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New Ways of Analyzing Sociolinguistic Perception

Novos caminhos para a análise da percepção sociolinguística

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The title of this thematic issue of *Revista de Estudos da Linguagem* (RELIN) was intended to attract papers that would focus on new methodologies for the approach of perception in Sociolinguistics, as well as papers that would discuss theoretical issues involved in the study of the social meaning of linguistic variation. The issue comprises seven articles. Three of them (Freitag; Mendonça and Araujo; Carreão) are particularly focused on methodologies to analyze perceptual and attitudinal data, while they also have a descriptive interest vis-à-vis Brazilian Portuguese. Two of them (Canever and Mendes; Lillelund-Holst *et al*.) discuss social meanings of particular variables (in Brazilian Portuguese and Danish, respectively), by employing the matched-guise technique in perceptual experiments. Lastly, although the remaining two (Oushiro; Vaughn and Kendall) also apply specific methodologies for data collection and analysis, they revolve around theoretical points: respectively, a falsifiable and replicable representation for the indexical field of a variable and its variants; and the cognitive representation of stylistically coherent variants and their social meanings.

In her article, Freitag discusses the use of Kappa statistics to measure the agreement among judgments in a perception test. She analyzes data obtained from a verbal-guise, subjective reaction test focusing on the variable pronunciation of (t, d) as stops or affricates in Aracaju (Brazil), and on social meanings related to aesthetics (e.g. sounding pleasant or beautiful), rhythm (quick, singsong) and region.

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She asserts that Kappa statistics, in combination with other tests of association, can show aspects of the inter-rater agreement and reliability that can help explain how linguistic change is driven in the community.

Mendonça and Araujo use a software called Iramuteq (an interface of R) to compare the vocabulary used by university students in their evaluative descriptions of four forms: pronouns *a gente* 'we' and *tu* 'you' and nonstandard subject-verb agreement with the pronouns – *a gente vivemos* 'we 1PL live 1PL' and *tu vai* 'you 2SG go 3SG'. This case of variation in Brazilian Portuguese is within the realm of an earlier change through which the verbal inflection paradigm has been reduced, and the article neatly shows how students' evaluations of forms vary according to notions of vitality and standardization (based on CARGILE *et al*., 1994). Despite the fact that emergent *a gente* and *tu vai* are forms that might be negatively evaluated (particularly the latter, since it is insistently pointed to as a mistake at school), their study shows that *a gente vivemos* is the only one to which stigma is attached. An even more central interest of their article lies in the multidimensional analysis of terms employed by the students in their social evaluations.

The article by Carreão discusses the results of a production analysis of variable (t,d) and coda (-r) in Louveira (a city in the countryside of São Paulo state), in light of the speakers' answers to the question "Do you think Louveira has an accent of its own?" Before [i], (t,d) can be pronounced as dental stops or affricates in Brazilian Portuguese and, while the affricate variants are far more frequent in the state capital (also called São Paulo), the dental variant is relatively less infrequent in Louveira. As for (-r), the retroflex and the tap are the most productive in the state, but the former is less frequent in the capital, while the latter is less frequent in the countryside (including Louveira). By including the speakers' yes/no answers about accent as a predictor in regression models that take (t,d) and (-r) as dependent variables, Carreão shows that there is no correlation in the first case, but there is in the second (for speakers of the second and the first age groups, but not for older speakers). He interprets these facts in consonance with the socioeconomic history of Louveira, which has shifted from a strictly agricultural setting to an industrial hub, home to a number of multinational companies. This has changed the way local speakers perceive their own accent, which in turn can help explain how they talk.

Canever and Mendes examine how competent speakers of Brazilian Portuguese (BP) sound depending on the variable number inflection of infinitive verbs. Based on earlier studies that have discussed how the nonstandard inflection of infinitives can be considered a case of hypercorrection, they use a modified matched-guise task (LAMBERT *et al*., 1960) in order to check whether speakers sound more educated, more intelligent and more formal in their inflected guises, and whether these perceptions vary significantly according to the syntactic context, the grammatical person and listeners' age. Their results indicate that speakers are judged as more competent-sounding in their uninflected guises, contradicting the initial hypothesis, and that this effect is stronger in hypercorrect contexts than in structures in which inflected infinitives are more frequent in production. According to the authors, this is a case in which higher rates of use translate into more neutral perceptions. In addition, since older respondents present stronger reactions to inflected guises (while younger respondents' judgments tend to be more neutral), their data suggest a change in progress in the sociolinguistic perceptions associated to inflecting infinitives (even though a diachronic examination of the variable does not reveal change in production).

Lillelund-Hurst, Pharao and Maegaard investigate the social meanings of (s) and (t) for Copenhagen girls in two different registers: modern Copenhagen speech and street language. They carry out two matched-guise experiments in order to examine the social connotations of standard [s] and [ts], and fronted [s+] and palatalized [tj]. Both experiments show that variable (s) has little to no effect in both registers, which the authors interpret as surprising, since [s+] is commonly perceived to index femininity and to be an integrated part of the street register. As for (t), the presence of palatalized [tj] significantly indexes non-Danish ethnic background and the Western suburbs of Copenhagen, which are traditionally associated with the working class and mixed ethnic backgrounds. In addition, their data show significant effects of prosodic frames, which link modern Copenhagen speech to intelligence and the Northern suburbs of Copenhagen (a traditionally upper middle class locale), and street language to non-Danish ethnic background, the Western suburbs of Copenhagen, and acting tough. A particularly interesting realization made possible by the analyses in this article is that neither (s) nor (t) index the exact same traits, associated personae, and stereotypes as those found for boys in previous work. While the authors

show that the social meaning ascribed to a particular variant can be highly dependent on the variation with which it co-occurs (a finding that has been portrayed in a number of other studies, e.g. CAMPBELL-KIBLER, 2012 and LEVON, 2014), the comparison between results obtained by using female voices with those of earlier work that used male voices for the stimuli, adds the effect of speaker gender to the relationship between segmental and prosodic variation – carefully controlled in the stimuli.

Oushiro also utilizes the matched-guise technique to examine the association of multiple social meanings to the tap and the retroflex realizations of coda (r) in São Paulo Portuguese. Her data show that, in São Paulo, this variable is strongly associated to geographical identities, from which further inferences arise regarding the social status of the speaker, including their social class, area of residence, level of education, and personal traits such as sounding "articulate" and "hardworking." She discusses the nature of the ideological inter-relations among multiple factual and potential social meanings, and proposes the use of Minimum Spanning Trees (GOWER; ROSS, 1969) as a falsifiable and replicable computational method for representing indexical fields. While such a representation does not constitute a mental mapping of how listeners arrive at their perceptions of how speakers sound, it objectively shows how close or distant social meanings are (according to listener's responses in an experiment) – both in relation to one another and to the variants of the variable being focused upon.

Finally, Vaughn and Kendall utilize a production method in order to approach whether and how stylistically coherent variants (that is, variants that are perceived as conjointly pertaining to a particular style) covary in the speech of subjects in a laboratory setting. As theoretical standpoints for their article, they assume (i) that the perception of social meanings and styles is dependent upon the contributions of a constellation of multiple covarying sociolinguistic variants; and (ii) that this suggests that listeners maintain associations between stylistically coherent variants and their social meanings in mental representation. They asked four American English speakers to produce sentences containing (ING) words (as in *talking* vs. *talkin'*), in their *–in* and *–ing* variants. Then they analyzed the speakers' productions in order to check whether the speakers also manipulated other stylistically-linked variables, even though prompted only to manipulate (ING). Their results show that speakers indeed modulated other variables beyond (ING) in ways that

align with the Southern and casual social meanings of *–in*. This suggests that speakers not only hold indexical linkages between variants and styles in mental representation, but that variants are also linked to variants of other variables through associations with those styles. Therefore, their article argues that a better understanding of social meaning in cognition provides an important base upon which to advance research on sociolinguistic perception.

Although all of the articles in this issue of RELIN fall under the perception umbrella, they also employ other terms to refer to the interpretation of social meanings linked to sociolinguistic production, such as "(social) evaluation" and "attitudes". These notions are certainly all associated with one another, but, in practice, the term "perception" seems to be used more and more frequently (including in the articles in this issue) to refer to subjective reactions to stimuli that contain or are organized according to specific variables, which the participants in the experiment are either not aware of or are led to not consciously focus on. This is particularly evident in the experiments carried out by Canever and Mendes, Lillelund-Hurst *et al*. and Oushiro, in which the matched-guise technique was utilized, among other reasons, as a method to access associations between linguistic forms and social meanings without asking direct questions to the speakers-hearers (though it should be noted that Oushiro and Lillelund-Hurst et al. did start with and open-ended questionnaire, in order to obtain vocabulary that would later be converted into relevant scales for their second, matched-guise experiment). In addition, although Vaughn and Kendall did not perform a perception experiment per se in asking speakers to attend to their production of (ING) but then analyzing how they employed other variables, the speakers were not directed towards employing certain variables of particular variants. Thus, their approach is indicative of methods that can distract the speakers-hearers involved in an experiment from the linguistic variables being focused upon.

In contrast, Freitag's article addresses subjective reactions to linguistic data that were obtained in a verbal-guise experiment consisting of near-minimal pairs of isolated words that did not undergo manipulation. All participants listened to all stimuli – defined by (t,d) variation – and rated them categorically (ugly/beautiful; quick/slow etc), and it is likely that the listeners become more and more aware – as they proceed through the task – of the variable(s) being studied. Thus, this could be a particularly

useful method when the variable of interest is below the level of consciousness (in the terms of LABOV, 2001). Similarly, the data analyzed by Mendonça and Araujo were acquired by directly asking speakers what they thought about all four linguistic forms. The authors were particularly interested in descriptions and variable vocabulary volunteered by the students that participated in the research, and their methodology directly and clearly elicited attitudes associated to linguistic forms. Since speakers might refrain from uttering what they actually "think" about a certain variant, especially when there is stigma or prejudice involved, further work could utilize perception strategies to address this possibility. In the case of Carreão's article, he does not focus on particular variables when asking his speakers "Do you think Louveira has an accent of its own?". However, speakers might simply say "yes" or "no" even when they're not sure. Building on Carreão's work might include employing methodologies that would seek to elicit speaker's evaluation about accented speech by utilizing stimuli containing the variables of interest in ways that would not guide their attention to such variables.

These issues are particularly eloquently stated by Campbell-Kibler (2010, p. 2), in her overview of research on language attitudes, social evaluation and sociolinguistic perception:

> A common concern in attitudes research (…) is the distortion that may occur as a result of conscious manipulation on the part of respondents, for example in order to adhere to social constraints against articulating negative judgments. To elicit responses that participants are unwilling or unable to describe consciously, verbal guise and matched guise techniques have been developed. (…) While listeners are still consciously evaluating the stimuli, they are evaluating specific individuals, relieving them of the social task of conveying an attitude toward an entire group. The differing evaluations of the guises are then taken to reflect participants' attitudes toward the varieties employed and the group associated with them. This connection is assumed to be particularly strong in matched guise work, where the use of the same speakers across guises ensures some level of consistency of paralinguistic cues.

In studying local social evaluations of New York City English, Labov (2006) seems rather radical for the time in his considerations about directly asking speakers about what they think of linguistic variables (especially phonetic ones):

> Most reactions to phonological variables are inarticulate responses (…). They occur as part of an overall reaction to many variables. There is no vocabulary of socially meaningful terms with which our informants can evaluate speech for us. We therefore need to proceed not by direct questions, but by eliciting some kind of evaluative behavior that is sensitive enough to reflect the influence of many variables, and is subject to quantitative measurement. Direct questions are almost useless. (…) Direct questions will tap the reactions of only a handful of exceptionally articulate middle class speakers.

However, it is undeniable that metalinguistic discourse developed by speakers in reference to specific variables are not just revealing of potential social meanings (even when speakers have difficulty referring to specific variables or variants), but also useful for further work that implicitly tests associations between forms and types of speakers, personae or characteristics. Take, for example, Oushiro's (2015) analysis of São Paulo speakers' comments in their answers to the question "What do you think of this way of speaking: *Meu, você tá entend[ejn]do o que eu tô diz[ejn]do?* 'Dude, are you understanding what I'm saying?' The pronunciation of nasal /e/ (indicated as [ejn] here) was purposely and particularly emphatic, in all 118 interviews that she analyzed. Yet, only 2 of the speakers specifically referred to such pronunciation, recalling a characterological figure known as *patricinha* – a type of hyper feminine, frivolous girl who is considered to spend too much time on her looks and on aspiring to a higher social class (similar to the North American stereotype of the "valley girl"). The great majority of the interviewees did not reference that pronunciation in their responses, instead making comments on (i) the use of vocative *meu* as something very particular to São Paulo speakers; (ii) the reduction of *está* and *estou* to *tá* and *tô*, respectively; and (iii) the reasons for being asked such question (as an expression of worry about whether one is being understood).

These evaluations are in line with results of production analysis: the diphthongization of nasal /e/ (41% in a sample 7,235 tokens) is favored in the speech of women, higher classes and in the deployment of careful styles (OUSHIRO, 2015). Both the distribution of data in the community (considering the representativeness of the sample) and the speakers' metalinguistic comments (or lack thereof) on nasal /e/ constitute fairly strong evidence that the variable functions below São Paulo

speakers' level of consciousness. Based on these findings, Mendes (2016) designed a matched-guise experiment in which the stimuli were organized according to nasal /e/ (as a diphthong or a monophthong). Four speakers were listened to by 44 respondents in one of their guises, and then were rated in various scales (including femininity and Paulistanity – the quality of sounding like a genuine speaker from São Paulo). In addition, listeners could also pick out traits that they thought were useful in describing the images that they had formed of the speakers, based on what they heard – among which was the term *patricinha*. Mendes's analyses of the listeners' ratings showed a significant effect of nasal /e/ on how feminine one of the female speakers sounded – but not the other, who in turn sounded significantly more or less like a genuine São Paulo speaker depending on the guise (differently from the former). Thus, femininity and Paulistanity can be considered as social meanings (potentially) associated with diphthongized nasal /e/, integrating the indexical field of the variant – although São Paulo speakers are frequently unable to make any metalinguistic comment on the variable when directly asked about it. Furthermore, very few of the listeners marked the characteristic *patricinha* on the perception form, suggesting that, although this was a comment volunteered by two of Oushiro's interviewees, the relationship between nasal /e/ and such a characterological figure is likely not strongly enregistered in the community (AGHA, 2007).

In sum, the research of social meanings associated to linguistic forms can utilize several methods: (i) asking subjects to provide metalinguistic commentary about variables; (ii) inferring them from practices in a certain community; (iii) applying experiments that carefully avoid directing listeners toward specific variants. In addition, we can also ask speakers to produce certain variables, while our analysis of such production will also look into other variables that they conjointly end up using (as in Vaughn and Kendall, this issue). The second method listed above would probably be more efficient in communities of practice, rather than in a larger community (considering that sampling methods of speech in a larger community usually do not include the observation of actual practices). Metalinguistic commentary, though very useful to help verify if a variable is "above the level of conscience", may yield speakers' attitudes and ideologies (which may be the actual goal of a certain study, as in Mendonça and Araujo, this issue), rather than actual social meanings that they operate with in their practices. As for perceptual

experiments, although they can certainly help us figure out which social meanings integrate the indexical field of a variable or variant, they are not necessarily efficient in testing for meanings that would only arise locally, in particular practices. In isolation, none of these methods are sufficient and our research on language attitudes, social evaluation of linguistic forms and sociolinguistic perception should strive to take advantage of all of them.

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Kappa statistic for judgment agreement in Sociolinguistics

Estatística Kappa para concordância de julgamento em Sociolinguística

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Abstract: Perception studies have required the development of new techniques, as well as new ways of analyzing data. This paper discusses the proposal of Kappa statistic for the measurement of agreement amongst judgments in perception tests. The analysis deals with data obtained from a subjective reaction test focusing on the variable pronunciation of /t, d/ as stops or affricates in Aracaju, Sergipe, Brazil, considering aesthetic, rhythmic, and dialectal factors. Kappa statistic shows aspects of the inter-rater agreement and reliability that can explain how the linguistic change is driven in the community. This type of analysis also allows to account for, in a perception study, the sex/gender bias observed in production. Results suggest that Kappa-statistics is a tool that can improve the explanatory power of perceptual studies in Sociolinguistics.

Keywords: Sociolinguistic perception; statistic tools; inter-rater agreement; /t,d/ palatalization.

Resumo: Estudos de percepção têm demandado o desenvolvimento de novas técnicas, assim como novas formas de analisar os dados obtidos. Este texto discute a proposta do teste Kappa para a aferição da força de convergência de julgamentos em testes de percepção. A análise é realizada com dados obtidos em um teste de reação subjetiva quanto à realização variável de /t,d/ em Aracaju, Brasil, considerando fatores estéticos, rítmicos e dialetais. A estatística Kappa mostra aspectos da concordância e da confiabilidade entre os avaliadores que podem ser usados para explicar como a mudança linguística se dá na comunidade. A análise também permite identificar em um estudo da percepção o viés de sexo/gênero observado nos estudos de produção. Os resultados mostram que a estatística Kappa é uma ferramenta que pode ampliar o poder explanatório dos estudos de percepção em Sociolinguística.

Palavras-Chave: Percepção sociolinguística; ferramentas estatísticas; concordância de juízes; palatalização de /t,d/.

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Introduction

Since the earliest work in sociolinguistics, studies of linguistic production have paid attention to methods of data collection and analysis. To overcome the observer's paradox (LABOV, 1972), in which the act of observation itself works against obtaining the most casual speech styles, strategies were developed to gather linguistic data during observation. The large samples of production data constituted through sociolinguistic interviews have led to the development of appropriate mathematical models for quantitative analysis. For example, the study of variation of post-vocalic /r/ in department stores in New York City was initially explored through percentages (LABOV, 1972, 2006) and afterwards through logistic regression (PAOLILLO, 2002) and decision trees (EDDINGTON, 2010; TAGLIAMONTE; BAAYEN, 2012). Each approach has contributed to methods of quantitative analysis currently used in the study of production data.

However, although subjective reaction tests have been conducted since the early studies of sociolinguistics (SHUY, 1969), the same consideration has not been given to methods of quantitative analysis in the study of perception: there is little agreement about the most appropriate statistical method and studies commonly use percentages, as they did in the earliest production studies.

This paper proposes a new quantitative approach to the analysis of data collected in perception studies in sociolinguistics. Its goals are: 1) to explore the concepts of reliability and agreement in judgment tests (as in subjective reaction test, for example), considering inherent inter- and intra-rater variance; 2) to present Kappa as a statistical technique to quantify variability in judgment tests; and 3) to reanalyze a previous dataset using the Kappa statistic.

Quantitative approach to perceptual studies in Sociolinguistics

Perception studies in sociolinguistics try to answer questions about the social meaning of variants and the role of speakers in linguistic change, usually in order to inferred a certain change direction from the data. When participants answer questions as "Does this person sound "ugly" or "beautiful"?" or "Does this person sound "quick" or "slow"?", answers are not necessarily consensual: if all participants answer "quick", or "ugly", there is consensus, and some type of change may be regarded as complete, at least at the level of awareness. However, in processes of inceptive change, variability in answers is expected, and identifying the extent of agreement in answers provided by the participants can help to interpret the direction of change. The extent of agreement also enables identification of sex/gender, dialectal, educational, or other social or cultural biases that drive variant choices. For example, women (or educated or urban participants) may attribute more positive values to one variant than men (or non-educated or rural people).

One technique to account for the extent of agreement is measuring the percentage of judgments, which is easy to calculate and interpret. However, percentages do not take into account differences in agreement that may result from random variability or chance. Studies of patterns of judgment in other fields such as psychology, education and medicine have adopted a more robust measurement, the Kappa statistic, a metric of inter-rater agreement that takes into account the effect of random variability. In this paper, I propose adopting this method for perception studies in sociolinguistics. I will begin by considering the concepts of reliability and agreement in psychometrics before detailing the Kappa statistic and its application to perceptual studies in sociolinguistics.

Reliability and agreement

Measurements of agreement among listener judgments need to consider inter- and intra-rater patterns, which relate to the concepts of **reliability** and **agreement**. Reliability concerns the relative consistency of measurements, be it a test or a scale. Reliability differs from agreement, which concerns the convergence of ratings, that is, consensus in responses. In other words, reliability refers to consistency of judgement, while agreement is about consensus among judges.

This approach considers intra-rater reliability (the consistency of ratings by the same rater at different times) and inter-rater reliability (the consensus of ratings by independent raters) (LEBRETON; SENTER, 2008). That is, the inter-rater agreement refers to the absolute consensus in scores provided by multiple judges for one or more targets, while intra-rater agreement refers to the absolute consensus in scores by a same rater at different times.

Measuring reliability and agreement in perception studies can help to outline the effects of demographic differences between groups of raters (inter-rater agreement), and raters' consistency in their own ratings (intra-rater reliability). Kappa is a statistic measure that permits to show and test reliability among multiple raters for categorical data, a common situation in subjective reaction tests.

The Kappa statistic

Kappa (**κ**) is a statistical coefficient that measures the degree of agreement and reliability between two raters who classify each subject in a rating scale. The Kappa coefficient was introduced by Cohen (1960), who considered only two raters and a nominal scale. A later version of Kappa (Fleiss's Kappa), labeled a Kappa-like statistic or the Kappa statistic (POSNER *et al.*, 1990), expanded the number of judges and the type of scale (centered-weighted Kappa). A weighted Kappa (FLEISS; COHEN, 1973) is a measurement of agreement in ordinal data (CHOUDHARY; NAGAJARA, 2017). Thus, the choice of Kappa test depends on the number of raters and whether the ratings are nominal or ordinal, as shown in Figure 1.

FIGURE 1 – Kappa-statistics application

	Scale measure	
Number of raters	**nominal/categorical**	**ordinal**
two raters	Cohen's Kappa	Weighted Kappa
+ two raters	Fleiss's Kappa	

Based on Cohen (1960), the basic assumption of the Kappa statistic is the ratio of the difference between the expected Pr(e) and observed agreement Pr(a), as in (1).

(1) $$\kappa = \frac{Pr(a) - Pr(e)}{1 - Pr(e)}$$

The Kappa coefficient ranges from -1 to +1, where 0 represents the amount of agreement expected from random chance, and 1 represents perfect agreement between raters (figure 2). If Kappa is negative, raters agree with one another less than it would be expected just by chance (which is particularly important in sociolinguistics, as seen below).

FIGURE 2 – Value of Kappa and its interpretation (LANDIS; KOCH, 1977, p. 165)

Value of Kappa	Level of agreement
0.00 – 0.20	None
0.21 – 0.39	Minimal
0.40 – 0.59	Weak
0.60 – 0.79	Moderate
0.80 – 0.90	Strong
Above 0.90	Almost perfect

Fleiss's Kappa (FLEISS, 1971) provides a measure of agreement among three or more raters. The formula is the same as in (1), but in Fleiss's Kappa, Pr(e) is the expected proportion of agreement if the ratings from one trial are independent of the others.

Some other aspects must be considered in adopting the Kappa statistic. First, the rating is measured on a nominal scale, with ordinal or nominal variables, and the response categories are mutually exclusive (that is, no categories overlap). Second, the rating is paired observations of the same phenomenon, which means that all raters assess the same observations. Finally, raters are independent, which means that one rater's judgment does not affect the other raters'.

The Kappa statistic has several applications in research fields where judgment tasks are required. It is also used to measure agreement between classifications made by the same participants on different occasions, between classifications made by different observers, or

between classifications made with different methods. For example, Aman and Szpavowicz (2007) used Kappa to measure consensus between two pairwise judgments that consisted in identifying emotions in texts based on an appraisal framework, which includes attitudes, judgments, and emotions. The procedure consisted in comparing the results of one judge, the specialist who established a reference standard, against three other non-specialist participants, and calculating the mean of agreement with the reference standard in labeling emotion/non-emotion, emotion categories, and emotion intensities. In a famous study about the universality of facial expressions, Ekman *et al*. (1987) also adopted the Kappa statistic in a judgment test that consisted of the selection of one emotion term for each expression, in a set of three expressions per emotion (180 subjects) by 10 raters for each of the 10 cultures.

Carletta (1996, p. 253), who notes the interest of computational linguistics and cognitive science in subjective judgments, claims the Kappa statistic is a uniform measure of reliability:

> Kappa is widely accepted in the field of content analysis. It is interpretable, allows different results to be compared, and suggests a set of diagnostics in cases where the reliability results are not good enough for the required purpose. We suggest that this measure be adopted more widely within our own research community (CARLETTA, 1996, p. 253).

For perceptual studies in sociolinguistics, reliability can be considered as the ratio of true score variance to total variance, and the Kappa statistic measures pairwise agreement among a set of raters making category judgments, correcting for expected chance agreement. Results may be affected by skewed distribution of categories and by the degree of disagreement among raters. The next section provides a hypothetical example of inter-rater agreement in the discrimination of sounds and how the Kappa statistic can address this question.

Explaining the Kappa-statistics

In the process of phonetic transcription, continuous sounds are usually segmented impressionistically. For example, segmenting /t/ and /d/ segmenting is relatively simple, but there are certain cases where the cutoff is subjective, particularly when there is a process of palatalization,

which produces a gradience of sounds (e.g. /t/ and /tʃ/ in Brazilian Portuguese (FREITAG; SOUZA, 2016).

For example, suppose that two transcribers are given a set of 40 sounds that must be transcribed each as non-palatalized (/t/) or palatalized (/tʃ/). Since sounds are inherently grandient, there is no reference standard to judge the transcriptions as right or wrong. Rather, the goal is to identify agreement between transcribers. The results can then provide a reference standard for subsequent transcriptions. In the spreadsheets 1 and 2 in Figure 3, we have different transcribers' decisions and the indication of whether there's agreement between them or not.

FIGURE 3 –Spreadsheets of transcribers' agreement

Spreadsheet 1

	Transcriber 1	Transcriber 2	agreement
sound_1	t	t	√
sound_2	t	t	√
sound_3	t	t	√
sound_4	t	t	√
sound_5	t	t	√
sound_6	tʃ	tʃ	√
sound_7	tʃ	tʃ	√
sound_8	tʃ	tʃ	√
sound_9	tʃ	tʃ	√
sound_10	t	t	√
sound_11	t	t	√
sound_12	t	t	√
sound_13	t	t	√
sound_14	t	t	√
sound_15	t	t	√
sound_16	tʃ	tʃ	√
sound_17	tʃ	tʃ	√
sound_18	tʃ	tʃ	√
sound_19	tʃ	tʃ	√
sound_20	t	t	√
sound_21	t	t	√
sound_22	t	t	√
sound_23	t	t	√
sound_24	t	t	√
sound_25	t	t	√
sound_26	t	t	√
sound_27	t	t	√
sound_28	t	t	√
sound_29	t	t	√
sound_30	t	t	√
sound_31	t	t	√
sound_32	t	t	√
sound_33	t	t	√
sound_34	t	t	√
sound_35	t	t	√
sound_36	tʃ	tʃ	√
sound_37	tʃ	tʃ	√
sound_38	tʃ	tʃ	√
sound_39	tʃ	tʃ	√
sound_40	tʃ	tʃ	√

Spreadsheet 2

	Transcriber 1	Transcriber 2	agreement
sound_1	t	t	√
sound_2	t	t	√
sound_3	t	t	√
sound_4	t	tʃ	X
sound_5	t	tʃ	X
sound_6	tʃ	tʃ	√
sound_7	tʃ	tʃ	√
sound_8	tʃ	tʃ	√
sound_9	tʃ	tʃ	√
sound_10	t	t	√
sound_11	t	t	√
sound_12	t	t	√
sound_13	tʃ	t	X
sound_14	tʃ	t	X
sound_15	t	t	√
sound_16	tʃ	tʃ	√
sound_17	t	tʃ	X
sound_18	tʃ	tʃ	√
sound_19	tʃ	tʃ	√
sound_20	t	tʃ	X
sound_21	tʃ	t	X
sound_22	tʃ	t	X
sound_23	tʃ	t	X
sound_24	tʃ	t	X
sound_25	tʃ	t	X
sound_26	tʃ	t	X
sound_27	t	tʃ	X
sound_28	t	tʃ	X
sound_29	t	tʃ	X
sound_30	t	tʃ	X
sound_31	t	t	√
sound_32	t	t	√
sound_33	t	t	√
sound_34	t	t	X
sound_35	t	t	X
sound_36	tʃ	tʃ	√
sound_37	tʃ	tʃ	√
sound_38	tʃ	t	X
sound_39	tʃ	tʃ	√
sound_40	tʃ	t	X

The ideal scenario is perfect agreement, in which transcribers 1 and 2 transcribe all 40 sounds the same way, as in Spreadsheet 1. Both

transcribers agree that 25 tokens in the dataset are alveolar stops and 15 are palatals, yielding a 63% rate of palatalization, and 100% agreement. However, this ideal scenario is unlikely. In Spreadsheet 2, the distribution of rates is equal (transcribers 1 and 2 transcribe half of the tokens into each category), but the transcribers agree in only 25% of the cases.

If the task were to select transcribers, there is no doubt that the transcribers in spreadsheet 1 would be better than the those in spreadsheet 2. In spreadsheet 2, we must identify the transcriber in disagreement, but we cannot do so based only based on the percentage of agreement: one more transcriber must be added, to compare their mean of agreement with the other ones and to decide which of the three transcribers is in disagreement. Identifying the disagreeing transcriber requires the Kappa statistic. First, we transform the data in the spreadsheets to an *n* x *n* contingency table, as shown in Figure 4:

FIGURE 4 –Layout of contingency table for Kappa statistics

		Rater 1		
		1	0	total
Rater 2	1	a	b	g_1
	0	c	d	g_2
	total	f_1	f_2	n

In the table:
a and *d* refer to the number of times of simultaneal agreement of rater 1 and rater 2;
b and *c* refer to the number of times of simultaneal disagreement of rater 1 and rater 2;
f_1 and f_2 refer to the sum of the columns from rater 1 (a + c) and rater 2 (b + d), respectively;
g_1 and g_2 refer to the sum of the rows, from rater 1 (a+ b) and rater 2 (c + d), respectively;
n is the total number of observations.

Second, we calculate the expected agreement Pr(e) and observed agreement Pr(a). The observed agreement is calculated by dividing the sum of the frequencies in the main diagonal cells (*a* and *d*) by *n*, as in (2), and multiplying by 100 to find the percentage of agreement.

(2)

$$Pr(a) = (a + d)/n$$

The expected agreement is based on the assumption that transcription decisions are independent between transcribers. Therefore,

the frequency of chance agreement for a sound to be transcribed as /t/ or /tʃ/ is calculated by multiplying the marginal totals corresponding to each cell on the main diagonal, and dividing by *n*. The proportion of expected agreement is then calculated by summing across chance agreement in these cells and dividing by *n*, as in (3).

(3)

$$Pr(e) = [(f_1 * g_1)/n + (g_2 * f_2)/n)]/n$$

Finally, these results are input to Kappa's formula, in (4):

(4)

$$\kappa = 1 - (1 - Pr(a))/(1 - Pr(e))$$

In the example of spreadsheets 1 and 2, the sum of ratings is shown in Figure 5, where the Kappa coefficient points to two different scenarios: spreadsheet 1 shows perfect agreement, and spreadsheet 2 shows random agreement.

FIGURE 5 –Summarizing spreadsheets of agreement

Perfect agreement

		Transcriber 1		
		t	tʃ	*total*
Transcriber 2	t	25	0	25
	tʃ	0	15	15
	total	25	15	40

Pr(a) = 1
Pr(e) = 0.53
κ = 1
Percent agreement = 100%

Randomly agreement

		Transcriber 1		
		t	tʃ	*total*
Transcriber 2	t	10	10	20
	tʃ	10	10	20
	total	20	10	40

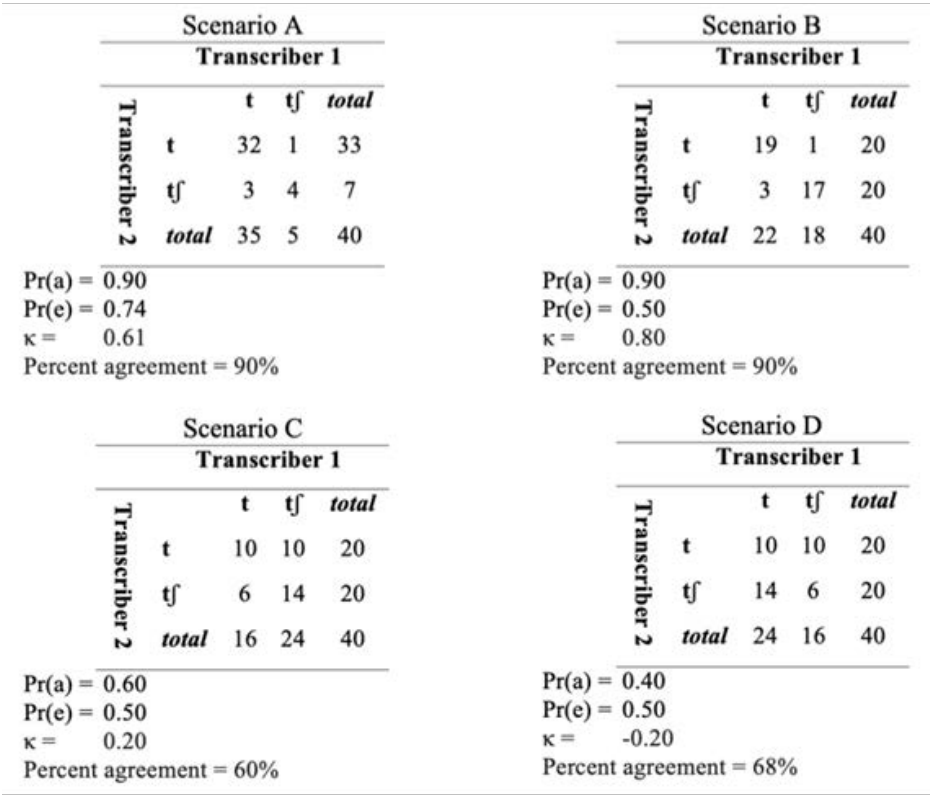
Pr(a) = 0.5
Pr(e) = 0.5
κ = 0.0
Percent agreement = 50%

Obviously, perfect agreement has the highest Kappa coefficient (1.0) and random agreement the lowest (0.0). However, results are not always so obvious as these. Suppose two other scenarios, A and B, shown in Figure 6: both show 90% agreement, but the Kappa coefficients suggest that in scenario B the transcribers exhibit strong agreement ($\kappa = 0.80$), while in scenario A, they show moderate agreement ($\kappa = 0.60$). Comparing results in order to establish a reference standard for

impressionistic transcription of palatalization, scenario B is more reliable than scenario A.

Consider now two other scenarios, C and D. In scenario C, the percentage of agreement is 60% but **κ** = 0.20, suggesting low agreement. In scenario D, the percentage of agreement is 40% and **κ** = -0.20. McHugh (2012) warns that a Kappa coefficient of 0 indicates a serious problem in the data (in this case of transcription, if one transcriber is a specialist and the other is not, for example). A negative Kappa signals that agreement is worse than expected by chance. A large negative Kappa is considered very bad in clinical studies, the most common application of Kappa statistics. However, negative Kappa is particularly interesting for sociolinguistic perception studies as it provides evidence of inter-rater bias and intra-rater consistency.

FIGURE 6 –Four scenarios for agreement between transcribers



Reanalyzing perceptual data with Kappa statistic

The remainder of this paper is devoted to using the Kappa statistic to re-analyze a dataset from another study, the perception of /t/ and /d/ as palatal or alveolar stops in Brazilian Portuguese spoken in Sergipe. Palatalization of /t/ and /d/ may be regressive, triggered by a following vowel /i/ (e.g. *tia* 'aunt', *dia* 'day'), or progressive, triggered by a preceding glide /y/ (e.g. *oito* 'eight', *peito* 'chest').

In regressive contexts, urban dialects in most of Brazil palatalize /t/ and /d/. In some dialects, the alveolar stop is more common, especially among certain social groups. For example, in southern Brazil, alveolar stops are characteristic of descendants of Italian immigrants (BATTISTI *et al*., 2007; BATTISTI; DORNELLES FILHO, 2015), and border areas with Spanish-speaking countries such as Argentina and Uruguay (CARVALHO, 2004; CASTAÑEDA, 2016), or the descendants of immigrants in general (BISOL, 1991). In southeastern Brazil, alveolar stops are interpreted as 'caipira', a term used to refer to people from country-side São Paulo, or as 'nordestino', which refers to people who have immigrated to São Paulo from northeastern Brazil (OUSHIRO, 2017). In both cases, the value associated with the alveolar stop realization is negative. On the other hand, progressive palatalization is less common and highly stigmatized, restricted to certain dialect areas like the countryside of Sergipe (MOTA, 2008, FREITAG, 2015). Production studies in Sergipe have indicated a change in progress (SOUZA NETO, 2008; SOUZA, 2016; CORREA, 2019; FREITAG; SOUZA NETO; CORRÊA, 2019), but these studies do not investigate the social forces driving this process nor how the innovative variant is evaluated by the community.

Perceptions of /t,d/ variation by undergraduate students in Sergipe have been presented in Freitag and Santos (2016), an exploratory study that considered only percentages of responses. The stimuli consisted of a verbal guise based on samples collected in sociolinguistic interviews from the Falares Sergipanos database (FREITAG, 2013), in near-minimal pairs of isolated words that did not undergo phonetic manipulation (LADEGAARD, 2000; DAILEY; GILES; JANSMA, 2005). Judges listened to the stimuli and responded to a series of questions regarding aesthetic, rhythmic, and regional evaluations about speech (cf. CARDOSO, 2015): "Does this person sound "ugly" or

"beautiful"?", "Does this person sound "quick" or "slow"?" Responses were binary, consisting of opposing values such as "ugly"/"beautiful" or "quick"/"slow". The raters were 36 volunteer (18 male and 18 female) undergraduates from the Federal University of Sergipe, who were born and lived in Aracaju, the capital of Sergipe. The rating task was run in PsychoPy v.1.82.01 (PEIRCE, 2007).

The sample of judges is relatively homogeneous: undergraduates of roughly the same age and level of education, who only differed by sex. To expand the analysis beyond percentages, we measured intra- and inter-rater agreement in light of the following questions: Do the observed percentages of ratings match the expected agreement? Do the observed agreement and the percentage of ratings converge? Does the sex of the speaker affect their perceptions?

With 36 raters independently rating all stimuli on a categorical scale, Fleiss's Kappa is the most appropriate measure. Ratings were arranged in a 3-way table matrix, one for each rated feature. The observed and expected frequencies were calculated for Fleiss's Kappa, using the `kappam.fleiss` function (GAMER *et al*., 2012) in the R `irr` package (R CORE TEAM, 2018).

The results are presented in two parts: first, the global results for the sample, comparing the palatal and alveolar stop realizations of /t,d/ in regressive and progressive contexts, and second, the distribution considering sex/gender stratification.

The dialectal distribution and the level of consciousness and stylistic monitoring of the variants recall Labov's (1972) distinction between indicators, markers, and stereotypes. Indicators have no salient variants, with few social or geographic information. Markers and stereotypes carry social, geographic and indexical information, and have a degree of consciousness to emerge within those categories in stylistic variation; while stereotypes are subject to metapragmatic discussion, markers are not.

While regressive palatalization is a sociolinguistic indicator in most of Brazil, previous production studies suggest that in Sergipe this variant is a positive stereotype, since it is evaluated positively and conforms to patterns in the rest of the country, locally viewed as "outside of Sergipe". The rate of /t,d/ palatalization is 12% (SOUZA NETO, 2008; SOUZA, 2016); it is an ongoing change in the community, led by women and by more educated younger, urban people. However, progressive /t,d/

palatalization is considered 'ugly', characteristic of "nordestinos" and people from the countryside. Previous production studies found a rate of 12%, with a decreasing change in the community, characteristic of older, less-educated, non-urban male speakers. These findings suggest that progressive palatalization is negatively stereotyped in the community, which should affect patterns of subjective reaction.

Table 1 presents the results of listener reactions to regressive palatalization (11 subjects, 36 raters, and 396 observations). The mean percentage of agreement for the alveolar stop realization is 61.3% (sd = 0.06), and 65.5% for the palatal realization in all features rated; the range between the global means of the innovative (palatal) and conservative (alveolar stop) realization of /t,d/ in this context is 4.1, which is *quasi*-chance. The Kappa coefficient shows that in this pairwise comparison, the aesthetic feature "beautiful" and the rhythmic feature "quick" present minimal agreement. In other contexts, there is no agreement. The Kappa statistics confirm that regressive palatalization is not stigmatized, since the judges' agreement is close to chance, which means that listeners do not care if /t,d/ are palatals or alveolar stops in regressive contexts (i.e. it is below the level of consciousness). Furthermore, all Kappa coefficients for regressive contexts are statistically significantly different from zero ($p < 0.05$).

TABLE 1 – Percentage of agreement and Kappa coefficient for ratings of regressive palatalization

		alveolar stop /t,d/		regressive palatal /t,d/	
Aesthetic features	pleasant	0.199	62.3%	0.173	68.2%
	beautiful	0.158	52.5%	0.134	61.9%
Rhythmic features	clear	0.314	62.6%	0.212	73.0%
	quick	0.200	65.5%	0.362	62.1%
	not sung	0.015	55.8%	0.127	52.8%
Regional features	region of residence	0.126	68.9%	0.051	74.5%
	Mean		61.3%		65.4%

Table 2 presents the results for listener reactions to progressive palatalization (7 subjects, 36 raters, 352 observations for alveolar stops;

5 subjects, 36 raters, 180 observations for palatals). The range in global mean is 18.1, with 63.9% (sd = 0.02) for alveolar stop realizations and 45.3% (sd= 0.14) for palatal realizations, which indicates that the negative stereotype is perceived by the judges.

TABLE 2 – Percentage of agreement and Kappa coefficient for ratings of progressive palatalization

		alveolar stop		**progressive palatal**	
Aesthetic features	pleasant	0.228	65.5%	0.066	39.4%
	beautiful	0.225	60.7%	0.059	32.8%
	clear	0.229	67.1%	0.306	43.3%
Rhythmic features	quick	0.082	60.7%	0.356	72.2%
	no sung	0.058	64.3%	0.051	51.1%
Regional features	region of residence	0.076	65.1%	*0.025*	32.8%
	Mean		63.9%		45.3%

(*italics* means p > 0.05)

The Kappa coefficient shows that, in this pairwise comparison, the aesthetic feature "beautiful" and the rhythmic feature "quick" present minimal agreement for palatal realization. For alveolar stop realizations, the rhythmic feature "quick" also presents minimal agreement, as do the aesthetic features "pleasant" and "beautiful".

In all other features in both contexts (progressive and regressive), the Kappa coefficient points to 0, which indicates that agreement is not better than chance. Negative values indicate that agreement is worse than chance (0.5, or fifty-fifty). From a sociolinguistic perspective, these results suggest that there is no consensus in the community for these processes of variation.

Despite high percentages of agreement, the Kappa coefficients are at or close to 0, suggesting that positive or negative values of the variants are not picked up on by the raters, or that the raters in the sample are more heterogeneous than assumed.

Tables 3 and 4 separate the results by linguistic context (regressive and progressive) and by sex (the number of raters in each table is half of those in Tables 1 and 2).

TABLE 3 – Percentage of agreement and Kappa coefficient for regressive context ratings and sex/gender raters

		alveolar stop				**regressive palatal**			
		men		women		men		women	
Aesthetic features	pleasant	0.086	58.1%	0.307	61.8%	0.120	61.1%	0.209	74.2%
	beautiful	0.106	50.5%	0.212	54.5%	0.071	55.6%	0.202	68.2%
	clear	0.283	64.2%	0.314	61.1%	0.189	71.7%	0.237	74.2%
Rhythmic features	quick	0.176	66.2%	0.219	65.5%	0.392	67.7%	0.316	56.6%
	not sung	*0.003*	63.6%	*0.008*	48.0%	0.149	61.1%	0.148	44.4%
Regional features	region of residence	0.126	66.7%	0.142	52.5%	*0.040*	77.8%	0050	71.2%
	Mean								

(*italics* means p > 0.05)

TABLE 4 – Percentage of agreement and Kappa coefficient for regressive context ratings and sex/gender raters

		alveolar stop				**progressive palatal**			
		men		women		men		women	
Aesthetic features	pleasant	0.202	63.5%	0.224	67.5%	*0.023*	43.3%	0.081	35.6%
	beautiful	0.186	57.9%	0.239	63.5%	*-0.035*	32.2%	0.147	33.3%
	clear	0.332	68.3%	0.250	65.9%	0.201	43.8%	0.409	38.9%
Rhythmic features	quick	*-0.0002*	56.3%	0.211	65.1%	0.309	74.4%	0.374	70.0%
	unsinging	*0.042*	69.8%	0.067	58.7%	*0.016*	48.9%	*0.039*	53.3%
Regional features	region of residence	*0.058*	69.0%	0.070	61.1%	*0.060*	37.8%	*-0.032*	27.8%
	Mean		61.5%		57.2%		65.8%		64.8%

(*italics* means p > 0.05)

In regressive contexts, the mean of the range between alveolar stop and palatal /t,d/ for female judges (7.6) is higher than that for male judges (4.3). Female judges present more features with minimal agreement (all the aesthetic features and the rhythmic feature "quick", for both realizations). Male judges present minimal agreement only in the aesthetic feature "clear", for alveolar realizations, and in the rhythmic feature "quick", for palatal realizations.

In progressive contexts, again, the mean range for female judges (20.5) is higher than that for male judges (17.4).

In this context, the variants are very different in social value: while the alveolar stop is the unmarked realization (neutral), the palatal is a negative stereotype. It is in this realization that the Kappa coefficients for men and women converge in the limit between minimal and weak agreement for the aesthetic feature "clear" and the rhythmic feature "quick". For the alveolar variant in progressive contexts, female raters present the same pattern shown in regressive context, but the same cannot be said about male raters.

When raters are separated, we get negative Kappa coefficients (despite not being significant; italic values in tables are $p > 0.05$). According to Landis and Koch (1977), a small negative Kappa coefficient should be interpreted as indicative of no agreement.

No agreement seems to be the conclusion for these findings. The range of inter-rater agreement (<0 – 0.40) reaches the beginning of weak agreement. The range between the contexts varies, which allows us to formulate hypotheses about the relationship between the size and the homogeneity of the sample: Do fewer raters yield a higher range? Does the same group yield a higher range? These questions address the sample size effect: how many raters must there be in a sociolinguistic perception study? Following LeBreton and Senter (2008), calculating inter-rater agreement or reliability requires a sample with 10 judges. However, it is not clear whether a sample of 10 is sufficient for sociolinguistic studies (FREITAG, 2018).

Could the direction and strength of (dis)agreement indicate directions of variation? If there is ongoing linguistic change in the community, the pattern in judgments should be in agreement, but that does not always happen.

The Kappa statistic is then a useful tool for perception studies in measuring (non-) agreement among raters, and can be used in combination with other statistic tools to gauge reliability of ratings.

Conclusion

In sociolinguistic perception studies, simple percentages are insufficient to account for variability in judgments between and within raters. The Kappa statistic provides a technique to measure this variability,

based on the assumption that inter-rater agreement reflects the degree to which different raters are interchangeable. The Kappa statistic is not without limitations: it may prove inconsistent if there is strong agreement between raters, since the coefficient assumes lower values than would have been expected (BLOCK; KRAEMER, 1989; FALOTICO; QUATTO, 2015). Furthermore, since Agresti (1989, p. 273) warns that different patterns of agreement can have the same Kappa value, the Kappa coefficient on its own may not account for agreement. The Kappa coefficient is not a measure of reproducibility, but rather of predictive association (DE MAST, 2007) that can be applied in combination with others tests of association, such as Principal Components Analysis (PCA) (WOLD; ESBENSEN; GELADI, 1987). PCA aims at maximizing the amount of variance in the original data in a dataset with fewer variables, each of which is a linear combination of the original variables. If all the raters strongly agree with each other, their ratings should all weigh heavily on a single factor. Thus, despite the minimum agreement expected, the Kappa statistic can be used combined with other statistic tools in order to provide greater reliability of ratings.

Kappa results can be visualized in an agreement chart, which provides a visual representation for comparing the concordance in paired categorical data, like Bangdiwala's agreement chart (BANGDIWALA; SHANKAR, 2013), or the Receiver Operating Characteristic (ROC) curve, a powerful tool for measuring raters' accuracy in binary ratings. In contrast with Kappa, which is a scalar coefficient, ROC is a two-dimensional graph that requires additional transformations (BEN-DAVID, 2008). Thus, the Kappa statistic, when combined with other statistical tools, can contribute to improving the explanatory power of subjective reaction tests in sociolinguistic studies.

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Evaluation of the pronouns 'a gente' and 'tu' and of the grammatical patterns of agreement[1]

Avaliação dos pronomes 'a gente' e 'tu' e dos padrões gramaticais de concordância

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Abstract: We present results of a comparative study of beliefs about (i) the pronominal forms *a gente* ("we") and *tu* ("you") and (ii) the social evaluation of nonstandard verbal agreement with these two pronouns by a group of students from the Federal University of Sergipe (Itabaiana-SE). We discuss the methodological advances in the use of the Iramuteq software, through a multidimensional analysis of beliefs and linguistic attitudes. A survey was designed to measure the attitudes towards the following grammatical patterns: i) *a gente* ("we"); ii) *tu* ("you"); iii) *a gente vivemos* ("we 1PL live 1PL"); and iv) *tu vai* ("you 2SG go 3SG"). The results reveal that the students' perception of grammatical patterns is based on dimensions of standardization and vitality; they attribute two types of social values to the linguistic forms: cultural (common, habitual, strange, normal) and normative (correct, wrong). The form *a gente vivemos* ("we live-1PP") seems to be the only one to which stigma is attached in the community. The results also reveal that the students link these forms to notions of social adequacy both to the interactional context and to the speech community. The analysis

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with Iramuteq represents a methodological advance for perception studies, by enabling comparability between the vocabulary used by the students and the linguistic forms under evaluation, and providing an objective, reliable statistical analysis.

Keywords: grammatical patterns; variation; linguistic attitudes.

Resumo: Apresentamos os resultados de um estudo comparativo entre crenças relativas às formas pronominais *a gente* e *tu* e a avaliação social da concordância não padrão com tais formas por um grupo de universitários da Universidade Federal de Sergipe. A partir de uma análise multidimensional das crenças por meio do Iramuteq, objetivamos discutir as vantagens metodológicas do uso desse software para estudos de atitudes linguísticas. Um questionário foi desenvolvido para mensurar as atitudes acerca dos seguintes padrões gramaticais: i) *a gente*; ii) *tu*; iii) *a gente vivemos*; e iv) *tu vai*. Os resultados evidenciam que a percepção dos universitários em relação aos padrões gramaticais considerados baseia-se nas dimensões de padronização e vitalidade, atribuindo às formas linguísticas dois tipos de valores sociais: cultural (comum, costume, estranho, normal) e normativo (correto, errado). Dentre as formas linguísticas avaliadas, apenas *a gente vivemos* parece carregar estigma na comunidade, com avaliação negativa. Os resultados mostram também que os universitários atrelam o uso dos padrões gramaticais avaliados à noção de normas sociais de adequação ao contexto interacional e à comunidade de fala. A análise com o Iramuteq representa um ganho metodológico para os estudos de percepção, pois, além de permitir a comparabilidade entre o vocabulário utilizado pelos participantes e as formas linguísticas sob avaliação, oferece uma análise estatisticamente sólida, confiável e objetiva.

Palavras-chave: padrões gramaticais; variação; atitudes linguísticas.

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1 Introduction

In Brazilian Portuguese (BP), the second person singular (2SG) may appear as the canonic form *tu* 'you', as in (1), or as the emergent form *você* 'you', as in (2). This type of variation involving subject pronouns in BP is not restricted to the second person of speech, but it also characterizes the first person plural (1PL), which may appear as the canonic form *nós* 'we' (3) or as the emergent pronoun *a gente* 'we' (4).

(1) *Aquela comédia O Alto da Compadecida eu gosto muito dela… Eu acho bem engraçado… assim, é uma estória de eu n*ão sei nem explicar… Andréia… *direito (hes) porque é uma estória engraçada…* né? Tu já assistiu*?*

'That comedy *O Auto da Compadecida* I like a lot... I think it is quite funny… like, it is a story about I can't even explain… Andreia, because it is a funny story, right? Have you watched it?'

