This Volume; Gradoville 2007a, 2007b, 2008, 2009, 2010), I view the investigation of the role of frequency of use as a logical continuation of this research. However, it must be pointed out that *de*, the most frequent word in the variable context, had palatalization rates of 30.9% (65/210) in the story narration task and 35.9% (55/153) in the paragraph reading task. Being the most frequent word in the variable context, a relatively high rate of palatalization in *de* would be expected if this is a physiologically-motivated change, yet a relatively low rate is found. Since other factors may be contributing effects, a detailed investigation is warranted to resolve this issue.

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