Tu já assistiu?

2SG already watch-3SG

(2) *Olha… Geralmente, se tiver um conhecido que lhe indique às vezes você chega lá… aí você tem uma capacidade maior do que o outro mas só porque aquele é mais conhecido… mais isso… acaba contratando o outro e deixando você de fora*

'Look... In general, if there is an acquaintance that suggests your name you sometimes get there… then you are in a greater capacity than somebody else, but only for being more well-known… it's more about that… they end up hiring that other guy and leaving you behind'

Às vezes você chega lá

At time 2SG arrive-3SG there

'Sometimes you get there'

Você tem uma capacidade maior do que o outro

2SG have-3SG a capacity bigger than the other

'You are in a greater capacity than the other'

Deixando você de fora

Leaving 2SG of out

'Leaving you behind'

(3) É porque é assim nós *tá num mundo né… Andréia... que cada vez mais vem aumentando a violência né?*

'It is because it's like that we are in a world, right, Andreia? where violence is increasing more and more, right?'

Nós tá num mundo

1PL be-3SG in-a world

'We are in a world'

(4) *Quando a gente vai entrar aqui na universidade a gente imagina uma coisa totalmente diferente… né?*

'When we are about to enter the university, we have a completely different idea of what it is like, right?'

Quando a gente vai entrar na universidade

When 1PL go-3SG enter at-the university

'When we are about to enter the university'

A gente imagina

1PL imagine-3SG

'We imagine'

(33ent.UFS-Itabaiana2018_desl. II_final_jos.fs.30)[2]

The emergence of *você* and *a gente* as pronominal forms in BP led to linguistic variation/change in the pronominal system of the language. This process also triggered other linguistic phenomena at various language levels (cf. LOPES, 2007), such as subject-verb agreement, which has been the focus of a number of studies over the years (NARO, 1981; BAXTER; LUCCHESI, 1993; LOREGIAN-PENKAL, 1996; SCHERRE; NARO, 1997; NARO; GÖRSKI; FERNANDES, 1999;

[2] These examples were extracted from the speech corpus built by the authors. This data base was composed by 80 sociolinguistic interviews of university students from the Universidade Federal de Sergipe. The codes identify the sociolinguistic interview, indicating the number, the sample (community and year of the recording) and the social stratification of the informant (movement in function of the university, term, initials of the informant, sex, level of schooling, and age respectively).

HAUSEN, 2000; MONGUILHOT; COELHO, 2002; SCHERRE; NARO, 2014; FREITAG, 2016, among many others).

Research about subject-verb agreement in spoken BP has demonstrated that, through a process of gramaticalization, the insertion of these forms into the pronominal paradigm has changed the paradigm of verbal inflection – from six different forms [*eu vivo* ("I 1SG live 1SG"), *tu vives* ("you 2SG live 2SG"), *ele/ela vive* ("he/she 3SG lives 3SG"), *nós vivemos* ("we 1PL live 1PL"), *vós viveis* ("you 2PL live 2PL"), *eles/elas vivem* ("they 3PL live 3PL")] to only two: [*eu vivo* ("I 1SG live 1SG*"),* tu ("you 2SG")/ você ("you SG")/ vocês ("you 2PL")/ ele, ela ("he, she 3SG")/ eles, elas ("they 3PL")/ a gente ("we 1PL")/ nós ("we 1PL") vive ("live 3SG")]. This indicates that "Brazilian Portuguese is in a clear process of loss of verbal inflection" (SILVA, 1998, p. 190). Furthermore, in the expression of first-person plural, the subject-verb agreement may be expressed not only with the omission of *–mos* [*nós vive-Ø* ("we 1PL live 3SG")], but also with /-s/ deletion [*nós vivemo-Ø* ("we 1PL live 1PL"), or with vowel alternation [*nós cantamos ~ cantemos* ("we 1PL live 1PL ~ live 1PL")] (cf. CASTILHO, 1992; PEREIRA; LEHMKUHL-COELHO, LOREGIAN-PENKAL, 2016; PEREIRA, 2018). Differently from the prescribed normative tradition – which considers subject-verb agreement as a categorical rule – this clearly constitutes a variable in non-standard BP (CAMACHO 1993, p. 104). In this article, we will henceforth refer to non-standard 2SG subject-verb agreement as tu-Vø. For the combination between *a gente* and the verb inflected as first-person plural [*a gente vivemos* ("we 1PL live 1PL")], we will use *a gente-Vmos*, which is also non-standard.

The expression of subject-verb agreement is one of the most sociolinguistically salient phenomena for speakers/hearers. Based on distributional patterns, in the expression of first-person plural, for example, the covariation between the *nós*/*a gente* and the presence/ absence of number-person inflection *–mos* '1PL', points to a social stigma towards *a gente*-V*mos*, which is associated with less educated speakers (FREITAG, 2016). *Tu-Vø*, which also diverges from the canonic pattern, is characterized as incorrect in the normative tradition. These forms can then be taken as part of a stigmatized linguistic phenomenon, depending on the indexical meaning attributed to them locally, in the community (OUSHIRO, 2015).

Variable 1PL pronouns (canonic vs. emergent), variable reference to 2SG (tu vs. você), and variable subject-verb agreement are all interconnected as grammatical patterns, and all identified and evaluated by speakers/hearers. According to Cargile et al. (1994), attitudes towards language phenomena relate to the immediate social situation, culturally perceived features, interpersonal histories of the interlocutors and the speaker's and the hearer's social characteristics. Among other culturally perceived features, the degree of standardization and vitality of the variants are significant to the evaluation of grammatical patterns. The standardization is a static dimension related to the compilation of dictionaries and grammar books, as well as the promotion of certain varieties by the social elite and the government. Vitality is a more dynamic dimension and is related to the reach and importance of the variety, as well as the social pressures driving changes in language use (CARGILE *et al*., 1994).

In the linguistic samples from the university belonging to the data base *Falares Sergipanos* (FREITAG, 2013), the expression of the 1PL is very often made with *a gente*, otherwise, non-standard *nós-Vø* and *a gente-Vmos* are infrequent (cf. FREITAG, 2016). The expression of 2SG is more frequently made with *você/cê*, which indicates that this community is part of a subsystem *você/ tu-Vø* (cf. SCHERRE, *et al*., 2015).

Based on these introductory facts, this article poses the following questions: What perceptions and beliefs in relation to the use of pronouns *a gente* and *tu* do university students hold? Do these students' perceptions and beliefs change when these pronouns are employed with non-standard agreement (*a gente-Vmos, tu-Vø*)? How do they evaluate these patterns in reference to beliefs about use, metalinguistic judgment, region, education and prejudice?

In order to answer these questions, we interviewed 60 students from the Federal University of Sergipe, in Northeastern Brazil, using a questionnaire to assess their opinions and attitudes towards *a gente* and *tu*, as pronouns, and *a gente-Vmos* and *tu-Vø* as non-standard subject-verb agreement structures. These questions are displayed and justified in section 3, after a brief overview of what we consider key theoretical standpoints for our analysis (section 2). In the remaining sections, we analyze the data we collected, with the Iramuteq software – an interface of R, used for multidimensional analysis of texts (CAMARGO; JUSTO, 2013).

Hypothetically, the students' beliefs about *a gente* are more positive than those related to *tu,* considering how frequent *a gente* is. On the other hand, the use of *tu-Vø* would be less negatively evaluated, differently from *a gente-Vmos*. We also expect that the students believe they use *a gente-Vmos and tu-Vø*, and that they associate these forms with people at lower levels of education and who live in specific regions of the country. In addition, we also look into whether they consider that people who use these grammatical forms are subjected to prejudice.

2 Linguistic attitudes and perception of linguistic variables

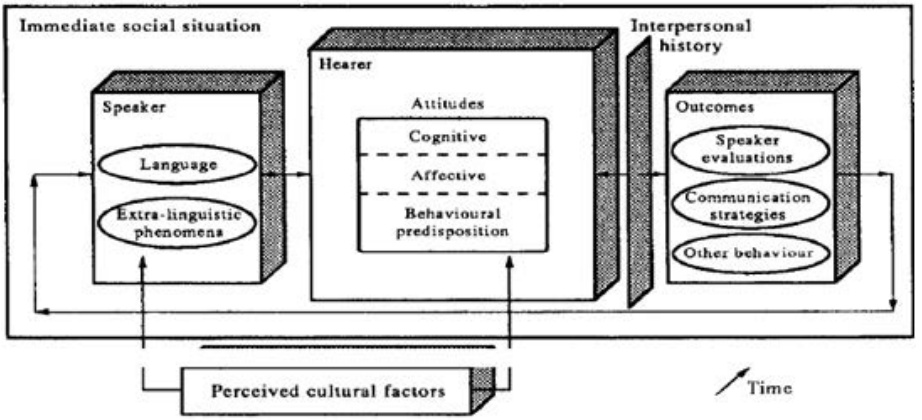
Language variables are subject to social evaluation; positive or negative values are more or less consciously attributed to them. The social meanings relating to linguistic behaviors encompass the salience of the variant on three levels: structural, distributional, and socio-cognitive (FREITAG, 2018). However, structural and distributional salience do not always reflect the social perception of the phenomenon. For instance, linguistic facts with high frequency in a community may not be marked from the social point of view. Only variables that are salient from a socio-cognitive perspective tend to be consistently indexed to specific social profiles.

Linguistic attitudes comprise beliefs, feelings, and actions (cognitive, affective, and behavioral dimensions respectively) (GARRETT, 2010). Beliefs are socially formed from intergroup relationships and from linguistic and social experiences. Considering the cognitive dimension of linguistic attitudes, beliefs are also formed through formal education. The affective dimension of attitudes consists of the resulting emotions of the contacts with linguistic varieties. There is an interrelation between the cognitive and affective dimensions, since beliefs may interfere with the feelings towards a certain linguistic variant (CARGILE *et al*., 1994). The behavioral dimension of linguistic attitudes relates to the actions which come from beliefs and feelings towards a linguistic variant. This dimension may also be influenced by other factors related to the current social norms in the community.

Based on these considerations, Cargile *et al*. (1994) developed a model of linguistic attitudes as a social process. As shown in Figure 1, this model takes into account various components: linguistic attitudes, the

immediate social situation, cultural factors, the interpersonal histories of the interlocutors, and the social characteristics of hearers and speakers. The immediate social situation has consequences for linguistic attitudes because negatively evaluated linguistic forms in one social situation may be positively evaluated in another.

FIGURE 1 – Model of linguistic attitudes as a social process



Source: CARGILE *et al*., 1994, p. 214.

Linguistic attitudes are also subject to political, historical, and economical realities – cultural factors that are part of the macro-context of the interactive situation. In this macro-context, there are two interrelated dimensions, as we mentioned in the introduction: standardization and vitality.

Standardization is related to the influence of normative instruments in the coding, adoption, and promotion of a linguistic variety. It is a static dimension, defined by grammar handbooks and dictionaries, as well as by the linguistic norms disseminated by the socioeconomic elite, the government, the media and the school.

On the other hand, vitality is a more dynamic dimension of the social-structural context. It is related to the reach and importance of a linguistic variety and to the social pressures directing changes in language use. This dimension is formed by speakers' status (economic, social, political, and historical), by the demographic force of the linguistic

variety, and also by the institutional support for the maintenance of the linguistic variety.

The perception of these two dimensions by speakers and hearers contributes to the constitution of linguistic attitudes towards a variety. These concepts were initially developed in reference to multilingualism (STEWART, 1968), but they also apply to the evaluation of variants inside a linguistic variety, since standardization and vitality contribute to the prestige or stigma of a variant.

Along with the dimensions of standardization and vitality, the social norms established by social groups offer a basis for linguistic judgements. In other words, evaluations of linguistic behaviors reflect the status, prestige, or adequacy with which they are conventionally associated within a given speech community.

The interpersonal histories of interlocutors enable a reduction of uncertainty in interaction: hearers have expectations about the forms and linguistic styles that speakers will use in specific contexts. In more familiar situations, the stereotypical readings are set aside in deference to individual interpersonal histories. Therefore, conventional attitudes are more likely to affect the behavior of hearers in contexts of lower familiarity (CARGILE *et al*., 1994, p. 223).

The social characteristics of speakers and hearers also affect the process of developing linguistic attitudes. The way a speaker is perceived is important in determining the linguistic attitudes of the hearer. For example, ethnicity, region, gender and age of the speaker may interact with linguistic behaviors to produce different evaluative reactions. The hearer's affiliations to social groups also interact with the speaker's attributes, yielding distinct linguistic attitudes. Therefore, Cargile et al. (1994) propose that hearers' interpretations of their own social identities can be considered as a variable in the process of forming linguistic attitudes.

Linguistic attitudes also suggest communication strategies, for instance, processes of linguistic accommodation, characterized by the realignment of patterns of codes and selections of language related to beliefs, attitudes, and underlying social-structural conditions (GILES; COUPLAND; COUPLAND, 1991).

The development of linguistic attitudes as a social process affect and is affected by various elements in a virtually infinite and

recursive way (CARGILE *et al*., 1994). The study of linguistic attitudes is extremely important for sociolinguistics because it enables analyses of the emergence and endurance of group stereotypes, individuals' position within social groups, and relationships between individuals and between different groups (GARRETT; COUPLAND; WILLIAMS, 2003), contributing to the understanding of social factors involved in the processes of variation and linguistic change.

In addition to the various factors involved in linguistic attitudes, their analysis itself requires methodological rigor. The Iramuteq software enables multidimensional analysis of texts, and transforms qualitative data into quantitative information. The Correspondence Factorial Analysis (CFA) performed by Iramuteq enables the graphic representation of beliefs about linguistic variants, which represents an advance for the study of linguistic attitudes, to the extent that it permits a more objective analysis.

3 Methodological procedures

In order to collect data regarding beliefs about *a gente* and *tu*, and about non-standard agreement with the pronouns, we prepared a questionnaire composed of five evaluation parameters: i) students' beliefs about their own linguistic use; ii) judgements about *a gente*, *tu*, *a gente-Vmos* and *tu-Vø*; iii) relations between the linguistic forms and the student's regional origins; iv) perceptions about the influence of education in the use of these forms; and v) linguistic prejudice related to these forms. The questionnaire consisted of 20 yes-no and open questions, five per linguistic form, as Chart 1 displays. Data were collected individually, through an audio recording of the informants' answers.

CHART 1 – Attitude questionnaire

1-	Do you say *a gente*?
2-	What do you think about saying *a gente*?
3-	Do you think that saying *a gente* is typical anywhere in Brazil? Where?
4-	Do you think that saying *a gente* has anything to do with one's level of schooling? Why?
5-	Do you think that people who say *a gente* are subject to prejudice? Why?
6-	Do you say *a gente vivemos*?
7-	What do you think about saying *a gente vivemos*?
8-	Do you think that saying *a gente vivemos* is typical anywhere in Brazil? Where?
9-	Do you think that saying *a gente vivemos* has anything to do with one's level of schooling? Why?
10-	Do you think that people who say *a gente vivemos* are subject to any prejudice? Why?
11-	Do you say *tu*?
12-	What do you think about saying *tu*?
13-	Do you think that saying *tu* is typical anywhere in Brazil? Where?
14-	Do you think that saying *tu* has anything to do with one's level of schooling? Why?
15-	Do you think that people who say *tu* are subject to any prejudice? Why?
16-	Do you say *tu vai*?
17-	What do you think about saying *tu vai*?
18-	Do you think that saying *tu vai* is typical say anywhere in Brazil? Where?
19-	Do you think that saying *tu vai* has anything to do with one's level of schooling? Why?
20-	Do you think that people who say *tu vai* are subject to any prejudice? Why?

We contacted 60 students from the Federal University of Sergipe, stratified according to sex (30 women and 30 men). Beliefs about each form in relation to regional factors, education, and linguistic prejudice were gathered from the yes-no questions. The students' perceptions in relation to region, education and prejudice were observed both through their responses to yes-no and open questions. Evaluations on the pronominal forms and their respective non-standard agreements were obtained through open questions.

For the responses to yes-no questions, we performed a frequency analysis in R. Other answers were transcribed, edited, and submitted for lexical analysis through the Iramuteq software[3] – an interface of R, used for multidimensional analysis of texts (CAMARGO; JUSTO, 2013). Editing the texts consisted of a thorough proofreading, and incorporating a command line for each answer (indicating the informant, the informant's sex, and the linguistic form).

From statistic calculations based on vocabulary, Iramuteq reorganizes the structure of a text or set of texts. To measure students' beliefs about *a gente*, *tu*, *a gente-Vmos*, and *tu-Vø*, we performed a Correspondence Factorial Analysis (CFA), considering four textual *corpora*, according to: i) evaluation of the forms; ii) perception related to region; iii) perception related to level of schooling; and iv) prejudice. The CFA generates a graphic representation relating the vocabulary to the selected variable for analysis.

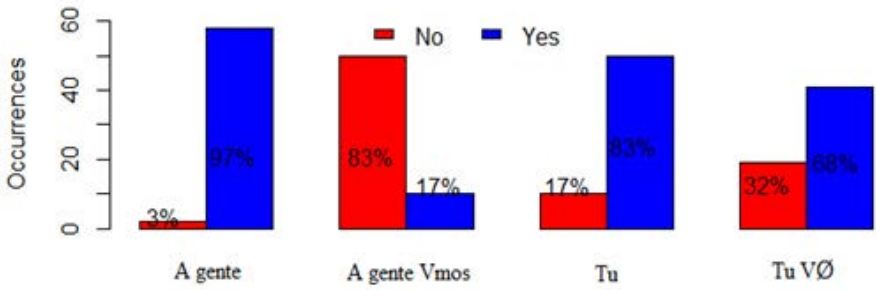
From a contingency table set at a minimum frequency of 10, the CFA presents the intersection between the vocabulary used by the students to express their beliefs and the linguistic variable. We calculated the error in correlation between the terms used in the answers and the linguistic forms. In addition to CFA, we also performed a Specification Analysis of the terms "custom", "wrong", and "strange", used by the students to characterize the linguistic forms. The Specification Analysis associates terms with characterization variables, indicating the strength of a certain term for each variant of the characterization variable. In the next sections, we present and discuss the results of our analyses.

4 Student's beliefs about their uses

Graph 1 brings the distribution of the students' responses about whether they use the forms being focused here. The form *a gente* is the most frequently used by them (97%). Only two students stated that they do not say *a gente*. This clearly indicates that *a gente* is part of the linguistic norms of the community, as far as 1PL pronouns go. However, non-standard agreement (*a gente-Vmos*) is negatively evaluated by 83% of the students.

[3] Available for download at: www.iramuteq.org.

GRAPH 1 – Students' beliefs about their own linguistic usage



As for *tu* and *tu-Vø*, we found positive beliefs both for the pronoun (83%) and non-standard agreement (68%). Despite the 15-point percentage difference, this indicates an overall positive evaluation for both forms, in contrast to *a gente* vs. *a gente-Vmos*. These data suggest that, even though *a gente-Vmos* and *tu-Vø* are both non-standard agreement forms, they are quite differently evaluated by the students, with *a gente-Vmos* being stigmatized in the community.

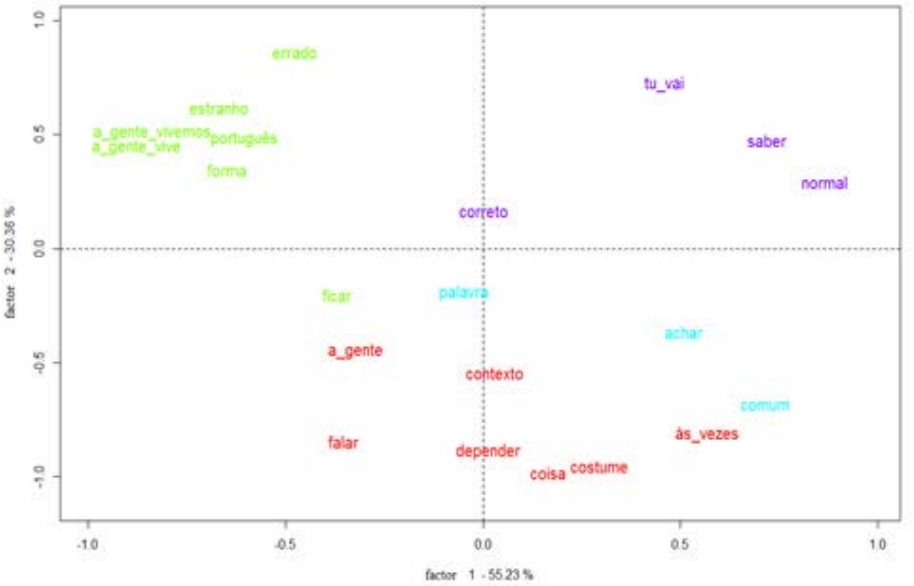
5 Students' evaluations and social meanings

Students' judgments about *a gente*, *tu*, *a gente-Vmos,* and *tu-Vø* were accessed through the question: "what do you think about saying (this form)?". CFA was performed on words with a minimum frequency of 10 occurrences in the *corpus.* Figure 2 crosses the vocabulary used by the students and the linguistic variable with the score calculation by hypergeometric law. We considered the correlation between factor 1 (x-axis) and factor 2 (y-axis) for presenting the results in a factorial plan,[4] with the following color code: red (*a gente*), light blue (*tu*), green *(a gente-Vmos*) and purple *(tu-Vø*).[5]

[4] Figures 2, 3, 4 and 5 follow this configuration: representation by correlation – factor ½ and without overlay.

[5] Through CFA, Iramuteq automatically generates two graphics, the first one with the vocabulary distribution in the factorial plan and the second one with the position in the plan of the selected variable factors for analyses. The interpretation must take into account graph representations.

FIGURE 2 – CFA of the judgement of the linguistic forms



According to Figure 2, saying *a gente,* in the students' perceptions, is a context-based act (*contexto*) and a custom (*costume*), as excerpts (5) and (6) below illustrate. On the other hand, *tu* is a word that students consider as common (*comum*), as in (7). In regard to *a gente-Vmos*, the students used terms wrong (*errado*) (8) and strange (*estranho*) (9), and they also mention the form considered correct (*correto*): *a gente vive* (with standard agreement) (10), (11). Finally, the terms associated with *tu-Vø* were *normal* ("normal") (12) and *correct* ("correto") (13).

(5) I think that, at least in my case, it depends on the context, depending on what I will say (...). (Informant 22)

(6) *A gente* is custom, it is a matter of custom, sometimes people say it without realizing. (Informant 14)

(7) For me, it is common, it is common. The same thing as saying *você* is saying *tu* to me. It is common for me, it is common (Informant 22)

(8) I think it is wrong to speak like this. (Informant 24)

(9) I think everyone has the right to speak like they want, but not me, I think it is strange. I am not going to criticize anyone because they speak like this, but not me. (Informant 8)

(10) *A gente vivemos* is, for example, a sentence. *A gente vivemos* in a capitalist world, this sentence could be used, but then I think that it is not wrong, considering the context, it depends… there are rules in the Portuguese according to which some words are not permitted. (Informant 42)

(11) This is a little bit more wrong than *a gente*, like...*a gente vivemos* because I think that if we get *a gente*, *a gente* will get in *nós,* not *nós vive*, it is *a gente vive*, it is difficult if you get and put *a gente* next to *nós*. I do not even know how to say, depends on how you want to combine the words, *a gente vivemos* do not seem to agree, *a gente vivemos*... on the other hand, *nós vivemos* in an incredible way, but *nós vive, nós vive* it is impossible, no…*nós vive*… no, *nós vivemos* it is ok, *a gente vive, a gente vive* it is also ok. I think that *nós* and *a gente* it is wrong, it is wrong. (Informant 31)

(12) I think it is funny, but normal. (Informant 40)

(13) I believe it is correct. (Informant 24)

These results indicate that students' perceptions about the four forms are based on the dimensions of standardization and vitality, since the terms they use attribute two types of social values to the linguistic forms: cultural value (common, custom, strange, normal) and normative value (correct, wrong). The pronouns *a gente* and *tu* were evaluated through the cultural prism, while the non-standard agreement forms were judged either from the cultural or the normative points of view, but with distinct values. *A gente-Vmos* was negatively evaluated and associated

with the cultural value *strange* and with the normative value *wrong*. On the other hand, the *tu-Vø* was referred to with the cultural value *normal* and to the normative value *correct*. Similarly to the students' beliefs about their own usage (presented in Graph 1), here we have stigma attached to *a gente-Vmos*.

The distribution in Figure 2 reveals the correlation between factor 1 (first-person plural and second-person singular) on the x-axis and factor 2 (the pronominal forms) on the y-axis. As can be seen, the opposition between the first-person plural and the second-person singular accounts for 55.23% of the variance in the terms used by the subjects to express their judgment, while the y-axis opposes the pronominal forms and the standard agreement, showing a variance of 30.36%. The total variance of vocabulary in Figure 2 is 85.59%.

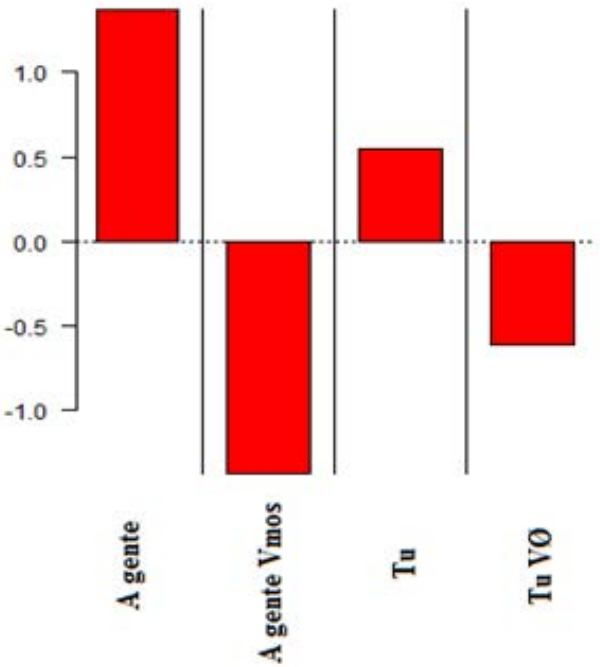
Table 1 summarizes the results of a specificity analysis of the words which were more representative in terms of social meaning of the evaluated linguistic forms. The scores represent the index of correlation between the terms and the linguistic forms. Higher positive values indicate a higher probability of correlation, while the negative values indicate a low probability of the word being associated to the factor.

TABLE 1 – Specificity analysis according to the linguistic form

Term	**A gente**		**A gente Vmos**		**Tu**		**Tu VØ**	
	Score	Freq.	Score	Freq.	Score	Freq.	Score	Freq.
Context	2.642	8	-0.8555	1	-0.9493	0	-0.3635	1
Custom	1.3702	8	-1.3741	1	0.5458	4	-0.6089	1
Commom	0.3982	6	-0.6404	3	0.4172	4	0.2382	3
Wrong	-1.7423	11	2.6077	28	-1.3773	6	0.6246	13
Strange	-2.1691	2	3.6402	16	-0.5543	3	-0.469	3
Normal	-1.5729	15	-9.0555	2	3.5078	26	5.1198	28
Correct	0.4643	11	-0.2489	9	-0.8827	3	0.533	7

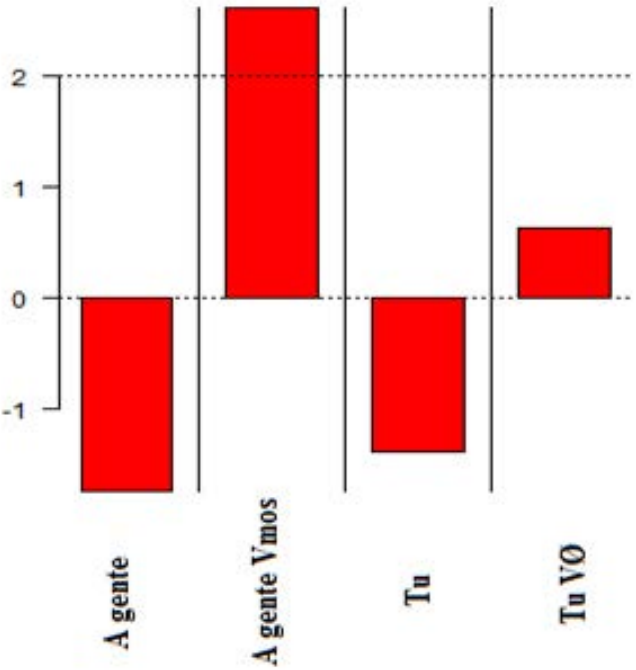
The correlations between the words used by the students and the linguistic forms suggest two further evaluations: pronouns vs. agreement forms and neutral/positive vs. negative value. A Specification Analysis of the three most representative terms – *custom*, *wrong* and s*trange* – yields the results presented in graphs 2, 3, and 4 respectively.

GRAPH 2 – Specification Analysis of the term custom



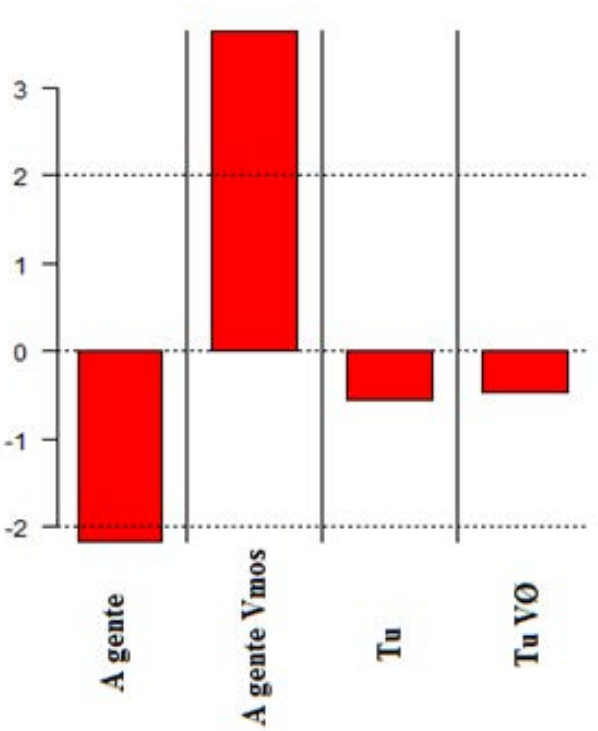
According to Graph 2, the use of the term *custom* distinguishes the pronominal forms from their respective agreement forms, with this term being positively associated with *a gente* and *tu,* but not with non-standard *a gente-Vmos* and *tu-Vø*. The correlation with the first-person plural forms is stronger, both positively form *a gente* and negatively for *a gente–Vmos*. The correlation for for *tu* (positive) and *tu-Vø* (negative) is weaker.

GRAPH 3 – Specification Analysis of the term wrong



Specification Analysis of the term *wrong* (Graph 3) also distinguishes the pronominal forms from their respective non-standard agreement forms, with positive values for *a gente-Vmos* and *tu-Vø*, and negative values for *a gente* and *tu*. This indicates that while forms of agreement are evaluated with a normative bias, the pronouns are not subject to the same type of social evaluation, confirming the CFA results presented in Figure 2. The strongest correlation with *wrong* is for *a gente-Vmos*.

GRAPH 4 – Specification Analysis of the term *strange*

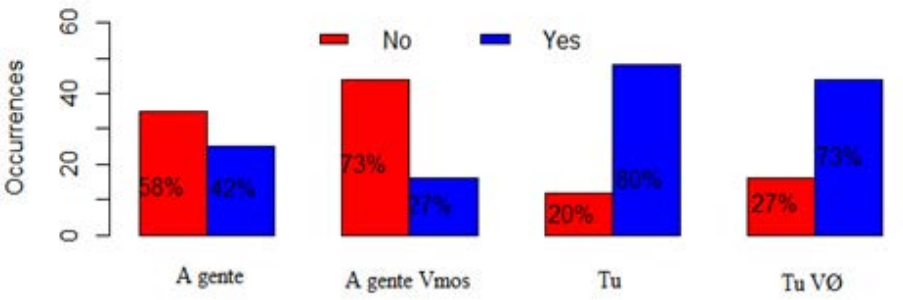


Finally, according to Graph 4, the analysis for *strange* reveals a strong correlation with *a gente-Vmos*, indicating a negative social value, while it is not strongly associated with the other three forms.

6 Region

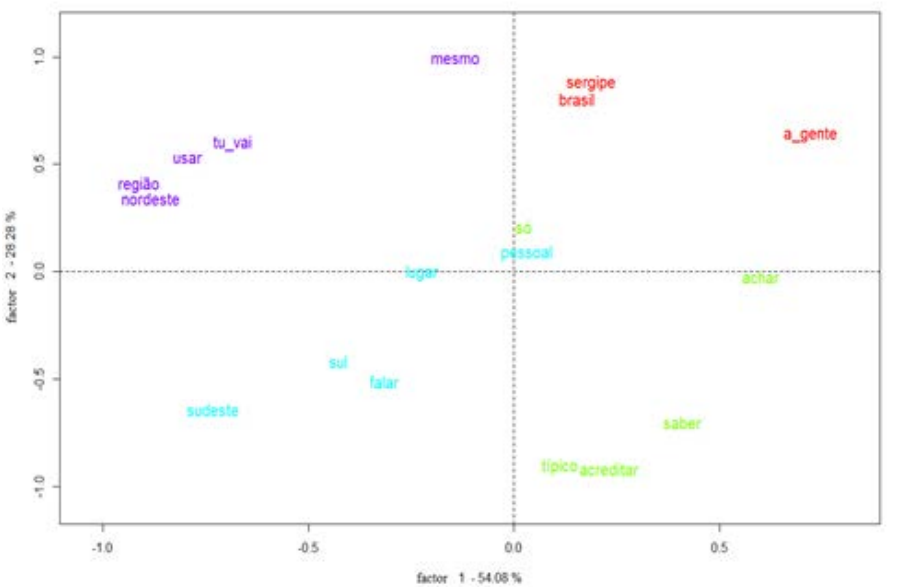
Graph 5 shows that the students do not relate *a gente* and *a gente Vmos* directly to a specific region, with negative responses for regionality of 58% and 73%. Conversely, *tu* and *tu-Vø* are seen as regional.

GRAPH 5 – Students' responses for region



The answers to the question "Do you think that this way of speaking is typical anywhere in Brazil?" were analyzed through CFA. The results are displayed in figure 3 with *a gente* in red, *tu* in light blue, *a gente-Vmos* in green, and *tu-Vø* in purple.

FIGURE 3 – CFA of responses for region



The students perceive *a gente* as typical of both Sergipe and all of Brazil. This parallels sociolinguistic studies of production which reveal that the use of *a gente* in spoken BP is very frequent all over the country (VIANNA; LOPES, 2015). In contrast, *tu* was associated by the students with Southern and Southeastern Brazil. Sociolinguistic research does indicate high rates of *tu* in southern Brazil (cf. LOREGIAN-PENKAL, 2004), but not in the southeast (cf. CALMON, 2010). They did not associate *a gente- Vmos* with a specific region, but placed *tu-Vø* in Northeastern Brazil.

As for the distribution of terms in the factorial plan, the factor 1 (x-axis) opposes the second-person singular (left plan) and the first-person plural (right plan), accounting for 54.8% of the variance of terms used by the students to characterize the linguistic forms, with regard to region. Factor 2 is responsible for 28.28% of the variance of the answers; however, it does not indicate that the pronominal forms are opposed to the non-standard agreements, differently from the CFA presented earlier, in figure 2. In addition, here the distribution of terms in the y-axis occurs from the perspective of belonging, i.e., belonging to Brazil, Northeastearn Brazil, and Sergipe.

Table 2 summarizes the specificity analysis of regions identified by the students.

TABLE 2 – Specificity analysis according to the linguistic form

Term	**A gente**		**A gente Vmos**		**Tu**		**Tu VØ**	
	Score	Freq.	Score	Freq.	Score	Freq.	Score	Freq.
Brazil	0.5951	5	-0.5895	1	-0.2469	4	0.2658	4
Sergipe	1.1148	6	-1.1157	0	-0.3958	3	0.3221	4
Northeast	-0.8366	8	-0.3888	7	-0.3623	13	1.4026	18
South	-2.4274	1	-0.9476	2	2.8349	16	0.3559	8
Southeast	-1.3826	0	0.2154	2	0.6563	5	0.4733	4

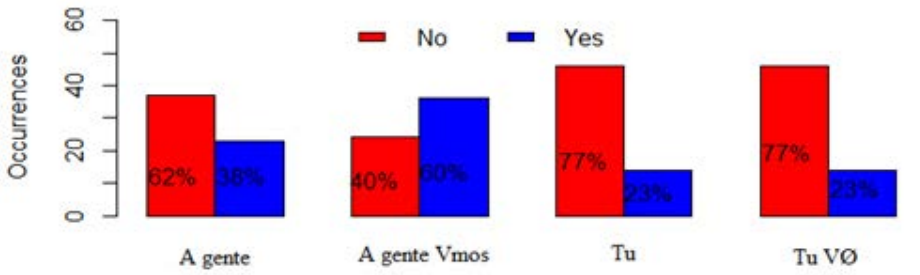
The terms students used, which are highlighted in the factorial plan, attribute the *tu* and *tu-Vø* to specific regions of the country, while

a gente was associated both to Brazil and to Sergipe, the state where the participants are from. Although *a gente-Vmos* was not associated with any specific region in the factorial plan, the specificity analysis evidences a correlation with the Southeast.

7 Education

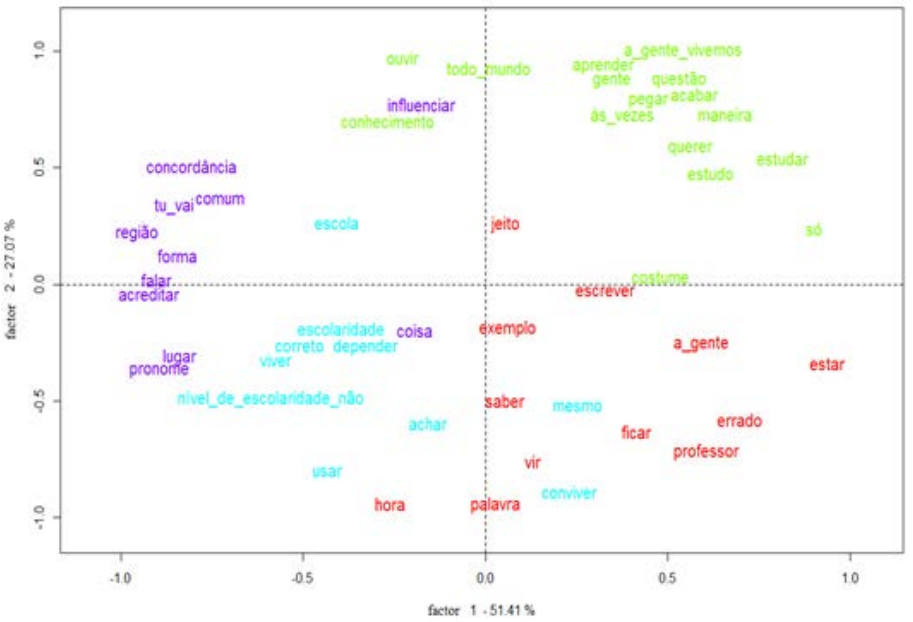
Sociolinguistic studies have demonstrated that, depending on the linguistic phenomenon, education may condition the use of specific variants, thus promoting or preventing a specific linguistic change (VOTRE, 2008). Here, we analyze the students' responses for: "Do you think that the use of (this form) has anything to do with one's level of education?".

GRAPH 6 – Students' responses about the relationship between the linguistic forms and education



Graph 6 reveals that, among the four forms, *a gente-Vmos* was the only one associated with education by the students. Figure 4 shows the CFA results for the responses given by the students about the relationship between the linguistic form and education.

FIGURE 4 – CFA of responses for education



The correlation between factors 1 and 2 explains 78.48% of the variance of terms used by the students in their answers. Factor 1 (x-axis) opposes 2SG (left plan) to 1PL (right plan). This factor accounts for 51.41% of the variance. Factor 2 (y-axis), which accounts for 27.07% of the variance, opposes non-standard agreement (superior plan) to the pronominal forms (inferior plan). The proximity between the terms in the factorial plan evidences a representation of the connections among the words in the *corpus*. The terms agreement (*concordância*), *tu vai*, and common (*comum*) are close to one another, suggesting that *tu Vø* is common in participants' perception. Similarly, the terms region (*região*), form (*forma*), speak (*falar*), and *believe* (*acreditar*) are correlated in the *corpus*, which indicates that students consider that *tu-Vø* is a way of speaking linked to the regional factor.

Figure 4 shows that *a gente* is correlated to the terms like way (*jeito*) and hour (*hora* – representing the moment in which one speaks). Words related to formal education, like knowledge (*conhecimento*), wrong (*errado*), write (*escrever*), and teacher (*professor*) were also associated to this pronominal form. These correlations reveal that students relate *a gente* to the formal education as well as to demands and needs of the communicative event. The form *tu* (in light blue) was associated with terms such as correct (*correto*), life with (*conviver*), live *(viver)*, and with "to think it has nothing to do with education*"* (*achar que não tem a ver com a escolaridade*).

The form *a gente-Vmos* (in green) was related to terms like knowledge (*conhecimento*), study (*estudo*), learn (*aprender*) (all linked to the role of education), and to hear (*ouvir*) and a custom (*costume*). For *tu-Vø* (in purple), the terms most frequently used were: region (*região*), place (*lugar*), agreement (*concordância*), common (*comum*) and "to believe it is a form of speaking*"* (*acreditar que é uma forma de falar*). These terms evidence the lack of relation between *tu-Vø* and education.

Except for the terms associated to *tu-Vø*, which associate that form with region, the other terms in the factorial plan recall two semantic fields: the influence of linguistic contact and social linguistic contexts (custom, listening, life, utterance situation) and school terminologies (writing, correct, wrong, learning, professor). Table 3 presents the words with the strongest association with each linguistic form, vis-à-vis the students' perceptions in terms of the influence of education in the use of the variants.

TABLE 3 – Specificity analysis according to the linguistic form

Term	**A gente**		**A gente Vmos**		**Tu**		**Tu VØ**	
	Score	Freq.	Score	Freq.	Score	Freq.	Score	Freq.
Wrong	1.3072	17	-0.2902	10	-0.3116	6	-1.1604	4
Writing	0.9975	6	-0.2087	3	-0.9535	0	-0.2525	2
Professor	0.5975	5	-0.2087	3	0.4983	3	-1.176	0
Non-schooling level	-1.3222	1	-1.8893	0	2.4328	7	0.882	5
Depend	-1.7548	4	-0.4552	7	2.4314	12	0.3114	7
Level of Education	-0.6786	2	-0.2643	3	0.8088	4	0.2981	3
Study	0.458	15	0.9672	16	-0.693	5	-0.7998	6
Knowledge	-2.1581	2	0.9538	10	0.3551	5	0.5963	7
Listening	-1.1115	4	0.9538	10	-0.7852	2	0.8872	8
Region	-1.0483	1	-0.8662	1	0.2096	2	2.4973	7
Common	-0.5311	5	-0.6092	4	-0.6189	2	2.1375	10
Agreement	-0.9152	1	-0.3687	2	-0.3592	1	2.0175	6

In general, the results show that *a gente* was not associated, by most university students, to education – although they do talk about it in terms of writing, as in (14). Note that, in this example, the informant is concerned with subject-verb agreement, not focusing the pronominal form itself. This is the reason why, sometimes, the term wrong (*errado*) was mentioned by the speakers in their answers about education. These results parallel those obtained from the yes-no question about whether educations interferes with pronoun choice (Graph 6), as well as with results of production studies (FRANCESCHINI, 2011; MENDONÇA, 2012; FOEGER, 2014; SCHERRE; NARO, 2014). As for *tu* and *tu-Vø,* they were not linked to the speaker level of education: the first was commented on with "it depends on custom" ("depende do costume") as in (15); the second was associated to regionality (16).

(14) Because it is not wrong to say *a gente*. I do not think it is wrong to say *a gente*. Now, writing *a gente*... not *a gente vai*, you have to contextualize the sentence to consider it correct because it is not the word that is wrong… yes, also because if you write *agente* ("agent"), what kind of *agente* ("agent") it is? It is a person that provides a service. But if it is *a gente,* you have to contextualize with the sentence to make sense also because *nós vai* is it correct? *N*ós is beautiful, it is a pronoun to more than one person, but not *nós vai,* it is wrong, so *nós vamos*…then it is correct. And *a gente* you can also combine in the sentence to make sense. (Informant 02)

(15) No, I think it is going to depend on the custom where the person lives and people around her. (Informant 52)

(16) Also no, because it will depend on the region that the person lives. (Informant 36)

Students' perceptions of *a gente-Vmos* follow two directions: they reaffirm the importance of education (17) and of interaction (18).

(17) Because, like, to us, the correct is to say *a gente vive,* I think that most people say *a gente vive*, I think that there is a minority that says *a gente vivemos*, so I think there is a similarity when you say *a gente vivemos*, I believe that when I hear *a gente vivemos* it is wrong because I hear *a gente vive* a lot. (Informant 29)

(18) I do not think so, depends on the reality of the place, what is common to that region is what the population, most people will learn. Because we learn at school how to speak correctly, but we hear so much on streets, at work, *a gente vai*, the mind starts to get used to say the wrong expression. (Informant 03)

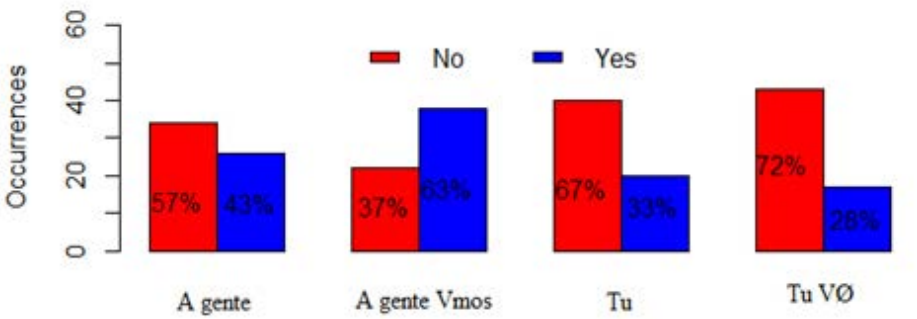
These results about *a gente-Vmos* and education are in line with the studies about subject-verb agreement that demonstrate how important the role of schooling is in these processes of variation and change (cf. FREITAG, 2016). It is worth to highlight that, for *tu* and *tu-Vø*, most

students did not mention education, contrarily to sociolinguistic studies that have been advocating for the significance of this factor (LOREGIAN-PENKAL, 1996; LOREGIAN-PENKAL, 2004; MODESTO, 2006; FRANCESCHINI, 2011).

8 Prejudice

There are linguistic phenomena that are subject to social stigma, often resulting in linguistic prejudice and social discrimination (BAGNO, 2009). Analyzing this issue is the goal of our question: "*Do you think that people who say (this form) are subject to any prejudice? Why?*"

GRAPH 7 – Students' responses for prejudice



Graph 7 shows that, according to the students, only people who say *a gente-Vmos* are subject to prejudice (63% answered yes). Note that this is not the case for the pronoun *a gente* (43% yes). Here too, we display the CFA results for words used to explain the perception about prejudice associated to the four forms.

FIGURE 5 – The CFA of the perception of the factor prejudice

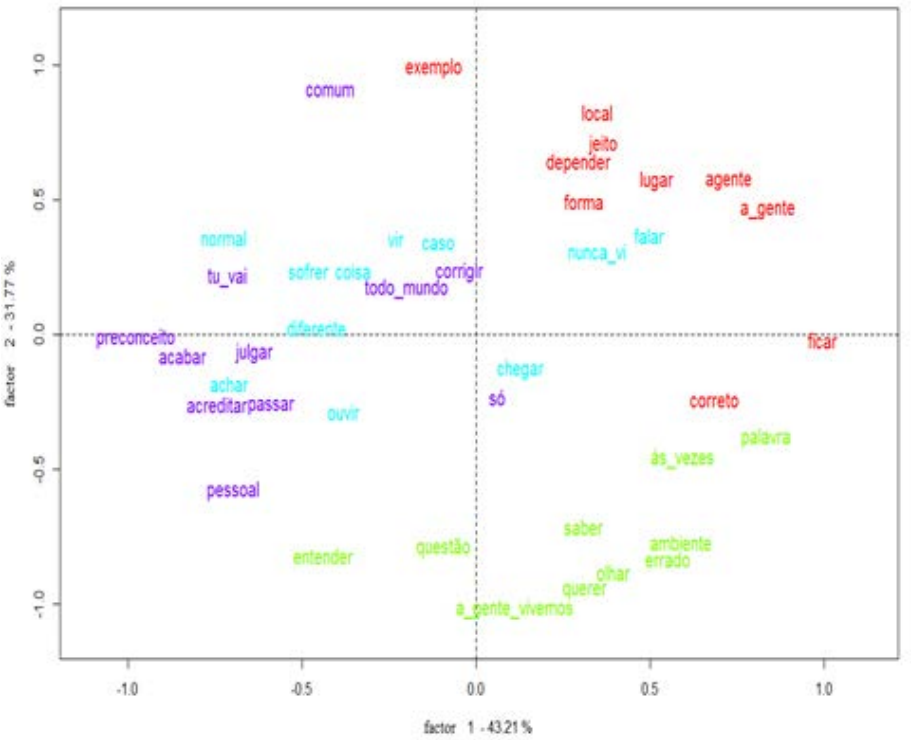


Figure 5 shows that the students described *a gente* with the words like way (*jeito*), local (*local*), place (*lugar*), and correct (*correto*), which are not linked to notions of prejudice. Similarly, when talking about *tu*, the expressions "I have never heard*"* (*nunca vi falar*), normal (*normal*) indicate that the students are not aware of prejudice in relation to that pronoun.

As for *a gente-Vmos*, the students use the terms wrong (*errado*), understand (*entender*), know (*saber*), situation (ambiente), which can be related to prejudice. For *tu-Vø*, they used expressions like common (*comum*), "everybody corrects it*"* (*todo mundo corrige*), to judge (*julgar*), and to believe (*acreditar*). Even though these are more related to the

emergence of prejudice, graph 7 shows that the majority of students believe that people who speak *tu-Vø* are not subject to prejudice.

Here, Factor 1 (x-axis) is based on the opposition between 2SG and 1PL, and accounts for 43.21% of the variance in the terms employed by the students. Factor 2 did not establish a clear opposition among *tu* and *tu-Vø*, since the terms attributed to them are considerably close and to the center of the factorial plan. However, we have a clear opposition between *a gente-Vmos* and the other forms: the terms associated with *a gente*, *tu* and *tu-Vø* are close to one another and far from those that describe *a gente-Vmos***.**

Table 4 shows a specificity analysis of the most frequent terms used by the students in their responses about prejudice.

TABLE 4 – Specificity analysis according to the linguistic form

Term	**A gente**		**A gente Vmos**		**Tu**		**Tu VØ**	
	Score	Freq.	Score	Freq.	Score	Freq.	Score	Freq.
Agent	6.1476	11	-1.4456	0	-1.2362	0	-1.2783	0
Depend	1.1023	15	-0.728	7	-0.6898	6	0.4044	10
Local	1.0642	6	-0.8562	1	-0.3336	2	0.2529	3
Normal	-0.7291	4	-0.6108	4	0.8918	8	0.5542	7
Different	-0.6002	2	-0.2595	3	0.8205	5	-0.1949	3
Have never seen	0.2906	4	-0.2595	3	0.4696	4	-0.4176	2
Wrong	0.4126	17	2.8024	25	-1.0974	8	-1.9204	6
Understand	-1.5453	1	1.3107	8	-0.6567	2	0.7298	6
Know	0.313	17	1.2076	21	-1.2663	8	-0.3254	13
Jugde	-0.5139	3	-0.2265	4	-0.5871	2	1.2439	7
Prejudice	-1.5512	22	-0.4163	27	0.6651	29	1.1848	33
Common	0.3004	6	-1.7266	1	0.5353	6	0.7832	7

Prejudice was related to *a gente,* but in reference to writing it as one word: *agente* 'agent', as in (19). *A gente-Vmos* was described as *errado* 'wrong' and linked with linguistic prejudice (20). The terms most frequently used to talk about *tu* were *normal* 'normal' (21) and *diferente* 'different' (22). Finally, *tu-Vø* was related to *julgar* 'judge', as in (23).

(19) I think that people who write *agente* suffer [prejudice] because they do not know how to write, they write everything together, *agente*, and *agente* is a person from CIA, a guy from the police, anyway. (Informant 56)

(20) If you are in a place where people think it is wrong, you will suffer prejudice and people will give you the look, but if you are among people who do not mind, I think nothing wrong will happen, like, let's say with prejudice. (Informant 07)

(21) No, because I think that something like that is so normal... I have never seen anyone complain that they suffered prejudice because he said *tu*. (Informant 17)

(22) Someone suffers, suffers, suffers, because they suffer prejudice because people will give them the look, like, "look that stupid person", I do not know. People have prejudice to what is different, with people who speak differently. (Informant 37)

(23) They suffer because people think that it is wrong. I think that the language, I mean, the language has nothing to do with the writing or the grammar. People judge a lot because if...if people spoke according to grammar, they would not be able to speak, it is hard, everybody will judge anyway. (Informant 54)

The specificity analysis shows that all four forms can actually be subject to prejudice, a *gente-Vmos* is the most frequently talked about in terms of prejudice by the students – which parallels what we have seen with Graph 7 and Figure 4.

9 Final Remarks

The aim of this study was to analyze university students' beliefs about the pronouns *a gente* and *tu*, as well as about non-standard agreement with these forms. The students are from the Federal University of Sergipe (Campus Professor Alberto Carvalho, Itabaiana-SE), and the analyses were done with the Iramuteq software. The methodological contribution to perception studies is in the relationship between the vocabulary used by the students to express their beliefs and the linguistic variants evaluated. Describing such relationship in statistical terms was enabled by Iramuteq, which also permitted Correspondence Factorial Analysis: comparisons between beliefs related to each linguistic variant, which provides objectivity and reliability (in addition to replicability).

We designed an attitude questionnaire composed of five evaluation parameters: beliefs about usage, metalinguistic judgment, region, education, and prejudice. The students' beliefs about their own linguistic behavior indicate a high frequency of acceptance of *a gente* and *tu*, suggesting that these variants are part of the linguistic norms of the community. In addition, students' beliefs about *a gente* had a higher percentage of positive answers in comparison to those regarding *tu*, confirming our hypothesis.

Although *A gente-Vmos* and *tu-Vø* are both non-standard forms of subject-verb agreement, they were given different social values by the students. The first is frequently negatively evaluated, while the second was described rather positively, showing that only *a gente-Vmos* is stigmatized in the community.

Concerning the metalinguistic judgment of the four forms, the students' perceptions were based on the dimensions of standardization and vitality. The pronouns *a gente* and *tu* were both evaluated through the cultural prism, while the non-standard agreement forms were differently judged. *A gente Vmos* was associated with the cultural value *strange* and with the normative value *wrong*. *Tu-Vø* was described as *normal* and *correct*. These results for metalinguistic judgments confirm our initial hypothesis.

As for perceptions of region, *tu* and *tu-Vø* were associated to specific regions of the country. *A gente* was generally associated with Brazil and with the participants' home state of Sergipe. On the other hand, *a gente-Vmos* was not linked to any particular region. These results

confirm our hypothesis only partially, since we expected that students would associate both *a gente-Vmos* and *tu-Vø* with specific regions of the country.

The results also indicate that the majority of students did not correlate the use of *a gente* to (lack of) education, differently from *a gente-Vmos*. Moreover, students also consider that *custom* is as relevant as education for the use of *a gente-Vmos*. Differently, the students did not associate *tu* and *tu-Vø* to education. This result does not correspond to earlier sociolinguistic studies, which have evidenced the influence of education on the use of these forms. Therefore, our hypothesis for *tu-Vø* was not confirmed. Finally, the students generally linked all four forms to prejudice – but particularly *a gente-Vmos*.

Overall, the students' beliefs are based on three elements of the model of attitude as a social process: their own social characteristics, the social-structural dimensions of standardization and vitality, and the established social norms of the community. When expressing their beliefs about *a gente, tu, a gente-Vmos and tu-Vø*, they express both beliefs formed throughout their years of education and normative practices of the community (such as frequency of use of the forms, the social profile associated with a certain use, and the context in which the uses are acceptable or negatively evaluated). This study provides, then, a methodological contribution as ways of measuring beliefs about grammatical structures and of considering the social process involved in the emergence of such beliefs.

Authors' contribution

This paper is part of the authors' ongoing doctorate research advised by Professor Raquel Meister Ko. Freitag. The two authors selected and discussed the theoretical framework, designed the methodology, and gathered and transcribed the data used in the research. The theoretical section on Linguistic Attitudes was written by the first author. The other sections were jointly written by both authors.

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Linguistic evaluation and variation: accent marks in the opinion of Louveirenses

Avaliação linguística e variação: marcas de sotaque na opinião dos louveirenses

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Abstract: Linguistic evaluation is portrayed and explored in sociolinguistic studies in various ways (e.g. LABOV, 2008 [1972]; KROCH, 1995). In this paper, we discuss the ways in which speakers are asked, in sociolinguistic interviews, about their perceptions and evaluations of accent: what the speakers understand by this term and how the opinion about their own accent can be correlated to the production of linguistic variables. Firstly, we compare how these questions are asked in three studies of Brazilian Portuguese (BARBOSA, 2002; OUSHIRO, 2015; CARREÃO, 2018). Secondly, we focus on data about Louveira (a city in the countryside of São Paulo state, but rather close to the state capital, also named São Paulo), which shows a correlation between opinions on accent and the production of two linguistic variables: (i) (t,d) followed by [i] – variably pronounced as dental stops [t, d] or africates [tʃ, dʒ]; and (ii) coda (-r) – variably pronounced as retroflex [ɻ] or tap [ɾ]. Louveira's less common variants ([t, d] and [ɾ]) correlate in production to accent evaluation by the speakers. Considering that accents tend to be ranked in comparison to one another (see BARBOSA, 2002), we discuss how the opposition "capital vs. countryside" is operationalized in Louveira. The cities that exert the greatest influence on speakers also determine which values (positive or negative/stigmatized) are attributed to certain linguistic variants.

Keywords: linguistic evaluation; accent; socioeconomic changes; linguistic variation.

Resumo: A avaliação linguística é retratada e explorada de diferentes maneiras em estudos sociolinguísticos (como em LABOV, 2008 [1972]; KROCH, 1995). Neste trabalho, coloca-se em pauta a maneira pela qual é possível perguntar aos falantes sobre suas percepções e avaliações linguísticas em torno da noção de "sotaque": o que os

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falantes entendem por esse termo e como a opinião sobre seu próprio sotaque pode se correlacionar à produção de variantes linguísticas. Para tanto, em um primeiro momento verificamos como são feitos esses questionamentos em três trabalhos sociolinguísticos acerca do português brasileiro (BARBOSA, 2002; OUSHIRO, 2015; CARREÃO, 2018). Em um segundo momento, concentramo-nos em dados sobre a cidade de Louveira (no interior do estado de São Paulo, mas próxima à capital), que revelam correlação entre a opinião sobre sotaque e a realização de duas variáveis linguísticas: (i) (t, d) diante da vogal [i] – cujas variantes são dentais (t, d) ou africadas [tʃ, dʒ]; e (ii) a realização de (-r) em coda silábica – cujas variantes são o retroflexo [ɻ] ou o tepe [ɾ]. As variantes menos comuns no município ([t, d] e [ɾ]) estão correlacionadas à opinião dos falantes sobre sotaque. Considerando-se que um sotaque é sempre classificado em comparação a outro (segundo BARBOSA, 2002), interessa verificar como a oposição "capital vs. interior" opera em Louveira. As cidades que exercem maior influência sobre os falantes são aqueles que, aparentemente, ditam o valor e o estigma atribuídos a determinados traços linguísticos.

Palavras-chave: avaliação linguística; sotaque; mudanças socioeconômicas; variação linguística.

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1. Introduction

In light of speakers' opinions about accent ("*sotaque*" in Brazilian Portuguese, henceforth BP), this paper analyzes two variables – (t,d) before [i], as dental stops or africates, and coda (-r), as tap or retroflex – employed by speakers in Louveira (a small city in the countryside of São Paulo state, next to Campinas and to the state capital). Louveira is a city where migrants from Northeastern Brazil and Italian immigrants' descendants have established. The city is connected to other locations by important state highways, and the area is known for its many multinational companies as well as agricultural fields. Home to few more than 44,000 inhabitants, it used to be an agricultural location, which has changed to a big logistics center and is nowadays seen as the richest city in Brazil in terms of per capita income (G1 2012; PRATES, 2014). We explore the relationship between Louveira's speakers notions of accent and their variable pronunciation of coda (-r) and (t, d) followed by [i]. The data analyzed were extracted from 25 interviews, stratified by gender,

age (18 to 29; 30 to 45; and 46 to 60 years old), and place of residence (new or old neighborhoods in the city). Age group is an important social variable as it encompasses speakers who lived through different stages of the city's development: those who are the oldest lived during the political emancipation of Louveira; those whose age range from 30 to 45 years old are the ones who lived during the economic shift of the city (from plantations to big companies and factories); and the youngest Louveirenses are the ones who were born in an already wealthy and industrialized city. Louveira was a rather encapsulated city, which opened economically to others as the years went by. This gradual connection to other places and people has meant that Louveirenses have gotten more frequently in contact with other language varieties. Therefore, it is important to check what these speakers, in each age group, consider as an accent mark – if we are to use this as a reference point to analyze the variables aforementioned in their sociolinguistic production. In one of the sociolinguistic interviews in this sample, speaker IE17[1] states (CARREÃO, 2018, p. 81):

IE17 *Louveira não tem sotaque porque a gente é muito mesclado*
'Louveira has no accent because we are very mixed'

Since there are many companies and factories in Louveira, there are also many people visiting from nearby cities (such as São Paulo, the state capital, and Campinas). Statements regarding this "blend" as an accent nullifier are certainly not particular to Louveirenses. In the cities of Brasília (Brazil's capital) and São Paulo, which are much bigger than Louveira and characterized by many varieties in contact, their speakers commonly refer to how mixed their cities are, in terms of "people from everywhere". In her dissertation about spoken BP in Brasilia, Barbosa (2002, p. 57) gives examples of similar statements as the one made by our informant in Louveira, as in:

A22G *Em Brasília tem gente de tudo quanto é canto do Brasil*
'In Brasília there are people from all around Brazil'

[1] IE stands for *Informante Entrevistado* 'interviewed informant' and the number corresponds to the order in which the interviews were collected.

One of Oushiro's (2015, p. 10) informants states something similar, when talking about speakers in the city of São Paulo:

> ROMULO S. M3MC: porque isso aqui... draga as pessoas não tem como... e e eu acho que as pessoas acabam/ tem um um amálgama aí né um... sabe uma uma uma junção de todos os sotaques veio junto que faz uma sopa... e e todo mundo entra nessa sopa chega uma hora que você acaba tomando essa sopa... do so/ dos sotaques todos que é um/ que vira o sotaque paulista entendeu... que é uma mistura que tem uma coisa bastante misturada né
>
> ROMULO S. M3MC: because this here... drags people there's no way around that ... and I think people end up/there's a a blend right?… you know like a a gathering of all accents together which makes a soup… and and everybody gets into that soup and it gets to a point that you end up taking that soup… of all the accents which is/ which becomes the Paulista accent you know… which is a blend that has something very blended you know

Many other examples can be found in the studies cited above, but the main point here is that speakers perceive accents according to their references, which are usually related to cities/areas known to them. In other words, one accent is always conceived of in opposition to another.

In our study in Louveira, the accent issue was brought up in the final moments of the sociolinguistic interviews – similarly to what is done by Kroch (1995) – by asking informants "do you believe that Louveirenses have an accent, or any mark of speech that would show people where they come from?" Each sociolinguistic interview (conducted as described by Labov 2008 [1972]) was about 45-minutes long, and the final 10 to 15 minutes were dedicated to questions about accent. This paper shows how this sort of question may be used as a way of collecting/extracting data for statistical tests, in the form of an independent variable. In other words, we analyze how Louveirenses' beliefs about whether they have an accent correlate to variation in their speech. In addition, we also check for correlations between accent perception (positive or negative) and variation in production. As mentioned earlier, the linguistic variables being focused are: the pronunciantion of onset (t, d) followed by [i] (in words like *tia* 'aunt' and *dia* 'day', which can be pronounced as dental stops or affricates in Louveira – ['tia] or ['tʃia]; ['dia] or ['dʒia]), and coda (-r) (in words like *porta* 'door' and *mar* 'sea', respectively variably pronounced as ['pɔɻ.ta] or ['pɔɾ.ta], and ['maɻ] or ['maɾ]). In Louveira, the

dental stops [t, d] and the tap [ɾ] are the less common variants observed for these sociolinguistic variables (CARREÃO, 2018). Out of the 25 speakers that were interviewed, 13 believe that Louveira has its own accent – and all of them refer to the retroflex as a characteristic feature (but not to the dentals [t.d]).

In the following sections, statistic models built in R (R CORE TEAM, 2018) are presented according to age groups, and focus on speakers' opinions about Louveira's accent (whether it exists or not) and on speakers' sex/gender. The interest in age groups is related to Louveira's economy, which has shifted from agriculture-based to logistics-based and, as mentioned earlier, speakers from each age group lived in different economic situations and interacted with people outside Louveira in different degrees. Speakers' opinions about accent also relate to the different degrees of interaction that our speakers likely have had with people from other cities (and their language varieties): it is possible to check if their opinions on accent are comparisons to other people's varieties or comparisons among Louveirenses themselves. Finally, the decision to look into sex/gender is based on our speakers' comments about how men and women appear to have different roles/professions in the community.

When asking our informants about their opinion regarding a Louveirense accent, the word "accent" was followed by the word "mark" (as in "what accent mark do Louveirenses have?"). The idea was to get an answer from our informants that would bring up a specific linguistic variety. Had we only used the word "accent", our question might have led our informants to compare the speech in Louveira to other varieties. Differently, by employing "accent mark" in our question, their answer would be more likely to center in an evaluation of their own dialect, since examples of their own speech variety might be provided. In the following section, we present how data is distributed according to age groups – first for (t, d), and then for (-r).

2. Accent and linguistic variation in louveira

Our 25 informants – all born and raised in Louveira - are stratified as follows: (i) 18 to 29 years old (4 men and 5 women); (ii) 30 to 45 years old: 4 men and 4 women; (iii) 46 to 60 years old: 4 men and 4 women. The following subsections show data distribution for both variables: (t,d) followed by [i] and coda (-r).

2.1. (t, d)

As we mentioned earlier, the dental variants [t, d] for (t, d) are not mentioned by louveirenses in their interviews when they are asked about linguistic features that are commonly observed in the countryside and in Louveira. There's a clear distinction between older and younger speakers, as Table 1 shows:

TABLE 1 – Proportions of affricated and dental variants for (t, d) by age group

Age group	Affricated	Dental	Total	Chi-square
18 to 29 y.o	2413 (99%)	17 (01%)	2430	**$\chi 2 = 1817{,}4\ (2)$, $p < 0{,}001$**
30 to 45 y.o	2186 (90%)	233 (10%)	2419	
46 to 60 y.o	1324 (54%)	**1115 (46%)**	2439	

Source: Carreão (2018, p. 79)

Speakers from the first age group affricate (t,d) nearly categorically. In a comparison among the three age groups, it is possible to attest that a linguistic change was in course (from the dental to the affricated variant) and is completed in the speech of the youngest speakers. Because of this, the occurrences from the first age group will be ignored in the regression models that follow, since the interest here is to analyze data by the speakers whose pronunciation of (t,d) is more variable. The data for second and third-age-group informants (respectively referred to as "younger" and "older" speakers for the (t, d) analysis) are presented in detail in Table 2:

TABLE 2 – (t/d) data by second- and third-age-group speakers

Informant	Affricated	Dental	Total
Younger speakers (2nd age group)			
IE21	178 (99%)	01 (01%)	179
IE28	391 (100%)	0 (0%)	391
IE31	283 (72%)	**110 (28%)**	393
IE35	324 (88%)	43 (12%)	367
IE38	293 (97%)	04 (03%)	297
IE40	279 (97%)	09 (03%)	288
IE43	153 (72%)	**60 (28%)**	213
IE44	285 (98%)	06 (02%)	291
TOTAL	**2186 (90%)**	**233 (10%)**	**2419**
Older speakers (3rd age group)			
IE22	123 (31%)	277 (69%)	400
IE24	233 (68%)	111 (32%)	344
IE29	193 (58%)	141 (42%)	334
IE30	170 (56%)	132 (44%)	302
IE36	40 (13%)	260 (87%)	300
IE39	270 (95%)	**13 (05%)**	283
IE41	101 (38%)	164 (62%)	265
IE42	194 (92%)	**17 (08%)**	211
TOTAL	**1324 (54%)**	**1115 (46%)**	**2439**

Source: Carreão (2018, p. 86)

The lines in red in Table 2 highlight the speakers who state that Louveira has an accent of its own. In the second age group, 4 speakers (IE38, IE40, IE43 and IE44) believe Louveira has its own accent, differently from the other 4 (IE21, IE28, IE31 and IE35). Among the older speakers, 3 (IE24, IE41 and IE42) believe that Louveira has an

accent, and the other 5 (IE22, IE29, IE30, IE36 and IE39) do not. In our sample of speakers, there is no bias regarding accent perception as both age groups have different visions about Louveira having an accent of its own or not.

Informants IE31 and IE43 (of the younger group) are the ones with highest frequencies of dental (t, d); in the older speakers group (the third age group), informants IE39 and IE42 are the ones with lowest frequency of dentals. The data for these informants show that some speakers may present high use of one variant while others rarely use them. After presenting (t, d) and coda (-r) data, we check if these speakers with high frequency of dental [t, d] also present high rates of tap [**ɾ**], and whether they differ in relation to the common variants in Louveira.

Regarding the interviewees' responses about accent in Louveira (to the question "does Louveira have an accent of its own?), the distribution of data for (t, d) is as follows:

TABLE 3 – Proportion of affricated and dental (t,d) variants according to the answer given by the informants to "Does Louveira have an accent of its own?"

Does Louveira have an accent of its own?	**Affricated**	**Dental**	**Total**	**Chi-square**
Yes	3057 (89%)	387 (11%)	3444	**$\chi 2 = 239{,}88$ (1), $p < 0{,}001$**
No	2866 (74%)	**978 (26%)**	3844	

Source: Carreão (2018, p. 96)

As shown in Tables 1 and 2, dental [t, d] is much less frequent than the affricate variant in Louveira. Table 3 shows that dental (t,d) is most frequently observed in the speech of Louveirenses who believe that Louveira does not have an accent of its own. These facts suggest that dental (t,d) (very uncommon in the speech of capital São Paulo speakers) is a variant below the level of consciousness of Louveirenses, and it would be uncommon in the speech of the first age group speakers', considering that these informants were born after a generation of louveirenses with low use of dental [t, d] (as the second age group presents only 10% use of this variant). Table 4 shows the distribution of (t,d) according to the accent response by speakers of the second and third age groups.

TABLE 4 – Proportions of affricated and dental (t,d) according to the responses given by speakers of the second and third age groups

Does Louveira have an accent of its own?	**Affricated**	**Dental**	**TOTAL**
Age group 2	**2187**	**233**	**2420**
Yes (4 speakers)	1011 (93%)	79 (07%)	1090
No (4 speakers)	1176 (88%)	**154 (12%)**	1330
Age group 3	**1324**	**1115**	**2439**
Yes (3 speakers)	528 (64%)	292 (36%)	820
No (5 speakers)	796 (49%)	**823 (51%)**	1619
TOTAL (16 speakers)	**3511**	**1348**	**4859**

These numbers show, in more details that those in Table 3, that the speakers who believe that Louveira does not have an accent of its own are the ones who most frequently pronounce (t,d) as dentals. To verify this, regression models were built in R (R CORE TEAM, 2018) to test the correlation between the responses given by speakers about an accent in Louveira and variable pronunciation of (t,d). For the older speakers, there is no such correlation. As shown in Table 1, the total number of occurences for this sociolinguistic variable is balanced (46% of dental stops and 54% for the affricates). For the speakers of the second age group, this scenario is different, as those informants who believe that Louveira has an accent are the ones prone to pronounce (t,d) as dentals [t, d]. Table 5 summarizes the results of a logistic regression model, specifically for the 8 informants of the second age group, regarding their opinion on Louveira's speech and their sex/gender:

TABLE 5 – Estimates (in logodds) for the realization of (t, d) in relation to speaker 'sex/gender' and 'response about accent' – speakers of the second age group

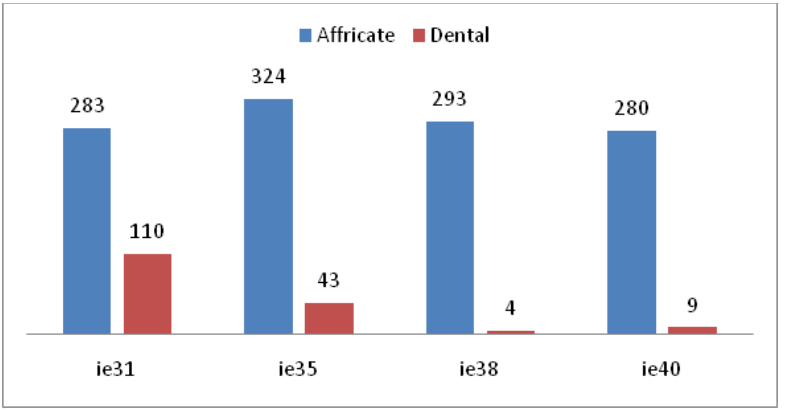
FACTORS	**Estimate**	**Std. Error**	**z value**	**Pr(>|z|)**	
(Intercept)	-2.35	1.1573	-2.034	0.0419	*
No, Louveira does not have an accent	-0.64	1.3649	-0.470	0.6380	
Sex/Gender Male	-1.60	1.3633	-1.171	0.2417	
C = 0.620[2]	+ *0,1* < *p* > 0,05; **p* < 0,05; ***p* < 0,01; ****p* < 0,001				

* Formula: mod.glmer <- glmer(VD ~ Response.accent + sex + (1|Informant), data = dentals, family = binomial)

As mentioned in the introductions, Louveira was a city with an agriculture-based economy. More recently, logistics and industries have become the main source of income and revenue for the city's Gross Product and, with that, the Louveirenses started to get more frequently in contact with people from different cities, especially because of companies that had different suppliers in their logistic chains. If the accent perception is a byproduct of this economic phenomenon, it is possible to associate one's profession to one's sense of accent perception. Do men and women in Louveira have the same professions and have similar chances to get in contact with people that speak other varieties? Figure 1 shows the number of (t,d) occurrences for each female speaker of the second age group (30 to 45 years old):

[2] The C index, according to Hosmer and Lemeshow (2000) (apud LEVSHINA, 2015, p. 259), is described as follows: C <0.6 indexes would have little power of outcome discrimination, whereas values 0.7 <C <0.8 would have acceptable discrimination result. Higher values, such as 0.8 <C <0.9, would represent excellent power of outcome discrimination and, finally, a C value greater than 0.9, a notorious power of outcome discrimination. As we are working with an extralinguistic variable which has only two factors, the C index is expected to be low. The more variables and variants there are in the statistical model, the higher the C index tends to be.

FIGURE 1 – Occurrences of affricate and dental (t, d) for female speakers (age group 2)



Both IE31 and IE35 are middle-class women who have worked in Louveira for their whole lives. They have also been working with the local community for a long time and, at the same time that they make clear their work is important in and for the local community, they also intend to advance in their job positions by studying more and by expanding the reach of their services to those who come from other cities. Their jobs, though not in the same area, are related to social service (IE31 works in an NGO and IE35 is a social worker), and they work directly with the community, with people from all social classes, but not people from other cities. Unlike the male speakers of the same age group, who work in companies, these women are more locally connected to other Louveirenses.

As mentioned before, IE31 and IE35 believe Louveira does not have an accent of its own – differently from IE38 and IE40, who are female speakers that work in companies and get in contact with people from different cities. As we have seen, the former two present significantly higher rates of dental (t,d) than the latter. On the other hand, we have IE43 (TABLE 2), a male speaker of the same second age group, who works in a small food business (selling goods mainly to Louveirenses), and also presents a high rate of dental stops [t, d]. Differently from IE31 and IE24, he states that Louveira has an accent of its own, but like the two female speakers, he also presents high rates of dental (t,d).

Their proximity to different groups of people (Louveirenses vs. people from other cities) is the characteristic that may explain why certain variants are unnoticed. Dental (t,d) is more frequently found in the speech of speakers who are closer to Louveirenses on a daily basis. This may also explain why the dental (t, d) is not mentioned as an accent mark in any of the interviews – not even by those who claim that Louveira has an accent. Those who work in big companies do not pronounce (t, d) as dentals, so there is no actual variability in their workplace, as far as (t,d). If there is no perception of this variant as an accent mark, questioning speakers about accent in general will lead to answers that do not take variants that are below the level of consciousness into account.

Next, we turn to variable coda (-r). Like dental (t,d), tap (-r) is generally less frequent in the community, but this variable is likely above the level of consciousness for our speakers, since the retroflex variant is often mentioned as part of the Louveirense accent. The idea is to verify if the production of a variant above the level of consciousness – differently from (t,d) – is correlated to speakers' perception about whether Louveira has or not an accent of its own.

2.2. Coda (-r)

Our interviews revealed that the speakers who believe Louveira has an accent of its own consider the retroflex variant an accent mark typical of the inhabitants of the state countryside – which includes Louveira. In opposition to it, the tap variant was mentioned by some informants as the variant used in the state capital. As the community in Louveira is also formed by migrants from various Brazilian states – especially from the Northeast – some comments made by our speakers also highlighted that the glottal (or uvular) variant for coda (-r) was found in Louveira.

The analysis of (t, d) above showed that the speakers who present higher rates of the less common variant in Louveira (dental [t, d]) are those who have occupations and play social roles centered in the community. Considering this as a starting point for the present analysis of (-r), we check which informants present higher rates of tap (less common in the community than the retroflex), as well as their occupation/role in the community and their opinion on accent. Our hypothesis is that occupation/role in the community is connected to one's perception

about accent and that this may influence their use of tap. Coda (-r) data are distributed as it follows:

TABLE 6 – Proportions for retroflex and tap by age group

Age group	Retroflex	Tap	Total	Chi-square
18 to 29 y.o	1209 (92%)	106 (08%)	1315	**$\chi 2 = 91{,}172\ (2)$, $p < 0{,}001$**
30 to 45 y.o	898 (79%)	**232 (21%)**	1130	
46 to 60 y.o	1031 (89%)	124 (11%)	1155	

Source: Carreão (2018, p. 97)

The second age group of speakers is the one with the highest tap rates. The chi-square test shows a significant difference between the groups, but there is more behind these numbers. If we look at the data according to whether the speakers answered yes or no about Louveira's having its own accent, we have the following scenario:

TABLE 7 – Proportions of retroflex and tap according to the informants' answer to the question 'Does Louveira have an accent of its own?'

Does Louveira have an accent of its own?	Retroflex	Tap	Total	Chi-square
Yes	1528 (91%)	145 (09%)	1673	**$\chi 2 = 47{,}804\ (1)$, $p < 0{,}001$**
No	1610 (83%)	**317 (17%)**	1927	

Source: Carreão (2018, p. 114)

There is a significant difference between the tap rates corresponding to the yes/no responses given by the speakers to the accent question. But, according to Table 6, the second age group is the one with the highest tap rate, so Table 8 crosses these variables specifically for the speakers of that group:

TABLE 8 – Proportions of retroflex and tap for speakersof the second age group, according to their answer about a Louveirense accent

Opinion on accent/age group	Retroflex	Tap	TOTAL
Louveira has an accent of its own	430 (88%)	57 (12%)	487
Louveira does not have an accent of its own	468 (73%)	175 (**27%**)	643
TOTAL	**898**	**232**	**1130**

In the second age group, the speakers who believe that Louveira does not have an accent of its own are those that produce tap (-r) more frequently, which is an accent mark that is not related to Louveira, as the retroflex variant is mentioned as the one that is part of the Louveirense accent. Next, each age group is analyzed separately, starting with the third age group (older speakers) and moving to the two younger groups, in order to see how the patterns changed from one generation to the other.

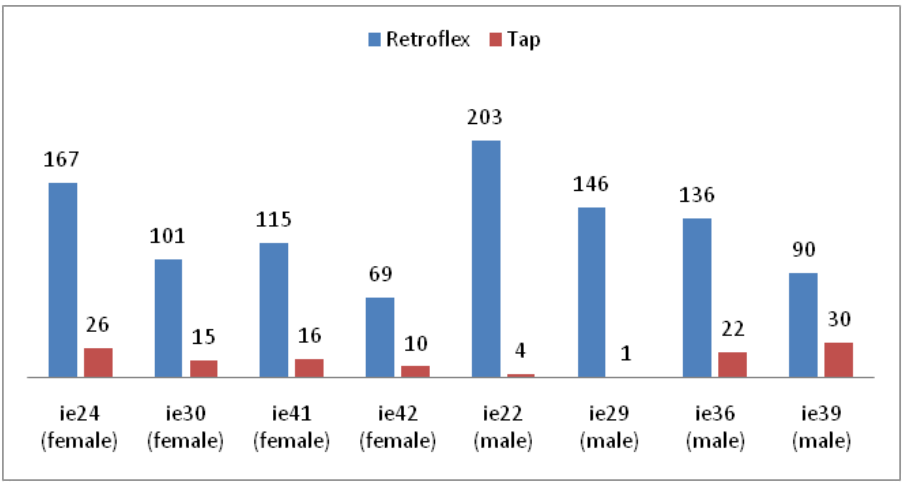
TABLE 9 – Estimates (in logodds) for [ɾ] according to speaker sex/gender and their response about accent in Louveira – third age group

FACTORS	**Estimate**	**Std. Error**	**z value**	**Pr(>|z|)**	
(Intercept)	-1.95	0.56083	-3.475	0.00051	***
No, Louveira does not have an accent	0.01	1.12209	0.014	0.98863	
Sex/Gender Male	-0.81	1.09990	-0.740	0.45935	
C = 0.550	+ *0,1* < *p* > 0,05; **p* < 0,05; ***p* < 0,01; ****p* < 0,001				

* Formula: mod.glmer <- glmer(VD ~ Response.Accent+ sex + (1|Informa), data = RCODA, family = binomial)

For this group, speakers' answers to the accent question and their sex do not correlate with tap (-r). Figure 2 shows the number of tokens for each informant in the group:

FIGURE 2 – Coda (-r) for informants of the third age group



Only female speakers IE24, IE41 and IE42 say that Louveira has an accent of its own. The first two descend from Italian immigrants and commented that this accent would be a result of the contact between Brazilians and the immigrants back in the beginning of the twentieth century. One of the male speakers – IE36 – also descends from Italian immigrants, and presents a relatively highest rate of (-r); however, he does not believe that Louveira has an accent of its own. IE36 is a farmer and he states that back in time he would help his father in the plantations and would hear a dialect that was different from the one he listened to at his elementary school. He also stated that it is a pity to see this different dialect disappearing as the years go by. For him, Louveira has no accent of its own, but the immigrants had a different way of speaking Brazilian Portuguese. On the other hand, IE39 is not a descendent from immigrants, but has a big business in the city and works with suppliers from different cities; he presents a higher use of tap (-r) – especially compared to IE36 – and also believes that Louveira has no accent of its own. In this age group, the only comments regarding an accent are associated to the pronunciation of immigrants, but this is not related to the number of tap (-r) observed. The few occurrences of this variant makes it hard to find a correlation between accent perception and variation.

For the second age group, we do see a correlation between (-r) and the speakers' responses about accent:

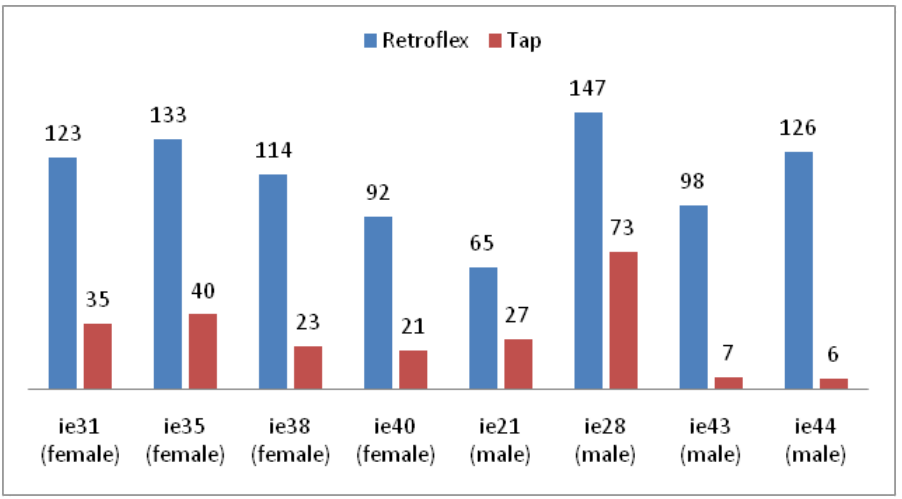
TABLE 10 – Estimates (in logodds) for [ɾ] in relation to speaker sex/gender and their response about accent in Louveira – second age group

FACTORS	**Estimate**	**Std. Error**	**z value**	**Pr(>|z|)**	
(Intercept)	-1.97	0.2673	-7.385	1.52e-13	***
No, Louveira does not have an accent	1.10	0.3113	3.546	0.000392	***
Sex/Gender Male	-0.28	0.3151	-0.906	0.364734	
C = 0.640	+ *0,1* < *p* > 0,05; **p* < 0,05; ***p* < 0,01; ****p* < 0,001				

* Formula: mod <- glmer (VD ~ Response.accent + sex + (1|Informant), data = RCODA, family = binomial)

Out of the 232 tokens of tap in this group, 119 (51%) were found in women's speech. Figure 3 shows the distribution of (-r) per speaker:

FIGURE 3 – Coda (-r) distribution for second age group informants



Informants IE31 and IE35 – the speakers who pronounce (-r) as tap most frequently amongst the women – are the same who pronounce (t,d) as dentals more frequently in their group. Recall that IE38 and IE40 work in big companies in Louveira, an occupation that promotes their

connection with people from other cities, who speak other varieties. Based on these facts, we expected that they would show higher tap rates, but that is not what our results show. As for the male speakers, IE21 and IE28 both work in big companies in Louveira (differently from IE43 and IE44, who work in small businesses) and are the ones who present the highest tap rates. The four speakers in this group who believe that Louveira has an accent of its own (IE38, IE40, IE43 and IE 44) are also those who least frequently pronounce (-r) as tap – which explains the correlation shown in Table 10.

As stated previously, the retroflex is the most common variant for coda (-r) in Louveira. Those who believe that Louveira has an accent of its own seem to embrace the idea of the retroflex variant as an accent mark, therefore they have no problems on using this variant, nor assuming it as part of their linguistic repertoire. On the other hand, those who claim that Louveira does not have an accent of its own try to support this statement by realizing coda (-r) as tap, which is a variant related to the state capital (according to our speakers' comments).

Finally, for the youngest speakers (18 to 29 years old), there is also a correlation between their answers to the question about accent and their production of (-r).

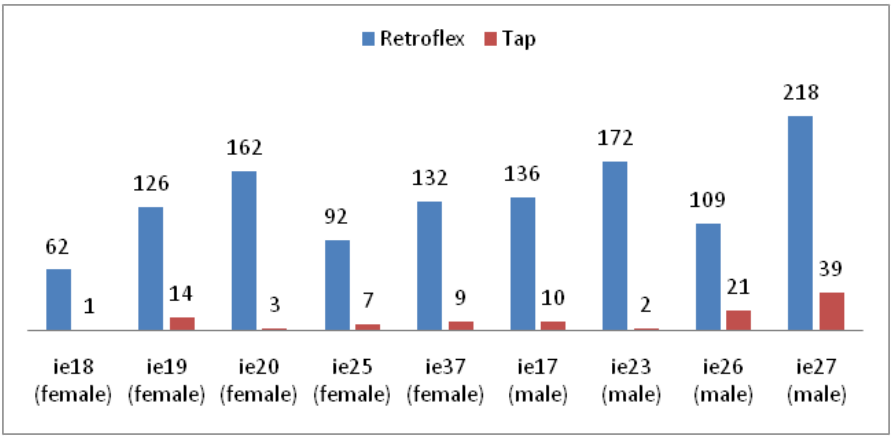
TABLE 11 – Estimates (in logodds) for [ɾ] in relation to speaker sex/gender and their response about accent in Louveira – first age group

FACTORS	**Estimate**	**Std. Error**	**z value**	**Pr(>|z|)**	
(Intercept)	-2.91	0.2631	-11.065	< 2e-16	***
No, Louveira does not have an accent	2.55	0.8548	2.981	0.00287	**
Sex/Gender Male	-1.60	0.8519	-1.878	0.06038	.
C = 0.650	+ *0,1* < *p* > 0,05; **p* < 0,05; ***p* < 0,01; ****p* < 0,001				

* Formula: mod.glmer <- glmer(VD ~ Response.accent + sex + (1|Informant), data = RCODA, family = binomial)

Figure 4 shows how the data is distributed per speaker.

FIGURE 4 – Coda (-r) distribution for informants in the first age group



In this age group, 6 speakers answer 'yes' to the question about Louveira having an accent of its own: all of the female speakers (IE18, IE19, IE20, IE25 and IE37) and one of the male speakers (IE23). Note that the sex difference is nearly significant ($p = 0.06$), according to the model summarized in Table 11. IE26 lives in a neighborhood that was recently included in the city's law for urban planning. IE27 lives in a neighborhood characterized by a blend of Louveirenses and migrants from other Brazilian states. Both mention the retroflex variant as an accent mark in the state's countryside (inlcuding Louveira), but also refer to the migrants' speech as a dialect. As stated by the speakers, the migrants are also part of the community, therefore their variety of speech is part of Louveira's accent. In this sense, in regarding accents the speakers in this age group make no comparisons between Louveira and other cities. The only comparisons they do make are related to the diversity of the community within Louveira. As these speakers were born in a city with big companies and industries, they see this phenomenon as a characteristic of Louveira – differently from the speakers of the other age group, who witnessed the implementation of these companies and the gradual transformation of the city.

Going back to previous results, there is no correlation between responses about accent and coda (-r) for the speakers in the third age group (TABLE 9) – differently from what we have obtained for the second- and the third-age-group speakers (TABLES 10 and 11, respectively). Those in

the second group (30 to 45 years old) are the ones with the highest rates of tap – a variant that is generally infrequent in Louveira. The speakers of this age group are those who lived the economic changes in the city, which could be the main reason for paying attention to Louveira's accent. Particulary, the female informants IE31 and IE35 (from the second age group) are the ones that present high rates of tap (-r), even though they work within the community and not in big companies. Speakers from the first age group – born in an industrialized Louveira - follow the same pattern observed for the second age group: those who believe that Louveira does not have an accent are those who use the retroflex and not the tap.

We considered earlier that tap (-r) is above the level of consciousness of our speakers and the results for the second and the first age groups confirm this hypothesis. In these groups, speakers refer to a Louveirense accent by commenting on the retroflex as one of its characteristics. This is not the case for the older speakers (third age group), who talk about accent in reference to immigrants' descendants, who had moved to Louveira back in time. More generally, our results show that using speakers' perceptions about accent as a variable is useful to understand linguistic variation, especially when the variable being focused is above the speakers' level of consciousness.

3. Final remarks

Dental stop pronunciation of (t, d) is ignored in the comments by Louveirenses about accent in the city. Coda (-r) is more sensitive to the judgment by our informants, and it comes as a variable to which positive value or stigma can be easily attributed. In some of our sociolinguistic interviews, our informants commented that the retroflex is typical of São Paulo state's countryside (which is also shown in other studies, like AMARAL, 1920 and RODRIGUES, 1974). They also say that Louveira is a rich and developed city because of the companies that settled there, which makes it a city that is "not typical of the countryside" –comparatively to other cities of the region. The dichotomy of meanings that seems to operate in Louveira is "countryside vs. capital": to have an accent is to assume that an individual is from the countryside, while not having an accent is to assume that an individual is from the modern Louveira. Barbosa (2002, p. 69. Translated by us) draws attention to this:

> In assuming the negative pole of the dichotomy, in defining his speech as a non-accent, a speech without characteristic traits, although private (as if this were possible), this group corroborates for itself the ideology of the modern and the different, which moved the very construction of the capital, and ratifies the external image that is wanted for the Federal District.

The dichotomy of accents works only for the varieties of speech that are known to the speakers. The relationship between tap (-r) and accent in Louveira is established in reference to the capital of the state. This shows how the relation between cities/communities is important in this for the perception of accent. It can be said that this relationship is based on a "sociolinguistic space", because it does not always necessarily correspond to a city: it can be associated with an idea that is made of a certain place, near or far from the community that is studied. For example, Louveirenses are unaware that the retroflex variant is also found in the capital São Paulo (OUSHIRO, 2015). However, the idea created in the imagery of the Louveirense speaker is that the capital city cannot present a variant that also exists within the state's countryside. And in these processes we create the dichotomies about accents, which are the central axes for possible processes of linguistic variation/change to be understood.

This paper has explored the idea of using speakers' perceptions about accent in a quantitative way – as a predictor for the production of variables. However, our results suggest that such predictor may come up as significant only for variables that are above the level of consciousness. For variables below the level of consciousness, results are most likely to show no significance, but in case linguistic variation is observed, this information may be useful to understand why it is unnoticed by speakers. It is only possible to realize whether a variant is above or below the level of consciousness if a qualitative method is employed. In our study, asking Louveirenses about accent was a way of gathering such data, which was backed by sociohistorical facts. The economic shift in Louveira, in this paper, was the thread that connected perceptions about accent with other variables (such as age group).

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Infinitive verbs, verbal agreement and perceived competence

Verbos infinitivos, concordância verbal e competência percebida

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Abstract: This paper examines how competent speakers of Brazilian Portuguese (BP) sound depending on variable number inflection of infinitive verbs (INF). Recent research has shown high rates of inflected infinitives in syntactic contexts in which it is prescriptively optional, such as adverbial clauses (CANEVER, 2012, 2017). According to that work, inflected infinitives also occur in nonstandard contexts, such as complements of auxiliary verbs, which can be taken as cases of hypercorrection. Informed by these findings and given the prestige usually associated with overtly marking verbal agreement in Brazil (SCHERRE; NARO, 2006, 2014), this study uses a modified matched-guise task (LAMBERT *et al*., 1960) in order to check whether speakers sound more educated, more intelligent and more formal in their INFflex-guise, and whether these perceptions vary significantly according to the syntactic context, the grammatical person and listeners' social characteristics (e.g. age). Results show that speakers are judged as more competent-sounding in their uninflected (INFø) guises, contradicting the initial hypothesis. However, further analyses show that this effect is stronger in the hypercorrect context as opposed to the syntactic context in which INFflex is more frequent. These results indicate a relation between frequency of occurrence in production and sociolinguistic perception, with higher rates of use translating into more neutral perceptions. Moreover, older respondents presented stronger reactions to INFflex guises, while younger respondents' judgments tended to be more neutral. Such age effects suggest a change in progress in the sociolinguistic perceptions associated to (INFflex).

Keywords: infinitive verbs; verb-subject agreement; perception.

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Resumo: Este artigo examina quão competente soa o falante de português brasileiro (PB) a depender da flexão do infinitivo (INF). Pesquisas recentes demonstram altas taxas de infinitivos flexionados em contextos sintáticos opcionais, tais como orações adverbiais (CANEVER, 2012, 2017). De acordo com esses trabalhos, infinitivos flexionados também ocorrem em contextos não padrão, tais como complementos de verbos auxiliares, que podem ser considerados casos de hipercorreção. Considerando-se esses achados e o prestígio usualmente associado à marcação de concordância verbal no Brasil (SCHERRE; NARO, 2006, 2014), este estudo desenvolve uma versão modificada de um teste de estímulos pareados (LAMBERT *et al*., 1960) para checar se o emprego de INFflex faz com que falantes soem mais educados, mais inteligentes e mais formais, bem como se tais percepções variam a depender do contexto sintático, da pessoa gramatical e de características dos ouvintes (p. ex. idade). Os resultados mostram que falantes foram julgados como mais competentes na presença de INFø, contrariando a hipótese inicial; análises mais detalhadas mostram, porém, que esse efeito é mais forte no contexto de hipercorreção em oposição ao contexto sintático no qual a variante INFflex é mais frequente. Tal resultado indica uma relação entre frequência de ocorrência na produção e percepção sociolinguística, com taxas mais altas de emprego traduzindo-se em percepções mais neutras. Além disso, respondentes mais velhos apresentaram reações mais polarizadas em relação a INFflex enquanto os mais jovens tenderam à neutralidade. Tal efeito de idade sugere uma mudança de percepção sociolinguística em progresso.

Palavras-chave: verbos infinivos; concordância verbal; percepção.

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1 The problem of inflecting infinitives

Brazilian Portuguese (BP) is similar to a number of other Romance languages in reference to marking plural person redundantly. See in (1), for example, the first person singular and plural forms for the verb *cantar* 'sing' in the imperfect preterite; in Portuguese, Spanish, Italian and French, both the pronoun (*nós, nosotros, noi, nous*) and the morphemic inflection (*-mos, -mos, -ano, -ions*, respectively) work as plural marks. As (2) illustrates, Brazilian Portuguese is known to stand out among these languages, to the extent that subject-verb number agreement is actually variable (MENDES; OUSHIRO, 2015; NARO, SCHERRE, 1991; RÚBIO, GONÇALVES, 2012; SCHERRE; NARO, 2014, 2006; *inter*

alia), in spite of prescriptive grammars, which present (2a) as an invariable rule (ALMEIDA, 2009; BECHARA, 2009; CUNHA; CINTRA, 2013; LIMA, 2017; SAID ALI, 1966). However, when it comes to subject-verb agreement involving infinitive verbs, BP is the only language among those that appear in (1) that allows the addition of a plural morpheme to the infinitive verb, as *comprarmos* 'to buy-PL', in (3). In fact, the inflection of infinitives (a contradiction in terms) is considered an anomaly particular to very few of the Romance languages: Portuguese, Gallician, Mirandese, Sardinian, Old Neapolitan and Old Leonese (SCIDA, 2004).

(1) a. eu cantava-Ø nós cantáva-mos
b. yo cantaba-Ø nosostros cantaba-mos
c. io cantav-o noi cantav-ano
d. je chant-ais nous chant-ions
'I used to sing.' 'We used to sing.'

(2) a. nós cantáva-mos
we sing:PST.1PL
b. nós cantava-Ø
we sing:PST
'We used to sing.'

(3) Fomos lá para comprarmos os ingressos.
go:PST.1PL there to buy:INF.1PL the tickets
'*We went there to buy the tickets*.'

The example in (3) is a case that grammarians classify as optional (BECHARA, 2009; CIPRO NETO; INFANTE, 2010; CUNHA; CINTRA, 2013; LIMA, 2017; SAID ALI, 1966). This means that, in such contexts, the verb form is prescriptively considered correct with or without the plural inflection, and choosing one of the forms depends on stylistic factors and/or speakers' preferences; Bechara (2009, p. 286) states that the use of INFflex in a case like (3) shows that our focus is on the subject, while not inflecting the infinitive reveals that our attention is especially directed to the verbal action.

In this article, we refer to variable inflection in infinitive verbs as (INF), in parentheses. The variants are referred to as INFflex (as in

VERBmos) or INFø. Other cases in which these forms are considered optional by grammarians appear in (4) and (5). In (3-5), note that (i) the infinitive form is preceded by a preposition, which functions as the head of an adverbial subordinate clause, and that (ii) its verb subject is the same as the one in the main clause. Said Ali (1966, p. 349) also points to the optionality of INFflex when the infinitive verb serves as a complement of either nouns or adjectives, as in (6) and (7).[1] Therefore, we are calling cases such as the ones in examples (3-7) *prescriptively optional.*

(4) Chegamos cedo por estarmos ansiosos.
arrive:PST.1PL early for be:INF.1PL anxious:PL
'We arrived early because we were anxious.'

(5) Eles usam o computador para assistirem a filmes.
they use:PRS.3PL the computer to watch:INF.3PL to movies
'*They use a computer to watch movies*.'

(6) Entendemos a importância de controlarmos nossos gastos.
understand:PRS.1PL the importance of control:INF.1PL our expenses
'*We understand the importance of controlling our expenses*.

(7) Somos capazes de criarmos novos neurônios.
be:PRS.1PL capable of create:PRS.1PL new neurons
'*We are capable of creating new neurons*.'

However, there are contexts in which only the INFflex form is considered correct by grammarians, as in (8-9), when an overt plural subject precedes the verb. In other words, we have here a case of *prescribed* INFflex:[2]

[1] While the optionality of INFflex in co-referential adverbial clauses is mentioned by many grammarians, the status of INFflex in complements of nouns and adjectives is rarely discussed. Said Ali (1966) is one of the few exceptions.

[2] INFflex is also possible with 2SG, as in "Tu não perceberes a mentira me surpreende" ("*Your not noticing the lie surprises me"*), as well as with 2PL. However, 2SG forms are less frequently used (in a few dialect regions in Brazil) while 2PL forms are virtually nonexistent. Therefore, in this article we focus on the variable use of INFflex with 1PL and 3PL.

(8) A prioridade é os alunos aprenderem a ler.
the priority be:PRS.1SG the students learn:INF.3P to read:INF
'*The priority is for the students to learn to read*.'

(9) É importante nós analisarmos esse ponto de vista.
is important we analyze:PRS.1PL this point of view
'It is important for us to analyze this point of view.'

Finally, (10) is an example commonly ruled out by prescriptive grammarians, who state that INFflex should not be employed when the infinitive verb is a complement of an auxiliary verb (ALMEIDA, 2009; BECHARA, 2009; CUNHA; CINTRA, 2013; LIMA, 2017, SAID ALI, 1966).[3]

(10) Nós podemos cancelarmos a assinatura após 12 meses.
we can:1PL cancel:INF.1PL the subscription after 12 months
'*We can cancel the subscription after 12 months*.'

While the use of INFø in (8-9) could be considered *nonstandard*, in this article we are using this term specifically to refer to the use of INFflex in cases like (10). That is, we do not focus on nonstandard lack of prescribed INFflex, but rather on nonstandard instances in which INFflex is overused – cases that we are thus considering examples of hypercorrection (LABOV, 1972).

If on the one hand there is consensus among grammarians when it comes to examples like (10), on the other hand some grammarians openly disagree on the use of INFflex in syntactic contexts like those in (3)-(7). See for example Almeida (1981, p. 156), for whom the use of INFflex must be limited to "instances of real need to indicate its subject".[4] When the verb subjects both in the main and in the subordinate clauses

[3] Many grammarians, such as Bechara (2009), Cunha and Cintra (2013), Lima (2017) and Said Ali (1966), consider INFflex justifiable in cases like (10) when there is a long distance between the main verb and its infinitive complement, but none of them specifically discuss how far the infinitive verb must be from the main verb for INFflex to be "acceptable" (LIMA, 2017, p. 506).

[4] Original: "*casos de real necessidade de identificação do seu sujeito*".

are identical and there is no lack of clarity, as in examples (3-5), Almeida (1981, p. 155) considers the use of INFflex "extravagant and silly".

In contrast to Almeida (2009), who sees the expansion of INFflex in Brazilian Portuguese (BP) as evidence of linguistic decay, Maurer Jr. (1968) purports that this process is natural and an expected linguistic phenomenon. According to him, since INFflex has emerged in the language, there is a tendency for its uses to expand (MAURER JR., 1968, p. 89).

Recent empirical studies have indicated that an expansion of INFflex is indeed in progress. Regarding European Portuguese (EP), Bossaglia (2013a) carried out a corpus-based study on the variable use of INFflex using the CETEMPúblico corpus, focusing on constructions with causative (11-12) and perception verbs (13-14).[5]

(11) ...o mais sensato seria deixá-las escolher o nível.
the most reasonable would.be let-3PL.ACC choose:INF the level
"... the most reasonable thing would be to let them choose the level."

(12) não se consegue fazer as pessoas comprarem discos à força.
not REFL can make the people buy:INF.3PL records by force
"... it is not possible to make the people buy records forcefully."

(13) A gente ouvia-os chegar, falar e instalar o material.
The people heard.3PL.ACC arrive:INF talk:INF and set-up:INF the material
"We heard them arrive, talk and set up the material."

(14) ... ouve os revisionistas negarem a existência do Holocausto.
Hear.3SG.PRS the revisionists deny:INF.3PL the existence of-the Holocaust
"... he hears the revisionists deny the existence of the Holocaust."

Based on the premise that a higher semantic integration corresponds to a higher syntactic integration (GIVÓN, 1995), Bossaglia (2013b) tested whether the fact that perception constructions are less semantically integrated – and thus more syntactically independent – would favor the use of INFflex. Not only has her data analysis confirmed

[5] Examples (11-14) were extracted from Bossaglia (2013a, p. 225).

that hypothesis,[6] it has also revealed higher rates of inflection for causative verbs that have a more agentive nature, such as *permitir* 'to allow', *impedir* 'to prevent', and *obrigar* 'to force'. The study also revealed data that Bossaglia (2013b, p. 228) considered "irregular", such as:

(15) ... não os deixa ficarem sozinhos.
not 3PL.ACC let.3PL.PRS stay:INF.3PL alone
"… he doesn't let them be alone."

(16) Nunca os ouvi reclamarem o ordenamento do território.
never 3PL.ACC hear.1SG.PST demand:INF.3PL the planning of-the space
"I've never seen them demanding the spatial planning."

(17) Quero fazê-las serem elas próprias.[7]
want.1SG.PRS make-3PL.ACC be:INF.3PL 3PL.NOM own
"I want to make them be themselves."

(18) Vi-os assinarem a paz com a maioria dos clãs.
see.1SG.PST-3PL.ACC sign:INF.3PL the peace with the majority of-the clans
"I saw them signing the peace treaty with most clans."

From a formal perspective, examples (15-18) are considered Exceptional Case-Marking structures (ECM), in which the infinitive subject receives the accusative case from the main verb, and therefore only INFø could supposedly occur. According to Bossaglia (2013b), the use of INFflex in (15-18) can be interpreted as a result of an "overgeneralizon of the inflection", possibly related to higher subject agentivity and the presence of the preposition.[8] For Maurer Jr. (1968),

[6] Perception constructions display "a higher degree of freedom in the use of inflected infinitives by virtue of the lower degree of semantic integration" (BOSSAGLIA, 2013b, p. 229).

[7] This is a reduced version of the original example in Bossaglia (2013b, p. 228), which was "Quero desarmar as pessoas, fazê-las serem elas próprias" *("I want to defuse people, make them be themselves").*

[8] The variable use of INF in EP is also explored by Vandershueren (2013), Vanderschueren and Diependaele (2013) and Vanderschueren and de Cuypere (2014), who focused on adverbial clauses.

these examples would serve to illustrate his prediction for the expansion of INFflex to new, at-first unexpected syntactic contexts.

As for Brazilian Portuguese (BP), Ladeira (1986 *apud* CABRAL, 2006) analyzed data on infinitive verbs extracted from the news and from the Bible,[9] and found the following conditioning factors for the use of INFflex: (i) 1PL; (ii) sentence-initial infinitive clauses; (iii) a long distance between the main-clause verb and the infinitive verb; (iv) the presence of plural predicates and participles; (v) the occurrence of the infinitive in adverbial clauses; and (vi) the presence of reflexive pronouns. Ladeira also found that the occurrence of oblique pronouns in the position of infinitive subject inhibits INFflex.

Drawing on these results, Cabral (2006) investigated the use of INFflex in written news[10] in order to test whether the variable use of INFflex is guided by stylistic factors, as defended by some grammarians, or whether there are syntactic, semantic and extralinguistic factors that correlate with the use of INFflex. As a result of both the frequent use of verbal agreement (NARO; SCHERRE, 2003) and the preference for an explicit pronominal subject in BP (DUARTE, 1995), Cabral expected that INFflex would be more frequent than INFø in standard language, as in written news. Contradicting her main hypothesis, Cabral observed a higher rate of INFø. She also found that non-canonical types of relative clauses (19) and the passive voice are contexts that favor INFflex (CABRAL, 2006, p. 84).

(19) É claro que surgem, habitualmente, obstáculos a serem vencidos.
is obvious that appear habitually obstacles to be:INF.3PL overcome:PTCP
'It is obvious that, habitually, obstacles appear that need to be overcome.'

Another study that focuses on variable (INF) in a written corpus is Canever (2012), who shows high rates of INFflex in prescriptively optional contexts: 75% in adverbial clauses (N=525),[11] 53,5% in

[9] Ladeira (1986 *apud* CABRAL, 2006) used *Jornal do Brasil* editorials and a Brazilian translation of the *Jerusalem Bible*.

[10] Cabral (2006) extracted her data from editorials and news reports from the newspapers *Jornal do Brasil* and *O Globo*.

[11] Canever (2012) only considered cases of optional INFflex those with co-referentiality between the subjects of the adverbial and the main clause.

complements of adjectives (N=101) and 94,5% in complements of nouns (N=54). Canever (2012) also finds, in academic writing, instances of what was defined above as nonstandard/hypercorrect INFflex:

(20)	...tão	importantes	que	não	poderiam	serem	esquecidas
	so	important	that	not	could	be:INF.3PL	forgotten

'... so important that they couldn't be forgotten.'

(21)	As	virtudes	começam	a	serem	tratadas	no	capítulo 8
	The	virtues	begin	to	be: INF.3PL	treated	in.the	chapter 8

'*The virtues begin to be treated in chapter 8*.'

In (20) and (21), as well as in (10) earlier, we have tokens of INFflex in periphrastic constructions, with the infinitive verb serving as a complement for an auxiliary verb. The fact that these data occurred in theses and dissertations – which involve a high degree of formality and careful style in the sense of LABOV (1966) – is strong evidence that the variable use of INFflex in verbal periphrases is an actual feature of the "Brazilian cultivated norm" (FARACO, 2008). In addition, Canever (2012) also indicates a preference for INFflex with (i) 1PL in adverbial clauses (90%, N=177) and (ii) with passive voice (92%, N=101).

So far, we have discussed (INF) both from the perspective of prescritive grammars and from the perspective of descriptive studies. Although linguists are concerned with language description, taking into consideration the viewpoint of prescriptive grammarians is particularly important when it comes to investigating (INF). This morphosyntactic variable constitutes a gray area for prescriptive grammarians themselves (differently from other cases, for which their positions are categorical and unambiguous), and speakers are exposed to those positions when searching for the prescribed (INF) forms. Speaker's beliefs about language are informed by this kind of information, and this is particularly true in the case of (INF). As for empirical studies on (INF), while they do shed light on the use of INFflex in both European and Brazilian Portuguese, they do it from a synchronic perspective and, in the case of (BP), offer no statistical analyses of the data. The next section establishes the ground for the perception study by summarizing a diachronic analysis of INFflex in (BP).

2 The motivation for a perception study on (INF)

Considering both the occurrence of INFflex in nonstandard/ hypercorrect contexts and the frequent use of optional INFflex in academic writing, Canever (2017) hypothesized that the frequency of INFflex in optional contexts would be on the rise. This hypothesis was tested in a corpus of 1,346 master theses and Ph.D. dissertations defended at the University of São Paulo between 1995 and 2014 (Corpus_Pós_ USP). The study focused on (INF) in adverbial clauses, as well as in nominal and adjectival complements – the three syntactic contexts in which, according to Bossaglia (2013b), variable (INF) emerged. Given the findings of Canever (2012), variable grammatical person (1PL x 3PL) and the verb (‘*be’* x others)[12] were tested as linguistic predictors.[13]

In a total of 285,182 tokens of (INF) extracted from the corpus, 21% (61,444) were instances of the three syntactic contexts being focused. From these, a qualitative analysis carefully excluded the tokens in which the verb of the main clause was impersonal, as in (22-23).[14] The remaining 24,945 tokens were then statistically analyzed in R.[15] Table 1 shows how these data are distributed across the three syntactic contexts.

(22) ...mas há razão para suporØ que a intersecção é grande.
but exists reason to assume:INF that the intersection is big
‘... but there is reason to assume that the intersection is big.’

(23) Quais são os principais planos para atingirØ estes objetivos?
what are the main plans to reach:INF these goals
‘What are the main plans to reach these goals?’

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[12] This variable was tested given the fact that all nonstandard instances of INFflex found by Canever (2012) were with ‘*be*’, as in (20-21).

[13] A full description of the variables tested in this study can be found in Canever (2017, p. 62)

[14] Although INFflex is possible in these impersonal constructions (e.g. “para supormos”, “para atingirmos”), the meaning of the sentences would be completely different. Therefore, these are not instances of (INF), that is, they are not in the envelope of variation – differently from those with clear co-referentiality between the subject of the main clause and the subject of the infinitival clause.

[15] For a detailed explanation of data extraction and qualitative analysis, see Canever (2017, p. 49-64).

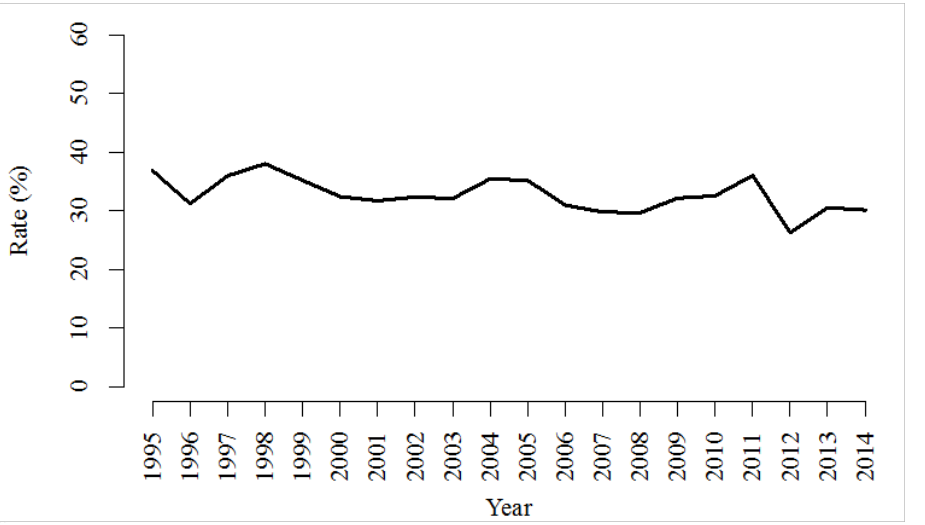
TABLE 1 – Distribution of (INF) according to syntactic context (CANEVER, 2017)[16]

	(INF)
Adverbials	17,045
Adjective complements	4,205
Noun complements	3,695
Total	24,945

Figure 1 shows that, in academic writing, the frequency of INFflex in these contexts did not rise from 1995 to 2014. Differently from what was hypothesized, we observe a rather stable frequency of INFflex overall, and, in fact, statistical analyses showed no significant difference among the rates of INFflex over the years. While one could argue that a 20-year period is relatively short, this diachronic pattern is revealing not only in that it contradicts the trend pointed out by Canever (2012), but also in that it indicates an unexpected stability regarding the use of INFflex in written BP. Still, more diachronic studies are needed in order to shed light on the usage patterns of INFflex considering earlier years.

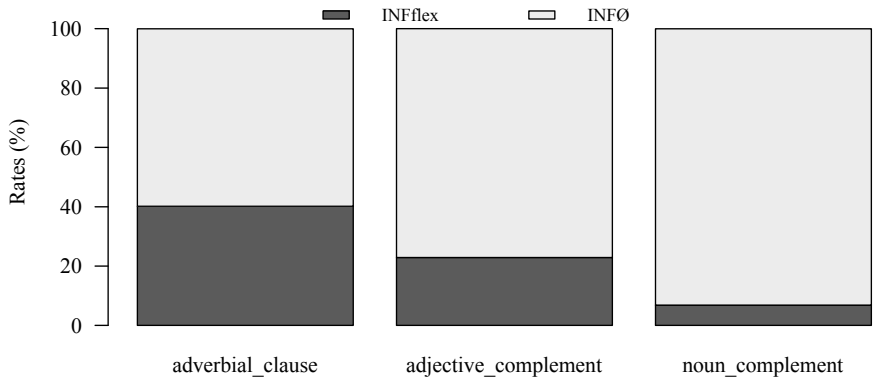
[16] Only 8 instances of INFflex in complements of modal verbs were found in the corpus, namely 3 instances of 3PL and 5 instances of 1PL. Although infrequent, they can be taken as instances of hypercorrect INFflex, as they have been produced by highly educated speakers in a very careful style.

FIGURE 1 – Rate of INFflex in academic writing from 1995 to 2014 (CANEVER, 2017)



Canever (2017) also found that (i) INFflex is more frequent in adverbial clauses than in complements of nouns and adjectives (Figure 2), and (ii) there is a statistically significant preference for INFflex with 1PL in adverbial clauses – as expected, based on Canever (2012) – and in nominal complements, and for 3PL in adjectival complements.

FIGURE 2 – Rates of INFflex according to syntactic context (CANEVER, 2017)



Drawing on the diachronic study by Canever (2017), this paper essentially asks whether INFflex is currently associated with positive social meanings. In light of the stability regarding the use of INFflex in academic writing, it is of interest to investigate to what extent this diachronic pattern relates to sociolinguistic perceptions of INFflex among BP speakers. Is it the case that stable and frequent rates of INFflex in adverbial clauses over the years have impacted speakers' perceptions when it comes to INFflex in this syntactic context? Regarding the attested preference for INFflex with 1PL in adverbial clauses, do speakers's perceptions vary depending on whether INFflex occurs with 1PL or 3PL?

Given the prestige usually associated with overtly marking agreement in BP (MENDES; OUSHIRO, 2015; NARO; SCHERRE, 1991; RÚBIO; GONÇALVES, 2012; SCHERRE; NARO, 2014, 2006; *inter alia*), our main goal here is to verify if speakers sound more educated, more intelligent and more formal in their INFflex- than in their INFø-guises. Although subject-verb agreement is one of the most studied variables in BP, there has been little research focusing on infinitive verbs,[17] and no perception study regarding inflected infinitives in BP.

It is of particular interest to check how the social values of INFflex differ depending on whether it is used in a prescriptively optional syntactic context (like adverbial clauses) or in a nonstandard/hypercorrect context (as complements of modal verbs – see example (10) in section 1). In this regard, an effect of listeners' education is expected, with nonstandard INFflex-guises leading to more positive perceptions among less educated speakers. This prediction is not only related to the fact that hypercorrection has been originally associated with lower middle class speakers (LABOV, 1972), but also to the stigma associated with lack of verbal agreement in Brazil. In light of this scenario, we hypothesize that less educated Brazilian speakers might have a generalized belief that *the more verbal agreement they use, the better they speak*.

The next section outlines the design of a matched-guise experiment that deals with all of these variables: the speaker (two men and two women), the main linguistic variable (INF), the plural person (1PL or 3PL), the syntactic context (adverbial clause, in which INFflex is optional; or complement of modal verbs, in which INFflex is nonstandard).

[17] Besides the aforementioned studies that dealt with written BP, Görski (2000) investigated (INF) in oral BP and found a rate of 8% of INFflex.

3 Designing a perception experiment: (INF) and notions of competence

In the previous sections, we built an argument in favor of a perception experiment to test if INFflex indexes positive social meanings. Crucially, we want to check if there is a difference in listeners' reactions to INFflex and INFø depending on whether (i) their syntactic context is optional or nonstandard, and (ii) the person subject is first (1PL) or third (3PL) and (iii) they were produced by a man or a woman. For (i), we decided that we should use adverbial clauses, since it is the most frequent context in which (INF) occurs (at least in academic writing) and the one in which INFflex itself is also significantly more frequent (see FIGURE 2). For (ii), our decision to include subject-person as a variable in the experiment is based on the fact that INFflex (instead of INFø) is preferred with 1PL when it comes to adverbial clauses. Finally, since we had four combinations (2 syntactic contexts x 2 grammatical persons) and we wanted each voice to be heard only once by each respondent, we decided to record four different speakers, so that we could check for differences in perceptions depending on whether the stimulus was produced by male or female voices. In addition, we decided to use two female and two male voices in order to check if differences in perception would correlate to gender or to speakers.

In order to account for these variables, we created the following sentences:

TABLE 2 – INFflex and INFø stimuli used in the task

		INFflex	INFØ
Adverbial clause	1PL	Aqui em casa, além da televisão, nós também usamos o computador 'pra' **assistirmos** a filmes e séries. *'Here at home, besides the tv, we also use the computer in order to watch movies and series.'*	Aqui em casa, além da televisão, nós também usamos o computador 'pra **assisti'** a filmes e séries. *'Here at home, besides the tv, we also use the computer in order to watch movies and series.'*
	3PL	Hoje em dia, com diversos aplicativos novos, muitas pessoas usam a internet 'pra' **fazerem** ligações. *'Nowadays, with many news apps, many people use to the internet to make calls.'*	Hoje em dia, com diversos aplicativos novos, muitas pessoas usam a internet 'pra **fazê'** ligações. *'Nowadays, with many news apps, many people use to the internet to make calls.'*
Modal verb complement	1PL	No caso da televisão a cabo, só depois de 12 meses nós podemos **cancelarmos** a assinatura. *'When it comes to cable tv, we can cancel the subscription only after 12 months.'*	No caso da televisão a cabo, só depois de 12 meses nós podemos '**cancelá'** a assinatura. *'When it comes to cable tv, we can cancel the subscription only after 12 months.'*
	3PL	Com tantos aplicativos infantis hoje em dia, as crianças podem **aprenderem** muito. *'With so many child apps nowadays, kids can learn a lot.'*	Com tantos aplicativos infantis hoje em dia, as crianças podem '**aprendê'** muito. *'With so many child apps nowadays, kids can learn a lot.'*

We recorded the speakers as they read the INFflex version of these sentences as naturally as they could (that is, by trying to sound as if they were not reading them). We then selected the most natural-sounding recordings and created their INFø version, by using PRAAT (BOERSMA; WEENINK, 2019) to cut the plural inflections (1PL *–mos* and 3PL *–em*). We also cut the infinitive morpheme /-r/, since final /r/ is nearly-categorically deleted in spoken BP, especially when it comes to the pronunciation of infinitive verbs (OLIVEIRA, 1983; OUSHIRO;

MENDES, 2014; OUSHIRO, 2015).[18] In other words, leaving the infinitive /-r/ in the INFø guises would have made the stimuli sound noticibly different from what is usual in spoken BP.

Considering the 4 original INFflex stimuli and their corresponding 4 INFø matches (2 syntactic contexts x 2 grammatical persons x INFflex/INFØ), 32 stimuli were created in total, since 4 speakers were recruited. The goal in this case is to test how the same speaker is perceived when listened to in each of the guises. For instance, if a speaker is perceived as more intelligent when heard in their INFflex-guise comparatively to their INFø-guise, this difference in perception can be attributed to the only feature that differentiates the guises; the infinitive inflection.

With that in mind, the stimuli were organized so that each respondent would listen to both syntactic contexts (adverbial x modal clauses), both grammatical persons (1PL x 3PL), and both inflection variants, but only once to each speaker – in a way that every participant would listen to four stimuli (one by each of the speakers). Although some studies that also utilize modified versions of matched-guised tasks have respondents listen to the same speakers more than once, such as Bekker and Levon (2017),[19] we assumed that our respondents would realize that they were listening to the same speakers repeatedly, in a way that their perceptions stimulated by later stimuli would be likely primed by earlier ones. Given the number of speakers and the nature of the linguistic variable being focused on, we preferred to reduce the time necessary to accomplish the task in order to reduce task abandonment.

To satisfy these conditions, we created eight sets of stimuli, with four stimuli each, one by each speaker. For example, Table 3 shows that set A1 is composed of the stimuli highlighted in black. Table 4 shows set A2 – the matched version of A1 (the cells that were white in Table 3 are black in Table 4). Sets A1 (Table 3) and A2 (Table 4) are the same, except for variable (INF), which defines the guises. In the interest of concision, we do not illustrate the remaining 6 matched sets of stimuli (B1/B2, C1/C2, D1/D2), but their structure follow the same design shown in Tables 3 and 4, but with the stimuli that are grey.

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[18] These authors found a rate of 97% of deletion of infinitive /-r/.

[19] Bekker and Levon (2017) presented respondents with two stimuli from the same speaker – one in English and one in Afrikkans.

TABLE 3 – Example of a set of stimili: set A1

A1	Man 1		Man 2		Woman 1		Woman 2	
Adverbial 1PL	flex	Ø	flex	Ø	flex	Ø	flex	Ø
Adverbial 3PL	flex	Ø	flex	Ø	flex	Ø	flex	Ø
Modal 1PL	flex	Ø	flex	Ø	flex	Ø	flex	Ø
Modal 3PL	flex	Ø	flex	Ø	flex	Ø	flex	Ø

TABLE 4 – Example of a matched set of stimuli: A2

A2	Man 1		Man 2		Woman 1		Woman 2	
Adverbial 1PL	flex	Ø	flex	Ø	flex	Ø	flex	Ø
Adverbial 3PL	flex	Ø	flex	Ø	flex	Ø	flex	Ø
Modal 1PL	flex	Ø	flex	Ø	flex	Ø	flex	Ø
Modal 3PL	flex	Ø	flex	Ø	flex	Ø	flex	Ø

The task was set up in the online survey platform Qualtrics, and people were invited to participate via e-mail and social media. Once respondents accessed the survey, they were randomly assigned one of the eight sets of stimuli (or conditions). After a short introduction that described the basic instructions for the task, the four stimuli of the assigned condition were then randomly presented to the participant. After listening to each audio clip, the listener was asked to rate it on five evaluative scales (see Appendix A), which were designed so as to elicit listener judgments of speaker competence (*educated/not educated, intelligent/ not intelligent, formal/not formal*), sexuality (*gay-lesbian/ not gay-lesbian*), and accent (*Paulistano/not Paulistano*).[20] The idea of testing a correlation between gay-soundingness and the variants of (INF) is based on Mendes (2016), whose work on nominal number agreement showed that four male voices were consistently perceived as more masculine-sounding when heard in their nonstandard guises, that is, when their plural NPs lacked plural /s/ in the nominal nucleus (as in *as coisa-ø* 'the things'). Similarly, given the fact that this study is part of a body of research that has been investigating how certain linguistic variants make speakers sound more or less *Paulistano* – such as Oushiro (2015) and Soriano (2016), about coda (-r) pronunciation, and Mendes (2016) about (EN) –, the accent scale was included in order to verify if

[20] *Paulistanos* are those born and raised in the city of São Paulo.

there is any correlation between inflecting the infinitive and sounding more or less *Paulistano*. Prior to a final demographic questionnaire, in which respondents were asked about their age, sex, education, and place of origin, they answered a few multiple-choice questions about the speakers (see Appendix A). This article, however, focuses on the scalar responses, more specifically on the scales that are related to perceived competence.

Each set of stimuli was listened to by at least 50 respondents, for a total of 411. Most of them (61%) are from the city of São Paulo and its metropolitan area, although there were a considerable number of participants from other states (31%). The great majority of listeners are highly educated (44% have a college degree and 48% have a postgraduate degree), and most of them are between 20 and 39 years old (74%).

5 Findings

Listeners' reactions to the 32 experimental stimuli were statistically analyzed in R (R CORE TEAM, 2018). In order to check if the responses in the scales correlated to one another, we initially ran a Principal Components Analysis of the data (function *principal* of package *psych* – REVELLE, 2016). Table 5 shows, as expected, that the responses on the scales for education, intelligence and formality are positively correlated – meaning that respondents that perceived a certain speaker in a certain guise as more educated- also perceived her or him as intelligent- and formal-sounding (note that the responses on the the two first scales load on to the first principal component more strongly than the third). Following Levon (2014) and Mendes (2016), we named this first component as Perceived Competence. As for the responses on the scales for gay-soundingness and Paulistanity, they do not correlate with any of the others and we simply used the same terms to name the corresponding components.

TABLE 5 – Factor loadings for five perceptual evaluation scales
(Method: PCA with promax rotation)

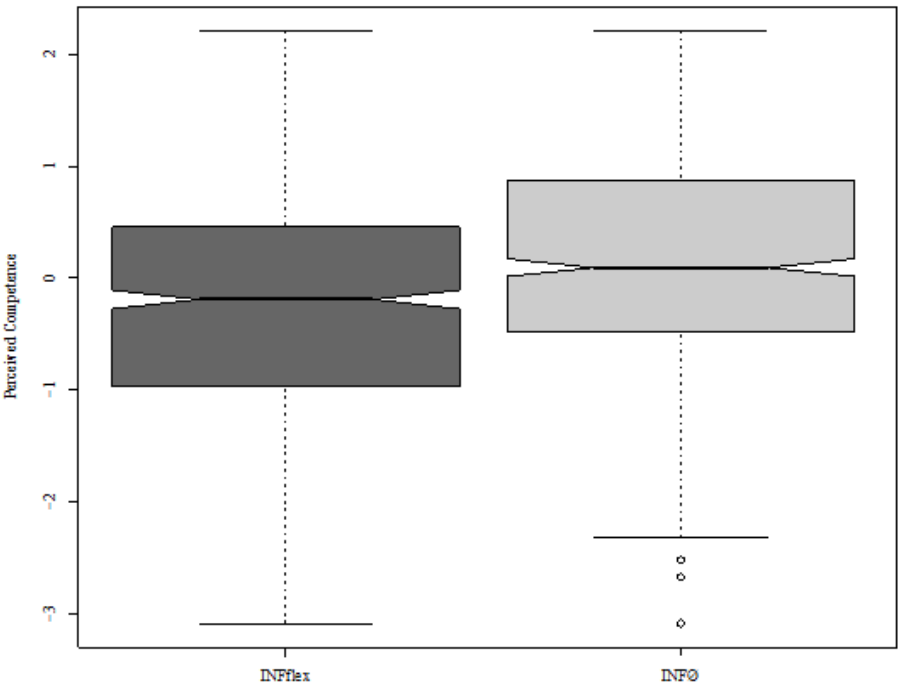
	'Competence'	'Gay-soundingness'	'Paulistanity'
Education	**0.89**	-0.03	0.04
Intelligence	**0.89**	-0.03	0.01
Formality	**0.75**	0.07	-0.05
Gay-soundingness	-0.03	**1.00**	0.00
Paulistanity	0.02	0.00	**0.99**
SS loadings	2.13	1.00	1.00
Proportion Variance (%)	43	20	20
Cumulative Variance (%)	43	63	83
Proportion Explained (%)	52	24	24
Cumulative Proportion (%)	52	76	100

The factor scores generated by the Principal Component Analysis were taken in subsequent regression modeling as the dependent variable. Mixed-effect regression models were run, with both the respondents and the speakers being included as random intercepts.[21]

Contradicting our hypothesis that INFflex might be associated with positive social values, such as higher perceived competence, speakers were perceived as more competent-sounding in their INFø-guises, as can be seen in Figure 3. Furthermore, Figure 4 shows that the difference is greater in modal constructions – a context in which the use of INFflex is an example of hypercorrection, as discussed earlier – while in adverbial clauses, in which INFflex is *prescriptively optional*, there is a smaller difference in how speakers were perceived in reference to the guises (INFflex or INFø).

[21] Speaker and Speaker Gender did not turn out to be significant predictors of the participants' responses.

FIGURE 3 – PCA scores for perceived competence based on INFflex and INFØ



Considering that the intercept is alphabetically defined as INFø and Adverbial clauses, Table 6 shows that all differences are statistically significant: (i) between responses based on INFflex and INFø; (ii) between responses based on the syntactic contexts (modal *versus* adverbials); and (iii) between responses based on the interaction (INF):Syntactic Context. In other words, the results summarized in Table 6 confirm what the boxplots indicate: speakers are heard as more competent-sounding in their INFø-guises, and this effect is greater in modal constructions. In other words, (INF) has a stronger effect in the hypercorrect context as opposed to the prescriptively optional one. Also note that sentences with modal forms, regardless of the INF-guise, generally get lower ratings (-0.216, p<0.001).

FIGURE 4 – PCA scores for perceived competence based on INFflex and INFØ in two syntactic contexts

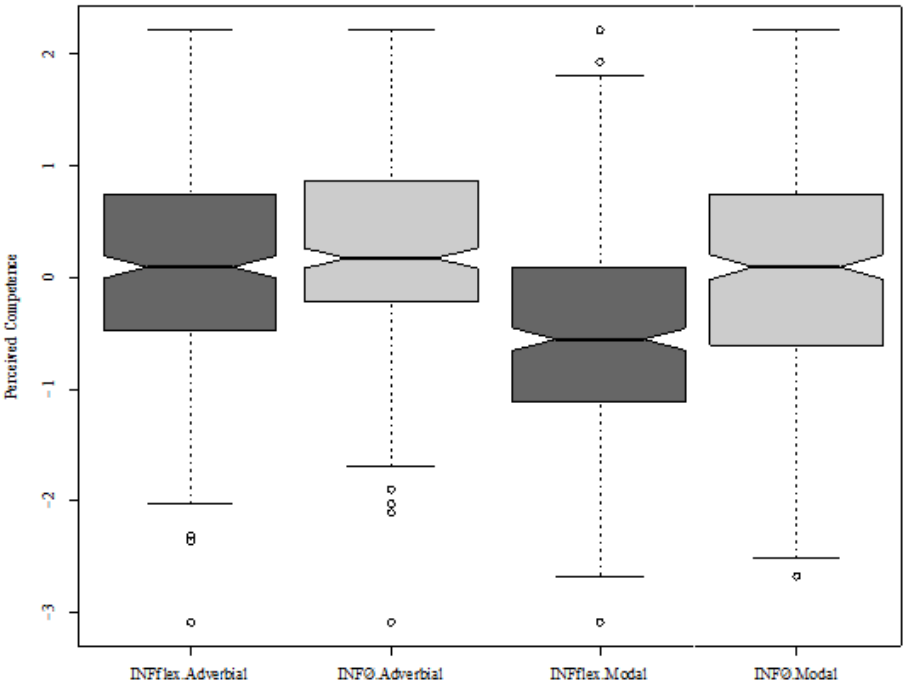


TABLE 6 – Linear mixed-model regression results for *Perceived Competence*: Syntactic context effect

Fixed effects	Estimate	Standard error	t value	*p* value
(Intercept)	0.246	0.132	1.865	0.139
(INF)-INFflex	-0.159	0.057	-2.794	0.005**
Syntactic Context (Modal)	-0.216	0.057	-3.797	<0.001***
(INF)-INFflex:Syntactic Context (Modal)	-0.309	0.080	-3.827	<0.001***

Total N: 1432. Random effects: RESPONDENT (368), SPEAKER (4). Log likelihood: -1833.492

Formula: PCA ~ INF * SYNTACTIC_CONTEXT + (1 | RESPONDENT) + (1 | SPEAKER)

If instead of Syntactic Context (modal x adverbial clauses) we include Grammatical Person (1PL x 3PL) in the regression model, we see that this is not a significant predictor of the participants' responses

– differently from what we expected at first. The difference between responses based on INFø (Intercept) and INFflex is still significant (p= 0.001), but there is no effect of Grammatical Person, nor of the interaction (INF):Grammatical Person.[22]

TABLE 7 – Linear mixed-model regression results for *Perceived Competence*: Person

Fixed effects	Estimate	Standard error	t value	*p* value
(Intercept)	0.083	0.134	0.621	0.567
(INF)-INFflex	-0.246	0.077	-3.165	0.001 **
Grammatical Person-3PL	0.111	0.077	1.430	0.153
(INF)-INFflex:Gram.Person-3PL	-0.137	0.131	-1.046	0.296
Total N: 1432, Random effects: Respondent (368), SPEAKER (4).Log likelihood: -1833.492				

Formula: PCA ~ INF * GRAMMATICAL PERSON + (1 | RESPONDENT) + (1 | SPEAKER)

With regard to Respondents' Age, we found that younger respondents tend to perceive speakers' competence more neutrally irrespective of the guise, while older listeners tend to perceive the speakers as more competent-sounding in their INFø guises and less competent-sounding in their INFflex guises. Table 8 shows a significant interaction between (INF) and the Respondent's Age, even though (INF) and Age are not, themselves, predictors in this model.

TABLE 8 – Linear mixed-model regression results for *Perceived Competence:* Age effect

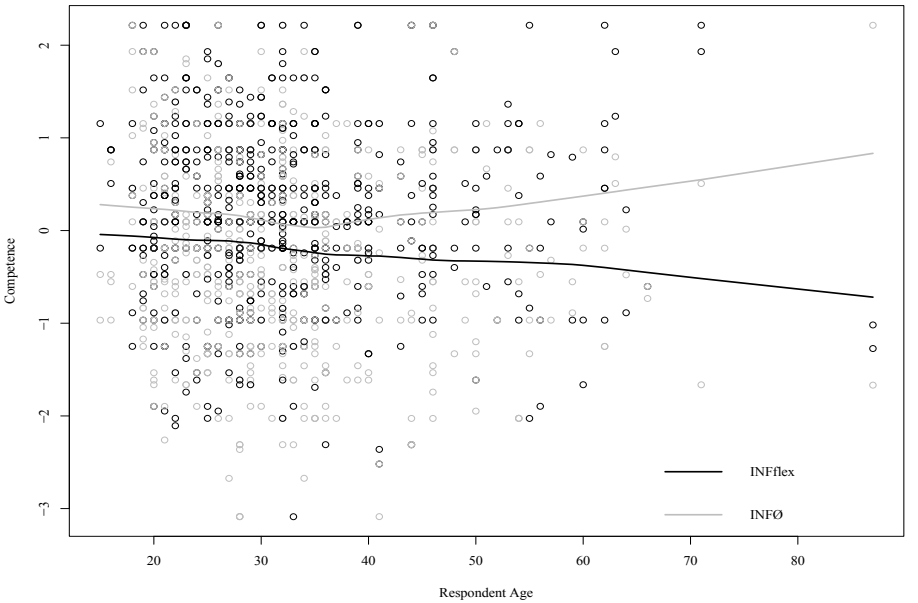
Fixed effects	Estimate	Standard error	t value	*p* value
(Intercept)	0.084	0.178	0.471	0.646
(INF)-INFflex	0.056	0.138	0.405	0.685
Respondent_Age	0.001	0.003	0.462	0.643
(INF)-INFflex: Respondent_Age	-0.011	0.004	-2.785	0.005 **
Total N: 1408. Random effects: Respondent (362), SPEAKER (4). Log likelihood: -1856.558				

Formula: PCA ~ INF * RESPONDENT_AGE + (1 | RESPONDENT) + (1 | SPEAKER)

[22] There is also no significant interaction (INF): Grammatical Person if we include Syntactic Context as another interaction in the regression model (p=0.534).

Figure 5 shows the effect of the interaction between (INF) and Respondents' age. Each dot represents an answer given by a respondent (based on INFflex/black or INFø/grey), the x-axis represents Respondents' age while the y-axis represents perceived competence ratings (PCA scores). The corresponding regression lines indicate that younger speakers (especially those that are 35 years old or younger) have similar perceptions of competence (the lines are parallel and close to one another). Toward the right portion of the plot, the patterns move in opposite directions: older participants hear the speakers as more competent-sounding in their INFø-guises and less-competent sounding in their INFflex-guises.[23]

FIGURE 5 – Respondents' answers according to their age



[23] In Figure 5, there is actually only one participant over 80 years old (hence the rightmost four dots – one response for each of the speakers). By excluding the data volunteered by this speaker, re-running the model yields similar results, and the interaction between (INF) and Age remains significant without the oldest participant/outlier (p=0.019).

To further investigate this significant interaction between (INF) and Respondents' age, we analyzed the subsets of adverbial and modal data separately, and found that such interaction is actually only significant for the modal subset, as Table 9 shows.[24]

TABLE 9 – Linear model regression results for *Perceived Competence:* Age effect in the modal data subset

Fixed effects	Estimate	Standard error	t value	*p* value
(Intercept)	-0.199	0.168	-1.184	0.236
(INF)-INFflex	0.002	0.236	0.012	0.990
Respondent Age	0.007	0.005	1.430	0.153
(INF)-INFflex:Respondent Age	-0.014	0.007	-2.111	0.035*
Total N: 703. Log likelihood: -971				

Formula: PCA ~ INF * Respondent Age

Considering instances of INFflex in modal complements as cases of hypercorrection, this result suggests that, when it comes to hypercorrect use of (INF), older speakers are more sensitive than younger speakers. As shown in section 2, according to the diachronic study of academic writing by Canever (2017), there is no clear indication of change in production. However, the difference between older and younger participants evidences a change in progress, in reference to how they perceive speakers as more or less competent-sounding depending on the variants of (INF).

So far, our results lead to the question of whether perception changes faster than production, particularly when it comes to a linguistic variable that is so "in the spot", with some consensus and much dispute among grammarians and how their prescriptions are enforced at school and by social pressures. Our results also lead to the question of whether social meanings linked to morphosyntactic variants are dependent on syntactic context and frequency of use.

[24] For the adverbial subset, the interaction between (INF) and Respondents' age was not significant (p=0.5133).

5 Conclusion

This study used a modified matched-guise task (LAMBERT *et al.*, 1960) in order to verify if speakers sound more educated, more intelligent and more formal in their INFflex-guises than in their INFø-guises, and whether these perceptions vary significantly according to the syntactic context, the grammatical person and the listeners' social characteristics (e.g. age and education). Based on the diachronic study by Canever (2017) and given the prestige usually associated with overtly marking agreement in BP (MENDES; OUSHIRO, 2015; NARO; SCHERRE, 1991; RÚBIO; GONÇALVES, 2012; SCHERRE; NARO, 2014, 2006; *inter alia*), we expected to find that INFflex is associated with positive social meanings when used in a prescriptively optional syntactic context, such as adverbial clauses, and, more specifically, with 1PL. Regarding INFflex in a nonstandard context (as complements of modal verbs), we expected to find an effect of listeners' education, with nonstandard/hypercorrect INFflex-guises leading to more positive perceptions only among less educated speakers.

Taking these hypotheses into account, we created eight sentences that accounted for the three variables we wanted to test: syntactic context, grammatical person, and (INF). After recruiting and recording four speakers (two men and two women), we organized the 32 stimuli in eight sets, each of which contained only one stimulus per speaker. We had a total of 411 respondents, and their reactions to the 32 experimental stimuli were statistically analyzed in R.

Contradicting the initial hypothesis that speakers would sound more educated, more intelligent and more formal in their INFflex-guises, results show that speakers are generally judged as more competent-sounding in their uninflected (INFø) guises, and that this effect is greater in the nonstandard/hypercorrect context used in the experiment (modal constructions). We interpret the results for adverbial clauses as a hint that frequency of use plays a crucial role in the sociolinguistic perception of (INF). Although there are variables that are high in frequency of use and are still stigmatized – such as the lack of verbal agreement in BP –, when it comes to (INF) it seems to be the case that social meanings depend both on the construction (the syntactic context) and the frequency of use. Drawing on Canever (2017), while there were only 8 instances of hypercorrect INFflex in modal complements (in a very large corpus

of written BP), the rate of INFflex (40%) is stable over the years. This relatively high frequency use of INFflex in a *prescriptively* optional context such as adverbial clauses might be leading to more neutral perceptions of (INF) in this syntactic context.

Given the fact that most of the respondents were highly educated, it was not possible to test if INFflex in the nonstandard/hypercorrect context (modal constructions) might be associated with more positive values among less educated speakers, as hypothesized. However, older respondents presented stronger reactions to Modal-INFflex guises, while the judgments or younger respondents tended to be more neutral. Such an age effect suggests a change in progress in the sociolinguistic perceptions associated to (INF).

For these reasons, future studies should further investigate the effects of age, education, syntactic context and frequency of use in the social meanings associated with this morphosyntactic variable. Since INFflex frequently occurrs in written language, it would also be interesting to replicate the perception task reported here with written stimuli. Additionally, further research should explore patterns of variation and change of (INF) in spoken BP as well, not only to discuss the evolution of this variable (at the interface spoken/written BP), but also to shed more light on the relationship between perception and production.

Authorship Statement

This paper is part of Canever's (2017) Ph.D. dissertation, advised by Professor Ronald Beline Mendes. Both authors designed the experiment reported in the article. Data collection and statistical analyses were performed by the first author. Both authors collaborated on interpreting results and writing and revising the article.

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"Not from a 'Danish' home; typical of trying to sound 'tough'" – Indexical meanings of variation in /s/ and /t/ in the speech of adolescent girls in Copenhagen

"Não é de família dinamarquesa; mas é típico de tentar parecer 'durona'" – Significados indiciais das variáveis /s/ e /t/ na fala de meninas adolescentes em Copenhague

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Abstract: The aim of this article is to examine the social meaning of /s/- and /t/-variation for Copenhagen girls in two different registers. The examined features consist of [s] and [t^{s}], which are considered the standard variants, and [s+] and [t^{j}] which carry different social connotations. Both variables are examined in the registers MODERN COPENHAGEN SPEECH and STREET LANGUAGE in two different matched guise experiments. Stimuli for both experiments consist of segmentally manipulated natural speech, and experiment

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1 was conducted with open responses, while experiment 2 used fixed scales based on experiment 1. Both experiments show that /s/-variation has little to no effect in both registers. This is surprising because [s+] is commonly perceived to index femininity and to be an integrated part of the STREET register. For/t/-variation, the presence of [tʲ] significantly indexes non-Danish ethnic background and the Western suburbs of Copenhagen, which are traditionally associated with the working class and mixed ethnic backgrounds. Finally, there are significant effects of prosodic frames alone. These link MODERN COPENHAGEN SPEECH to intelligence and the Northern suburbs of Copenhagen, which traditionally denote upper middle class, and STREET LANGUAGE to non-Danish ethnic background, the Western suburbs of Copenhagen, and playing tough.

Keywords: indexicality; perception; female speech; sociophonetics; Danish.

Resumo: O objetivo desse artigo é examinar os significados sociais das variáveis /s/ e /t/ em dois registros distintos na fala de meninas em Copenhague. As variantes examinadas são [s] and [tˢ], consideradas variantes padrão, bem como [s+] and [tʲ], que veiculam diferentes conotações sociais. Ambas variáveis são examinadas nos registros FALA MODERNA EM COPENHAGUE e LINGUAGEM DE RUA, em dois experimentos do tipo *matched-guise*. Os estímulos para ambos experimentos consistem de trechos de fala natural manipulados, mas o experimento 1 foi conduzido com respostas abertas, enquanto o experimento 2 utilizou escalas, estabelecidas com base no experimento 1. Os dois experimentos mostram que a variável /s/ não tem praticamente nenhum efeito na percepção dos registros. Esse é um resultado inesperado, na medida em que [s+] é comumente percebido como um índice de femininidade e é parte integrante do registro LINGUAGEM DE RUA. Para a variável /t/, a presença de [tʲ] indicia significativamente uma descendência não dinamarquesa e é associada aos subúrbios do oeste de Copenhague, tradicionalmente associados a classe trabalhadora e miscigenação étnica. Finalmente, há efeitos significativos de frames prosódicos, isoladamente: por um lado, FALA MODERNA EM COPENHAGUE é associada a inteligência e aos subúrbios do norte da cidade (estes últimos, tradicionalmente entendidos como uma região de classe média alta); por outro lado, por meio dos mesmos frames prosódicos, LINGUAGEM DE RUA associa-se a etnia não dinamarquesa, aos subúrbios do oeste de Copenhague, e a uma postura "durona".

Palavras-chave: indicialidade; percepção; fala de mulheres; sociofonética; dinamarquês.

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1 Introduction

The study of indexicality is integral to the field of sociolinguistics, particularly with the increase in so-called third wave studies (ECKERT, 2010). The indexicality or social meanings of variants of phonetic variables have been shown to be dynamic rather than fixed, and this has been studied in different ways. Some studies have shown how the social meanings of linguistic features may change over time (e.g. MOORE; CARTER, 2017, MAEGAARD *et al*., forthc.) either cross-generationally or in real time. Other studies have shown how the meaning of linguistic variants can vary not only across time or speakers, but may in fact co-exist in the same moment in time. Approaches like this can be broadly said to work within a framework of indexicality that is based on Silverstein (2003)'s notion of indexical order. Particularly influential in the field of sociolinguistics has been Eckert's (2008) concept of indexical fields, in which the many different social meanings that can be seen to be associated with a particular phonetic variant are connected in a network of related social meanings which then go on to form associations with different stereotypical personae. For instance, Podesva (2007) argues that the use of /t/-release serves different functions for the speaker Heath depending on the situation in which he is employing this particular phonetic resource: when he releases his /t/ in conversations with patients at his job, he is drawing upon the association of /t/-release with professionalism and education, whereas when Heath uses /t/-release at a barbecue party with friends, the feature is used as a resource for portraying a particular kind of gay persona. In other words, Podesva (2007) shows that the same feature can be used for very different indexical means by the same speaker depending on the situation, the topic of talk and the relations he has with his interlocutors.

That listeners also ascribe different social meanings to the same phonetic variant has been shown in a handful of studies using the matched guise technique (LAMBERT *et al*., 1960) in different speaker evaluation experiments. A number of such studies have focused on the indexicalities of fronted versus alveolar variants of the phoneme /s/ in varieties of English. The use of fronted /s/ (henceforth [s+]) in English seems often to evoke stereotypical perceptions of male speakers as gay (CAMPBELL-KIBLER, 2011; LEVON, 2006, 2014; MACK; MUNSON,

2011) and, conversely, perceived gender identity has been shown to have an effect on perceptions of /s/ quality in English (STRAND; JOHNSON 1996, MUNSON, JEFFERSON; McDONALD, 2006). In Danish, [s+] also seems to be quite strongly associated with femininity or gayness (PHARAO *et al.*, 2014, PHARAO; MAEGAARD, 2017). However, [s+] has also been observed to be used in social and linguistic contexts where the social meanings appear to be clearly different. In a follow up study to the investigations of the social meanings ascribed to [s+] in Copenhagen Danish, the variation in /s/ was combined with variation in the production of /t/ in order to study how indexical meanings of a phonetic feature are influenced by the cluster of other features with which it co-occurs (PHARAO; MAEGAARD, 2017). Two such clusters are those that are stereotypically associated with "Modern Copenhagen speech" on the one hand, and "Street language" on the other. These clusters – which we will refer to as MODERN and STREET in keeping with the practice from previous studies – are associated by young Copenhageners with categories of speakers that stereotypically have very different social characteristics, in particular with respect to gender and ethnicity. We refer to these clusters with the term *register* (e.g. AGHA, 2004), since this term and the theorization around it focuses on the link between the linguistic cluster and social meaning and at the same time stresses the historical emergence of this link. Like other cultural models, registers are formed by the history and the changes in the community in which it is brought into existence. In Copenhagen, and in Denmark generally, the increasing migration, especially from the 1960s onwards, has changed the demographic composition of society, and new ways of speaking have developed – "street language" being one of the more salient ones. However, it is not the case that "street language" is only used by speakers of immigrant background (e.g. MAEGAARD, 2010; MADSEN *et al*., 2016), or that there is no intra-individual variation. Ideologically, the STREET register is linked to certain speaker types, but this does not mean that it is the case in actual usage, and that is why we find the term *register* more appropriate than e.g. *variety* or *dialect*.

The follow up study including variation in /t/ found that the effect of [s+] on the perception of male speakers of MODERN as feminine and gay was significantly attenuated when the [s+] occurred in an utterance that also contained a palatalized variant of /t/, the [tʲ] variant which has

commonly been observed in the STREET register (MAEGAARD, 2007, STÆHR, 2010). Together with previous studies of the indexicality of [s+] in American English when it occurs in combination with variants of the variable (ING) (CAMPBELL-KIBLER, 2012) as well as Levon's (2014) study of [s+] in combination with (th)-fronting in British English, the follow up study clearly indicates that the social meaning ascribed to a particular variant can be highly dependent on the variation with which it co-occurs, be that segmental or prosodic variation.

However, all of these studies have kept the nature of the voices used in the speaker evaluation experiments stable by only using samples of speech produced by males to study the relationship between different types of phonetic variables. In the present study, we continue the work on the social perception of variants of /s/ and /t/ in the registers MODERN and STREET in Copenhagen Danish by using samples of speech from female adolescents. By comparing our results with those obtained in the studies using male voices for the stimuli, we will be able to study the effect of speaker gender as well as studying the relationship between the different types of segmental and prosodic variation, which was carefully controlled in the stimuli. Specifically, we study the role of speaker gender in the social meanings associated with /s/ fronting and /t/ palatalization in the MODERN and STREET registers of Copenhagen Danish and ask:

1) What social meanings are associated with [s+] in female speech?
2) How are these meanings affected by [t̠] in female speech?
3) What differences are there between the social meanings found for female speech and those previously reported for male speech?

2 Background

The present study involved a number of steps deemed necessary to answer the questions posed above. In line with Maegaard (2007, 2010) and Pharao *et al.* (2014), it was decided to first collect listener responses to the variation to be studied by using questionnaires with open questions. This was to ensure that the scales to be used in a subsequent experiment would be locally meaningful. Thus, rather than simply using the same 8 scales that had been used in the studies of the variables in male speech,

data was collected to enable us to construct scales based on traits that were deemed relevant when the variables occur in female speech. While it may at the outset seem reasonable to expect that boys and girls can be meaningfully evaluated on the exact same scales, we would argue that this could lead to a risk of missing the specific dimensions of social evaluation that are linked to speaker gender. In particular, we suspected that sexual orientation would not play a role in the evaluation of the features when they occur in female speech.

2.1 The variables studied

In Danish phonology, the alveolar articulation of /s/ is described as the 'standard' pronunciation, both in Copenhagen speech, and in Danish in general (GRØNNUM 2005, p. 111). However, there is variation, and the most salient 'non-standard' variant is probably the fronted variant [s+]. This is a free variant of /s/, and not an allophone bound to a particular phonological context or position in the syllable or word. As already mentioned, the [s+] variant has been shown to be associated with femininity and gayness by listeners, when they encounter it in the speech of male adolescents speaking with the prosodic pattern characteristic of MODERN. Furthermore, an audiologopedic study of [s+] in Danish has analysed the variant as a speech impediment (HUTTERS; BAU 2006). But they also noted that this so-called disorder is mainly tied to female speakers. Thus [s+] is referred to as "young girls' lisp" (*ungpigelæsp*) in Hutters and Bau (2006), imbuing it with certain connotations even when it occurs in female speech. Maegaard (2007) also looked at speech production, specifically phonetic variation in a Copenhagen school. Here, it was found that [s+] was used mainly by the group of girls labelled the 'nice Danish girls' (MAEGAARD, 2007). Together this shows a connection between [s+] and femininity in public discourse as well as in studies of speech perception and production. However, Maegaard (2007) also found a relatively high frequency of [s+] in the group of boys known in school as the 'foreign boys', where 'foreign' is used by the adolescents themselves to label people with a minority ethnic background, i.e. immigrants of first and second generation descendants of immigrants, in particular from Turkey and the Middle East. This connection is more surprising, since the linguistic style, the clothing, and the behavior associated with these boys is stereotypically

linked to a streetwise, heterosexual masculinity that is very different from stereotypical gay masculinities or hyper-femininity, which as mentioned above appears to be what [s+] indexes in boys who use the MODERN register. As was also shown in Pharao *et al*. (2014), the [s+] did not have an effect in the STREET register, so it can be said that for certain types of male speakers, [s+] does not index gayness or femininity, but instead contributes to (or at least is not incompatible with) constructions of another kind of masculinity where heterosexuality and toughness are prominent parts. It also shows that the same variant [s+] may function as a stereotype in one context but as a marker in another context (in the sense of LABOV, 1971). Looking at the ascription of social meaning to variants within a more contemporary theoretical framework, we could suggest that the feature [s+] is to be viewed as part of different registers (AGHA, 2007), and perhaps even different indexical fields (cf. MAEGAARD; PHARAO, fthc.), and that this is why the social meaning of [s+] varies across users and their speech.

For the phoneme /t/, it is also the case that the alveolar variant is the standard pronunciation (GRØNNUM, 2005). Interestingly, the non-standard variant of /t/ that is most salient in Copenhagen-based speech is the palatalized variant [tʲ]. While there are words in Danish that phonetically start with [tʲ] (e.g. 'tjener, tjekke, tjans' *waiter,check, gig*), these contain combinations of /t/ and /j/ to speakers of Danish, i.e. the realization [tʲ] in these words is not the result of a process of palatalization, but simply a combination of the alveolar stop and the palatal glide, and minimal pairs exist, e.g. /tjɛgə/ *check* vs. /tɛgə/ *thatch* and /tjænˀs/ *gig* vs. /tænˀs/ *tooth's*. However, Maegaard (2007) as well as Stæhr (2010) found the realization of /t/ as [tʲ] to be prevalent in the speech of adolescent boys, and in particular those with an immigrant background. Maegaard (2007) also found evidence for the variant in the speech of adolescent girls, but it was very rare and never occurred in the group labeled 'foreign girls'. Hyttel-Sørensen (2011) found that this feature was very salient even for primary school children, who would spontaneously mention it as a feature of the way boys with immigrant background speak. In fact, Hyttel-Sørensen (2011) shows that primary school children sometimes perceive a female speaker of STREET using [tʲ] for /t/ to be a boy. That [tʲ] also has indexical value for adolescent Danes in Copenhagen was shown in Lillelund and Pharao (2014) and Pharao and Maegaard (2017),

where it was found that [tʲ] would lead even male speakers of MODERN to be rated higher on the scales *immigrant* and *gangster* by most listeners. Furthermore, it attenuates the perception of male speakers of MODERN using [s+] to be perceived as "feminine sounding", suggesting at least an indirect link to masculinity for [tʲ].

Taken together, studies of language use, popular discourse about youth language and experimental results from the study of male-adolescent speech, all show the variation in /s/ and /t/ in Copenhagen-based speech to be doing indexical work related to stereotypical gender roles.

2.2 Associations of MODERN and STREET in previous evaluation studies

The linguistic features which are associated with the concept of STREET have been described in a number of sociolinguistic studies (QUIST 2000, 2008; MAEGAARD, 2007; MADSEN, 2008; MØLLER, 2009; STÆHR, 2010; AG, 2010; HANSEN; PHARAO, 2010; MADSEN; MØLLER; JØRGENSEN, 2010: MØLLER; JØRGENSEN, 2011). Our stimulus samples include only one characteristic feature of STREET, namely the prosodic patterns. The characteristic feature of STREET prosody is a perceived difference in rhythm from the MODERN register. It is described in Quist 2000 as sounding more "staccato" than MODERN and was shown in Pharao and Hansen (2005, 2010) to be closer to patterns found in syllable-timed languages, since the difference in duration between phonologically short and long vowels is neutralized in STREET by making long vowels as short as short vowels (on average, for details see PHARAO; HANSEN, 2010). The prosody of STREET was shown to have indexical effects of its own in Pharao *et al*. (2014), Lillelund and Pharao (2014) and Pharao and Maegaard (2017) where it was clearly tied to perceptions of speakers as having a 'foreign' or 'immigrant' background, and was also found to be a particularly salient characteristic of this register in Møller (2009)

The concept of the type of speech labeled MODERN is also well described in Danish sociolinguistics. In a series of speaker evaluation experiments, where MODERN was represented in the stimulus material, Kristiansen and colleagues have shown that MODERN is consistently evaluated more positively than "Conservative Copenhagen speech" (and more positively than the local dialect as well) on scales concerning *self-assurance*, *fascination*, *coolness*, and *friendliness* (for an overview

of this research, see KRISTIANSEN, 2009). Furthermore, Kristiansen *et al*. (2013) and Tøndering and Pharao (fthc.) show that Danish listeners can place the origin of a speaker with quite high accuracy on the basis of prosody alone, and that the prosody found in MODERN leads to between 70 to 89 % of listeners to identify the speaker as coming from Copenhagen. This suggests that the MODERN prosody, which is more stress-timed, is closely associated with Copenhagen-based speech in the minds of listeners and that prosody generally is an important feature in the construction of register (and even varieties) for Danish listeners.

These short summaries of studies of language-ideological structures point to important differences in how STREET and MODERN are perceived. It should be stressed that all of these studies have obtained largely homogeneous responses. In other words, people do recognize the features associated with the concepts of STREET and MODERN and react to them in accordance with established, highly shared, ideological schemes.

3 Experimental design

The matched-guise technique used in this study is a variant of the original matched-guise technique, which has been in use since 1960 (LAMBERT *et al*, 1960). It is aimed at eliciting implicit language attitudes and is also useful for investigating how members of a speech community evaluate linguistic variation within various relevant registers. This also includes insight into the activation of social stereotypes associated with particular registers and with different types of linguistic variation, making the matched-guise a suitable choice in terms of experimental design for this type of study. The design is similar to Lillund and Pharao (2014) and Pharao and Maegaard (2017) which investigated the indexical meanings for /s/-variation and /t/-variation among Copenhagen boys by using variants of /s/ and /t/ spliced into recordings of short utterance with either MODERN or STREET prosody. This study expands on that by changing the gender of the speakers, but otherwise the experimental design is the same: Experiment 1 uses an open-ended questionnaire, the responses of which are converted into relevant scales used in Experiment 2. Both experiments include guises taken from recordings for a study of adolescent speakers of MODERN and

STREET by Pharao and Hansen (2010) where participants completed a map-task designed to elicit particular phonetic features. From these recordings, four female speakers were chosen; two representing MODERN and two representing STREET. Two short speech samples were selected from each speaker, one containing three tokens of /s/, while the other contained three tokens of /t/, after which tokens of [s] and [s+] and [t] and [tʲ] respectively were spliced into the samples, thus creating a complete set of matched guises for each of the four speakers. All tokens were manipulated to have the same duration and intensity as the original they replaced. The tokens of [s], [s+] and [t] were extracted from the speech of a girl judged to be speaking STREET and the [tʲ] token from a boy judged to be speaking MODERN. We chose to use a token of [tʲ] produced by a boy because during the splicing process it became clear that the acoustic difference between [t] and [tʲ], when produced by a girl in the recordings we had available for creating the stimuli, was often perceived as a dental-alveolar contrast instead of an alveolar-palatalized one, in particular when played over speakers, rather than presented over headphones. In other words, when the two variants were contrasted in running speech produced by female adolescents, the alveolar variant, [t] (with a CoG of 8054 Hz) sounded fronted, and the palatalized variant [tʲ] (with a CoG of 6549 Hz) sounded alveolar, even when presented to phonetically trained listeners. We conducted a pilot test with 10 subjects, who were naïve to the purposes of the final study. This pilot test was aimed at determining whether using a [tʲ] token produced by a male adolescent (with a CoG of 4566 Hz) would make the guises of the female adolescents sound unnatural. This was compared to naturalness judgements of the same clips, but with the original palatalized /t/ produced by a female speaker. The results showed that guises containing either of the two [tʲ] tokens sound equally natural, so in order to ensure maximal variation between the tokens used in the final experiment, the male-produced token was spliced into the samples of female speech to produce the [tʲ] guises. This can be said to weaken the ecological validity of the /t/ guises. However, recall that palatalized /t/ was documented in the data for Maegaard (2007), an extensive study of phonetic variation among adolescents in a Copenhagen school. We measured CoG for both /s/ and /t/ in an excerpt of the recordings made by Maegaard, and for one of the 'Danish girls', we found that about

half of the tokens measured had a CoG in the 3900 – 4700 Hz range. In other words, the male-produced token of [tʲ] we used in our stimuli falls within the range found in spontaneous speech recordings of adolescent girls from the same environment as the girls in the recordings we based our stimuli on. Due to differences in recording circumstances, it was not possible to splice tokens of [tʲ] from the Maegaard (2007) recordings into our stimuli while also maintaining a naturalistic impression – which is why we used the male-produced token from our own recordings. Given that similar acoustic values were obtained in the Maegaard (2007) recordings, we feel confident that the ecological validity of our stimuli was not severely hampered. The differences between the centers of gravity for all four tokens in the final experiment are shown in table 1.

TABLE 1 – Acoustics of the stimuli

/s/	CoG	/t/	CoG
[s+]	7454 Hz	[t]	8054 Hz
[s]	5717 Hz	[tʲ]	4566 Hz

In summary, a total of 8 guises for /s/ variation (2 STREET voices x 2 segmental variants + 2 MODERN voices x 2 segmental variants), as well as 8 guises for /t/ variation (2 STREET voices x 2 segmental variants + 2 MODERN voices x 2 segmental variants) were created.

4 Experiment 1 – open responses

4.1 Method

Experiment 1 was an open-ended questionnaire. The stimuli consisted of the aforementioned speech samples from four different girls, two representing each register. For each speaker, one sample contained three instances of /s/ and the other sample three instances of /t/, and both samples were created in two versions: for the /s/ samples, one with [s] and another with [s+]; for the /t/ samples, one with [t] and another with [tʲ]. In total, experiment 1 contained 16 guises.

The questionnaire used in experiment 1 contained one open-ended question: *Hvad er dit umiddelbare indtryk af denne person?* 'What is your immediate impression of this person?' This wording was used so as not to direct explicit attention towards the linguistic aim of the experiment. The informants were told the experiment was conducted by researchers from the University of Copenhagen and that they were going to hear 16 different speakers their own age, after which they should write a few words about their immediate impression of the speaker. The guises were played in a fixed order to avoid the same guise twice in a row and with approximately 30 seconds between each guise.

Experiment 1 was carried out at two high schools in Copenhagen, which mainly differ in the number of students with a minority ethnic background, one having a larger percentage than the other. A total of 95 students between the ages of 17 and 21 participated as informants. Following the experiment, the informants filled out a questionnaire with background information and participated in a group discussion regarding the aim of the experiment; none had worked out the actual aim, but both the /s/- and /t/-variation had been noticed and so had the two registers.

When looking at the responses, certain categories appeared to be meaningful and relevant to the informants. Coding the responses was in part a matter of interpretation for the coder, but many responses were in the form of keywords or very short sentences that all related to *gender*, *ethnic background*, *linguistic characteristics*, *personality*, *geography*, *social characteristics*, *appearance*, or *type*. Most responses contained more than one categorization, and all categorizations were coded and counted once per response. An example of this is shown in table 2.

TABLE 2 – Examples of responses to the open question together with coding

Response	Code
Example 1	
Forvirret	*forvirret*
'Confused'	confused
Doven	*doven*
'Lazy'	lazy
Barnlig	*barnlig*
'Childish'	childish
Umoden	*umoden*
'Immature'	immature
Example 2	
Hård type med accent	*hård*
'Tough type with an accent'	tough
Opvokset et sted med "ghetto" typer	*ghetto*
'Raised with "ghetto" types'	ghetto
Perkeraccent	*perker*[1] *accent*
'*Perker* accent'	*perker*[1] accent

4.2 Results

Across all guises, the more anterior variant of either variable, i.e. [s+] and [t] appear to be treated in much the same way by listeners, as we will show in our analysis below. Further, the less anterior variants [s] and [tʲ] also appear to be treated equally by listeners. This is in some ways surprising, because [s] is generally considered the standard variant of /s/ in Danish (as discussed above), and therefore it might a priori be expected to pattern with [t], the standard variant of /t/, in the evaluations, rather than [tʲ]. As we shall see below, this expectation cannot be seen to be supported in the evaluation of the variants in the speech of female adolescents.

[1] Perker is a (usually pejorative) slang term for immigrants particularly from the Middle East.

For *gender*, the speakers in guises with the more anterior variants are generally perceived as female where gender is mentioned, MODERN guises more so than STREET guises. With the less anterior variants, a larger subset of listeners perceived the speakers as male, particularly when listening to speakers of STREET. This supports the notion that there seems to be a connection between STREET and masculinity as already hypothesized from earlier studies, where the use of [tʲ] among female adolescents is extremely rare (MAEGAARD, 2007), and among male adolescents it indexes a STREET persona characterized by masculinity, among other traits (MADSEN, 2013). The counts for each gender in each guise is shown in table 3.

TABLE 3 – Counts for gender in each guise

STREET					MODERN				
	[s+]	[s]	[t]	[tʲ]		[s+]	[s]	[t]	[tʲ]
Female	37	32	31	17	Female	42	28	38	25
Male	4	6	1	4	Male	0	4	0	2

For *ethnic background*, a clear distinction between Dane and non-Dane is apparent. Speakers using STREET are generally perceived as non-Danes regardless of /s/ variation, and, conversely, speakers using MODERN are perceived as Danes. Variable /t/ does seem to play a role as indexical marker for foreign-ness, as the presence of [tʲ] activates a foreigner stereotype consistently across *both* registers. The presence of [t], on the other hand, seems insignificant in both registers, in the sense that it neither enhances nor diminishes the foreign-ness or Danishness of the activated stereotype belonging to each register. This indicates that ethnic background is a relevant characteristic when working with the two registers and this type of /t/ variation. The counts for ethnic background in each guise are shown in table 4.

TABLE 4 – Counts for ethnic background in each guise

STREET					MODERN				
	[s+]	[s]	[t]	[tʲ]		[s+]	[s]	[t]	[tʲ]
Dane	7	6	7	4	Dane	25	15	31	14
Non-Dane	37	35	37	52	Non-Dane	2	3	1	25

Linguistic characteristics is a group of responses primarily concerned with how and how well the speakers speak Danish. In all STREET guises, the less anterior variant is commented on more often than the more anterior variant, and the same is the case for /t/ variation in the MODERN guises. Only for /s/ variation in the MODERN guises are the ratios of comments roughly the same. This indicates that the listeners do perceive the variation, but possibly not in the same manner across the registers. It is also worth noting that particularly for the STREET guises, many comments revolve around bad Danish, speaking with an accent, or using *ghetto* slang, all of which seem to correspond to features generally associated with the STREET register. This contrasts with the speakers from the MODERN register, who are generally described as speaking good and proper Danish. Once again, [s] stands out because many comments revolve around the speakers of the guises with [s] "chewing gum while speaking", "speaking with a lisp" or "with a blocked nose" (none of which was actually the case). [tʲ] also stands out and is explicitly pointed out in both registers. However, in STREET it merely seems to reinforce the activation of the foreigner stereotype, while the presence of [tʲ] in MODERN is more ambiguous. It does seem to also activate the foreigner stereotype, even possibly to an extent where it completely blocks out the MODERN stereotype, but it is also noted that it sounds fake and like the speaker is exaggerating their pronunciation. This poses the question: is it even possible for female speakers to use [tʲ] as a linguistic resource in MODERN? In STREET, it seems to alter the perceived stereotype slightly, but in MODERN it seems to be at odds with the register (as signaled by the prosody), thus making the combination unfeasible in the minds of adolescent listeners. Note that this is at odds with the findings from production as described above in the review of Maegaard (2007). The counts for the most distinct linguistic characteristics in each guise are shown in table 5.

TABLE 5 – Counts for linguistic characteristics in each guise

STREET					MODERN				
	[s+]	[s]	[t]	[tʲ]		[s+]	[s]	[t]	[tʲ]
Accent/slang/ ghetto language	19	15	16	22	Accent/slang/ ghetto language	-	-	-	13
Lisp/blocked nose	1	4	1	-	Lisp/blocked nose	14	15	1	2
Poor Danish	5	18	9	18	Poor Danish	1	5	3	4
Good Danish	2	4	2	6	Good Danish	16	5	23	4
[tʲ]	-	-	2	6	[tʲ]	-	-	-	21
Sounds fake	-	-	-	2	Sounds fake	-	-	-	2

Personality contains the largest number of individual responses ranging between 27 % and 47 % of all responses for each guise. There also seems to be an additional layer to the activated stereotypes compared to linguistic characteristics. The speakers in the STREET guises are generally perceived to be friendly, helpful, and confident with only very few mentions of the rough attitude and lack of interest in academics that is typically associated with adolescent males using the STREET register. Instead, the listeners characterize them as young and a little insecure, but overall friendly and normal, which again points to the stereotype associated with STREET being very different for adolescent girls than adolescent boys. For the MODERN register, the results are not as clear-cut. Both /s/ guises are perceived in a generally negative way as being insecure, unintelligent and annoying, while also being young and normal, but there seems once again to be a difference between the two variants. The [s+] guises are also perceived as confident and intelligent, pointing to a vague and not very well-defined stereotype, whereas [s] guises have very few positive comments overall, leaving the stereotype with a largely negative characterization. The positive additions to the activated stereotype for guises with [s+] are particularly surprising, because they contrast with a fairly well-known stereotype typically associated with [s+] called *poptøsen* 'the pop girl'. The term itself has been in use in Danish since 1989 (DET DANSKE SPROG- og Litteraturselskab, 2019), and the concept has remained largely unchanged through its common representation in Danish media and discourse. She is blond, shallow and

not terribly smart, and as indicated by the name, she follows whatever happens to be popular. The label *poptøs* was used by the respondents in Maegaard's study, especially when categorizing female guises containing [s+] (2007, p. 223; 2010, p. 201). We do not see this stereotype in the responses for [s+], but it could be argued that she is somewhat present in the responses for [s], just not using the actual word *poptøs*. We will return to this in the discussion. Variable /t/ in MODERN is similar to the STREET register overall regarding the ratio of positive comments. The presence of [t] activates an older, intelligent, and confident persona, while [tʲ] activates approximately the same characteristics as the STREET register – confident, helpful, and young. The counts for the most distinct personality traits in each guise are shown in table 6.

TABLE 6 – Counts for personality traits in each guise

STREET					MODERN				
	[s+]	[s]	[t]	[tʲ]		[s+]	[s]	[t]	[tʲ]
Young	7	5	9	7	Young	13	14	4	7
Older	-	4	-	1	Older	1	2	10	3
Normal	6	2	1	-	Normal	9	5	4	-
Helpful/friendly	11	7	9	9	Helpful/friendly	6	2	5	6
Confident	3	10	6	9	Confident	12	8	15	11
Smart	2	2	-	-	Smart	8	3	11	3
Insecure	7	4	6	3	Insecure	9	9	6	6
Unintelligent	2	4	5	3	Unintelligent	3	7	1	3
Poor attitude/ annoying	2	4	3	5	Poor attitude/ annoying	10	10	5	5
Overall positive	44	35	38	33	Overall positive	49	28	38	38
Overall negative	31	24	23	27	Overall negative	49	49	18	24

As for *geography*, *social characteristics*, *appearance*, and *type*, various, subtly different stereotypes are activated. For STREET, the already known stereotype from the ghetto or the Western suburbs of Copenhagen (traditionally a working-class neighborhood that now has a high percentage of inhabitants with immigrant backgrounds) is activated across the register. The presence of [t] diminishes some of the negative connotations related to STREET, particularly the connection to the ghetto, but in terms of personality characteristics, STREET as a register activates similar levels of being a gangster or a "perker" and equal levels of playing tough regardless of variable /t/. Playing tough, in this case, should not be confused with actual toughness. The respondents express a clear distinction between pretend toughness and real toughness, and while pretend toughness occurs much more frequently in the responses, there are also examples of actual toughness indicating that adolescent girls can be and are perceived as legitimately tough in some contexts. For /s/ variation, it appears that [s] activates a slightly rougher version of the stereotype than [s+]. This divide between the less anterior and more anterior variants is also present in MODERN, where the more anterior variant point to upper class, the Northern suburbs of Copenhagen (generally considered very affluent), and a typical blonde, Danish girl. Here we also see some links to the stereotypical *poptøs,* but they are not as readily apparent or distinctive as we would have expected. The [s] variant activates a less well-defined stereotype, but points towards the urban parts of Copenhagen and playing tough. The counts for the most distinct aspects of *geography*, *social characteristics*, *appearance*, and *type* are shown in Table 7. As these are among the least frequent responses in the questionnaire, the counts here are lower than in the other tables. The presence of [tʲ] in MODERN results in categorizations in the upper part of Table 7, notably "from the Western suburbs". There are also three responses in the "upper middle class" category, pointing towards the more affluent, upper-class stereotype, but these are, however, infrequent –compared to the same categorizations made for the [t] guises.

TABLE 7 – Counts for geographical features, social characteristics, appearance and type in each guise

street					modern				
	[s+]	[s]	[t]	[tʲ]		[s+]	[s]	[t]	[tʲ]
Plays tough	2	2	6	6	Plays tough	-	1	-	3
"Perker"/gangster	7	6	8	6	"Perker"/gangster	-	-	-	2
Dark hair	-	1	1	2	Dark hair	-	-	-	1
Western suburbs/ ghetto	4	6	2	14	Western suburbs/ ghetto	-	1	-	4
Petite	3	4	6	3	Petite	4	5	-	3
Northern suburbs	-	-	-	-	Northern suburbs	2	-	1	1
Upper middleclass	-	-	-	-	Upper middleclass	3	2	7	3
Blonde	1	-	-	-	Blonde	7	3	5	1

In summary, both variables /t/ and /s/ seem to have some effect on the stereotypes activated by the two registers. It also appears that [s+] and [t] can be interpreted as being the unmarked variants, which for [s+] is unexpected and does not align with previous descriptions of Danish /s/. To investigate the extent of the effects of this variation in a quantifiable manner, eight fixed scales have been chosen on the basis of the responses in experiment 1 reported here. They appear to be relevant across both registers and both types of variation. *Ethnic background*, *Northern suburbs*, and *Western suburbs* are not only relevant based on these results, they were also used in the previous studies of this variation in Copenhagen Danish for male voices (e.g. PHARAO; MAEGAARD, 2017), which also makes them relevant for comparison. Personality traits like 'intelligent', 'confident', 'helpful', and 'annoying' are also relevant across both registers as they occur with relatively high frequency. Finally, "plays tough" is relevant to the perceived fakeness that some listeners report, which falls well in line with previous studies reporting on the *wannabe* phenomenon, where speakers are perceived to be using linguistic resources they are not actually socially entitled to, resulting in inauthenticity (cf. PHARAO *et al*, 2014).

5 Experiment 2 – fixed scales

5.1 Method

Experiment 2 is based on the same speech samples as experiment 1. However, in order to investigate not only the effect of /s/ and /t/ variation, but also whether the order of /s/ and /t/ holds any significance, it was necessary to modify the samples. This was done by cutting the /s/ and /t/ guises for each speaker in half and combining them with the other guise from the same speaker. This means that while experiment 1 has one set of guises for /s/ variation and one set of guises for /t/ variation, experiment 2 has one set of guises with one /s/ token and two /t/ tokens, and one set with one /t/ token and two /s/ tokens. Allowing for all possible combinations, this adds up to four guises per sample and eight guises per speaker. In total, this is 32 guises and table 8 shows all the possible combinations.

TABLE 8 – Combinations of variable /t/ and /s/ in the guises for experiment 2

1 [t] & [s+]	5 [s+] & [t]
2 [t] & [s]	6 [s+] & [tʲ]
3 [tʲ] & [s+]	7 [s] & [t]
4 [tʲ] & [s]	8 [s] & [tʲ]

32 guises based on only eight unique samples is not ideal for within subject design. Experiment 1 showed that just two guises of the same sample will stand out to some listeners, so four guises would increase that risk. Therefore experiment 2 has a between-subjects design, with 16 guises in two separate sets.

The questionnaire used in experiment 2 was the same for both sets of guises and contained eight scales based on fixed characteristics that were selected due to their prevalence in the responses gathered in experiment 1. Each of the characteristics (shown in table 9) was rated on a scale from 1 to 5, where 1 corresponds to *No, not at all* and 5 corresponds to *Yes, very*. Again, the participants were not informed of the linguistic purpose of the experiment, and the guises were played in a fixed order to ensure maximum distance between similar guises. In addition, to ensure

that the guises would be rated based on female stereotypes, this time listeners were explicitly told that they were to listen to 16 different girls.

TABLE 9 – The scales used in Experiment 2

Immigrant background	Helpful
Plays tough	Intelligent
Annoying	Confident
Western suburbs	Northern suburbs

Experiment 2 was also carried out at two Copenhagen high schools, one of which also participated in experiment 1 and one which did not. Both these schools also differ in number of students with an immigrant background and are thus comparable to the high schools in experiment 1. A total of 108 students between the ages of 16 and 22 (mean 17) participated as informants, and as in experiment 1, all informants filled out a questionnaire with background information and participated in a group discussion about the aim of the experiment. Again, no informant figured out the precise aim of the task, although some had noticed the /s/- and /t/-variation as well as the two registers.

5.2 Results

Ordinal mixed-effects logistic regression models were fit to the responses on all of the 8 scales separately. Respondent and guise were included as random effects and interactions of /s/ and prosodic frame, and /t/ and prosodic frames were included as well as simple effects for school, self-reported ethnic background, order of the segmental variables in the guises and the set of guises, to test for a possible difference between the two sets. No effect was found for the sets for any of the 8 scales, and therefore the results reported below are based on responses from all of the 108 students. There was no effect of any of the background variables (i.e. there was no difference in responses between students from the two schools, nor any effect of whether listeners self-reported as having an immigrant background). In the following, we present the models for the responses to the scales *immigrant, Western suburbs, plays tough, intelligent* and *Northern suburbs*. For the three remaining scales

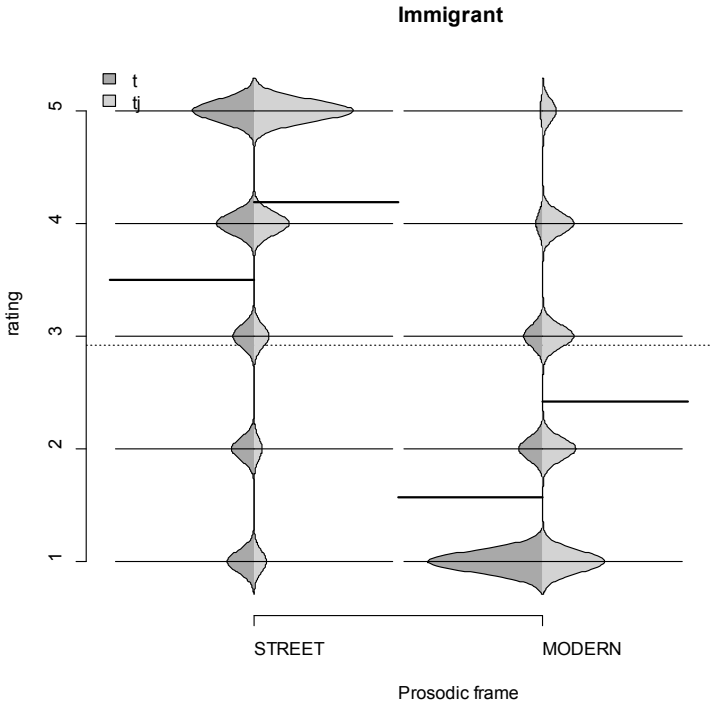
(*confident, helpful* and *annoying*) neither (s), (t) or the prosodic frame emerged as significant in the responses to the scales, even though they were frequently used as labels in the responses to the first experiment with the open question. Furthermore, the variable (s) never emerged as significant for any of the 8 scales. This was true regardless of the order of occurrence of the variables (s) and (t) in the guises (in contradistinction to the results found for male guises, cf. LILLELUND; PHARAO, 2014; PHARAO; MAEGAARD, 2017). We also did not find an effect of the interaction between the segmental variables and the prosodic frame. Thus, the following is a presentation of the stepped down models showing the effects of variable (t) and the prosodic frame. We start by looking at the scale *immigrant*.

TABLE 10 – Model summary for the scale *immigrant*

Factor	Estimate	Std. Error	z value	Pr(>|z|)
Prosodic frame (MODERN)	-3.40	0.69	-4.863	1.15e-06 ***
(t) type (palatalized)	1.25	0.56	2.196	0.0281 *

As the summary shows, there is an effect of prosodic frame, with MODERN guises rated lower on the scale *immigrant* than STREET guises, and guises with [tʲ] rated higher on the *immigrant* scale than guises with [tˢ]. Note that this is a simple main effect: the interaction between prosodic frame and (t) did not emerge as significant ($p = 0.67$). The partial effects of prosodic frame and (t) are shown in the beanplot in Figure 1. In a beanplot, distributions of responses are shown together with the mean rating. Furthermore, interactions of factors can be shown because the distributions are displayed with reference to the individual factors. In Figure 1 and in all subsequent figures in this article, dark grey distributions show the responses to guises containing the variant [t] and light grey distributions show the responses to guises containing the variant [tj]. The x-axis shows which of the two prosodic frames (STREET or MODERN) the distribution of responses belongs to. The distribution here is shown for each of the steps on the scale of 1 to 5. Means for each condition is shown by bold horizontal bars.

FIGURE 1 – Responses on the scale "immigrant" with distribution by variant and prosodic frame. The bold horizontal lines show the means for each condition.



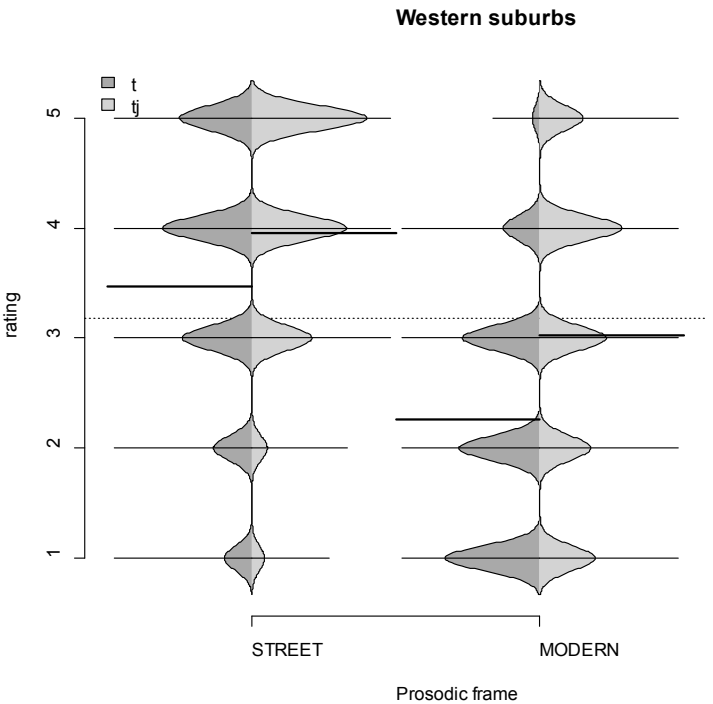
The distribution of responses to each of the steps shows that the effect of the prosodic frame is similar to that found in previous studies using male guises. The majority of responses to the STREET guises is 5 and 4 and the majority of responses to the MODERN guises is 1. It also shows that the variant [tj] has a similar effect in both prosodic frames showing that the effect of [t^{j}] is different for the female guises, since it has an effect in both STREET and MODERN. Next, we look at the scale *Western suburbs*.

TABLE 11 – Model summary for the scale *Western suburbs*

Factor	Estimate	Std.Error	z value	Pr(>|z|)
Prosodic frame (MODERN)	-2.02273	0.43219	-4.680	2.87e-06 ***
(t) type (palatalized)	0.86773	0.35217	2.464	0.0137 *

Again, we find only main effects for the prosodic frame and the variant [tʲ] as illustrated in Figure 2.

FIGURE 2 – Responses on the scale "Western suburbs" with distribution by variant and prosodic frame. The bold horizontal lines show the means for each condition.



The pattern is similar to the ratings on the scale *immigrant*, with the exception that the MODERN guises receive a higher overall rating on the *Western suburbs*-scale. This pattern is reminiscent of the connection found between the same scales in previous experiments with male guises, as shown in the correlation analyses presented in Maegaard and Pharao (2016).

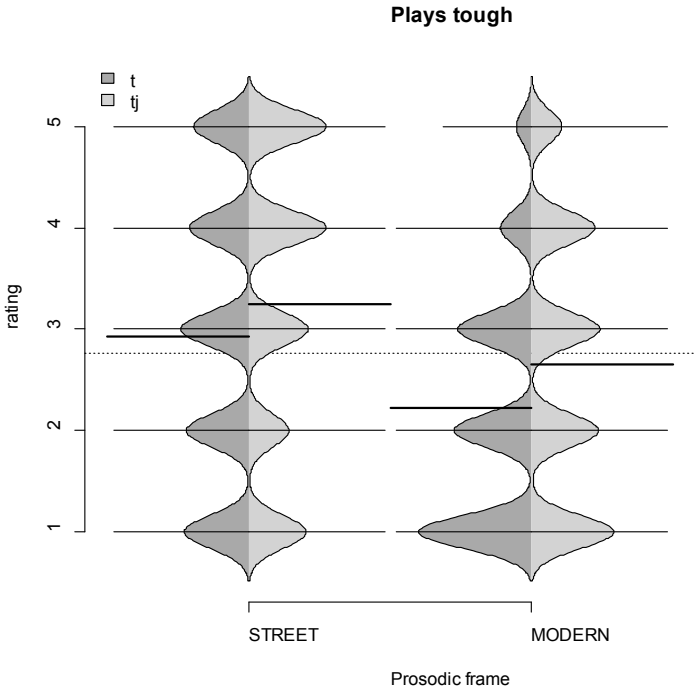
For the remaining scales we only found a main effect of the prosodic frames, but we continue to also present the differences between guises with [t^{s}] and [t^{j}] in the illustrations to emphasize the lack of the effect. First, we look at the scale *Plays tough*.

TABLE 12 – Model summary for the scale *Plays tough*

Factor	Estimate	Std. Error	z value	Pr(>|z|)
Prosodic frame (MODERN)	-1.20443	0.42548	-2.831	0.00464 **

The effect is shown in Figure 3.

FIGURE 3 – Responses on the scale "Plays tough" with distribution by variant and prosodic frame. The bold horizontal lines show the means for each condition. Note that the differences between [t] and [t^{j}] are not statistically significant.



It is worth noting that the average ratings for both registers are close to the center of the scale, indicating that the ratings should

not be interpreted as showing that the STREET register is perceived as particularly "tough sounding", only that they are more so than the guises representing the MODERN register. Note also that the responses are more evenly distributed among the individual steps on the scale for the STREET guises, whereas MODERN guises rarely receive ratings of 4 and 5.

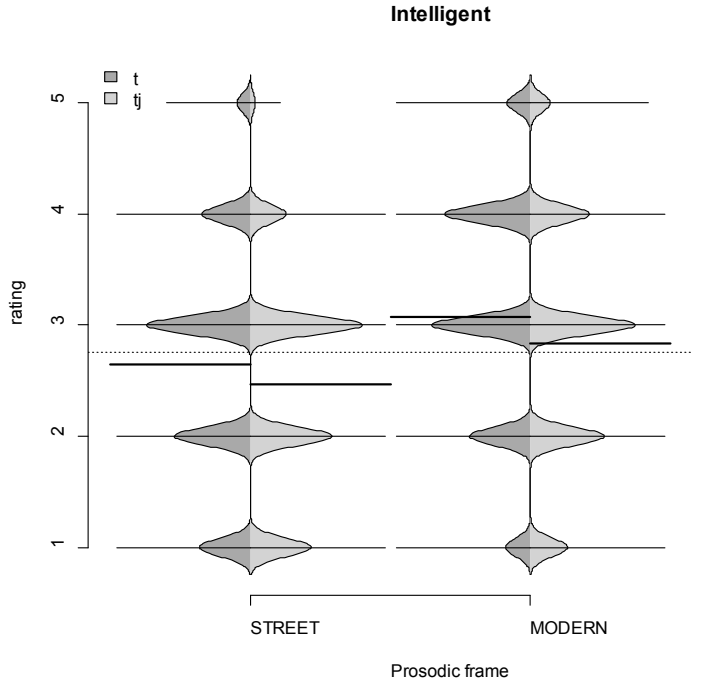
The model for the scale *intelligent* is shown below.

TABLE 13 – Model summary for the scale *intelligent*

Factor	Estimate	Std. Error	z value	Pr(>|z|)
Prosodic frame (MODERN)	.93	0.42	2.216	0.0267 *

For this scale, it is the MODERN frame that leads to an increase in rating as illustrated in Figure 4.

FIGURE 4 – Responses on the scale "intelligent" with distribution by variant and prosodic frame. The bold horizontal lines show the means for each condition. Note that the differences between [t] and [tʲ] are not statistically significant.



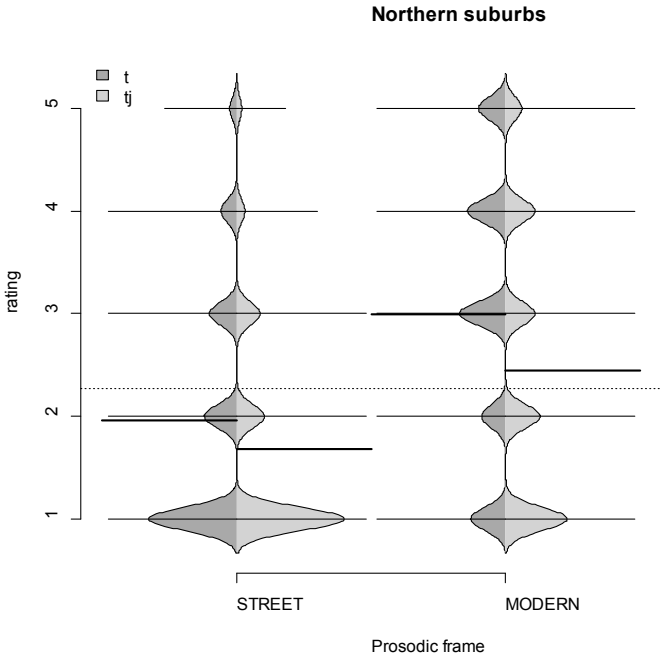
Again, the average ratings for both registers are close to the center of the scale, indicating that the prosodic frame of MODERN is not interpreted as "intelligent sounding" per se, only more than the STREET guises. Note also that for both prosodic frames the majority of ratings was 3, although of course the MODERN guises received significantly more ratings of 4, than the STREET guises did. Lastly, we look at the model for the responses on the scale *Northern suburbs,* which exhibits the same pattern.

TABLE 14 – Model summary for the scale *Northern suburbs*

Factor	Estimate	Std. Error	z value	Pr(>|z|)
Prosodic frame (MODERN)	1.78	0.43	4.096	4.21e-05 ***

The effect is illustrated in figure 5.

FIGURE 5 – Responses on the scale "Northern suburbs" with distribution by variant and prosodic frame. The bold horizontal lines show the means for each condition. Note that the differences between [t] and [tʲ] are not statistically significant.



Summarizing the results of the statistical models, we can say that both the STREET prosody and the palatalized variant of /t/ are closely associated with the traits "immigrant" and "Western suburbs". The STREET prosody is also associated with "playing tough" when compared to the MODERN prosody, whereas the MODERN prosody seems to be most closely tied to the trait "Northern suburbs" and, in comparison with the STREET prosody, associated with being more intelligent. While some positive effects were found for the linguistic factors, the most striking result, especially in comparison to the results from the first experiment, as well as in comparison with the results from previous studies of male guises, is the finding that the variation in /s/ did not emerge as statistically significant for any of the scales used in the experiment.

6 Discussion

In terms of answering the question of what social meanings are associated with [s+] in female speech, it is interesting to note that there are no statistically significant differences for /s/ variation in experiment 2. Experiment 1 does show a slight difference in the activated social stereotypes, so that while the acoustic difference appears distinguishable to the respondents, they do not seem to ascribe meaning to it in the same way that they do in male speech or for /t/ variation in female speech. This indicates that girls may have completely free variation for the production of /s/, or at least that [s+] is more expected in female speech than it is in male speech, which would explain the lack of statistically significant differences in experiment 2. This result could partly be a consequence of the chosen scales. Since research into male speech has shown a link between [s+] and femininity, it could be hypothesized that the same link would occur in female speech. Experiment 1, however, showed no such link, and thus the scale was not used in experiment 2. However, an argument could be made for including femininity in a future study, as the pilot test did show some variation on that scale. But if femininity is, indeed, a relevant scale to include, then why did the respondents in experiment 1 not use the word *feminine* when describing the person in the recording? It could be a matter of implicitness. Earlier descriptions of female speech (MAEGAARD, 2007, 2010) point to the fact that both variants of /s/ occur across a broad spectrum of social stereotypes for girls and in many linguistic contexts, which may in turn lead to listeners not

ascribing specific social meaning to this particular variation because it is common and expected and thus does not carry explicit social meaning. This, however, does not mean that the meaning potential does not exist. It simply means that it is not activated under these particular circumstances, i.e. a listening experiment including only female voices whose femininity may well be implicit and therefore deemed not worth mentioning. The pilot test did show that speakers using the MODERN frame were generally considered more feminine than speakers using the STREET frame, and so were the [s+] and [t] guises as opposed to the [s] and [tʲ] guises.

A *feminine* scale would possibly also more overtly point to the *pop girl* stereotype discussed in the results for experiment 1 and through that the ideological link between an overly feminine girl and [s+], which link to the effect of perceived femininity and gayness that [s+] has when encountered in male speech. While it may be the case that the label *pop girl* has fallen out of use for the generation of students who participated in this study, it seems likely that an inclusion of the scale *feminine* in a future experiment would help us get closer to the link between [s+] and gender in the minds of Danish listeners.

When adding [tʲ] to both registers, the activated stereotype for STREET is considered more *immigrant*-like and more like someone from the *Western suburbs*, which was to be expected. For MODERN, however, a number of respondents commented explicitly that something seemed artificial or unnatural, with one even asking if the speakers had been instructed to read their lines using [tʲ]. Considering that there was no reading and no instructions, this points to the quality of the manipulated guises being good enough to pass as authentic speech samples, but it also indicates that there is a conceptual issue with [tʲ] occurring in the MODERN frame. This is further supported by the distribution of responses to the guises containing [tʲ] in the MODERN frame. Recall from Figures 1, 2 and 5 that the distribution of responses to MODERN guises containing [tʲ] was more or less evenly distributed among the 5 steps on the scales *immigrant*, *Western suburbs* and *Northern suburbs* as shown by the light grey distributions in the beanplots. These are the scales representing traits where the conflict between the frame and the [tʲ] seems most explicit. The respondents were to some extent aware of this conflict, one saying that [tʲ] did not fit in with the rest of the sample, so she just ignored it, and another saying that as soon as she heard [tʲ], she immediately labeled the speaker an immigrant and did not consider the rest of the sample. While comments

like these seem to underline the clash between the MODERN frame and [tʲ] as well as be a point in favor of not combining MODERN and [tʲ], matters are not as simple as that. The original recordings used for the guises have girls speaking in the MODERN frame and authentically using [tʲ] without it being commented on. Maegaard also finds that while [tʲ] is rare in female speech, when it does occur, it occurs in the speech of girls perceived as Danish, not with immigrant girls (2007, p. 194, 2010, p. 196), which does not immediately align itself with the results of these two experiments. Nevertheless, earlier studies show that listeners may categorize speakers as immigrants when they hear a type of language use that they are not familiar with (see MAEGAARD, 2010 for a discussion of this). Thus, the categorizations of the MODERN [tʲ] guises as immigrant may be rooted in an experience of this combination of register and variant as strange. Furthermore, Maegaard's studies took place 15 years before the present one, and the social meanings of [tʲ] have arguably developed since then. The [tʲ]-pronunciation is often used in parodies, and is quite frequently reproduced in writings, often with a direct comment to minority speakers (HYTTEL-SØRENSEN, 2017; STÆHR, 2015).

Another possible explanation is rooted in the [tʲ] token itself, as the one used in both experiments is in fact produced by a male. Recall that what we perceived as a palatalized token of /t/ in female speech when listening over headphones, was perceived to be an alveolar variant of /t/ when heard over loudspeakers by phonetically trained listeners. It is quite likely that this is due to the acoustics of the token. While it had a spectral CoG that was 1500 Hz lower than the speaker's standard realization of /t/, it was still at 6549 Hz well above what is described as the typical range of 2000 to 4000 Hz for the CoG of postalveolar /t/ in other languages (TABAIN, 2001). The token we used ensured a greater contrast between the two variants of /t/ that listeners were to be presented with, and with a CoG of 4566 Hz it is much closer to the expected range. Recall also that in supplementary measurements of CoG in spontaneous speech of girls, we did find values in the 3900 – 4600 Hz range in recordings of a girl who had previously been heard as producing palatalized /t/. Furthermore, since participants in the pilot test judged guises containing this token of [tʲ] to be just as natural sounding as guises containing the token produced by a female speaker, and because the acoustics of the token produced by a male come closer to those expected for a postalveolar stop, we interpret the comments about a mismatch between the [tʲ] and

the MODERN prosody to reflect a stereotypical belief that girls do not use the [tʲ] variant, contrary to studies of language use. Certainly, the use of [tj] among adolescent girls is not as prevalent as the use of [s+], so while both Maegaard (2007) and Ag (2010) document the use of [tʲ] in the speech of girls, neither Madsen (2013) nor Hyttel-Sørensen (2017) find any trace of it. This greater variability across studies might explain why some respondents find it difficult to reconcile the occurrence of [tʲ] with MODERN prosody.

It is clear from the results of the experiments reported here that neither /s/ variation nor /t/ variation indexes the exact same traits and associated personae or stereotypes as those previously found for boys. There are some similarities: The two prosodic frames appear to carry similar connotations, and [tʲ] also indexes being an immigrant from the Western suburbs of Copenhagen. But no effect was found for the [s+] variant, possibly because it is used by many more different types of girls, leading to a more diverse indexicality. Interestingly, no effect was found for either of the segmental variants in connection with playing tough. Only prosody played a role here, with female guises with STREET prosody being judged as sounding more tough (or at least pretending to be) in comparison with girls with MODERN prosody. However, the difference was not large, and taken together with the lack of effect of the segmental variables, this may suggest that pretend toughness is not as relevant a trait as first indicated. What the results clearly demonstrate is that several factors interact in the meaning making process that occurs when listeners encounter phonetic variation. These factors are not limited to phonetic or linguistic aspects of the context in which the variation occurs, but also to a macro-social category like gender that is indexed by the voice of the speaker.

Authorship statement

The study was designed collaboratively between all three authors. Lillelund-Holst wrote the design sections and the majority of the first results section. Pharao wrote the second results section about the statistical analyses. Maegaard contributed to all other sections

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A computational approach for modeling the indexical field

Uma abordagem computacional para a modelagem de campos indexicais

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Abstract: This study investigates how multiple social meanings come to be associated with a linguistic variable. The analyses of listeners' perceptions of tap and retroflex realizations of coda /r/ in São Paulo Portuguese (as in *jornal* 'newspaper' and *bazar* 'bazar'), through an experiment based on the matched-guise technique (LAMBERT *et al*., 1960; CAMPBELL-KIBLER, 2006, 2009) applied to 185 participants, show that coda /r/ in São Paulo is strongly associated to geographical identities, from which further inferences arise on speakers' social status regarding their social class, area of residence, level of education, along with personal traits such as being "articulate" and "hardworking." Interactions between variable /r/ and participants' social profiles are explored, as well as the fact that certain plausible correlations do not arise, particularly in comparison to previous perception studies. In problematizing the nature of the ideological inter-relations among multiple factual and potential social meanings, an objective and falsifiable computational method for modeling indexical fields is proposed, based on Minimum Spanning Trees (GOWER; ROSS, 1969).

Keywords: indexical fields; social meanings of variation; coda /r/; São Paulo Portuguese; matched-guise technique; computational models of language variation.

Resumo: Este trabalho investiga de que modo múltiplos significados sociais vêm a se associar a uma variável sociolinguística. As análises de percepções de ouvintes sobre as realizações de /r/ em coda como tepe ou retroflexo no português paulistano (como em *jornal* e *bazar*), por meio de um experimento com base na técnica de estímulos pareados (LAMBERT *et al.*, 1960; CAMPBELL-KIBLER, 2006, 2009) aplicado a 185 participantes, mostram que a variável /r/ se associa fortemente a identidades geográficas, a partir das quais surgem inferências sobre o *status* social dos falantes com relação a sua classe social, região de residência, nível educacional, juntamente a

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traços pessoais como ser uma pessoa "articulada" ou "trabalhadora". Exploram-se as interações entre a variável /r/ e os perfis sociais dos participantes, assim como o fato de que certas correlações não se manifestam, particularmente em comparação com outros estudos prévios. Ao problematizar a natureza das inter-relações ideológicas entre múltiplos significados factuais e potenciais, propõe-se um método computacional objetivo e falseável para a modelagem de campos indexicais, com base em Árvores de Distâncias Mínimas (GOWER; ROSS, 1969).

Palavras-chave: campos indexicais; significados sociais da variação; /r/ em coda; português paulistano; técnica de estímulos pareados; modelos computacionais da variação linguística.

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1 Introduction

This study analyzes the social meanings of the tap and retroflex variants of coda /r/ (as in *jornal* 'newspaper' and *bazar* 'bazar') in São Paulo Portuguese, and how such meanings may have come to be inter-related in an *indexical field*. Following Eckert (2008), it is assumed that

> the meanings of variables are not precise or fixed but rather constitute a field of potential meanings – an *indexical field*, or constellation of ideologically related meanings, any one of which can be activated in the situated use of the variable. The field is fluid, and each new activation has the potential to change the field by building on ideological connections. Thus variation constitutes an indexical system that embeds ideology in language and that is in turn part and parcel of the construction of ideology. (ECKERT, 2008, p. 454)

Eckert's (2008) concept has fostered a more dynamic perspective on the social meanings of language variation and has been fruitfully applied in many different studies to explain ideological inter-relations among the potential meanings of variables (see, e.g., CAMPBELL-KIBLER, 2006, 2009; BECKER, 2013; WALKER *et al.*, 2014; TYLER, 2015; BATTISTI; OLIVEIRA, 2016). The concept has sprung from a criticism to sociolinguistic works that, according to Eckert (2008, 2012), have abandoned the interest in the social meaning of variation

in favor of wider linguistic processes, after Labov's (1963) initial work in Martha's Vineyard. In the development of the field, social meaning has come to be confused with demographic correlations between the usage of variants and speakers' social categories. The present analysis provides further evidence that the relation between variants and social meanings is not direct. Thus, for instance, the fact that men favor the use of a specific variant in a community does not imply that the variant means "masculine."

To build a model of the social meanings of variables, Eckert (2008) elaborates on Silverstein's (2013) concept of *indexical order*. In direct dialogue with Labov's (1972) concepts of *indicators*, *markers*, and *stereotypes*, Silverstein relates 1st-order indices to indicators, geographical or social variables that are not subject to pressures of stylistic variation. Social evaluation on the speakers who use certain variants may come to be associated to the index and be internalized in speakers' dialects to index other elements; according to Silverstein, at this point the variant becomes a marker or a 2nd-order index. The difference between Labov's and Silverstein's conceptualization is that, for the latter, an index is always available to be reinterpreted and to receive new social meanings, a process that takes place in discourse and in context, in a constant reexamination of linguistic forms.

Capturing such emerging meanings has proved to be a challenge and, to the present, there isn't yet a method for computing and reliably replicating indexical fields across studies. Although representations of indexical fields have been rooted in empirical evidence as a rule (see, for instance, the indexical fields for (ING) and /t/ release in Eckert, 2008, p. 466 and p. 469), one can question how speakers go from one meaning to the other, and how these meanings come to be associated to a linguistic variable. This is a matter of *falsifiability*: how to assess the ways in which proposed semantic and ideological relations are established by an individual or group of individuals. A second question is whether an independent researcher would come up with the same representation of the indexical field of a given variable: how can one ensure that the indexical field is not biased by the researchers' own associations of the different potential meanings of a variable? This is a question of *replicability* and *comparability* across studies.

In this study, these questions arise in an analysis of the social meanings of variable /r/ in São Paulo Portuguese. After reviewing results

from production studies that show the variable's main social correlates in the community (section 2), the methods and data are described in detail in section 3: a matched-guise experiment (LAMBERT *et al.*, 1960; CAMPBELL-KIBLER, 2006, 2009) built to assess subjective and unconscious reactions of São Paulo residents to the tap and retroflex variants. The results (section 4) point to the variable's strong correlation with geographical identities, as well as meanings related to speakers' social status. Section 4 also shows that listeners of different social profiles make different associations, and discusses the fact that certain expected correlations do not surface, in comparison to previous perception studies. Finally, a computational method, based on Minimum Spanning Trees (GOWER; ROSS, 1969), is proposed for modeling indexical fields from the same matched-guise data (section 5). It is argued that Minimum Spanning Trees may not only offer a more objective and falsifiable method for plotting visual representations of indexical fields, but also help to predict new potential social meanings of variables (i.e., capturing the "emergent" nature of the social meanings in language variation) and better understand how ideological relations are formed within the field.

2 Coda /r/ in São Paulo

Coda /r/, in words such as *jornal* 'newspaper' and *bazar* 'bazar,' is one of the most salient variables in Brazilian Portuguese (CALLOU *et al.*, 1996; MENDES, 2011; OUSHIRO, 2015) and one of the most studied in Brazilian sociolinguistics (see, e.g., OLIVEIRA, 1983; SKEETE, 1997; CALLOU *et al.*, 1998; GUIOTTI, 2002; BRESCANCINI; MONARETTO, 2008; BRANDÃO, 2009; LEITE, 2010). It can be realized as a trill [r], a tap [ɾ], a retroflex approximant [ɻ], velar fricatives [x ɣ], a uvular fricative [χ], glottal fricatives [h ɦ], and can also be deleted. In the city of São Paulo, home to approximately 11 million people – half of which are internal migrants –, all of these variants can be heard. But in native Paulistanos' speech, apart from deletion (which occurs almost categorically in infinitival verb morpheme, as in *cantar* 'to sing' [kã. ˈta]), the most frequent variants are the tap and the retroflex. The first is normally associated with the state capital city (CRISTÓFARO-SILVA, 2007) whereas the second is a stereotype of the so-called *caipira* dialect, the variety traditionally spoken by rural inhabitants of São Paulo and surrounding states (AMARAL, 1920; HEAD, 1987; BRANDÃO, 2007).

However, a recent study of the variable realization of coda /r/ in the city of São Paulo (OUSHIRO, 2015) shows that the retroflex variant is not infrequent among native Paulistanos. In a sample of 118 one-hour-long sociolinguistic interviews, with speakers balanced for sex/gender, three age groups (20-34 y.o.; 35-59 y.o.; 60+ y.o.), two levels of education (up to high school; college), and two areas of residence (central area; peripheral area), retroflex /r/ accounted for 28.3% of pronounced tokens of coda /r/ (N = 9,226).

The interview schedule included questions that aimed at collecting speakers' overt reactions and metapragmatic discourse on both retroflex and tap /r/. Thus, in the last part of the interview, participants were asked: "What do you think of this manner of speaking, *a porta tá aberta*" ('the door is open'), for which interviewers were instructed to pronounce the words *porta* and *aberta* with clear and exaggerated retroflex /r/ (see MENDES; OUSHIRO, 2012). Participants were also asked who speaks in this manner and whether they themselves speak that way. A content analysis of participants' answers to these questions was systematized in a word cloud (FIGURE 1), which visually represents the most frequent terms employed by the participants (the larger the font, the more frequently the term occurred).

FIGURE 1 – Word cloud of terms associated with the sentence *A porta tá aberta* 'the door is open,' realized with retroflex coda /r/

Source: Oushiro (2015, p. 98)

Figure 1 makes it clear that the main idea associated with the retroflex variant is *interior* 'countryside.' The notion is also elaborated in more specific definitions such as *interior de São Paulo* 'São Paulo's countryside,' *mineiro* (natives from the state of Minas Gerais, north of the state of São Paulo), and certain specific cities in the state (*São Bernardo*, *Campinas*, *Sorocaba*). The great majority of speakers commented overtly on the realization of /r/ to explain their answer. This manner of speaking was often referred to as a *sotaque* 'accent,' and very few participants recognized it as something a Paulistano (and themselves) would say.

In contrast, Figure 2 shows participants' metapragmatic comments on the exact same sentence ("What do you think of this manner of speaking: *a porta tá aberta*") in which, instead, the two tokens of coda /r/ were realized by the interviewer as taps. This question was made right after the previous questions in order to provoke a direct contrast and, in fact, most participants did characterize it as a "Paulistano" manner of speaking – the most frequent term they used. Notice, however, that the second and third most frequent comments were, respectively: (i) on the verb *estar* 'to be' – i.e., participants did not comment on coda /r/ realization but, instead, commented on the fact that the verb was reduced from *está* to *tá*, which implicitly signals that the tap realization of coda /r/ is not worth commenting in this case; and (ii) a characterization of such manner of speaking as *normal* – which can be similarly interpreted as a statement that there was nothing unusual to comment about, and also that this realization is the community's *norm*.

FIGURE 2 – Word cloud of terms associated with the sentence *A porta tá aberta* 'the door is open,' realized with tap coda /r/

Source: Oushiro (2015, p. 101).

Multivariate mixed-effects logistic regressions on the production data, performed in R (R CORE TEAM, 2014, 2018), included social and linguistic predictors[1] as fixed effects, and Speaker and Lexical Item as random effects. In addition to showing that retroflex /r/ is not infrequent in native Paulistanos' Portuguese – contrary to most Paulistanos' discourse on the variable –, occurring in nearly a third of all tokens of pronounced coda /r/, the results for social predictors showed that the main effects were speakers' social class, area of residence, mobility, level of education, and sex/gender. The retroflex variant was favored by working class speakers, living in peripheral areas, of low mobility (those who have always lived in the same neighborhood), lower levels of education and males – all expected correlations for stereotype variables. Although age group was not a significant predictor, an interaction between age group and social class/area of residence showed that there is a change in progress towards the retroflex in working-class peripheral areas and, in the opposite direction, a change in progress towards the tap in more affluent central areas. This raises the question of whether retroflex /r/

[1] The linguistic predictors were Preceding and Following Phonological Context, Syllable Stress, Position of coda /r/ in the word, and Morphological Class. See Oushiro (2015, chapter 5) for a full account of these results.

has different social meanings for different social groups, what these social meanings are, and how they come to be associated with different variants. From speakers' overt evaluations, tap and retroflex /r/ are mainly – and practically only – associated with geographical identities. Thus, a matched-guise experiment was applied to investigate speakers' subjective and unconscious judgments on variable /r/.

3 Experimental design

The experiment design follows Campbell-Kibler's methods for analyzing variable (ING) in English (2006, 2009). First, four native Paulistanos were recorded in sociolinguistic interviews – two men and two women, all of whom were around their early 30s, had a college degree and lived in the West Zone of São Paulo. Their social characteristics were controlled in order to minimize the effect of other variables beyond coda /r/. The option for naturally-occurring conversations instead of readings follows from the observation that this type of recording has the advantage of creating richer and more realistic impressions on the listeners, who perceive the speakers as real people with their own history and personality (CAMPBELL-KIBLER, 2006).

From these recordings, four short excerpts were selected, one from each speaker, and each containing 4-7 tokens of coda /r/. The speakers were contacted again to record controlled productions of coda /r/ as taps and retroflexes. The original recordings were then digitally manipulated in Praat (BOERSMA; WEENINK, 2004) to produce 8 stimuli, one pair for each speaker identical in all respects except for the realization of coda /r/, either as taps or retroflexes, extracted from the controlled recordings. In excerpts (1)-(4), tokens of manipulated coda /r/ are shown in bold.[2]

(1) Speaker 1 (M): mas aí você tem aqueles outros aspectos meio meio... bizarros né que nem a questão do **passaporte interno**... ahn... (Inteviewer: ahn) se você é do **interior**... (vo)cê não pode i(r) pra capital... sem a **ordem** do **governo**... (Inteviewer: ahn) se você não tive(r)... eh (vo)cê ainda- é/ o que que o pessoal faz? eles pula(m) a fronteira faz(em) que nem no México

[2] Tokens of deletion, all of which occurred in the infinitive morpheme, were not considered.

'but then you have all those other sort of… bizarre aspects right, such as the internal passport matter… uhn… (Interviewer: aham) if you're from the countryside… you can't go to the capital city… without a government's permit… (Interviewer: aham) if you don't have one… uhn you still can- uh what do people do? they cross the border just like in Mexico'

(2) Speaker 2 (F): e brincava muito assim de **Barbie** sabe? e brincava muito sozinha também mesmo quando eu não tinha as amiguinhas eu brincava... (Inteviewer: (vo)cê não tem irmãos?) sozinha... tenho uma **irmã** mais nova cinco anos... então nessa época da infância não dava pra brinca(r) né com ela era muito diferente... **porque** assim (de/)... na adolescência até quando ela tinha vai quinze eu tinha vinte até dava pra **conversa(r)** e tal hoje em dia dá pra... sai(r) com ela **normalmente**...

'and I used to play a lot with Barbie y'know, and I'd play a lot by myself too, even when I didn't have my little friends I played… (Interviewer: don't you have siblings?) by myself… I have a younger sister, five years younger than me… so at this time in childhood I couldn't play with her 'cause it was too different… like when we were teenagers, when she was fifteen and I was twenty, we could talk and such, like nowadays… we can normally hang out…'

(3) Speaker 3 (M): O BG era meio que um... **quartel** de elite... né... a gente tinha muito acampamento... e a gente tinha horas e horas todo dia de **ordem** unida... (Inteviewer: ahn) **ordem** unida é **marcha(r)**... **esquerda** volve(r) direita **volver**... (Inteviewer: uhum) (né) eu odiava... eu odiava... com toda minha **força**

'BG was sort of an elite quarter y'know... we had a lot of camping... and we had hours and hours of drill commands every day... (Inteviewer: uhn) drill command is marching... left turn right turn... (Inteviewer: uhum) I hated it... I hated it... from the bottom of my heart'

(4) Speaker (F): ah a gente tinha... **diversas** atividades né... tipo... coleta de **jornal**... eh entrega pra reciclagem... eh **organização** de **bazar**... e ah e tinha os... os acampamentos né... que era bem legal assim

'we had... tones of activities right… like… collecting newspapers… ahm delivering them for recycling… ahm organizing bazars… and ahm there was the camping trips right… which were like very cool'

The eight stimuli were separated into two groups, each with one stimulus per speaker, according to the distribution in Table 1. Henceforth, reference to each stimulus will be made by the identification of the speaker and the variant (e.g. "1.t," "3.r" etc.).

TABLE 1 – Distribution of stimuli in two groups

	Group A	Group B
Speaker 1 (M)	tap (1.t)	retroflex (1.r)
Speaker 2 (F)	retroflex (2.r)	tap (2.t)
Speaker 3 (M)	retroflex (3.r)	tap (3.t)
Speaker 4 (F)	tap (4.t)	retroflex (4.r)

Next the stimuli were played for a number of volunteers, who were asked to listen to the recordings and, as they were doing so, to imagine and to describe what they thought the speaker was like, in terms of social and personal characteristics. Some examples of such listeners' impressions are given in (5)-(9).

(5) José: ele [1.t] parece que (es)tá dando uma aula... eu imagino assim um um professor universitário tipo- alguém dando uma palestra...

'he [1.t] sounds like he's teaching a class… like I imagine a- a professor like- someone giving a lecture…'

(6) Antônio: meu muito 'paty' essa mina! [2.t] [risos] a patricinha de Higienópolis! (Interviewer: [risos] ah é? por que você acha...?) ah tipo ela brin-/ brincava de Barbie... não tinha amigos... parece aquelas menininha meio riquinha... fresquinha...

'bro this chick [2.t] is very *paty*![3] [laughs] the *patricinha* from Higienópolis![4] (Interviewer: [laughs] oh yea? why do you think…?) well like she pla- played with Barbies… didn't have any friends… sounds like those rich spoiled girls…'

[3] *Paty* and *patricinha* roughly refer to a "rich, upper class girl." See a more detailed definition ahead.

[4] Upper class neighborhood in São Paulo.

(7) Joana: [risos] eu acho ela... [2.r] maloqueira... maloqueirona assim... não sei... eu acho que ela é da zona leste... bem... bem suburbana...

'[laughs] I find her... [2.r] *maloqueira*… *maloqueirona*[5] like… I don't know... I think she lives in the East Zone… (she's) very… very suburban'

(8) Marcos: ele [3.t] deve se(r) um negão tipo armário!... três por quatro!... [risos] mas não sei onde ele mora... po- poderia se(r) qualquer lugar de São Paulo

'he [3.t] must be a huge black dude!... huge!... [laughs] but I don't know where he might live… it- it could be anywhere in São Paulo'

(9) Mariana: ela [4.r] é uma pessoa tímida mais recatada... diferente da outra... [2.t] deve ter crescido em apartamento... ou... não sei ela pode ser do interior

'she [4.r] sounds more shy more coy… different from the other one… [2.t] she must have grown up in an apartment… or… I don't know she may have come from the countryside'

Participants had little difficulty imagining a situation in which each of the speech events could have taken place and attributing social characteristics to the speakers. Although participants avoided making categorical statements about the speakers (which can be seen from the extensive use of expressions such as "I think," "must," "may," "I don't know"…), these are quite rich descriptions of very short speech excerpts: "professor giving a lecture," "*patricinha*," "resident of Higienópolis," "rich little girl," "spoiled," "*maloqueirona*," "East Zone," "suburban," "huge black dude," "shy," "coy," "grew up in an apartment," "countryside."

After listening to four stimuli, either from group A or B (see TABLE 1), in this phase of the experiment participants also listened to the corresponding alternative guise, to verify what kinds of contrasts would come up. When listening to a pair, most participants explicitly mentioned the different realizations of coda /r/, further confirming that it is a stereotype in the community.

[5] Originally, individuals living in *malocas*, precarious habitations in favelas. The term now means low class trouble-makers, but it is also associated with supporters of a specific soccer team (and, as such, it is not necessarily negative).

The most frequent terms used to describe the speakers were organized in the following questionnaire, intended for quantifying and systematically analyzing the responses. It includes ten 5-point semantic differential scales (10), three categorical variables (11), and 30 checkboxes of personal traits (12). For the latter, participants could check as many boxes as they considered pertinent to a particular speaker.

(10) Semantic differential scales
For you, this person seems...
(Choose one option on each line)

	Little/few				Very/many
Extroverted	☐	☐	☐	☐	☐
Educated	☐	☐	☐	☐	☐
Masculine[6]	☐	☐	☐	☐	☐
Intelligent	☐	☐	☐	☐	☐
Formal	☐	☐	☐	☐	☐
Friendly	☐	☐	☐	☐	☐
Paulistano	☐	☐	☐	☐	☐
To have an accent	☐	☐	☐	☐	☐
To have friends	☐	☐	☐	☐	☐

This person must live in a...
(Choose one option)

More peripheral area					More central area
☐	☐	☐	☐	☐	

(11) Qualitative variables
In which zone of the city does this person probably live?
☐ North
☐ South
☐ East
☐ West
☐ Downtown
☐ I don't know

[6] Or "Feminine," for female voices.

In which age group do you think this person is?

☐ Teenage years
☐ In his/her 20s
☐ In his/her 30s
☐ In his/her 40s

Which social class do you think this person is?

☐ Low class
☐ Low-middle class
☐ Middle class
☐ Upper-middle class
☐ Upper class

(12) Checkboxes

From what you heard, you think this person must be...
(Check as many boxes as you want)

☐ tall	☐ trustworthy	☐ sincere
☐ white	☐ simple	☐ gay/lesbian
☐ shy	☐ hardworking	☐ spoiled
☐ cool	☐ confident	☐ conservative
☐ pothead	☐ solidary	☐ *caipira*
☐ religious	☐ practical	☐ depressed
☐ close to Family	☐ lazy	☐ nerd
☐ articulate	☐ impolite	☐ sophisticated
☐ annoying	☐ funny	☐ independente
☐ snobbish	☐ laidback	☐ *patricinha*/*mauricinho*

Two italicized terms, *caipira* and *patricinha/mauricinho*, have not been translated from Portuguese, to avoid the risk of cultural mismatches. Roughly, *caipira* has originally referred to rural inhabitants and to their culture, especially from the state of São Paulo; currently, the term may be extended to all natives of the state, even in urban areas, but it may also carry the meaning of illiterate working-class peasants, or someone not used to the ways of the big city. *Patricinha* (or *paty*) generally refers to

upper-middle and upper-class girls who are especially concerned about fashion and looks; their male correlate is a *mauricinho*. These terms are in principle negative stereotypes, but it is possible to find online websites that will use them positively, in favor of certain lifestyles.

At the end of the questionnaire, participants also had the option to make comments and to describe other impressions they had about the speakers. Lastly, they were asked to provide some sociodemographic data: sex, age, occupation, neighborhood, place of birth, and length of residence in São Paulo (if not a native to the city).

The above list of variables can be classified into three types of social meanings possibly associated with variable /r/ (TABLE 2). Paulistanity, accent, area of residence, and city zone refer to geographical identities. From Oushiro's (2015) production analyses, the initial expectation was that speakers in retroflex-guise would be perceived as less Paulistano, as having a thicker accent,[7] and as residents of more peripheral areas.

[7] The notion of "accentedness" is certainly controversial. Many Paulistanos will not hesitate to say that their speech variety is the one that is closest to "standard Portuguese," heard on the national TV and radio news broadcast, or simply that they "don't have an accent." Many others, however, regard Paulistano Portuguese as a variety just like any other, and for them Paulistanos "have an accent." The comment of an online respondent illustrates the matter: "The question about the person having an accent is weird, to say the least. I answered it, but I don't know if it should count. I have a Paulistano accent. Some speakers sounded like they had a countryside accent. We all have accents." (participant 37, female, 54 years old, from São Paulo). Unfortunately, it is not possible to know each participant's opinion on the matter, as this is not something that was actively surveyed. However, this fact does not invalidate the analyses. One of the interests is to contrast the perceptions of different groups of listeners. If the notion of "accentedness" is indeed as fluid and relative, the expected result is that mean ratings for accent will be virtually identical for tap and retroflex /r/ for all groups. If, on the contrary, there are significant differences among groups, the analysis will signal which groups find Paulistanos to have an accent and which groups don't.

TABLE 2 – Classification of variables according to types of social meanings

	Geographical identity	**Status**	**Solidarity/ Dynamism**
Scale variables	Paulistanity Accent Area of residence	(Area of residence) Formality Education Intelligence	Friendliness Having friends Extroversion Femininity Masculinity
Qualitative variables	City zone	Social class	Age group
Checkboxes	*caipira*	(*caipira*) tall white articulate snobbish confident practical conservative sophisticated independent simple *patricinha*/ *mauricinho*	shy cool religious close to family trustworthy solidary lazy funny laidback sincere

City zone was included because two of the five city zones were frequently mentioned in the open interviews: the East Zone, normally associated with working-class speakers, and the West Zone, reversely associated with middle and upper classes. Area of residence can also be considered a status variable, since living in more central or more peripheral areas in São Paulo is closely related to people's social class. Other variables regarding status are education, formality, and intelligence. Since the production analyses showed that the retroflex is favored by less educated and working-class speakers, the present analysis aims to verify if these correlations are reproduced in people's perceptions and whether the symbolic value of education and social class extend to meanings related to formality and speakers' intelligence.

Previous studies on social perceptions and attitudes (LAMBERT *et al.*, 1960; BOURHIS; GILES, 1976; GILES; BILLINGS, 2004) have generally shown that variants associated with less privileged social groups tend to be more positively evaluated in traits of social solidarity and dynamism;[8] hence, for the variables in the third group, it is expected that speakers will be perceived as having more friends, and as being friendlier, more extroverted and younger when listened to in their retroflex-guise. The dimensions of femininity/masculinity are based on the correlation for the production study: since retroflex /r/ is favored by males, will speakers be perceived as more masculine-sounding (or as less feminine-sounding) when using this variant?

Finally, not all characteristics in the checkbox list fit perfectly into one of the three categories, but one can consider "caipira" a type of geographical identity (and, possibly, also related to status); attributes such as "tall," "white," "confident," "sophisticated," and "patricinha/mauricinho" as being related to status; and traits such as "religious," "close to family," "trustworthy," and "cool" as related to solidarity/dynamism.

The questionnaire was applied to 185 participants who live in the city of São Paulo; 84 of them were recruited in face-to-face interactions and 101 through online social media, which directed participants to a Qualtrics webpage.[9] Similarly to the "open interview" phase, participants

[8] Although some studies show that certain accents, such as Birmingham English, tend to be negatively evaluated in all dimensions (see, e.g., GILES, 1970; HIRAGA, 2005).

[9] The main researcher was assisted by a colleague in this task. To test for the possible interference of experimental condition (main researcher, colleague, Qualtrics) in participants' responses, chi-square tests and anovas were run, followed by Tukey post-hoc tests for multiple comparisons (see NIEDZIELSKI, 1999; HAY; DRAGER, 2010; CAMPBELL-KIBLER, 2010 for detailed discussions on the effect of experimental conditions). There were no significant differences between my colleague and me, but interestingly there were a few significant differences for two semantic differential scales when comparing face-to-face and Internet responses: (i) level of education (Qualtrics vs. researcher: $p < 0.001$; Qualtrics vs. colleague: $p < 0.01$); and (ii) friends (Qualtrics vs. researcher: $p < 0.01$; Qualtrics vs. colleague: $p < 0.001$). For both variables, differences between ratings for tap and retroflex /r/ were greater in the online condition, signaling that participants were somewhat more "neutral" when in presence of a researcher and more "judgmental" in their absence. This has implications for future studies, but this discussion is beyond the scope of the present article.

were asked to listen to each excerpt and imagine what each speaker was like, but, differently from the previous phase, they only listened to each speaker once (the stimuli in either group A or group B from Table 1); they could listen to each recording as many times as desired, but (as could be observed in the face-to-face data collection) few speakers did listen to each stimulus more than once. On average, it took participants 15 minutes to listen to four excerpts and fill out a questionnaire for each speaker.

Participants' demographic characteristics are summarized in Table 3. The sample is balanced for sex (97 women and 88 men), area of residence (94 living in central areas and 91 in peripheral areas), and to a lesser degree for place of origin (129 native Paulistanos and 56 from other places). It is quite unbalanced regarding age (145 between 18-34 years old) and level of education (178 in college or with a college degree), thus these two variables were excluded from further analyses.

TABLE 3 – Distribution of participants according to their social characteristics

		Females (N = 97)			Males (N = 88)			
		18-34 y.o.	35-59 y.o.	60+ y.o.	18-34 y.o.	35-59 y.o.	60+ y.o.	N
Central	High school	1	0	0	0	0	0	1
(N = 94)	College	24	20	0	42	6	1	93
Peripheral	High School	0	0	1	4	1	0	6
(N = 91)	College	43	7	1	31	3	0	85
	N	68	27	2	77	10	1	185

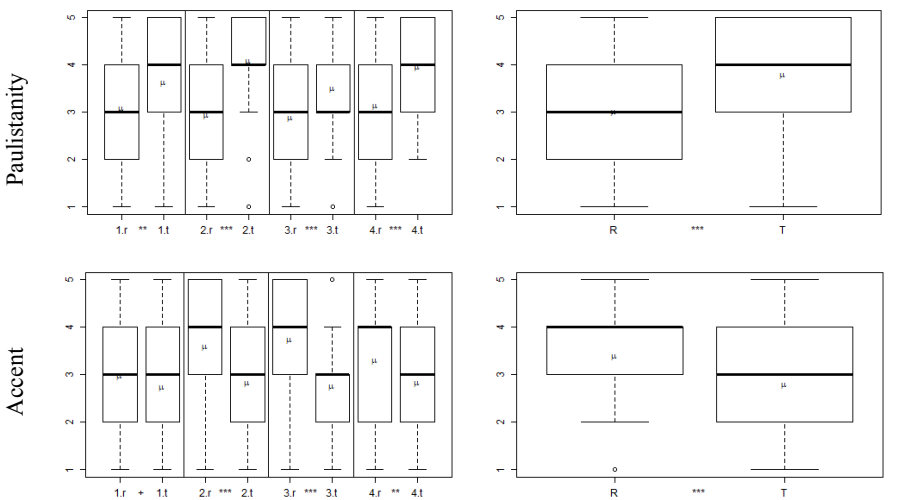
Statistical analyses on the 740 data points (185 participants x 4 speakers) were performed in R (R CORE TEAM, 2018). Quantitative variables (semantic differential scales) were analyzed in Wilcoxon tests (a non-parametric version of the t-test) and in mixed-effects linear models that tested for interactions between predictor variables; qualitative variables were analyzed in chi-square tests; and the checkboxes in chi-square and mixed-effects logistic regression models. The computational models for building indexical fields will be described in detail in section 5.

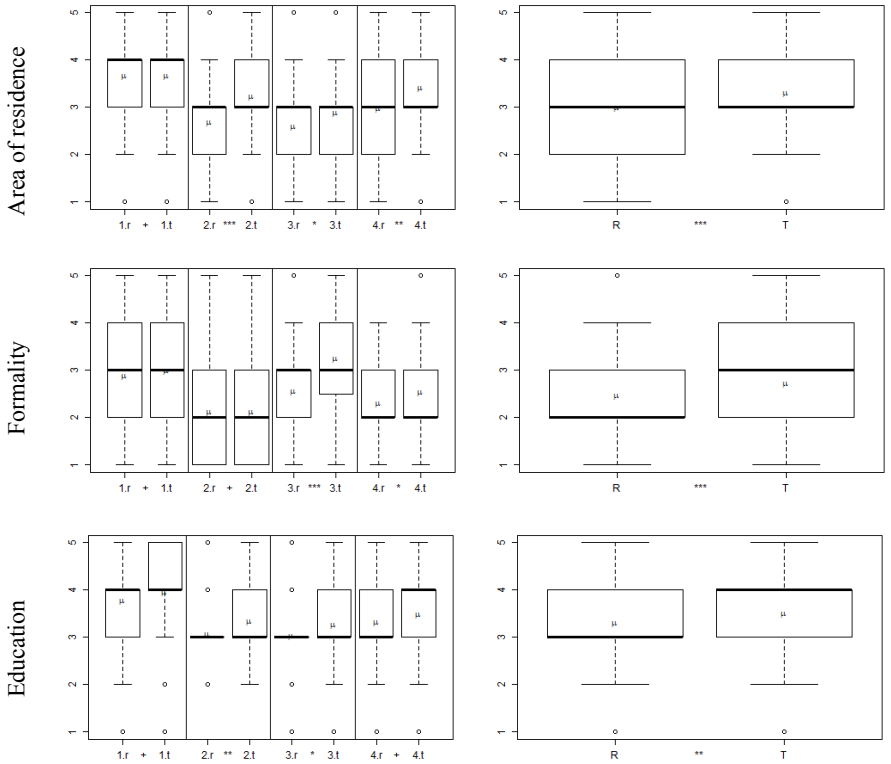
4 Social meanings of coda /r/

4.1 Scalar variables

This section analyzes listeners' responses to the semantic differential scales (how extroverted, educated, intelligent etc. the speakers sounded) according to guise and speaker. From the 10 scales, only Paulistanity, accent, area of residence, formality, and education exhibited significant correlations with variable /r/. Figure 3 summarizes participants' responses in boxplots, showing their distribution and dispersion in the five-point scales. Between each pair of variants (by speaker, on the left, and for the general sample, on the right), significance levels for one-tailed Wilcoxon tests corrected by the Bonferroni method are indicated according to the convention: $+p > 0.05$; $*p < 0.05$; $**p < 0.01$; $***p < 0.001$. The mean value for each distribution is signaled by "μ." The scales are shown according to the difference in mean value for tap and retroflex /r/, i.e., the biggest difference is found for the Paulistanity scale, followed by accent, area of residence etc.

FIGURE 3 – Scalar variables significantly correlated with variable /r/





The three main scales showing significant differences in participants' perception relate to geographical identities, indicating that the main social meaning of the variants is the opposition Paulistano vs. non-Paulistano, or prototypical vs. non-prototypical Paulistano. It is worth noting that in the Paulistanity and area of residence scales, judgments concentrate in the middle point 3 (the median represented by the bold horizontal line) for retroflex /r/, which shows a certain tendency for neutral responses (seen globally); in the accent scales, this occurs for the tap-guises. The dispersion of responses shows that there is less consensus on how Paulistano the retroflex sounds, how accented is the tap and the area of residence of retroflex users. For instance, in the accent scale, note that tap stimuli were judged both with low (1 and 2) and with high (4 and 5) degrees of markedness, in equal proportions, which reflects the divergence in opinions as to whether Paulistanos have an accent. On the other hand, the community is more consensual on the

Paulistanity of the tap, on how accented the retroflex sounds, and that the tap is associated with more central areas, as seen by the concentration of responses above the middle point on these scales.

In addition to a geographical identity, the correlation with area of residence can also be interpreted as a status differentiation between the variants. Since the upper class in São Paulo is concentrated in more central areas in the city, the association between the tap and these speakers also reflect an association with social class. The correlations with formality and education also support this interpretation. Relatively to the tap-guise, speakers were perceived as less formal and as less educated when listened to in their retroflex-guise.

However, correlations with these five scales are not uniformly reproduced for all speakers (figures on the left). The Paulistanity scale is the only one for which there are significant differences for all speakers: all are perceived as significantly more Paulistano-sounding in their tap-guises. In the other cases, the global correlations have greater contribution from specific speakers, whereas perceptions on others are not affected by the variants. Speaker 1, in particular, seems to be especially immune to the impact of the tap or the retroflex. Two facts may account for this result: (i) since stimuli order was not randomized, his recording was always the first to be listened, which possibly turned him into a baseline against which other stimuli were judged; (ii) speaker 1's excerpt is the only one in the third person, describing the use of an "internal passport," whereas the other three speakers are presented narrating personal past experiences (see excerpts in (1)-(4) above); the third-person narrative may have contributed to the impression of a more distanced and impersonal speech event. In that regard, recall a participant's comment in (5), in which this speaker is perceived as a professor; this frame has the potential to keep him from receiving attributions of personal characteristics such as thickness of accent and area of residence.[10]

[10] It is also curious that speaker 1 is the only one who employs a stigmatized variant at the end of the excerpt, namely absence of subject-verb agreement: *o que que o pessoal faz? eles pula(m) a fronteira faz(em) que nem no México* (lit. 'they crosses the border, does like in Mexico'). This doesn't affect listeners' judgments on his level of education, in average higher than for all the other speakers. It is possible that speaker 1, being initially perceived as a more educated, resident of a central neighborhood etc., becomes "immune" to the effects of nonstandard subject-verb agreement (see also CAMPBELL-KIBLER, 2006, 2009 on the "bullet-proof effect").

Even though not all scales exhibit significant correlations for all speakers, for each pair of stimuli, the relation between retroflex and tap /r/ has a definite directionality: for example, in the accent scale, no speaker is judged as having "less accent" when listened to in the retroflex-guise.

On the other hand, differently from the initial hypotheses, speakers were not perceived as having more friends, as being friendlier, more extroverted, less intelligent and less feminine (in the case of female speakers) or more masculine (in the case of male speakers) when listened to in their retroflex-guise.[11] Mendes (2016), in a study about perceptions on nominal number agreement, did not observe differences in the friendliness scale either but, differently from this study, observed significant correlations for effeminacy and intelligence according to the use of the standard or nonstandard variant. The sexuality dimension can probably be accounted for due to the fact that, in Mendes's study, all speakers were males and the scale measured how "effeminate" they sounded. The intelligence scale, however, can be more directly compared; differently from nominal agreement, although the realizations of coda /r/ also correlate with percepts of education, these don't extend to judgments of the speakers' degree of intelligence. This is evidence that two variables that have similar social stratification in terms of speakers' production (both the retroflex and nonstandard nominal agreement are favored by males, less educated and working-class speakers) do not necessarily have the same set of correlations in terms of perceptions. The relation between language uses and sociolinguistic perceptions is an indirect one. This point will be further explored ahead, in section 4.3.

Analyses so far have reported the perceptions of the community, not considering participants' social profile. To analyze whether female and male listeners, residents of central and peripheral areas, and from different places of origins differently perceive tap and retroflex, multivariate linear regression models including the interaction between guise and listeners' sex, area of residence and place of origin were performed in the data.[12] In particular, in knowing the strong correlation between variable /r/ and

[11] The statistical analyses for these two scales were performed separately for male and female speakers, since the hypotheses predicted opposite directions for speakers 1 and 3, on the one hand, and 2 and 4 on the other.

[12] R lmer formula: scale ~ variant * sex + variant * region + variant * origin + (1|speaker) + (1|participant).

speakers' area of residence in the production study, the interest here is too check whether residents of more peripheral areas, who favor retroflex /r/, have different perceptions of its social meanings than residents of more central areas.

For most scales, interactions were not significant, which means that perceptions were not substantially different according to the participants' social characteristics. However, two scales showed significant interactions: (i) Paulistanity, for which variant interacts with listener's area of residence and place of origin, and (ii) accent, for which variant interacts with area of residence. These interactions are shown in Figures 4 and 5.

FIGURE 4 – Difference in mean ratings for Paulistanity (R – T) according to participants' area of residence (above) and Place of origin (below)

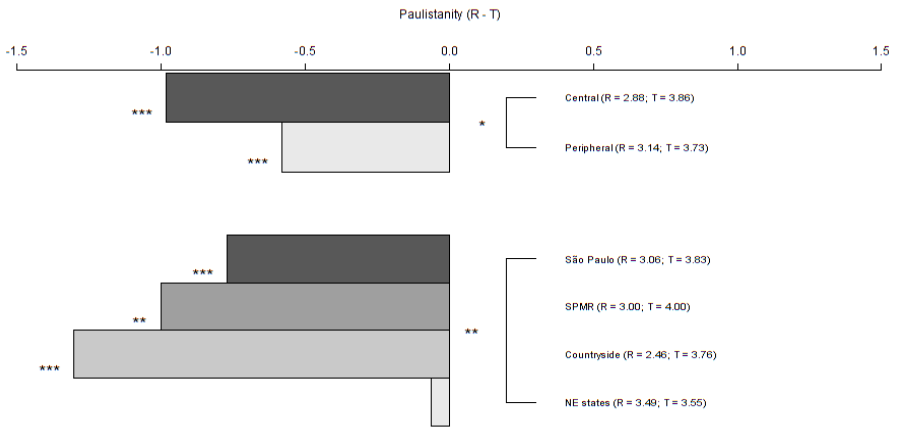
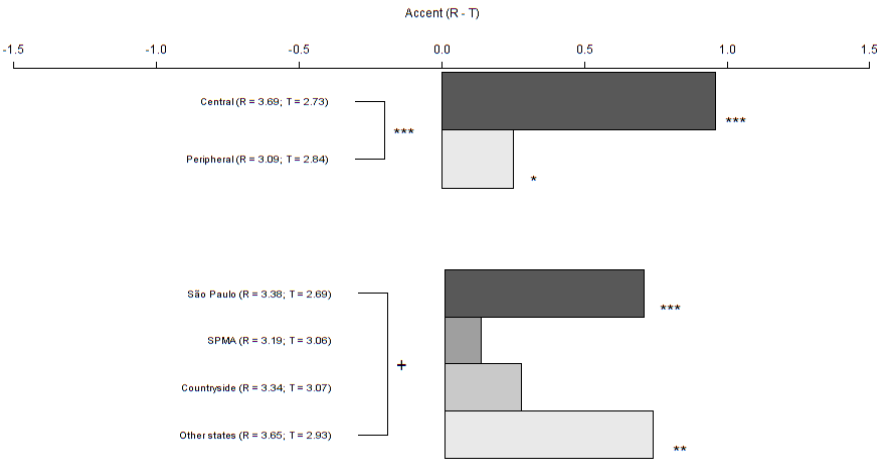


FIGURE 5 – Difference in mean ratings for Accent (R – T) according to participants' area of residence (above) and Place of origin (below)



The interactions indicate that individuals residing in different areas of the city (more central or more peripheral areas) and from different places of origin (São Paulo, SP Metropolitan Region,[13] state interior or other states) differently perceive retroflexes and taps regarding their degree of Paulistanity and accent.

Figure 4 shows the interactions in the Paulistanity scale. The horizontal bars represent the difference in mean ratings for retroflex- and tap-guises (μR – μT), for speakers living in different areas (top) and from different origins (bottom). The figure also shows the mean ratings for each variant. In all cases, the subtraction results in a negative value, indicating that retroflex /r/ was perceived as sounding less Paulistano than the tap for all groups (R < T), similarly to the global analyses. The interactions consist of the fact that such differences are greater for residents of central areas and participants who are native Paulistanos, native metropolitans or from the state of São Paulo. For residents of more peripheral areas, the difference is also significant, but it was smaller than

[13] The SPMR comprises 39 cities in a large conurbation of 20 million inhabitants. In this category were classified participants who were born in those cities, except for the state capital São Paulo.

for central dwellers; for participants from other states, tap and retroflex /r/ sound equally "Paulistano."

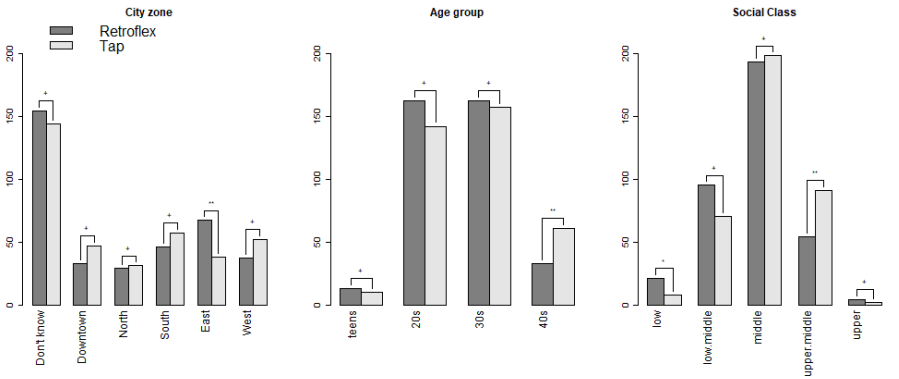
The production analysis in Oushiro (2015) had shown that variable /r/ strongly correlates with speakers' area of residence, especially among the youth (and recall that most of the present sample is composed of younger participants). Figure 4 shows that the distinction Paulistano vs. non-Paulistano is more properly made by residents of central areas, who perceive retroflex /r/ as non-native; residents of peripheral areas, although also showing the same trend direction, are somewhat more "tolerant" to the Paulistanity of retroflex /r/. Difference between these two groups is significant to a 5% α-level ($p = 0.02$). As for place of origin, Figure 4 shows that those born in the capital city São Paulo, in the SP Metropolitan area or the interior significantly differentiate tap and retroflex /r/ in their degree of Paulistanity, especially the latter group. These participants are the ones who are frequently recognized in São Paulo as non-natives because of their realization of coda /r/, and thus are the ones who differentiate the variants' geographical meaning more markedly – even more than native Paulistanos. On the other hand, listeners who have migrated from other states don't differentiate taps and retroflexes in their degree of Paulistanity. The great majority of these out-of-state migrants have come from Brazil's Northeast, an area of predominant fricative /r/ ([x ɣ χ h ɦ]) and, more importantly, no taps or retroflexes. The mean ratings for them were 3.49 for the retroflex and 3.55 for the tap, both above the middle "neutral" point, signaling that for these listeners, retroflex /r/ sounds just as Paulistano as the tap.

Listeners' area of residence also interacts with variants of /r/ in relation to percepts of accent (FIGURE 5). In this case, the subtraction μR – μT results in positive values, which means that retroflex /r/ is judged by all groups as a thicker accent than the tap (R > T). Nevertheless, residents of central areas consider the retroflex variant as a much more marked accent than the tap, and significantly more than residents of more peripheral areas ($p < 0.001$). Thus, although the direction of correlations is not different between central and peripheral residents, the degree to which they consider retroflex /r/ less Paulistano and more accented provides evidence of how tap and retroflex are perceived and may explain the opposite directions of language change in speakers' production, as seen in section 2.

4.2 Qualitative variables

The qualitative variables refer to the attribution of a city zone, age group, and social class to the speakers. These variables were analyzed in chi-square tests. The response distribution can be seen in Figure 6.

FIGURE 6 – Attribution of zone, age group and social class according to guise



For city zone, one can notice that most listeners were not able to attribute a specific zone of residence to the speakers, as most of them selected "I don't know" both for tap and retroflex-guises.[14] Although listeners associated /r/ variants with central or peripheral areas, the same can't be said about the five zones. The only significant difference is found for the East Zone: speakers listened to in their retroflex-guise were more frequently attributed this zone of residence than when they were in tap-guise ($p = 0.005$). The general response distribution for this variable has a low probability of being observed in case the null hypothesis is true ($\chi^2 = 14.55(5)$, $p = 0.01$).[15]

For age group, there is a high concentration of responses in factors "in their 20s" and "in their 30s," which is likely a result from speakers' true age (they all are around their 30s, and do sound like that group).

[14] This option was included only for city zone because, just as a number of participants of the open interview phase mentioned the East and the West Zones, many others stated that it's impossible to know in which zone a person lives in São Paulo.

[15] Since the analyses of qualitative variables and checkboxes in this and in the following section refer to 33 different chi-square tests, one might prefer to adopt an α-level of 0.05 / 33 = 0.0015 in reading and interpreting these data.

Here too there are no significant differences according to which variant was listened to, except for "in their 40s" ($p = 0.004$): there was a slight tendency for speakers to be attributed this trait in their tap- rather than in their retroflex-guise. Similarly to city zone, overall distribution of responses is not random ($\chi^2 = 10.13(3)$, $p = 0.02$).

The perception of social class also showed significant correlations ($\chi^2 = 19.78(4)$, $p < 0.001$). Although it was rare for speakers in this sample to be perceived as "low class," this occurred more frequently when they were listened to in their retroflex- rather than in their tap-guises ($p = 0.02$); conversely, the attribution of "upper middle class" happened significantly more frequently in tap than in retroflex stimuli ($p = 0.002$). Differences in "lower middle class" and "middle class," although not significant, seem to follow the overall association between retroflex-lower classes and tap-upper classes.

Thus, the nominal variables also point to the importance of the geographical and status dimensions for variable /r/, although in somewhat weaker correlations. A new dimension, relative to speakers' dynamism, is suggested by the correlation with speakers' age, as the tap is associated with older speakers. However, the fact that the converse relation "retroflex-younger speakers" is not observed and that most responses concentrate on the intermediary levels, whose differences are not significant, indicate that perceptions of age is more dependent on the speakers' individual voice traits than any effective intervention of variable /r/.

4.3 Checkboxes

Let us now turn to the analysis of the personal characteristics' list (being tall, white, articulate, snobbish, shy etc.). The aim here is to determine whether the attribution of a specific personal trait is due to impressions on an individual speaker or whether it is possible to infer an effect of variable coda /r/. Just as in the previous analyses, the expectation is that impressions evoked by specific speakers or by the speech content be neutralized when selected for tap and retroflex /r/ in similar proportions; if, differently, there is an effect of the variant itself, these should be reflected in significantly different rates of selection.

Each characteristic was initially analyzed in chi-square tests to determine the frequency it was selected for each variant. Out of the 30 checkboxes, only 5 are significantly correlated with coda /r/: *caipira*,

simple, *hardworking*, *articulate*, and *sophisticated*.[16] The first three are favored by retroflex /r/ and the last two by the tap. Table 4 shows the frequency and the proportions these characteristics were selected (✓) when speakers were listened to in each guise, as well as the result for the chi-square tests. The shaded cells highlight the variant favoring the box selection.

TABLE 4 – Traits correlated with variable /r/

Trait	R	%R	T	%T	Total N	χ^2	*p*
Caipira							
x	329	48	362	52	691	22.38(1)	< 0.001
✓	41	84	8	16	49		
Simple							
x	228	45	276	55	504	13.74(1)	0.0002
✓	142	60	94	40	236		
Articulate							
x	263	54	224	46	487	8.67(1)	0.003
✓	107	42	146	58	253		
Sophisticated							
x	357	51	340	49	697	6.32(1)	0.01
✓	13	30	30	70	43		
Hardworking							
x	255	48	281	52	536	4.23(1)	0.04
✓	115	56	89	44	204		
Total	370	50	370	50	740		

R = retroflex; T = tap; x = unselected checkbox; ✓ = selected checkbox.

The first characteristic associated with retroflex /r/, *caipira* ($p < 0.001$), relates to a geographical identity (often used to refer to people living in the countryside), but also relates to the speaker status for evoking the image of rural dwellers, who also tend to have lower levels of education and socioeconomic class. The *simple* trait ($p = 0.0002$) also relates to the status dimension, and *hardworking* ($p = 0.04$) relates to the solidarity dimension. The characteristics significantly favored by the tap, *articulate* ($p = 0.003$) and *sophisticated* ($p = 0.01$), also concerns speakers' status.

[16] Or only 2, if considering a corrected α-level of 0.0015.

An analysis by listeners' social profiles also shows similar trends to the community as a whole: in each subgroup, many of the relevant characteristics refer to a subselection of the above, always associated with the same variants. However, new correlations also arise: female listeners associate the traits *patricinha*/*mauricinho* and *spoiled* to the tap, and non-native Paulistanos associate *solidary* and *sincere* to the retroflex variant.

TABLE 5 – Traits correlated with variable /r/ by listener social profile

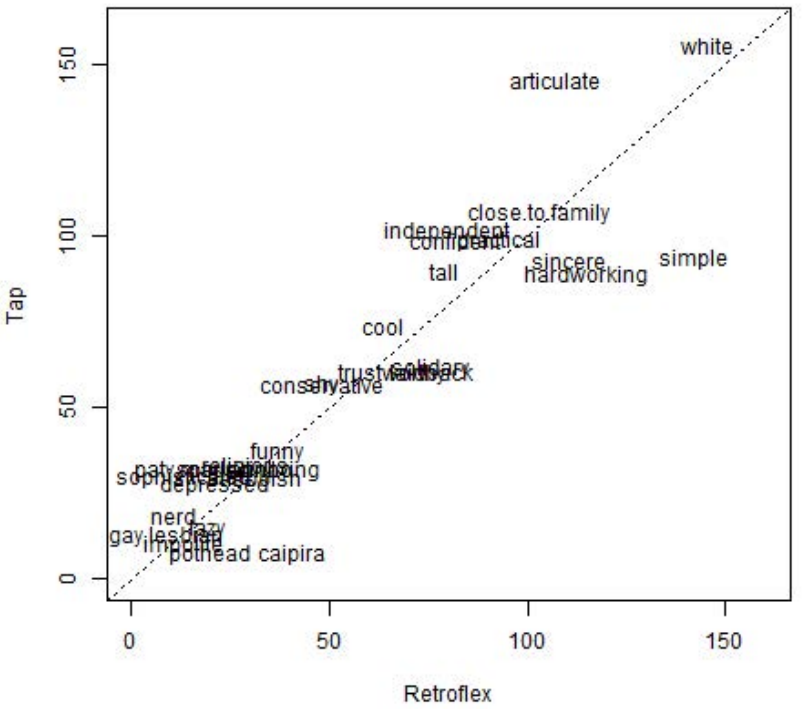
Listener group	Retroflex	Tap
Sex: Females	simple *caipira* hardworking	articulate sophisticated **spoiled** ***patricinha*/*mauricinho***
Sex: Males	*caipira*	--
Area of residence: Central	*caipira* simple	articulate
Area of residence: Peripheral	--	--
Origin: São Paulo	*caipira* simple	articulate sophisticated
Origin: SP Metropolitan area	**solidary**	--
Origin: SP interior	*caipira* simple **solidary**	--
Origin: other states	**sincere**	--

It is also worth noting that certain traits did not correlate with variable /r/, such as *tall*, *religious*, *close to family*, differently from Lambert *et al.* (1960). In the pioneering matched-guise study in Montreal, it was found that speakers in English-guise were more positively evaluated in 7 out of 14 traits, including *height*, *good looks*, and *ambition* – mostly related to the status dimension –, whereas speakers in their French-guise were more positively evaluated in traits such as *sense of humor*, *religiousness*, and *kindness* – related to the solidarity dimension.

More generally, these analyses show that few characteristics from the checkbox list are strongly correlated with variants of coda /r/ and, even when correlations do show up, it does not necessarily entail that the characteristic was frequently selected. Figure 7 visually summarizes

these results: the frequency with which the traits were selected with retroflex- or tap-guises are represented in the x- and y-axis respectively: traits showing on the bottom right were relatively more selected in retroflex-guises and those showing on the top left, in the tap-guises. The diagonal middle line represents a "neutral" point, of equal frequency of selection. For instance, the trait *close to family* was frequently selected, but practically in identical number of times between the variants (R = 103; T = 107). The significant correlations occurred for terms relatively more distant from the neutral line. Also note that all characteristics are more frequently not selected than selected. For instance, the trait *white* (top right corner), the most frequent selection (R = 146; T = 156), represents 41% (=302/740) of the total of responses. The concentration of terms on the bottom left corner shows that the selection of checkboxes was overall infrequent. In general, participants also avoided selecting negative traits such as *annoying*, *snobbish*, *lazy*, *depressed*, *impolite* for either variant, both in face-to-face and in the online data collection.

FIGURE 7 – Frequency of selection of traits in retroflex- and tap-stimuli



This means that the described correlations between /r/ variants and certain traits don't imply that the variants themselves clearly motivated listeners in their selections, but rather that these correlations obtain only on relative grounds. Take the term *articulate*: it was more frequently selected when speakers were listened to in the tap-guise (R = 107; T = 146), which resulted in a significant correlation as seen in Table 4. But the number of times the term was selected from retroflex-stimuli (R = 107) is higher than the total number of times *caipira* – also significantly correlated – was checked for all stimuli (R = 41; T = 8). Thus, the association of a trait, far from being categorical and dependent on a specific variant, is a more complex and indirect process. Retroflex /r/ does not mean *caipira* and *simple*, and tap does not mean *articulate* and *sophisticated* by themselves, because they are competing with multiple other meanings suggested by the same stimulus. We thus need a more comprehensive model, that gives room for multiple social meanings as well as the dynamics of their inter-relations. The next section discusses one such proposal, in dialogue with Eckert's (2008) concept of the indexical field.

5 A computational approach for modeling the indexical field

It has been shown so far that variants of coda /r/ are correlated with degrees of "Paulistanity," accent, area of residence, formality, education, social class, and personal attributes such as *caipira*, *simple*, *articulate*, and *sophisticated*. On the other hand, certain expected correlations were not observed – for instance, the association between tap /r/ and sounding "tall" or "patricinha/mauricinho," or between retroflex /r/ and sounding "close to family," "friendlier." In fact, there is great variability in participants' responses to all variables, which suggests that, far from being directly related to this set of characteristics, variants of /r/ interact in a network of ideologically related meanings, upon which listeners make inferences about the speakers.

These observations are in line with Eckert's (2008) proposal of the indexical field, which conceives of meanings of variants as dynamic, potential, and emergent in interaction. The concept of indexical field opens the possibility of more complex representations of social meanings, more coherent with what is observed in speakers' usage and in listeners' perceptions. For example, it explains why not all speakers and social groups react to the same variant homogeneously; why the term *articulate*, although favored by the tap, was also frequently attributed to retroflex

stimuli; or why the correlation between /r/ and level of education does not extend to the scale of intelligence, as seen in other studies (e.g. MENDES, 2016; CAMPBELL-KIBLER, 2006). On the other hand, sociolinguists still do not have a method to compute and reliably replicate or compare such findings across studies, as is the case, for instance, with the variable rule analyses of speech production data.

This section proposes a method to compute the co-occurrence and the inter-relations among multiple variables which can represent emergent indexical fields. Minimum Spanning Trees (GOWER; ROSS, 1969; henceforth MSTs) are graphical representations of multiple correlations, in which a strong correlation between two elements is represented by a smaller distance in a bidimensional plane, and weaker or absence of correlation is represented by greater distance between two variables.[17]

MSTs can be built in R using the spantree function of the vegan package (OKNANSEN *et al.*, 2018).[18] The spantree function requires a dissimilarity matrix as one of its arguments, which in turn requires a binarily coded spreadsheet. Hence the original data were recoded so that all variables had 0s or 1s for each of the participants' responses. For the scale variables, values from 1 to 3 were turned into 0 and 4-5 into 1. For the categorical variables, levels were likewise reorganized into binary variables, as lower / upper class, and less / more than 30 years old. Because City Zone is not an ordinal variable, each level was turned into a variable in itself (WestZ, NorthZ, SouthZ etc.) and coded as either checked (1) or unchecked (0). The same procedure was applied to the checkboxes: each characteristic (*tall*, *articulate*, *white* etc.) was coded binarily as checked or unchecked. Four terms in the checkboxes were discarded – *pothead*, *impolite*, *gay*/*lesbian*, and *nerd* –, as they were overall rarely selected (less than 30 times). After adjusting the coding, the function Dist from the amap package (LUCAS, 2018) was used to produce the dissimilarity matrix, which calculates correlations between all possible pairs of variables and outputs a matrix of *n* columns and *n* lines, *n* being the total number of variables – 63 in the present experiment.

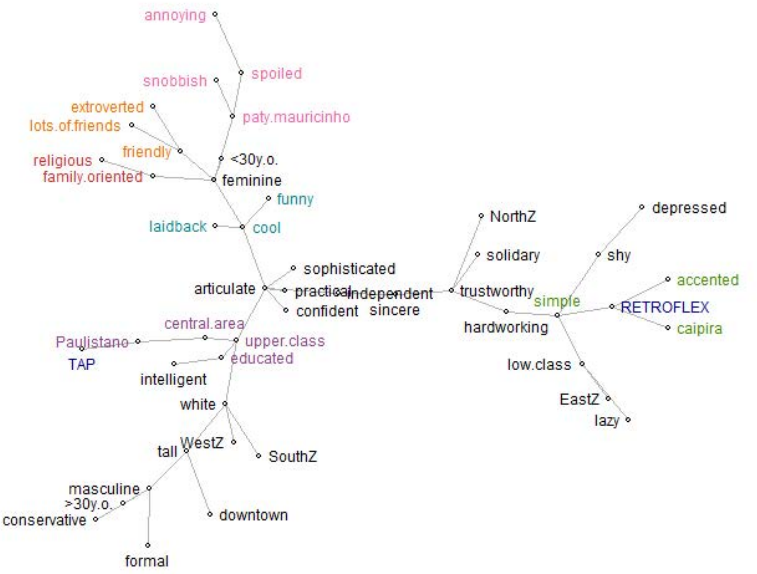
[17] The argument that correlation analyses can help model the indexical field has also been put forth in Tyler (2005).

[18] The vegan package has been originally designed for "diversity analysis, ordination methods" and "the analysis of dissimilarities" (OKNANSEN *et al.*, 2018, p. 4); though intended primarily for biologists, its multivariate analysis tools are particularly useful for sociolinguistic data.

The full code and data, from recoding participants' responses to the computation of the MSTs, can be downloaded from https://zenodo.org/record/2548037#.XEkCi817lPY.

Figure 8 is the visual representation of the MST. Nodes closer to one another indicate levels that co-occurred more frequently (i.e., were both 0s or were both 1s). It thus allows for an analysis not only of the relations between the variants of /r/ and other variables, but also the inter-relations among all variables in the questionnaire.

FIGURE 8 – Indexical field of variable /r/ in São Paulo Portuguese (all data)



It seems useful to first comment on how this and the subsequent figures are *not* meant to be read. First, they are not to be interpreted as a mental map of how listeners arrived at their percepts of the speaker. For example, although the terms *tap*, *Paulistano*, *central area* and *upper class* are connected in this order from left to right, it does not imply that a participant first listened to a tap, and then associated it with *Paulistano*, then with *central area*, then with *upper class* and so on, i.e., it is not claimed that they represent any specific chain of connections in any direction. Further, there is no intrinsic meaning for a term showing up on the left, on the right, at the bottom or at the top. What matters here is

the proximity between terms: the closer they are, the more likely they were to have co-occurred in participants' questionnaires, regardless of the direction from which listeners arrived at their conclusions and whether these were conscious or unconscious choices.

It should also be noted that MSTs, proposed here as *models* of an indexical field, are not meant to capture it in its entirety, as any given model is a simplified version of what it represents. It is clear that, being based on a closed questionnaire which was applied to a specific set of participants, the terms could have been different and are, necessarily, a subset of all its potential form and spread. The advantage of MSTs is the fact that they are built from observable correlation matrices that can be computed from our data.

Figure 8 thus shows that tap /r/ is close to the terms *Paulistano*, *central area* and *upper class*; being perceived as upper class, on its turn, frequently co-occurred with the perception of being *educated*, *intelligent*, *articulate*, and *white*. The retroflex variant, on the other hand, shows up closely associated with the notions of being *accented*, *caipira*, and *simple*, and the latter with *hardworking* and *low class*. The differently colored groups in Figure 8 represent clusters of terms that are consistently recurrent across different groups of participants, a point which will be further discussed ahead. This general representation of multiple correlations in the data agrees with the significant correlations seen in section 4. Here, in making explicit the relations that the participants made among multiple concepts when imagining who and how the speaker is, the MST provides a more reliable way to infer which terms are relatively more associated to one another.

Although the main focus here is on tap and retroflex /r/, it is likely that listeners didn't start with these variants in drawing their impressions on the speakers. It is possible to imagine, for instance, that the first impression of a listener was that of a professor giving a lecture, as in example (5), from the speech content and from a perception of good verbal articulation on the part of the speaker; the listener may then have consciously or unconsciously inferred the speaker's higher level of education, and possibly that he is an upper class individual who lives in a corresponding area of the city. In this scenario, listening to one or the other variant may reinforce the constructed image, lead to the revision of certain previous perceptions or even lead to the formulation of a new image altogether. It is worth mentioning that, in the face-to-face data collection, it was not uncommon for participants to change or adjust answers, both to the current and to previous speakers (although the latter occurred much less frequently).

The connections among all terms in the MST show that it is possible to arrive at any other, but with different probabilities. For example, the term *articulate* is close to the center of the MST, almost halfway between the tap and the retroflex, though a little closer to the former. This explains the correlation between the tap and sounding *articulate*, but is also in tandem with the fact that the term was frequently selected in retroflex guises. On the other hand, the term *caipira* is much closer to retroflex /r/, *accented* and *simple*, and quite far from the tap, which explains its strong correlation with retroflex /r/, even though it was selected for these guises fewer times than the term *articulate*.

Eckert's (2008) model also predicts shifts in the indexical field according to speakers, listeners, speech context, interlocutors' stances etc. Here, the experimental design was intended to minimize the effect of all these variables, but section 4 has already pointed to the fact that listeners of different social profiles show slightly different correlations. These differences can be visualized in the following figures, which show MSTs according to participants' sex (FIGURE 9), area of residence (FIGURE 10), and origin (FIGURE 11). The comparison between these diagrams and that of the general sample makes it possible to identify recurrent patterns in all groups, as well as their specificities.

Certain clusters appear in all MSTs: (i) Paulistanity-central area-upper class-educated; (ii) retroflex-caipira-simple; (iii) simple-hardworking-low class-EastZ; (iv) patricinha/mauricinho-spoiled-snobbish-annoying; (v) lots of friends-friendly-extroverted; (vi) laidback-cool-funny; (vii) religious-family oriented. These are identified by different colors in Figures 8-13. The first two are always close to the tap and the retroflex respectively, which signals the consistency of these associations in the whole community – thus exhibiting significant correlations in the statistical analyses. The correlation between the retroflex and the East Zone (and no other zone) may be explained by these networks of relations. In the community's imagination, this part of the city is associated with the working class, with simple and hardworking people. Such association is partially based on everyday experience, and partially by a process of *erasure* (IRVINE, 2001), in which certain facts are ignored, such as the massive presence of middle and upper middle-class individuals in this zone or the existence of working class in all other city zones. The perception that speakers were from the East Zone when listened to in their retroflex-guises, thus, occurs indirectly – but frequently – among the ideologically related terms.

FIGURE 9 – Indexical fields of variable /r/ in São Paulo Portuguese by participants' sex

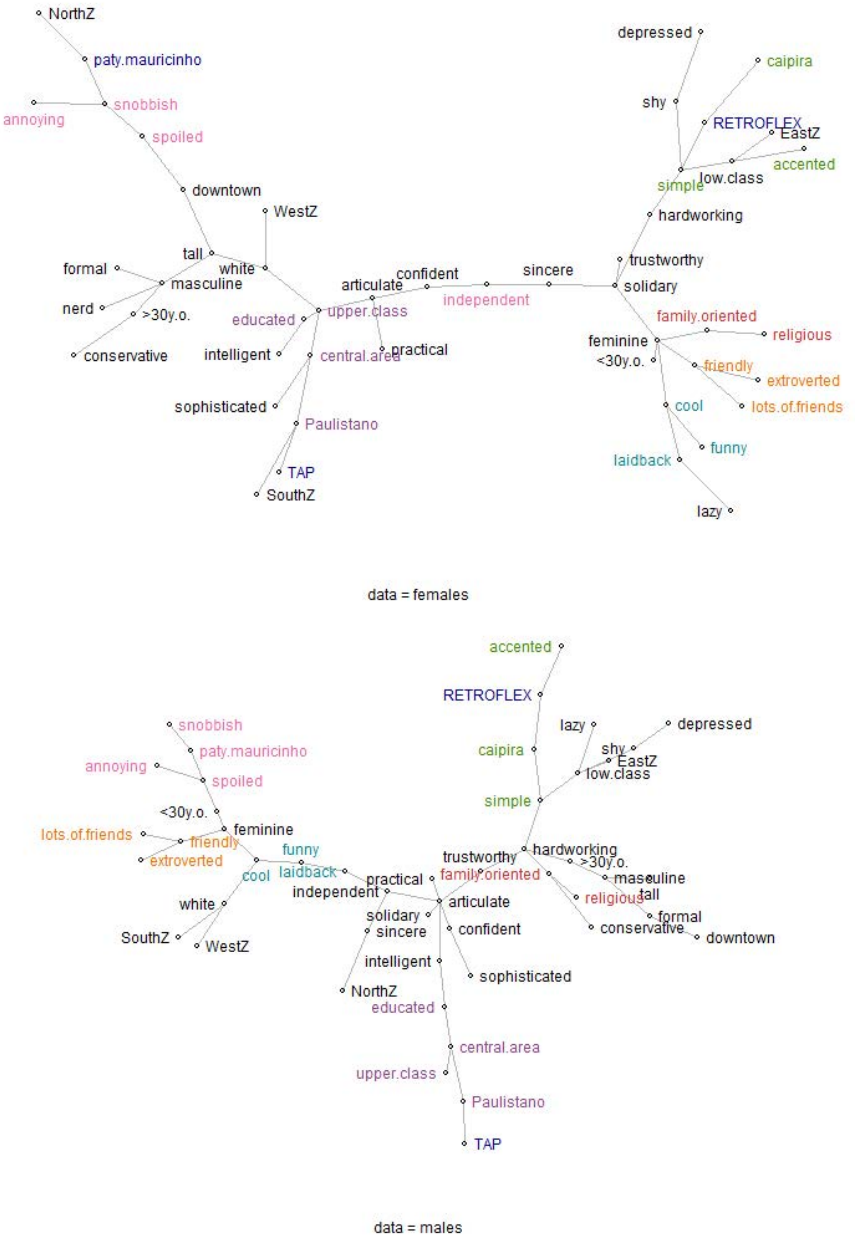


FIGURE 10 – Indexical fields of variable /r/ in São Paulo Portuguese by participants' area of residence

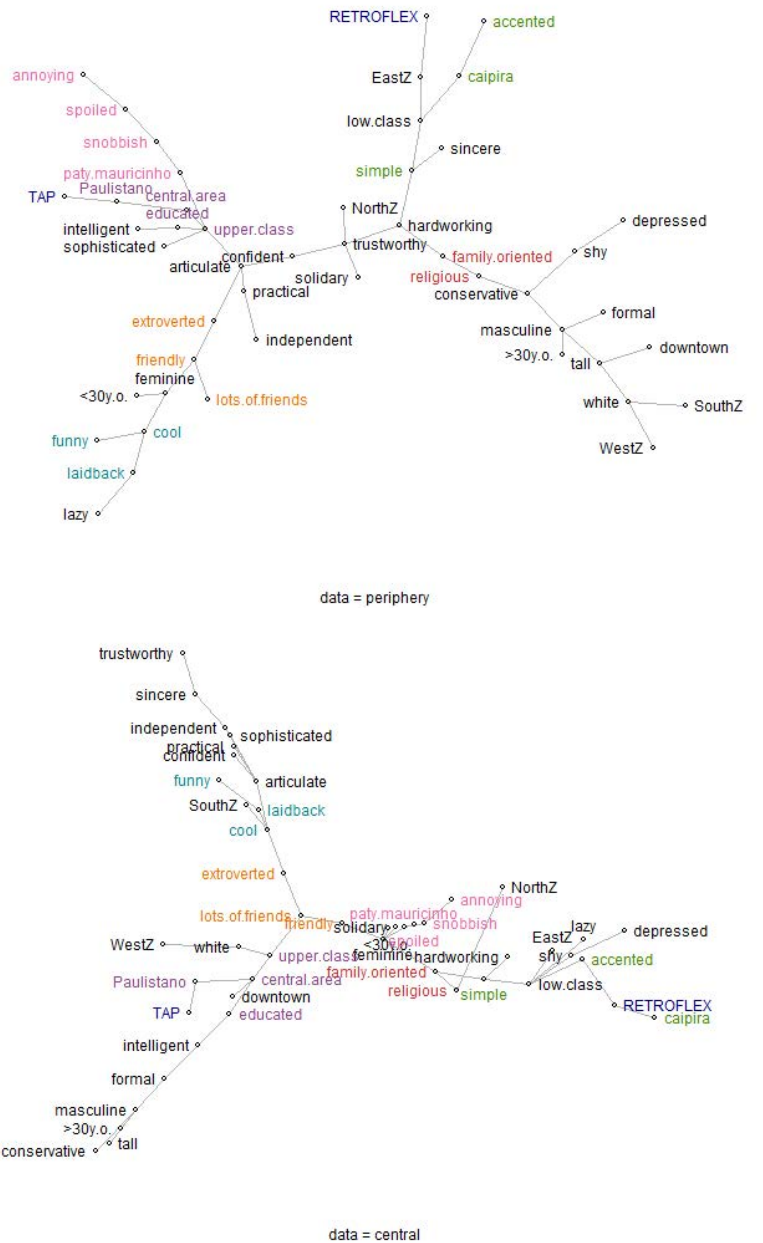
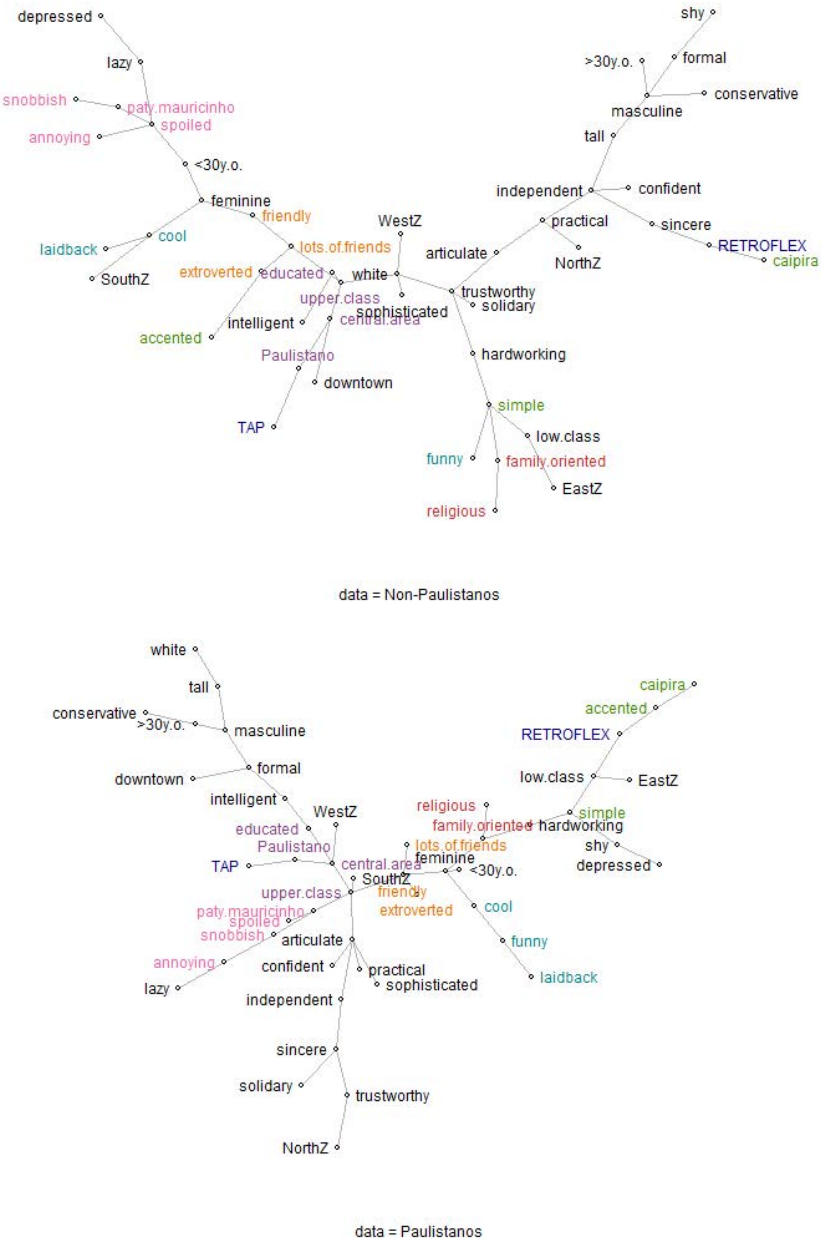


FIGURE 11 – Indexical fields of variable /r/ in São Paulo Portuguese by participants' origin



For participants living peripheral areas (FIGURE 10), the term *accented*, although also showing up in the "retroflex-caipira-simple" cluster, is relatively farther to the retroflex – as it is mediated by low class and East Zone – than for central area residents. For non-Paulistanos (FIGURE 11), *accented* is quite far from the retroflex – and actually closer to the tap. These differences reflect previously observed correlations: for peripheral area residents, the retroflex is not considered such a strong accent (FIGURE 5 above), and for out-of-towners, both retroflex and tap are "accents".

Other clusters are also differently placed among the MSTs. The "patricinha/mauricinho-spoiled-snobbish-annoying" cluster is closer to the tap for the females, residents of the periphery and Paulistanos, but relatively equidistant from the /r/ variants for men, central residents and non-Paulistanos. The fact that certain groups of concepts move "in bulk" is indicative of the new potential meanings of variants – in Silverstein's (2003, *apud* ECKERT, 2008, p. 464) words, "always already immanent." The clusters show ideologically related meanings that inhabit people's imagination independently from specific variables and usages; but once one of the terms approximates a linguistic variant, all that cluster becomes available for new meanings. The MST model shows that not all "immanent" meanings have the same probability of association, but rather that those pertaining to a relatively stable cluster is more likely to be evoked in specific contexts. Take, for instance, the "patricinha"-cluster: for females, Paulistanos and residents of peripheral areas, it is more closely related to "upper class"; in contrast, for males, residents of central areas and non-Paulistanos, it is more closely associated with femininity and younger people ("feminine" and "<30y.o."). Section 4 showed that variable /r/ significantly correlates more consistently with social class, but not femininity. This predicts that listeners who associate the "patricinha"-cluster with upper class – such as women – have greater probability to also associate the tap to "patricinhas" than those who associate "patricinha" with femininity (such as the males as a group). As observed, we verified a significant association between tap and "patricinhas" for women ($p < 0.02$), differently than for men ($p = 0.71$) (see TABLE 5 above).

Analyzing more subtle differences helps understand how the MSTs are built. Figure 12 compares the "Paulistanity-central area-upper class-educated" cluster for females and males. As already noted, this

cluster is remarkably similar across different social groups, and is always close to the tap. However, while *educated* is linked to *central area* via *upper class* for females, both *educated* and *upper class* are directly linked to *central area* for males. How does that obtain?

FIGURE 12 – "Paulistanity-central area-upper class-educated" clusters for females (left) and males (right), with dissimilarity indices

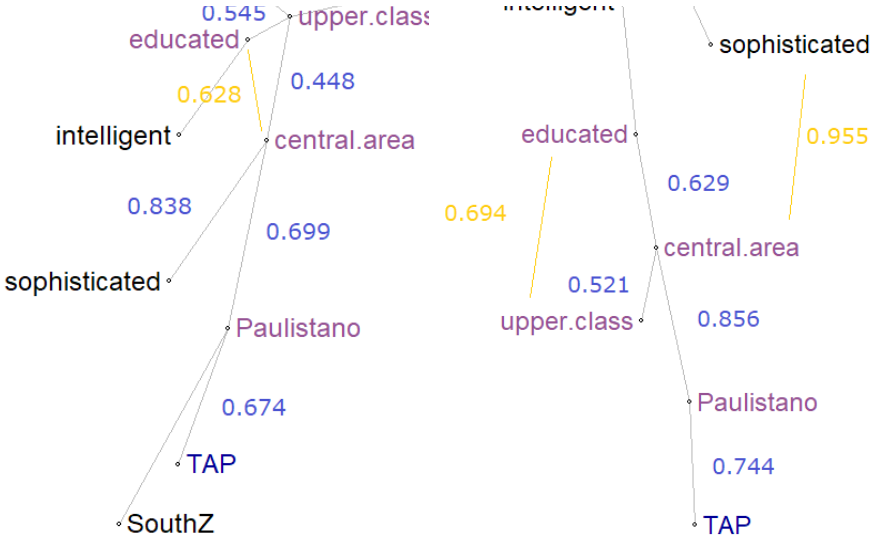


Figure 12 zooms into the "Paulistanity"-cluster for females and males, and also shows the dissimilarity indices computed by the dissimilarity matrix. Those in blue refer to nodes directly linked in the tree, and those in yellow refer to indirect relations between certain pairs. The dissimilarity indices for all pairs of relevant variables in Figure 12 are reported in Tables 6 and 7 for females and males respectively.[19] In the dissimilarity matrices, smaller indices (to the minimum of zero) represent stronger correlations and, conversely, greater indices (to the maximum of 2) represent complete lack of co-occurrence in the data. Not surprisingly, Tables 6 and 7 show indices of zero across the diagonal

[19] The full matrices are not shown here for concision but can be computed and visualized from the script in https://zenodo.org/record/2548037#.XEkCi817lPY.

row, relating a variable with itself, and maximum dissimilarity between *tap* and *retroflex*: as participants listened to stimuli with either variant, they naturally never co-occur in the data.

In the males' cluster, *central area* is directly linked to *Paulistano*, *educated* and *upper class* because the respective indices for the pair (0.856, 0.629, and 0.521) are the smallest indices for *central area*. In the females' cluster, the dissimilarity index between *educated* and *central area* (0.628) is quite similar to the one for males (0.629) but, for the former, there is yet a smaller dissimilarity index for *educated*, namely, the one between *educated* and *upper class* (0.545); thus, for females, *educated* is not directly linked to *central area*, because 0.628 is not the smallest index for each of these terms. This also explains "dead ends" in the trees: take, for instance, the node *upper class* in the males' MST. The fact that it is linked to *central area* (0.521) and no other term means that 0.521 is the smallest dissimilarity index for *upper class* and also that its dissimilarity index with other terms – say, with *Paulistano* – is not smaller than those for *Paulistano* and other terms.

TABLE 6 – Dissimilarity matrix for the "Paulistanity-central area-upper class-educated" cluster and surrounding terms for females

	Retroflex	TAP	Paulistano	central.area	upper. class	educated	intelligent	sophisticated
Retroflex	**0.0000**	2.0000	1.3252	1.2287	1.1586	1.0783	1.0411	1.1498
TAP	2.0000	**0.0000**	0.6748	0.7713	0.8414	0.9217	0.9589	0.8502
Paulistano	1.3252	0.6748	**0.0000**	0.6992	0.7679	0.7710	0.7923	0.9233
central.area	1.2287	0.7713	0.6992	**0.0000**	0.4479	0.6285	0.6391	0.8385
upper.class	1.1586	0.8414	0.7679	0.4479	**0.0000**	0.5450	0.7417	0.8477
educated	1.0783	0.9217	0.7710	0.6285	0.5450	**0.0000**	0.5841	0.9035
intelligent	1.0411	0.9589	0.7923	0.6391	0.7417	0.5841	**0.0000**	0.9093
sophisticated	1.1498	0.8502	0.9233	0.8385	0.8477	0.9035	0.9093	**0.0000**

TABLE 7 – Dissimilarity matrix for the "Paulistanity-central area-upper class-educated" cluster and surrounding terms for males

	Retroflex	TAP	Paulistano	central.area	upper. class	educated	intelligent	sophisticated
Retroflex	**0.0000**	2.0000	1.2554	1.0498	1.0827	1.0242	1.0082	1.0377
TAP	2.0000	**0.0000**	0.7446	0.9502	0.9173	0.9758	0.9918	0.9623
Paulistano	1.2554	0.7446	**0.0000**	0.8560	0.9037	0.8641	0.9304	0.9278
central.area	1.0498	0.9502	0.8560	**0.0000**	0.5214	0.6297	0.8467	0.9555
upper.class	1.0827	0.9173	0.9037	0.5214	**0.0000**	0.6939	0.8072	0.8808
educated	1.0242	0.9758	0.8641	0.6297	0.6939	**0.0000**	0.6526	0.9017
intelligent	1.0082	0.9918	0.9304	0.8467	0.8072	0.6526	**0.0000**	0.9403
sophisticated	1.0377	0.9623	0.9278	0.9555	0.8808	0.9017	0.9403	**0.0000**

It could be argued that the terms *tap* and *retroflex* have been artificially drawn apart in all MSTs due to the experiment design, since tap and retroflex /r/ never co-occur in the stimuli, and this is in fact true. This may have serious consequences for the representation of variables which are strongly correlated with tap or retroflex /r/ (such as *Paulistano*, *upper class*, *caipira*, and *simple*), because they may have been artificially separated. Three alternative analyses were then run in order to evaluate the effect of the /r/ variants on the structure of the indexical fields as a whole: one excluding both the *tap* and *retroflex* from the dataset (diagram at the bottom in FIGURE 13), and other two excluding either the tap or the retroflex (FIGURE 14).

FIGURE 13 – Indexical field of variable /r/ in São Paulo Portuguese with (top) and without (bottom) the terms "tap" and "retroflex"

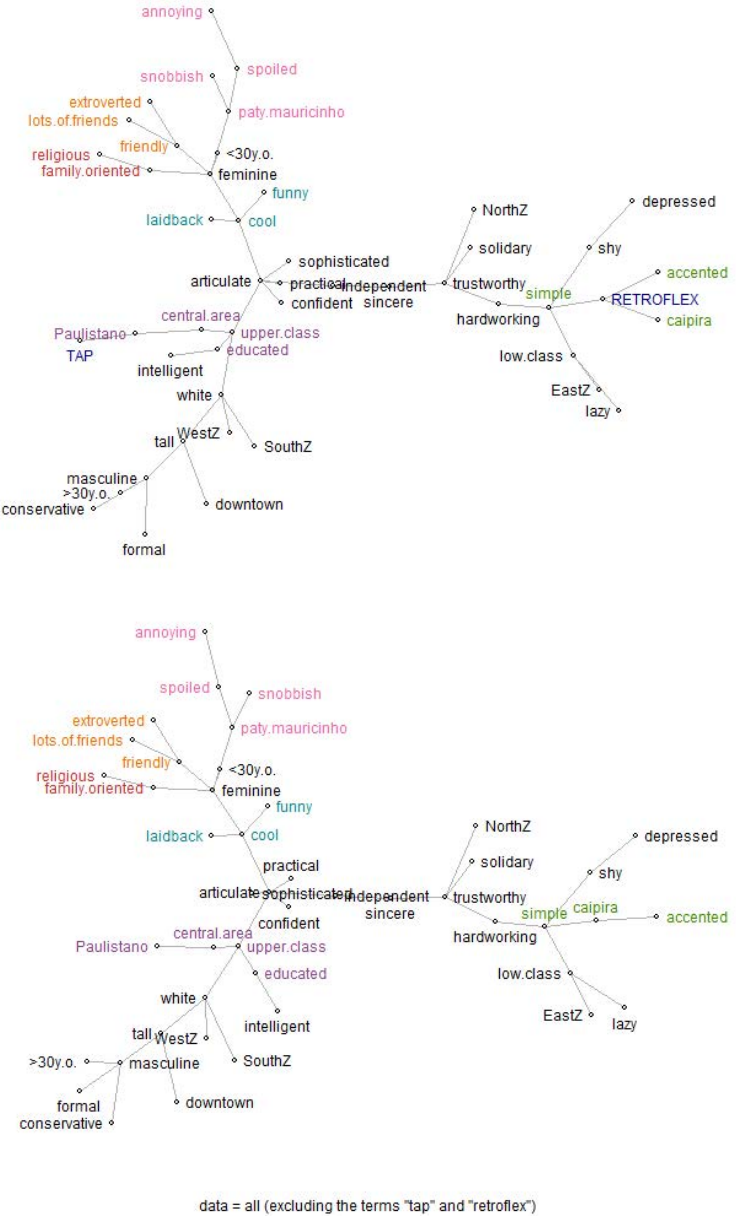
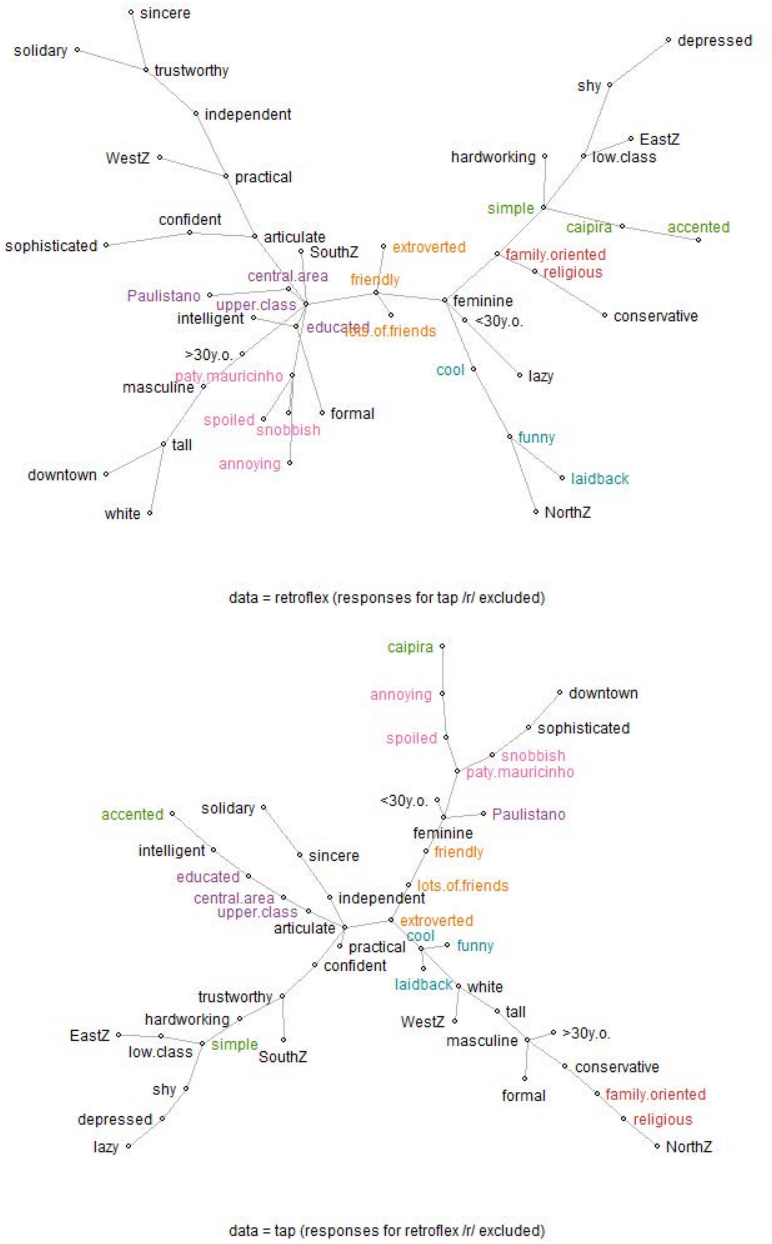


FIGURE 14 – Indexical fields of variable /r/ in São Paulo Portuguese by /r/ variant



For direct comparison, Figure 13 shows the MST for the full data (from FIGURE 8) at the top and the revised MST (excluding the terms *tap* and *retroflex*) at the bottom. There are only a few minor changes. For instance, the term *intelligent* is still connected to *educated* (and this one, on its turn, is connected to *upper class*), but now it shows up relatively closer to *SouthZ*, to reflect the fact that, in the absence of *tap*, *intelligence* is more closely related to other terms. Overall, however, the structure of both MSTs is virtually the same. Of course, excluding the terms *tap* and *retroflex* does not change the experiment design, and the fact that the correlations among multiple variables remain practically the same is indicative of the variants' strength is shaping the results.

Figure 14, on the other hand, shows more drastic changes when excluding only one of the variants (thus eliminating the potential artificial distance between certain variables). Notice that most clusters remain stable, which confirms that the ideological links between certain terms (such as *religious* and *family oriented*, and *snobbish*, *paty. mauricinho*, *spoiled*, and *annoying*) are relatively independent from variable /r/. Nonetheless, there are changes in both clusters originally linked to the /r/ variants, more specifically when considering only responses for the tap variant. While the clusters "Paulistanity-central area-upper class-educated" and "caipira- accented-simple" remain consistent when considering only responses to retroflex-stimuli, for the *tap* subset, the term *Paulistano* is separated from the "central area-upper class-educated" cluster, and the "caipira"-cluster is broken apart completely. This suggests that these ideological connections only emerge in face of the presence of the marked variant in the community and reinforces the dynamic and contextual nature of emergent social meanings.

Hence, in describing and interpreting the MSTs, it has been made explicit how they relate to the correlation results from the previous section. In this regard, MSTs can function as more falsifiable and replicable visual representations of the "constellation of meanings that are ideologically linked." Further, the analysis of MSTs not only illustrates these correlations, but makes it possible to describe regularities among different groups and predict the probability of new social meanings to be associated with linguistic variables. Hence, MSTs can represent the dynamic relation of linguistic variables and their potential social meanings, while also demonstrating that these relations are not fortuitous, chaotic or radically subjective: there is structure in these relations and

certain inferences are more likely than others. A coherent model of the social meanings of variation ought to encompass such links that are part of the individuals' communicative competence.

6 Conclusion

The analyses of a matched-guise experiment on the realizations of coda /r/ in São Paulo Portuguese, as tap or retroflex, have shown that the main meanings of the variants refer to geographical identities (capital city vs. interior; center vs. periphery), that such meanings extend to relative status of speakers in the community and, to a minor degree, to inferences about speakers' personal characteristics. All the significant correlations follow the predicted direction: speakers in retroflex-guise are perceived more negatively in the status variables (social class, level of education, formality, area of residence, articulation and sophistication), and more positively in traits associated to the solidarity and dynamism dimensions (work, simplicity, sincerity, solidarity). These results are in tandem with previous studies that noticed that languages, varieties, and variants favored by less privileged speakers tend to be perceived negatively in the status dimension and positively in the solidarity dimension.

In this sense, it is more interesting to pose the question of why certain expected correlations do not appear, such as the one with speakers' intelligence and femininity/masculinity (cf. MENDES, 2016), and with traits such as looks and religiousness (cf. LAMBERT *et al.*, 1960). MSTs show that whereas any one term/social meaning is potentially linked to another, some of them are consistently clustered across different groups in a community, whereas others may float more freely. It was shown in particular that ideological connections pertaining to the /r/ variants – namely, the "Paulistanity-central area-upper class-educated" and "caipira-accented-simple"-clusters, associated with the tap and retroflex variants respectively – emerge only in face of the marked variant in the community, when retroflex /r/ is heard. In all cases, potential meanings, although not fixed, are also not random: certain ideological links are more likely to be made by certain groups – and presumably, in certain contexts –, and such probability can be modeled.

Significant interactions were also observed between participants' area of residence and place of origin with perceptions of speakers' degree of "Paulistanity" and "accentedness." A model of sociolinguistic

perceptions and social meanings of variants should describe in detail the differences between groups of listeners, communities, and variables under investigation, i.e., it should account for the inferences made by the listeners as well as correlations that turn out to be insignificant or different from those for other variables and communities.

Hence, starting from Eckert's (2008) concept of indexical fields, a computational model of how different social meanings come to be associated with certain variants in a non-impressionistic, falsifiable, and replicable manner has been presented. The model provides a more objective interpretation of the observed correlations, as well as the prediction of probability of new meanings to be attributed to sociolinguistic variables. It thus reinforces the dynamic and structured character of sociolinguistic perceptions and evaluations.

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Stylistically coherent variants: Cognitive representation of social meaning

Variantes estilisticamente coerentes: Representação cognitiva de significados sociais

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Abstract: The perception of social meanings and styles is dependent upon the contributions of a constellation of multiple covarying sociolinguistic variants. This suggests that listeners maintain associations between stylistically coherent variants and their social meanings in mental representation. The present paper expands upon this notion, aiming to gain converging evidence from production as a way to explore the cognitive representations of variants and their social meanings more deeply. To do this, four American English speakers were asked to produce sentences containing (ING) words (as in *talking* vs. *talkin'*), in their *–in* and *–ing* variants, in a laboratory setting. Productions were acoustically analyzed to evaluate whether the speakers also manipulated other stylistically-linked variables, even though prompted only to manipulate (ING). The variant *–in* has been shown to index a range of social meanings in American English, including Southern and casual. Results demonstrate that speakers indeed modulated other variables beyond (ING) in ways that align with the Southern and casual social meanings of *–in*. That producing one variant (*–in*) could lead to stylistically congruent realizations of other variables suggests that speakers not only hold indexical linkages between variants and styles in mental representation, but that variants are also linked to variants of other variables through associations with those styles. A better understanding of social meaning in cognition provides an important base upon which to advance research on sociolinguistic perception.

Keywords: covariation; social meaning; cognitive representation; style.

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Resumo: A percepção de significados sociais e de estilos depende das constribuições de uma constelação de múltiplas variantes sociolinguísticas em covariação. Isto sugere que os falantes mantêm associações entre variantes estilisticamente coerentes e seus significados sociais numa representação mental. O presente trabalho expande essa noção, com o objetivo de ganhar evidências advindas da produção como meio de explorar mais profundamente as representações cognitivas de variantes e de seus significados sociais. Para isso, quatro falantes de inglês norte-americano foram convidados a produzir sentenças que contêm variantes de (ING) (como em talking vs. talkin' 'falando'), em contexto de laboratório. As produções foram acusticamente analisadas no sentido de avaliar se os falantes também manipularam estilisticamente outras variáveis, ainda que houvessem sido instruídos a manipular apenas (ING). Trabalhos anteriores já mostraram que a variante –in indicia uma grande extensão de significados sociais em inglês norte-americano, incluindo sotaque sulista e casualidade. Os resultados mostram que os falantes de fato modulam outras variáveis além de (ING) que se alinham a esses significados sociais de –in. O fato de que a produção de uma variante pode conduzir a realizações estilisticamente congruentes de variantes de outras variáveis sugere que os falantes não apenas detêm associações indiciais entre variantes e estilos em sua representação mental, mas também que variantes de diferentes variáveis estão ligadas entre si na sua associação a tais estilos. Entender melhor a significação social de múltiplas variáveis na cognição oferece uma base importante na qual deve avançar a pesquisa sobre percepção sociolinguística.

Palavras-chave: covariação; significado social; representação cognitiva; estilo.

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1 Introduction

The study of social meaning and style is a central focus in sociolinguistics, particularly in the third wave framework, which has seen increased interest in sociolinguistic perception. In this paper, we explore the cognitive representation of social meaning, in line with growing attention to the mental representation of socially meaningful variation (e.g., CAMPBELL-KIBLER, 2012; DRAGER; KIRTLEY, 2016; FOULKES; DOCHERTY, 2006; KLEINSCHMIDT; WEATHERHOLTZ; JAEGER, 2018; HAY *et al*., 2019; TAMMINGA; MACKENZIE; EMBICK, 2016; NIEDZIELSKI; PRESTON, 2000; SUMNER *et al*., 2014; VAUGHN; KENDALL, 2018). Specifically, we use a production-based methodology to investigate potential associations in mental representation between variants of multiple sociolinguistic

variables that may share congruent social meanings or styles. Prior work asking cognitive questions about social meaning has been primarily concerned with examining associations between linguistic forms and their indexical links to social structures, while questions regarding how covariation among multiple forms is represented cognitively have been underexamined (but see CAMPBELL-KIBLER, 2012). Better understanding the cognitive relationships between linguistic forms congruent in social meaning can help refine sociolinguistic theories of style and social meaning, and is essential groundwork for enhancing research on sociolinguistic perception.

In one prior study investigating relationships between sociolinguistic features in perception, Campbell-Kibler (2012) demonstrated that American English-speaking participants had implicit associations between (ING) (as in *talking* produced as *talkin'* [tɔkɪn] vs. *talking* [tɔkɪŋ]) and /aɪ/ monophthongization (as in *pie*, [pa:] vs. [paɪ]), but not between (ING) and /t/ release (as in *bat*, [bæt^{h}] vs. [bæt$^{\text{˺}}$]). This result (discussed in more detail in §2) suggests that listeners maintain associations between multiple stylistically coherent variants in representation, congruent with an account where styles, rather than individual variables, are the units being produced and perceived. In the present paper we expand upon this notion, investigating a similar set of variants but aiming to gain converging evidence across tasks and modalities, in order to consider the cognitive representation of social meaning in both perception and production. To do so, we investigate whether being asked to produce a marked variant of a salient variable (*–in*), indexically linked to Southern American English and casualness, triggers associations with other stylistically coherent variants (e.g., /aɪ/ monophthongization, /t/ realization), to the point that those variants also become a part of a speaker's performed production alongside *–in*. This task not only taps into how stylistically congruent variants may be represented, but can also gauge when these variants are used in production. Before discussing our data, we review prior literature about style, social meaning, and mental representation, as well as stylistic covariation among multiple features in perception and production. We intend for the present work to help advance the conversation on social meaning in cognition by pulling together the often disparate considerations of the cognitive representation of linguistic forms and the sociolinguistic exploration of social meaning. Further, we demonstrate ways in which the study of sociolinguistic perception can be enhanced by a stronger understanding of cognitive representation of sociolinguistic variation.

1.1. Social meaning, style, and their cognitive representations

The study of social meaning in sociolinguistics has advanced over the past several decades as researchers have increasingly turned attention to the many ways that language conveys meaning beyond the purely linguistic (e.g., CAMPBELL-KIBLER, 2009; D'ONOFRIO, 2018; PHARAO *et al*., 2014; PODESVA *et al*., 2015; VILLARREAL, 2018). For example, Campbell-Kibler (2009) demonstrated via a perception-based methodology that listeners make different inferences about a speaker's intelligence depending on their realization of variable (ING). Early work in the field focused on the social meaning of sociolinguistic variants as inferred from correlations of patterns of use in production. For instance, in Labov's ground-breaking (1963) study, island-oriented residents on Martha's Vineyard centralized the low diphthongs /aɪ/ and /aʊ/, so centralized /aɪ/ and /aʊ/ were interpreted as indexing an island-oriented identity. With the third wave framework's emphasis on indexicality, newer production studies have revealed even more nuanced facets of social meaning (e.g., ECKERT, 2011; PODESVA, 2007; ZHANG, 2008). For example, Podesva (2007) shows how falsetto phonation becomes a part of presenting a gay identity and associated with gay-sounding speech through that feature's role in contributing to an expressive meaning, which in turn leads to its connection to associated personae (e.g., diva). Thus, both perception and production methodologies have advanced and continue to advance the study of social meaning.

Despite this wide-ranging study of social meaning, relatively little work has examined its cognitive underpinnings, though this is a growing area of inquiry (e.g., CAMPBELL-KIBLER, 2012, 2016; DRAGER; KIRTLEY, 2016; HAY *et al*., 2019; LEVON, 2014; NIEDZIELSKI; PRESTON, 2000). How do language users represent the social meaning of variants? How are these social meanings accessed in the course of language processing and social cognition? Much work in this area calls on exemplar theoretic frameworks that posit linkages in memory between linguistic forms and social information to account for mutual influence between the linguistic and the social (e.g., PIERREHUMBERT, 2001, 2006; SUMNER *et al*., 2014). Under hybrid, dual-route implementations of exemplar models, for example, wordforms are stored with a detailed distribution of phonetic and social information alongside more abstracted forms of such information. Encountering new exemplars updates this distribution, and this representation is accessed, though in different ways, for perception and production.

A cognitive framework provides an important backdrop for theorizing about the mechanisms necessary for linking linguistic and social information. For example, Niedzielski and Preston (2000) and Preston (2010) consider potential steps involved in making social judgments based on linguistic forms using a connectionist network as a schema. The authors posit that this task may involve the following steps (paraphrased from PRESTON, 2010): (1) A hearer notices a production of *pen* as [pɪn], (2) classifies that production as "Southern U.S.", (3) retrieves caricatures of "Southerners" from mental representation and imbues the production of [ɪ] with them, and (4) responds with an evaluation. We note that such an approach shares some (but not all) characteristics with well-developed predictive models of person construal (e.g., FREEMAN; AMBADY, 2011) and stereotype formation and activation (MACRAE; BODENHAUSEN, 2001) in social psychology, where categories and attributes exist in linked networks. Preston suggests that a shortcut from steps 2-4 is taken when the variant is more directly associated with the evaluation due to frequency and salience of association between variant and group identity (e.g., when it has undergone iconization; IRVINE, 2001). In each case, the assumption underlying this approach is that variants have links to their social meanings in mental representation, derived from associations with groups of speakers or styles. This linkage raises a related question long-discussed by scholars of indexicality in language, but which has not been directly addressed cognitively: whether styles are built bottom-up, from variants (e.g., OCHS, 1992), or top-down, from registers (e.g., AGHA, 2003; SILVERSTEIN, 2003). We return to this question in §4. The present study does not constitute an empirical test of such models, but rather seeks to expand the range of sociolinguistic phenomena that cognitive models should account for. As the work reviewed here has demonstrated, richer models of how linguistic and social forms are cognitively represented are important for understanding both sociolinguistic production and perception.

1.2 Stylistic covariation in production and perception

A crucial observation in the study of social meaning and style is that individual variants do not exist in isolation, but rather show patterns of co-occurrence with other variants, which together make up a style (e.g., AGHA, 2003; AUER, 2007; ECKERT, 2008, 2012; ECKERT; RICKFORD, 2001; ERVIN-TRIPP, 1972; LEVON, 2007;

PODESVA, 2008, 2011; RICKFORD; MCNAIR-KNOX, 1994; SCHILLING-ESTES, 2004; SHARMA; RAMPTON, 2015; ZHANG, 2005, 2008). That is, in conversational settings, speakers manipulate a constellation of cues simultaneously. For instance, in their classic study Rickford and McNair-Knox (1994) demonstrate how a speaker, Foxy Boston, modulated several features of African American Vernacular English together across two interviews (and between different topics within interviews) in ways that patterned with differences between the interviewers. Zhang (2005) explores how local and non-local features of Mandarin were collectively manipulated by two different groups of Chinese professionals in Beijing in order to present different kinds of professional personae. Based on observations such as these, Eckert (2008) describes stylistic practice as a process of bricolage where speakers, and listeners, make use of the indexical associations (the indexical field) of variants to perform, enact, and interpret a range of identities.

Covariation among multiple features in speech has been an important focus not only in sociolinguistics but in phonetics more generally, which has demonstrated that the instantiation of different speech sounds is not completely independent, particularly within individual speakers (e.g., ALLEN; MILLER; DESTENO, 2003; CHODROFF; WILSON, 2017; NEWMAN; CLOUSE; BURNHAM, 2001; THEODORE; MILLER; DESTENO, 2009). The extent to which group-level phenomena like lects and coherent styles can be characterized by systematic covariation between features on a group vs. individual level has garnered mixed results (e.g., BECKER, 2016; BIGHAM, 2010; GREGERSEN; PHARAO, 2016; GUY, 2013; GUY; HINSKENS, 2016; TAMMINGA, 2014). However, characterizations of regional accents by analysts, of course, are made in terms of sets of co-occurring phonetic features (e.g., LABOV; ASH; BOBERG, 2006). Southern American English speech, for instance, is described by the phonetic properties of a range of vowels (e.g., FRIDLAND, 2001), by consonant features like /ɹ/-lessness (e.g., FEAGIN, 1990), by prosodic patterns such as slower speech rate (e.g., KENDALL, 2013) (and also by lexical, morphosyntactic, and pragmatic features; e.g., JOHNSTONE, 1999).

Further, recent work in perception has suggested that listeners may be aware of the cues that covary within styles (SUMNER *et al*., 2013; VAUGHN; KENDALL, 2018), and that listeners can attach social meaning to such covariation (e.g., CAMPBELL-KIBLER, 2009, 2011;

LEVON, 2007, 2014; PHARAO *et al*., 2014). Sumner *et al*. (2013) found that a variant's realization (i.e., word-medial /t/ as tapped or released) is processed by listeners with reference to the speaking style in which that variant usually occurs (i.e., casually or carefully). And, Vaughn and Kendall (2018) found that when listeners were asked to classify which variant of (ING) they heard in a sentence (*–ing* or *–in*), they were sensitive to cues in the signal beyond the variant itself. In that study, the carrier "frame" sentence (whether the speaker originally produced the sentence with *–ing* or *–in*) significantly interacted with the actual realization of the variable (cross-spliced *–ing* or *–in*) to influence listeners' classifications, suggesting that covarying cues were used by listeners.

In terms of perception of social meaning, Levon (2007) details how pitch range and sibilant duration work in tandem to affect listeners' ratings of speakers on an effeminate to masculine scale, supporting "a gestalt-like understanding of indexicality… whereby linguistic features are not only salient on their own but can also work in clusters to achieve social-indexical significance" (p. 546). Relatedly, prior work has shown that certain linguistic features are only effective indexical triggers when not "blocked" or "indexically bullet-proofed" by the presence of other features (CAMPBELL-KIBLER, 2011; LEVON, 2014; PHARAO *et al*., 2014). Whether this phenomenon is because listeners display different degrees of attention to different features, or because the weighting of one feature's indexical meaning is dependent upon the presence of other features, is an open question (see discussion in LEVON, 2014), but the central point is that there is an interplay among multiple variants in the construction of social meaning. Findings such as these in perception, that listeners are sensitive to subtle covarying cues, and that social meaning is contextually mediated across multiple variants, indicate the likelihood of indexical linkages between variants, and invite further investigation into the relationship between such variants and related social meanings in the mind.

Despite the attention to social meaning in cognition (reviewed in §1.1), and the attention to stylistic covariation among multiple variants (reviewed in §1.2), thus far there is little work explicitly investigating the intersection of these areas, the relationships among multiple variants with shared indexical meanings in cognition (but see CAMPBELL-KIBLER, 2012). A related study, Kim and Drager (2017), found that being primed with a variant that signals a sound change in progress in Korean (and

thus points to the speaker being a certain age) facilitated listeners' lexical access to words congruent with the inferred age of the speaker. This is in line with work that more generally shows that expectations about talkers can affect speech perception (e.g., STRAND; JOHNSON, 1996; SZAKAY; BABEL; KING, 2016; VAUGHN, 2019; WALKER; HAY, 2011). Many open questions regarding the cognitive representation of covarying features remain, however. In particular, are multiple variants linked in mental representation via congruent social meanings? Given that listeners are able to identify styles and lects based on shared linguistic features (e.g., CLOPPER; PISONI, 2007; D'ONOFRIO, 2018), it is likely that such a pathway exists. Thus, to advance the study of sociolinguistic perception, it is crucial to better understand cognitive associations between multiple variants that share indexical links. In the next section, we discuss a study that has examined this question in detail, Campbell-Kibler (2012), before going on to describe the present study.

2 The present study

Campbell-Kibler (2012) used an Implicit Association Task to infer the existence of several links in mental representation, between variants and social meanings (Experiment 1), and between multiple variants sharing a social meaning (Experiment 2). The task, originally developed by social psychologists for understanding implicit biases, essentially measures the degree to which participants can un-link associations they have formed. More specifically, the test asks whether participants have associations between two constructs (e.g., gender, and ability in STEM fields) in a particular direction, as measured by the difference in reaction times when the two constructs are paired in one direction (e.g., males: good at STEM fields, females: bad at STEM) versus the other (e.g., males: bad at STEM, females: good at STEM). Campbell-Kibler (2012) used the methodology to demonstrate that participants had associations between *–in* variants and Southernness, and between *–in* variants and /aɪ/ monophthongization (which share an indexical link to Southernness), but not between *–in* variants and /t/ release (which she argued do not have as salient an indexical connection).

Such findings are suggestive of socially mediated cognitive connections between variants and are central for the advancement of understanding sociolinguistic perception. As a way to provide converging

evidence, and to build on the findings of Campbell-Kibler (2012), the present study considers how production data can be explicitly mobilized to address cognitive representation. To do this, we draw on recorded sentence productions from four non-Southern American English speakers who were asked to read a series of simple sentences, each of which contained one word with word-final (ING), in two guises–one with the (ING) word realized in its standard *–ing* form and one with the (ING) produced as *–in.* (We further explain the production task, the features we examine, and our findings in detail in the sections that follow.)

Although production analyses have been the mainstay of sociolinguistic research over the past half century, here we use a slightly different type of production task, sentence reading, for a new purpose, to make inferences about mental representation. We investigate whether, when asked simply to produce *–in* for *–ing* in a laboratory reading task, speakers employ other variants sharing a social meaning with *–in*. We measure the extent to which producing the variant *–in* leads to systematic shifts in the production of other variants, and use those findings as an indirect indication that coherence in social meaning can serve as a cognitive link between variants. Such a pattern, taken along with Campbell-Kibler's (2012) results, would add to the suggestion that "linguistic forms with similar social indexes are associated with one another" (CAMPBELL-KIBLER, 2012, p. 758). These potential patterns would be consonant with theories of enregisterment, discussed further in §4, which posit that variants in fact gain meaning by virtue of their being located within socially situated clusters or lects (AGHA, 2003; JOHNSTONE, 2016).We note that performance speech, related to but not identical to the elicited speech we analyze here, has been suggested as a useful site to examine features and their associations: "… there is evidence that the greater perceptual awareness speakers have of a given language feature (whether this awareness is at the conscious level or not), the greater the extent to which the feature will figure in their demonstrations and discussions of the language variety in question" (SCHILLING-ESTES, 1998, p. 64).

Following Campbell-Kibler (2012), in this study we focus on the *–in* variant of the sociolinguistic variable (ING). *–in* is a variant with a strongly documented set of social meanings, and English (ING) is one of the most well-studied variables in sociolinguistics, with robust reports of its patterns in speech from many English-speaking communities around

the world (e.g., FISCHER, 1958; FORREST, 2015; HAZEN, 2008; KENDALL, 2013; LABOV, 2001; TAGLIAMONTE, 2004). (ING) is useful for our purposes for numerous reasons, especially because there is evidence that the realization of (ING) has been shown to trigger different social evaluations of speakers. For example, as mentioned above, Campbell-Kibler (e.g., 2007, 2009) has shown that listeners' inferences about speakers across a range of dimensions (e.g., accented, casual, intelligent, Southern) are affected by a speaker's realization of (ING). Specifically, the *–in* variant is associated with Southern American English speech; Southernness has been consistently identified in the literature as being part of, and the strongest member of, the indexical field of *–in* (CAMPBELL-KIBLER, 2007, 2012; ECKERT, 2008), along with *–in*'s other meanings like lower perceived socioeconomic status, articulateness, and education. In fact, several of the (non-Southern) speakers in our study, overtly and unprompted, remarked on their associations between the *–in* variant and Southernness, noting when exiting the sound booth after their recording session that they felt like they "became Southern" by the end of the production task where they produced sentences with *–in* forms. Southern American English itself can be considered an enregistered variety (e.g., CAMPBELL-KIBLER, 2012; CRAMER, 2013; JOHNSTONE, 1999; LIPPI-GREEN, 2012; PRESTON, 1997), with certain features (including *–in* and /aɪ/ monophthongization; CAMPBELL-KIBLER, 2012; LABOV *et al*., 2006) being more stereotypically associated with the variety than others. Work in perception has shown that the social meaning of different variants is moderated by the relative salience of the variant (LEVON; FOX, 2014), making *–in*'s strong associations with Southernness in the U.S. an important property for its use in this study. In sum, due to its well-established linkages with social meanings, and its status as a salient feature of an enregistered style, *–in* may be an especially effective trigger of stylistic covariation.

2.1 The task, speakers, and materials

In this study, we analyze production recordings collected as part of the stimulus creation process for Vaughn and Kendall (2018). 141 sentences were created, each containing one critical (ING) word (e.g., *I'm <u>having</u> a hard time with my homework*; see VAUGHN; KENDALL,

2018 for further details[1]). The 141 sentences included a total of 56 distinct (ING) word types (e.g., *morning*, *thinking*). The position of the (ING) word in the sentence varied across sentences, and sentences also varied along a range of (ING)'s internal conditioning factors, including grammatical category and phonological environment.

Four female native English speakers, all linguistics undergraduate students at the University of Oregon, were recruited to record the sentences. Two of the speakers were from Southern California (SA, age 18; SH, age 23), and two were from Oregon (HI and KY, both age 18). Three self-identified as Caucasian, and one self-identified as mixed race (Caucasian and Asian). Speakers were asked to produce the sentences as naturally as possible, and all were aware of and able to produce the difference between *–ing* and *–in* forms. No mention was made to the speakers of indexical associations or expectations about (ING) and its covariates.[2] Recordings were conducted with each speaker alone in a sound-attenuated booth using a Shure SM93 microphone and a Marantz PMD-661 recorder. Each speaker first read all 141 sentences as they were displayed on the screen in their *–ing* form (e.g., *I prefer swimming in the*

[1] These sentence recordings were collected in order to create stimuli for Vaughn and Kendall (2018), a perception study examining listener sensitivity to the grammatical category conditioning of (ING). For that study, a subset of 24 unique sentences were selected for each speaker "based on naturalness, fluency, and prosodic similarity across frames" for a total of 96 sentences. We note that the selection of those 96 sentences was done impressionistically, not based on the acoustic measures examined in the present analysis. Importantly, the patterns of covariation uncovered in this paper for the entirety of the recorded sentences (N = 141 sentences x 2 variants = 282/speaker) are consistent with the frame/realization interaction found in Experiment 2 (VAUGHN; KENDALL, 2018) for the cross-spliced version of the selected subset of these stimuli, providing some suggestions about the basis of that interaction effect. The findings in the present paper cannot account, however, for the central question of interest in Vaughn and Kendall (2018) regarding listener sensitivity to the (ING) word's grammatical category.

[2] Nonetheless, due to the salience of *–in* and its representativeness of the enregistered Southern style, it is of course possible that speakers operationalized our instruction to produce the sentences with *–in* forms as an instruction to enact a style or persona associated with *–in*. Although we cannot rule out this possibility (which in fact supports the idea that variants accrue meaning in the context of styles), we do not believe that speakers began the task with this directive in mind, since speakers who overtly remarked on the fact that they "became Southern" seemed surprised by this behavior.

ocean), and then read all 141 sentences as they were displayed on the screen in their *–in* form (e.g., *I prefer swimmin' in the ocean*). We refer to these as different guises or versions of each sentence.

2.2 Additional sociolinguistic variants examined

In this paper, we ask whether these four speakers (who, importantly, were not speakers of Southern U.S. English) use more features associated with *–in* (especially via *–in*'s Southern social meaning) in sentences where they were asked to produce (ING) as *–in* than in sentences where they were asked to produce (ING) as *–ing*. Campbell-Kibler (2011) suggests that variants are the site of social meaning (e.g., *–in*), rather than variables (e.g., (ING)), and here we specifically examine the indexical field of the variant *–in,* the marked variant of variable (ING). Further, given the relatively formal task of producing sentences in a laboratory, our predictions center around the *–in* productions of these sentences, the variant that is not expected to be the norm in this more formal setting.

We examine speakers' productions of a range of phonetic features associated with the indexical field of *–in*, specifically Southernness but also casualness. Following Campbell-Kibler (2012), we investigate /aɪ/ glide length and /t/ realization, but also include a number of other features linked to the social meanings of *–in* to get a more complete picture, including features associated with Southernness like: proximity of /e/ and /ɛ/, duration of /ɛ/ and /ɪ/, and speaking rate. Below, we discuss the known associations of these features with salient social meanings of *–in*, and include details about how each variant was measured in our production data. Predictions from prior literature about how each feature would be expected to co-vary with *–in* are summarized in Table 1; that is, for each variable, we offer predictions about the directions of any covariation effects if the measures were to show congruence with the social meanings of *–in* (again, primarily focusing on its primary association with Southernness). Any observed covariation in speech production in the direction predicted by stylistic congruence we take as converging evidence–with Campbell-Kibler's (2012) perception results–for connections in mental representation between variants and their social and stylistic meanings.

/aɪ/-glide length: /aɪ/ monophthongization is a commonly described feature of Southern American English, both in the research literature as a key piece of the Southern Vowel Shift (SVS) (FRIDLAND, 2003; KURATH; MCDAVID, 1961; LABOV *et al*., 2006) and in popular awareness (NIEDZIELSKI; PRESTON, 2000). Shorter /aɪ/ glides, representing more monophthongal articulations, would be expected for more Southern-like productions. As noted above, Campbell-Kibler (2012) found associations between *–in* and /aɪ/ monophthongization in her Implicit Association Task. Thus, we ask: do shorter /aɪ/ glides co-occur with *–in* productions? In our data, glide lengths for /aɪ/ vowels were measured as the Euclidean distance between normalized F1 and F2 values at the 20% and 80% points in each /aɪ/ vowel's duration (corresponding to the Vector Length measurement of FOX; JACEWICZ, 2009 and FARRINGTON *et al*., 2018).

Proximity of mid front vowels /e/ and /ɛ/: The Southern Vowel Shift (SVS) involves a spectral (near-)reversal of the positions of /e/ and /ɛ/. Several studies have suggested that /e/–/ɛ/ Euclidean distance is a useful measure of how Southern a speaker sounds (GUNTER; VAUGHN; KENDALL, under review; FARRINGTON *et al*., 2018; KENDALL; FRIDLAND, 2012), with smaller /e/–/ɛ/ Euclidean distances corresponding to more Southern-like speech. So, do sentences with *–in* productions also show more proximal /e/–/ɛ/ vowels? In our data, relative positions of mid-front vowels were assessed through a measure of the Euclidean distance between each speaker's mean F1 and F2 for /e/ and for /ɛ/ for each guise.

Duration of lax vowels /ɛ/ and /ɪ/: The lax front vowels /ɛ/ and /ɪ/ are known to be lengthened in Southern speech (CLOPPER *et al*., 2005; FRIDLAND *et al*., 2014). We ask: are /ɛ/ and /ɪ/ vowels longer in the *–in* versions of sentences? Durations were measured for all tokens of the lax vowels /ɛ/ and /ɪ/ with primary stress (as such, no tokens of /ɪ/ came from productions of the (ING) variants [*ɪŋ*] or [*ɪn*]*)*, and were natural log transformed for analysis.

Speaking rate: In addition to containing long lax vowels, Southern speech is described as being slower overall than non-Southern speech (e.g., JACEWICZ *et al*., 2010; KENDALL, 2013). Therefore, will we observe slower speech in *–in* versions of sentences? Speaking rate was calculated as the number of syllables produced in each sentence divided by the temporal duration of the sentence. Syllables were counted using

an automated script from Kendall (2013). (Although several other temporal measures could be relevant here, such as overall utterance length or average word length, these measures are entirely correlated with speaking rate in our stimuli since the *–ing* and *–in* sentence productions were matched word-for-word. Thus, we limit our examination of gross temporal measures to speaking rate.)

Intervocalic /t/ realizations: As noted earlier, Campbell-Kibler (2012) examined but did not find associations between *–ing* and /t/ release in her Implicit Association Task. Here we also examine realizations of /t/ to assess its covariation with (ING) realization in our production data. In American English, word-medial, intervocalic /t/s are often produced as flaps or taps (e.g., PATTERSON; CONNINE, 2001; SUMNER *et al*., 2013), and in laboratory phonetics work, intervocalic /t/ realizations are often considered and measured on a cline from flapped (highly reduced, short, etc.) to released (more intense, long, etc.) (e.g., BYRD, 1994; WARNER; TUCKER, 2011). In sociolinguistics, /t/ realization has often been measured as released vs. not released (e.g., CAMPBELL-KIBLER, 2012; PODESVA *et al*., 2015). We thus assess /t/ realizations in each of the two following ways:

Prior sociolinguistic work on /t/ variation and social meaning has primarily focused on characteristics of /t/ release (BENOR, 2001; PODESVA *et al*., 2015; WOLFRAM *et al.* 2016), which has been associated with meanings such as intelligence and articulateness. Hence, /t/ releases were expected by Campbell-Kibler (2012) to co-occur with *–ing*. Podesva *et al.* (2015) find that word-medial /t/ release (e.g., *butter*) is perceived as more socially meaningful than word-final /t/s (e.g., *closet*). Thus, we analyzed all word-medial intervocalic /t/ realizations following the methods of Podesva *et al*. (2015): each word-medial intervocalic /t/ in the stimuli was manually coded into one of four categories (released, flapped, glottalized, or deleted), based on a combination of auditory and spectrographic evidence. Following prior work on /t/ release, we consider the use of released word-medial /t/ relative to all other realizations (flapped, glottalized, or deleted).

We also examine /t/ realization in a more gradient, phonetic way. Another part of *–in*'s indexical field, casualness, would predict shorter and more reduced /t/ in intervocalic position. Warner and Tucker (2011) quantified /t/ realizations in terms of reduction using several measures including intensity difference, the difference between the

average intensity of the surrounding vowels' maximum intensity and the intervocalic /t/'s minimum intensity. We implemented the intensity difference measure following the methods of Warner and Tucker (2011) as a gradient metric of /t/ realization, calculated for all instances of intervocalic /t/ in the dataset. Reduced /t/s, as indicated by less intensity difference, would be expected in more casual speech.

TABLE 1 – Phonetic features included in analysis, with predictions and selected citations

Phonetic feature	*Prediction and citations*
/aɪ/-glide length	Shorter = Co-occur with *–in* (Southern meaning of *–in*) E.g., FRIDLAND, 2003; KURATH; MCDAVID, 1961
Proximity of mid front vowels /e/ and /ɛ/	More proximate = Co-occur with *–in* (Southern meaning of *–in*) E.g., FARRINGTON *et al*. 2018; KENDALL; FRIDLAND, 2012
Duration of lax vowels /ɛ/ and /ɪ/	Longer = Co-occur with *–in* (Southern meaning of *–in*) E.g., CLOPPER *et al*., 2005; FRIDLAND *et al*., 2014
Speaking rate	Slower = Co-occur with *–in* (Southern meaning of *–in*) E.g., JACEWICZ *et al*., 2010; KENDALL, 2013
Intervocalic /t/ realization	Fewer /t/ releases = Co-occur with *–in* (Less articulate meaning of *–in*) E.g., BENOR, 2001; PODESVA *et al*., 2015 More reduction (less intensity difference) = Co-occur with *–in* (Casual meaning of *–in*) E.g., BYRD, 1994; WARNER; TUCKER, 2011

2.3 Acoustic analysis procedure

Analysis began by first RMS amplitude normalizing all recordings to 70 dB SPL in Praat (BOERSMA; WEENINK, 2018). Then, we created phone-level alignments for all sentence productions for the four speakers (141 sentences x 2 guises x 4 speakers = 1,128 sentences), using the Montreal Forced Aligner (MFA; MCAULIFFE *et al*., 2017). MFA was configured using the standard English phonological model and a customized dictionary that included all of the words in our stimuli along with two pronunciations for each (ING) word, one ending in /ŋ/ and one ending in /n/. The output of the forced alignment process was checked by hand but after determining that the alignment

appeared accurate no changes were made to the alignment boundaries. Following alignment, a combination of Praat and R (R DEVELOPMENT CORE TEAM, 2018) scripts were used to extract many measures. The Penn FAVE-extract suite (ROSENFELDER *et al*., 2011) was used to extract formant measures. Vowel formant data were normalized using the Lobanov method (LOBANOV, 1971) using the vowels.R package (KENDALL; THOMAS, 2009). In addition to making formant data more comparable across speakers, this normalization technique also puts F1 and F2 on more comparable scales, making Euclidean distance measures appropriate for vowel data (KENDALL; FRIDLAND, 2012, fn. 7).

3 Findings

We analyzed the phonetic features described in §2.2 in these recordings in order to explore what happens when a speaker is asked to perform or enact not a style, but a single feature (*–ing* or *–in*). Is the realization of other features linked to *–in* via social meanings also affected? Before examining overall statistical models, we begin by considering how much each individual speaker's productions conform to the stylistic covariation predictions from Table 1 for each feature. We do this by visualizing and impressionistically describing the data by speaker. To examine the vocalic spectral features, Figure 1 displays vowel plots for each speaker, highlighting /aɪ/-glide length and the relative positions of /e/ and /ɛ/. From the figure, we observe that for three speakers (all but SH) /aɪ/ glides are shorter for *–in* versions of the sentences (in blue) than for the *–ing* versions (in red), showing stylistic congruence for those speakers. /e/ and /ɛ/ are visibly more proximate in the *–in* sentences for all four speakers, also suggesting socially meaningful coherence between variants.

FIGURE 1 – Vowel plots by speaker, highlighting /aɪ/-glide length and /e/–/ɛ/ spectral positions for *–in* and *–ing* sentences. Shorter /aɪ/ glides and more proximate /e/–/ɛ/ are congruent with more Southern-like productions.

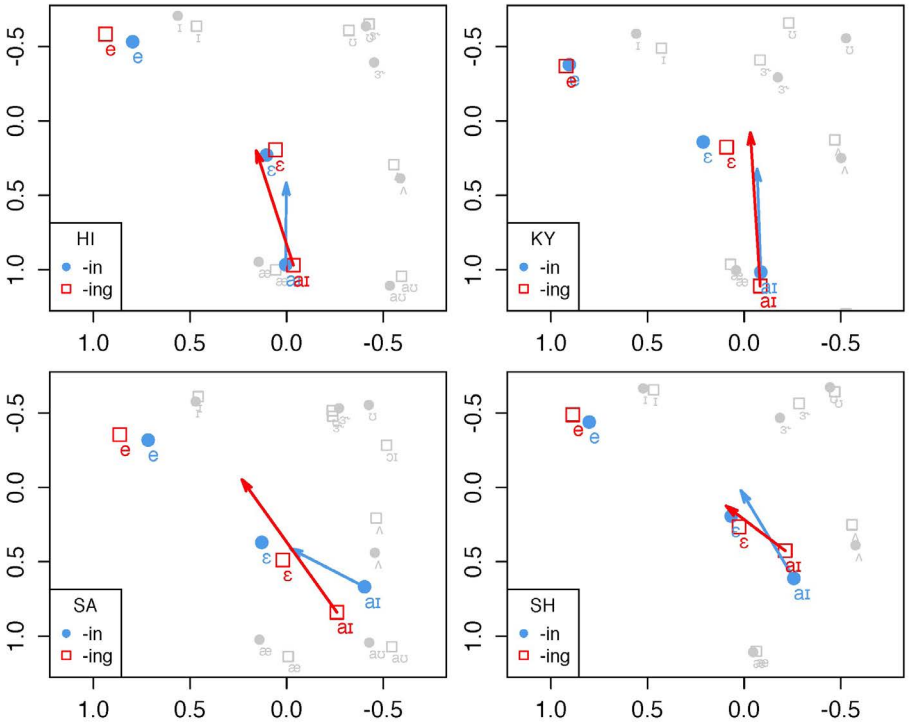


Figure 2 displays a boxplot of durations of the front lax vowels for each speaker. The figure suggests that two speakers, HI and KY, conform to the predictions for Southern style, realizing longer (more Southern-like) lax vowels in *–in* sentences than *–ing*. The vowel durations for the other two speakers, SA and SH, however, appear to be relatively similar across sentence guises. Altogether, the vocalic features show a tendency for some speakers to realize more Southern-styled vowels in their *–in* sentences than in their *–ing* versions of the same sentences.

FIGURE 2 – Lax vowel (/ɛ/ and /ɪ/) durations by speaker, for *–in* and *–ing* sentences. Longer durations for lax vowels are more congruent with Southern-like productions.

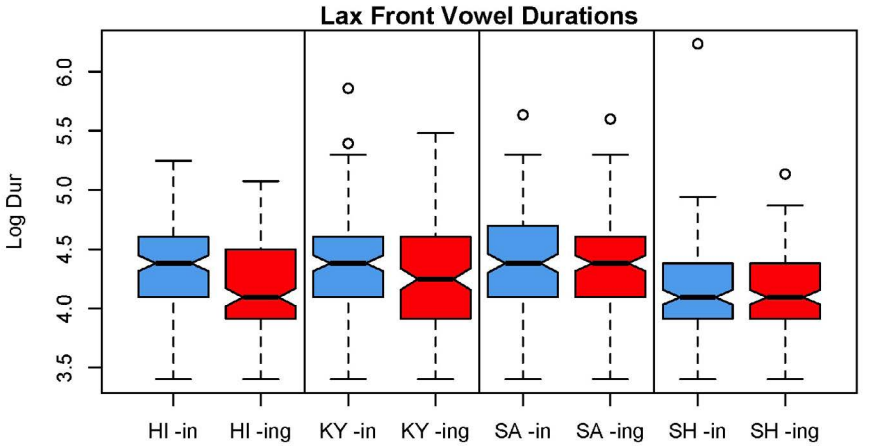
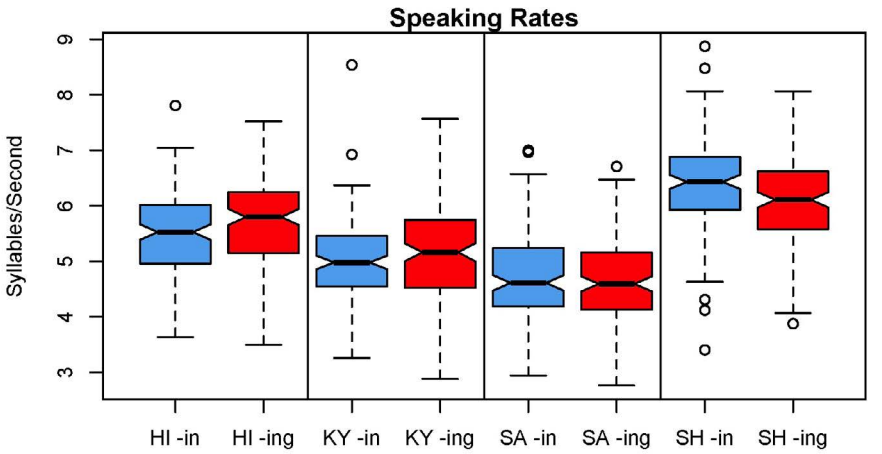


Figure 3 displays a boxplot of the speaking rate data. Speakers HI and KY appear to align with the stylistic prediction for speaking rate, producing *–in* sentences at slower rates than *–ing* sentences. SH, on the other hand, patterns in the opposite direction, speaking faster in *–in* sentences than in *–ing* sentences. SA produces both sets of sentences with similar rates. Thus, our speakers realize all three possibilities for speaking rate.

FIGURE 3 – Speaking rate by speaker, for *–in* and *–ing* sentences. Lower (slower) speaking rate values are more congruent with Southern-like productions.



Finally, Figure 4 displays the distribution of intervocalic /t/ realizations and Figure 5 displays intervocalic /t/ reduction as measured by intensity differences between the /t/ and its surrounding vowels. Figure 4 shows that all four speakers release /t/s much more often in *–ing* sentences than in *–in* sentences, and glottalize and delete /t/s much more often in the *–in* sentences. The impressionistic data of Figure 4 is congruent with Warner and Tucker's (2011) acoustic measure of /t/ reduction, shown in Figure 5; to varying degrees, the speakers show more intervocalic /t/ reduction in terms of larger intensity differences in *–in* sentences than in *–ing* sentences. This corresponds to the prediction that intervocalic /t/s would show greater evidence of associations with casual speech in *–in* sentences, although we also observe substantial intraspeaker variation in this measure.

FIGURE 4 – Intervocalic /t/ realizations by speaker, for *–in* and *–ing* sentences. Fewer released intervocalic /t/s are congruent with more casual-like productions.

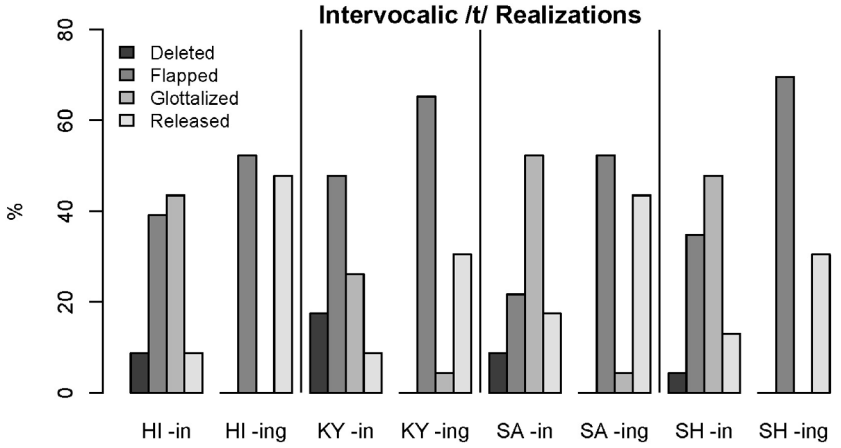
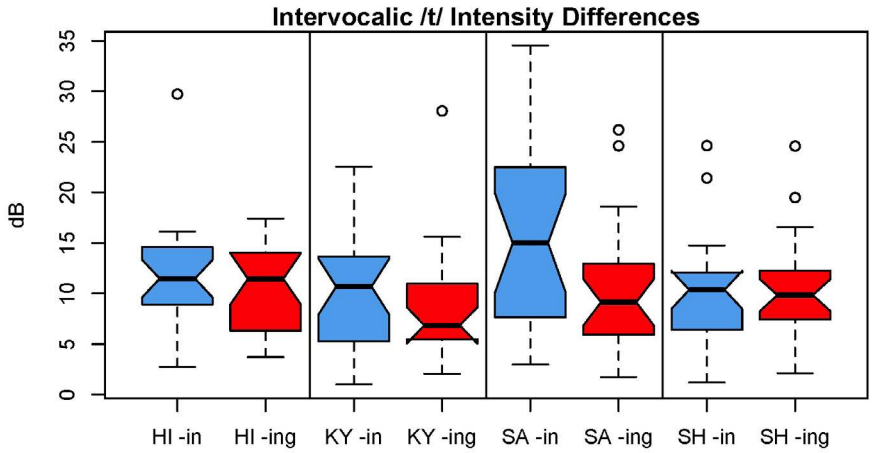


FIGURE 5 – Intervocalic /t/ reduction by speaker, for *–in* and *–ing* sentences. Larger values are more reduced, more congruent with casual-like productions.



In general, we observe many instances of stylistic congruence across speakers, with a certain amount of by-speaker variation. As discussed above, such individual variation is expected given that speakers have unique linguistic and social backgrounds, leading to unique sociolinguistic repertoires of variants and styles. Having reviewed the general patterns of these features in *–in* vs. *–ing* versions of sentences for individual speakers, we now consider what patterns arise as significant behaviors across all speakers. Table 2 displays the results from statistical analyses of the measures for the whole dataset. Recordings were analyzed for whether each acoustic measure significantly differed according to (ING) realization, *–in* vs. *–ing*, in line with predictions about stylistic covariation (from Table 1, relisted in Table 2). Details about the analysis and statistical modeling for each feature are listed in the Appendix.

TABLE 2 – Overall statistical results by acoustic feature, given in relation to predictions from Table 1. See Appendix for statistical details.

Phonetic feature	*Predictions*	*N*	*Results*
/aɪ/-glide length	Shorter = Co-occur with *–in*	692 (≈173/speaker)	Shorter co-occurred with *–in* *–in*: β = -0.118, χ^2 = 4.98, p = 0.026
Positions of mid front vowels /e/ and /ɛ/	More proximate = Co-occur with *–in*	8 Euclidian distance values (1 calculated per-guise per-speaker)	More proximate co-occurred with *–in* Mean of diff: -0.183; t = -5.11, p = 0.014
Duration of lax vowels /ɛ/ and /ɪ/	Longer = Co-occur with *–in*	1,169 (≈152 /ɪ/ per speaker, ≈141 /ɛ/ per speaker)	Longer co-occurred with *–in* *–in*: β = 0.093, χ^2 = 27.18, p < 0.001
Speaking rate	Slower = Co-occur with *–in*	1,128 (282/speaker)	Did not sig. co-occur with *–in*
Intervocalic /t/ realization	Fewer /t/ releases = Co-occur with *–in* More reduction = Co-occur with *–in*	184 (46/speaker)	Fewer /t/ releases with *–in* *–in*: β = -1.996, χ^2 = 17.50, p < 0.001 More reduction co-occurred with *–in* *–in*: β = 2.080, χ^2 = 8.42, p = 0.004

The overall patterns, as seen in Table 2, demonstrate that speakers indeed show significant stylistic covariation in line with indexical links to *–in* via Southern and casual styles, for most of the examined features. In sentences produced with (ING) as *–in* (compared to those produced with *–ing*), speakers produced variants with significantly shorter /aɪ/ glides, more proximate mid-front vowels, longer lax front vowels, fewer intervocalic /t/ releases, and more reduced intervocalic /t/s. As shown in Figure 3, individual speakers patterned differently from one another for speaking rate–two demonstrating slower speaking rates with *–in*, and one with faster speaking rates with *–in*–leading to no overall group pattern.

4 Discussion

While the data examined here only come from four speakers, and therefore the findings should be interpreted accordingly, the patterns uncovered demonstrate that, when simply asked to change the realization of (ING) across two productions of a set of sentences, these speakers manipulated features of their speech beyond solely the realizations of (ING). Specifically, when asked to produce sentences with the *–in* variant of (ING) words, speakers realized other features in a manner congruent with social meanings of *–in* (especially its association with Southernness). We interpret this covariation in production as evidence that speakers have formed cognitive links between variants, connected via shared social meanings. Indeed, as mentioned earlier, several of the speakers in the present study overtly remarked after the recording session that they felt like they "became Southern" by the end of the production task, during the *–in* production portion.

These overall patterns relate in important ways to Campbell-Kibler's (2012) results asking similar questions using a perception methodology. Like that study, we also observed an association between *–in* and /aɪ/ monophthongization. Additionally, our speakers illustrated that they had an association between *–in* and fewer /t/ releases (and more /t/ reduction), a pattern not observed in Campbell-Kibler's study. This discrepancy may perhaps be due to the fact that we limited our investigation of /t/ to word-medial contexts, which Podesva *et al*. (2015) found to have more salient social meanings to listeners, whereas Campbell-Kibler's /t/ stimulus was word-final. Beyond the two covarying features investigated by Campbell-Kibler, we also found consistent associations between *–in* and two other vocalic variants (more proximate /e/ and /ɛ/ and longer /ɛ/ and /ɪ/ vowels). We did not find significant covariation overall between *–in* and slower speaking rate, but note that individual speakers patterned differently from one another for this feature, a point we return to below.

Again, we emphasize that the data examined here represent just a small foray into potential empirical work in this domain. That said, we believe they speak to important open questions. For the rest of the paper, we explore potential implications of these patterns for advancing our understanding of sociolinguistic perception, cognition, covariation, and social meaning, with the goal to inspire more work in the intersection of these areas.

To begin, we offer an analogy from another stylistic modality often compared to linguistic style, namely fashion (e.g., CAMPBELL-KIBLER, 2011; ECKERT, 2000). Consider a person, say a young American man in particular, getting dressed and deciding to wear a salmon pink polo shirt (analogous here to producing *–in*). That shirt decision may invoke the style "preppy", which calls to mind other articles of clothing also associated with a "preppy" style. For instance, the dresser may then decide to wear khaki pants and loafers (wearing articles of clothing that co-occur stylistically). Of course, that person could have also ended up wearing the same outfit by first thinking "I want to dress preppy today" (analogous here to a directive to a speaker to, e.g., "talk Southern", see EVANS, 2002), which then led them to select the individual articles of clothing. Our findings, however, suggest that it is possible to initiate the style "preppy", and subsequent fashion choices, by an initial shirt selection. Producing *–in*/wearing a salmon pink shirt may call to mind a Southern/preppy style, which can affect other variant/clothing selections.

Thus, style shifting involving multiple variables may be achieved in a top-down or bottom-up way. A speaker could aim to convey a particular style (Southern/preppy) using a suite of stylistically covarying features (shorter /aɪ/ glides/khaki pants) to achieve that end, top-down. Or, stylistic covariation may be achieved bottom-up, where the use of a sufficiently prototypical or enregistered variant (*–in*/pink polo shirt) is linked to a style (Southern/preppy), which is associated with stylistically covarying features (again, shorter /aɪ/ glides/khaki pants) which can be optionally produced. Here we do not make claims about the degree of agentivity or awareness involved in this process, but simply note that the indexical links between variants sharing related social meanings are available to speakers upon the production of a particular salient form. With this analogy in mind, we explore the implications of these results for several areas, focusing especially on the mental representation of social meaning and on implications for sociolinguistic perception.

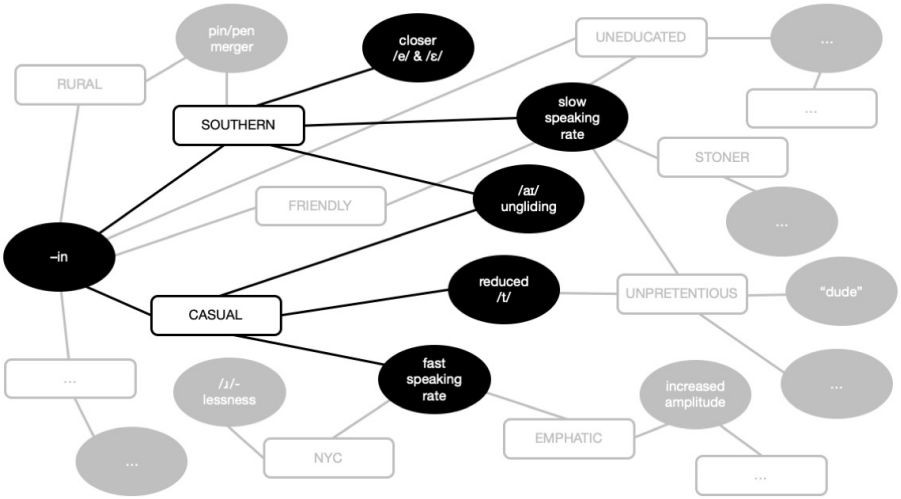
Our findings suggest that cognitive models positing links between linguistic variables and social meanings (e.g., DRAGER; KIRTLEY, 2016; FOULKES; DOCHERTY, 2006; KLEINSCHMIDT; WEATHERHOLTZ; JAEGER, 2018; NIEDZIELSKI; PRESTON, 2000; PIERREHUMBERT, 2001, 2006; SUMNER *et al*., 2014) should also attempt to account for relationships among variants. That is, although much work has been

devoted to understanding patterns of socially-mediated covariation among variables in production (e.g., BECKER, 2016; BIGHAM, 2010; GUY, 2013; GUY; HINSKENS, 2016; GREGERSEN; PHARAO, 2016; TAMMINGA, 2014), and to exploring how multiple variants together affect social evaluations of speakers in perception (e.g., CAMPBELL-KIBLER, 2011; LEVON, 2007, 2014) the present findings push us to ask questions about the cognitive representation of such patterns. Figure 6 offers a visualization of one potential web of relationships between variants, as connected via social meanings. We suggest that our results support the notion that a variant of a variable (such as *–in*; ovals in Figure 6) may be linked in representation with variants of other variables that share social meanings (in rectangles). Encountering a variant (in this case by producing it) invokes an exemplar cloud populated with many speech forms that are congruent with that variant's social meaning. Importantly, in this view, relationships between variants and their social meanings are bidirectional, where it may be possible under some circumstances (see further discussion below) for each to activate the other. The bidirectional relationship between a variant and its social meaning is not only evident from this study, but also from prior work. For example, among other studies, Campbell-Kibler's prior work (2007, 2009, 2012) has shown that listeners can infer a social meaning after being presented with the variant *–in*. And, work showing that non-Southern speakers can imitate aspects of Southern speech when prompted (e.g., EVANS, 2002) demonstrates that speakers activate variants after being presented with the meaning "Southern". Further, this figure is compatible with findings that social meaning is listener-mediated, is emergent and constructed situationally, and is dependent on multiple variants and factors (CAMBELL-KIBLER, 2011; ECKERT, 2008, 2012; LEVON, 2014; OCHS, 1992; PHARAO *et al*., 2014); for the listener whose indexical associations are depicted in the figure, a fast speaking rate in concert with /ɹ/-lessness and other features may evoke a "New York City" style, while a fast speaking rate in concert with reduced /t/ may instead lead to an inference that the speaker is in a casual mode.

As a schematic representation of variants and social meaning, we recognize that Figure 6 in some way resembles an indexical field (ECKERT, 2008). However, our proposal explicitly does *not* suggest that indexical fields exist as cognitive representations in the mind; the indexical field is an analyst's construct, useful for delineating the

numerous social meanings a variant can take on across many speakers, across many contexts. Instead, our proposal pertains to the relationships between variants and their social meanings that an individual has formed throughout their history of sociolinguistic experiences.

FIGURE 6 – Cloud of indexically linked variants (ovals) and social meanings (rectangles). Black items are explicitly discussed in the current paper, gray items are based on prior literature. Ovals and rectangles containing "…" indicate that the web of variants and social meanings that an individual may have represented in their minds extends outward beyond what is shown in the figure.



In this study, we have shown evidence suggestive of stylistically congruent associations between variants in production, just as Campbell-Kibler (2012) has shown in perception. Establishing these links is an important step, but we note that this evidence and our schematic in Figure 6 do not presuppose that these associations will be used in the same way in production and in perception. That is, production and perception are not necessarily mirror images of the same process (PIERREHUMBERT, 2001, 2006; SUMNER; SAMUEL, 2009). Future work should more systematically test the mechanisms associated with this potential cognitive architecture. For example, it may be that associations among variants with a strongly activated social meaning may be a part of what weights speakers' exemplar clouds toward the production of

stylistically congruent covariates (see PIERREHUMBERT, 2001). And, it may be that variants that covary with particularly prototypical variants of a given style may be more strongly encoded in the first place (see HAY *et al*., 2015). In general, we suggest that further engagement with the social psychological literature regarding person perception and stereotype activation (e.g., FREEMAN; AMBADY; 2011, MACRAE; BODENHAUSEN, 2001), as has been undertaken in some sociolinguistic studies (e.g., CAMPBELL-KIBLER, 2009, 2012, 2016; LEVON, 2014), will point the way toward developing predictive models of indexical meaning that generate testable hypotheses.

Another line of prior work has implications for how multiple variants may be represented cognitively (TAMMINGA, 2014; TAMMINGA *et al*., 2016). Tamminga (2014) finds different patterns of covariation in production among two variables, coronal stop deletion and /ð/-stopping, across stretches of talk for two speakers: for one speaker, more stop deletion covaries with more stopping of /ð/, and for the other, more stop deletion covaries with less stopping of /ð/. Tamminga *et al*. (2016) note that such covariation patterns can be caused by multiple factors. Among these potential sources are a speaker's implicit or explicit attempts at dynamic social positioning (which fall under their heading of *s-conditioning*), reliant on the activation of social or stylistic categories as in Niedzielski and Preston (2000), as well as sources like self-priming, a more speaker-internal cognitive factor (falling under their heading of *p-conditioning*). Indeed, as mentioned above, much work in experimental phonetics has shown that certain features covary for structural (e.g., articulatory and/or cognitive p-conditioning-like) reasons (e.g., ALLEN; MILLER; DESTENO, 2003; CHODROFF; WILSON, 2017; NEWMAN *et al*., 2001; THEODORE *et al*., 2009). Taken together with Tamminga *et al*.'s (2016) framework, then, we raise the possibility that some stylistic covariation across variants that share social meanings may be due to factors like priming.

Cognitive processes like priming, or associative learning and accessibility (e.g., KAPATSINSKI, 2018), are important pieces to consider in understanding representation, perception, and production as they relate to social meaning. Instances of variants sharing social meanings are likely to commonly co-occur, and those links are reinforced by societal language ideologies. Thus, if a social meaning of a given form, and other forms linked via that social meaning, are readily accessible

upon the production of that form, those associations will likely strengthen with repeated use. Of course, neither our results nor Campbell-Kibler's (2012) can tease apart the exact source of the association between variants (e.g., *–in* and /aɪ/ monophthongization). As just mentioned, such links may emerge associatively from their high co-occurrence frequency, or links may include additional levels of abstraction, explicitly labeling the relationship between variants into categories like "Southern" or "casual". In interpreting their results showing that age-congruent phonetic cues can prime age-associated target words, Kim and Drager (2017) argue for an account where forms that are likely to be produced by the same speakers are directly linked, without necessitating activation of the mental representations of the indexically linked social information.

Relatedly, from the patterns in the data examined here, we cannot determine whether the use of *–in* individually activates links to specific other variants, or abstract styles, or whether the use of *–in* instead invokes a speech setting more holistically. For instance, it could be argued that covariation with *–in* is the result of an overall casual/hypospeech setting for the *–in* sentences, rather than an indexically-mediated association with a style. In fact, since all *–in* sentence productions occurred after *–ing* sentence productions, the expectations for hypospeech and general reduction patterns are heightened for *–in* due to phenomena like second mention reduction (e.g., BAKER; BRADLOW, 2009; BYRD, 1994; FOWLER; HOUSUM, 1987; WARNER; TUCKER, 2011). This interpretation is indeed a possibility. In fact, Eckert (2008; ECKERT; LABOV, 2017) suggests that these two interpretations are not entirely at odds, positing that hypo- and hyperspeech "phonetic classes" may be broadly stylistically meaningful (see also SUMNER *et al*., 2013; PRATT, 2018). A strong version of the holistic casual speech setting account would predict that all features examined would show more casual/reduced realizations in *–in* sentences. Although several of our results are in line with this account (e.g., /aɪ/ glide length, /t/ realization), we note that the speech setting explanation cannot by itself account for all of our results. For example, lax vowel durations were *longer* in *–in* sentences, and the vowel plots in Figure 1 indicate that overall vowel productions in *–in* sentences were not more reduced in comparison to *–ing* sentences. Further, as illustrated in Figure 6, *–in* would be expected to covary with slower speaking rate via a Southern social meaning, but a faster speaking

rate with a casual/hypospeech social meaning or general speech setting.[3] In fact, one speaker (SH) indeed exhibited speaking rate patterns more aligned with a casual/hypospeech pattern than a Southern pattern (where speaking rate was slower in *–ing* sentences than in *–in* sentences). Thus, we suspect that each explanation is exerting an influence, and we expect that the relative degree to which holistic speech settings are adopted are likely to vary from speaker to speaker and situation to situation. More generally, the present findings underscore recent calls that the study of style and social meaning would do well to carefully cognitive factors alongside social ones (e.g., CAMPBELL-KIBLER, 2016; LEVON, 2014; SHARMA; MCCARTHY, 2018; TAMMINGA *et al*., 2016).

We note that the existence of cognitive links between variants sharing social meaning, and cognitive processes like priming and associative learning, may in fact relate to the ways in which certain styles get reproduced and enregistered (AGHA, 2003; JOHNSTONE, 2016). Although this proposed cognitive architecture does not entirely account for the process of enregisterment, it may enhance certain social and interactional processes already at work: repeatedly encountering a variant with a particularly salient social meaning may activate in the mind other variants with similar social meanings such that those variants are more accessible for use in production. Of course, we do not claim that *all* stylistic practice works this way, since adopting coherent, identifiable, or enregistered styles is only one of many types of stylistic practice a speaker can enact (ECKERT, 2008).

We underscore that our claim is not that every time a speaker uses *–in*, they are code-switching to a Southern style. A benefit of using the *–in* variant in our production task, in fact, is that it is a part of these non-Southern speakers' repertoires already. And, just because producing *–in can* lead to covariation among other cues does not suggest that speakers would always or automatically activate stylistic templates upon producing *–in* or another stereotypical variant. Rather, our data are consistent with

[3] It is also possible that slower speaking rate for *–in* sentences could be accounted for by hypothesizing that increased cognitive load is associated with producing *–in* in a laboratory setting, which is likely incongruent with *–in*'s more typical context for production (e.g., SHARMA; MCCARTHY, 2018). This possibility, which would require independent empirical support to verify, further underscores the necessity of considering cognitive and social accounts of style in concert.

the idea that speakers deploy stylistic packages that are appropriate for their goals in the current context (e.g., ECKERT, 2008, 2012; LEVON, 2006; SCHILLING-ESTES, 2004). If the pink polo shirt owner was dressing for a business meeting, for example, the social meanings that same shirt would invoke (and thus the covariants it activates) may be different than if they were about to go work in the yard. Likewise, for our speakers, *–in* triggered particular styles and covariants appropriate to their context: our speakers were asked to read 141 sentences in a row with an *–in* form, and to pay attention to the *–in* form, so the task likely especially encouraged speakers to perform a style congruent with the social associations they have with *–in*.

More generally, there is a host of potential reasons why individuals differed in the degree of covariation they employed. First, although we expect that Southern and casual are coherent styles well-known even to our Western U. S. speakers (CAMPBELL-KIBLER, 2012; LIPPI-GREEN, 2012; NIEDZIELSKI; PRESTON, 2000; PRESTON, 1997), as discussed above, each speaker's unique linguistic background contributes to their stored representations of variables and their social meanings (e.g., SUMNER; SAMUEL, 2009). And, every speaker has their own particular repertoire of variants and styles they command in production. The speaker's repertoire (or dresser's closet) is important. We expect that speakers would likely only enact styles that they have access to, not only in their mental representations, but in their production repertoire. That is, if a person decides to wear a salmon polo shirt, and that invokes the preppy style in the person's mind, if they do not own khaki pants and loafers, there is less of a chance to dress in congruence with the preppy style. The stylistic covariation produced by the speakers in our data alongside *–in* does not exclusively call on their own vernacular, but rather reflects the indexical associations that speakers have with variant *–in* from their broader experience of American society. This is an important difference between our analysis of linguistic performative production and Schilling-Estes' (1998) study of performance speech, for example. In this study, the variant *–in* was part of speakers' repertoires, but not all of the associated variants may have been. Again, it is likely that our task, which asked speakers to repeat the *–in* variant over and over again, potentially heightening the salience of their indexical links, perhaps led them to extend their production repertoire beyond what they would use in the course of regular conversation. We emphasize that each

speaker's mental representation of variants, and those variants' social meanings and associations with other variants, will not be identical, nor will each speaker's willingness or ability to use those forms in production.

Finally, our findings speak to the salience of certain variables and styles, highlighting an important open question about the kinds of variables that participate in stylistic covariation. As Schilling-Estes (1998) suggests in the quotation included in the opening of §2, performance speech can be helpful in determining the degree of associations that speakers have made between a variant and its social meaning. Just as a salmon pink polo shirt might readily invite the stylistic label "preppy" in certain contexts, *–in* may have been an ideal triggering variant: it is salient, easy to produce, expected to be already in variation in our speakers' own production repertoires, and strongly associated with an enregistered style that our speakers were undoubtedly aware of (CAMPBELL-KIBLER, 2007, 2012). That is, *–in* is a prototypical variant of the styles with which it is associated, like a salmon pink polo shirt is to its styles. But, the relationship amongst variants may be asymmetrical; initially putting on khaki pants may have activated styles like "business casual" in addition to "preppy", just like asking speakers to produce a slow speaking rate, for example, may not have invoked the Southern style as strongly because of its indexical links to many other styles. Empirical tests of this hypothesis await future work. Other aspects of language may also function as strong triggers of stylistic shifts. For example, Jaffe and Walton (2000) found that speakers differed in their reading performances of the same text depending on whether the text was written in standard or non-standard orthography. And, Preston (1996) found that performances of a dialect outside of one's own are improved by the use of an indexically related "catch phrase". It may be that the ability to trigger stylistic covariation is a property of variants on the stereotype end of the stereotype–marker–indicator continuum (LABOV, 1972), or of variants that are especially emblematic of an enregistered variety (e.g., JOHNSTONE, 2016). Investigating the salience of particular variants to particular lects or styles is an important part of understanding sociolinguistic perception (e.g., LLAMAS; WATT; MACFARLANE, 2016), and our study illustrates a converging approach to this question.

5 Conclusion

As sociolinguists have increasingly examined perception, important questions have emerged about how social meaning and linguistic forms are represented. This study addresses these questions using an elicited production methodology, and we hope demonstrates the value of using a range of approaches to better understand sociolinguistic cognition more broadly. When asked to produce sentences containing (ING) words as *–in* or *–ing*, speakers in our study sometimes (but not always) modulated other variables beyond (ING) in line with styles and social meanings associated with the *–in* and *–ing* variants. Although stylistic covariation has long been documented by sociolinguists, and Campbell-Kibler (2012) demonstrated associations between multiple variants in perception, this study shows that certain variants may carry enough stylistic meaning to induce some speakers to produce other stylistically congruent variants. Even in a sound booth in a lab setting, we find evidence that speakers carry indexically mediated associations of variants with them.

Developing a model of the cognitive architecture underlying the relationship between variants and social meanings is an important part of understanding sociolinguistic perception and production, and investigating each modality is necessary to complete the picture. For example, hypothesizing about how variants are related to social meanings and one another in representation helps to explain how results in sociolinguistic perception involving multiple variants, such as Levon's (2007) findings, arise cognitively. Further, the underlying cognitive associations proposed here can be used to generate novel predictions about sociolinguistic perception. For example, the existence of socially-mediated links between variants in representation predicts that, within a stylistically situated context, listeners exposed to a production of a particularly stylistically salient variant would expect the speaker to also use other stylistically congruent variants of other variables. In sum, the study of sociolinguistic perception can be enhanced by a stronger understanding of cognitive representation, and we look forward to future work that relates perception with production and representation in sociolinguistics.

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Authorship statement

Both authors contributed to all parts of the project, but CV led in study design and writing the manuscript, and TK led in acoustic and statistical analysis.

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Appendix: Statistical modeling

Statistical tests were conducted on the measured phonetic features in order to determine what group-level statistical patterns emerged. The total numbers of tokens for each feature, the statistical test used, the factors considered, and the best model for regressions (determined using likelihood ratio tests; anova() in R) are described here.

/aɪ/-glide length: $N = 692$ (ave. 173/speaker). Glide lengths were analyzed by mixed-effect linear regression, with random intercepts for speaker and for word. Modeling considered the following independent variables: Guise (*–ing* or *–in*; the factor of interest), onset F1 and F2 (Lobanov normalized values), (log) vowel duration, and following environment (voiced consonant, voiceless consonant, or none), as well as two-way interactions between guise and the other variables. The best model was: /aɪ/-glide length ~ Guise + F1 + FolEnv + (1|Spkr) + (1|Word).

Proximity of mid front vowels /e/ and /ɛ/: $N = 8$ (1 per-guise per-speaker). Since /e/–/ɛ/ Euclidean distance measures are calculated on a per-guise per-speaker basis, this measure was analyzed using a paired t-test.

Duration of lax vowels /ɛ/ and /ɪ/: $N = 1{,}169$ (ave. 152 /ɪ/ per speaker, 141 /ɛ/ per speaker). The logged durations of the lax vowels, /ɪ/ and /ɛ/, were analyzed using mixed-effect linear regression, with random intercepts for speaker and for word. Modeling considered guise (*–ing* or *–in*; the factor of interest), vowel identity (/ɪ/ or /ɛ/), and the voicing of the following consonant as factors, as well as two-way interactions. The best model was: LogDur ~ Guise + (1|Spkr) + (1|Word).

Speaking rate: $N = 1{,}128$ (282/speaker). Speaking rates were analyzed using mixed-effect linear regression, with random intercepts for speaker. Modeling considered guise (*–ing* or *–in*) as the sole fixed-effect predictor. The best model was: SpkRate ~ Guise + (1|Spkr).

Intervocalic /t/ release: $N = 184$ (46/speaker). /t/ realizations, coded into the four categories of released, flapped, glottalized, or deleted, were analyzed using mixed-effect logistic regression, with random intercepts for speaker and for word. The dependent variable was whether the /t/ realization was released, and modeling considered guise (*–ing* or *–in*; the factor of interest) and following environment (whether the following vowel was stressed or unstressed). However, all /t/s before stressed vowels ($N = 16$) were released so this factor was dropped from modeling. The best model was: TReleased ~ Guise + (1|Spkr) + (1|Word).

Intervocalic /t/ reduction: $N = 184$ (46/speaker). /t/ intensity differences were analyzed using mixed-effect linear regression, with random intercepts for speaker and for word. Modeling considered guise (*–ing* or *–in*; the factor of interest) and following environment (whether the following vowel was stressed or unstressed), as well and the interaction of these two factors. The best model was: TIntDiff ~ Guise + FolVStress + (1|Spkr) + (1|Word).