Sibilant variation in New Englishes: A comparative sociophonetic study of Trinidadian and American English /s(tr)/-retraction

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Abstract

The retraction of /s/, particularly in /str/ clusters, toward [ʃ] has been investigated in British, Australian, and American English and shown to be conditioned phonetically and sociolinguistically. To date, however, no research exists on the retraction of /s/ in New Englishes, the nativized Englishes spoken in postcolonial territories like the Caribbean. We take up this research gap and present the results of a large-scale comparative acoustic analysis of /s/-retraction in Trinidadian English (TrinE) and American English (AmE), using Center of Gravity measurements of more than 23,500 sibilants produced by 181 speakers from two speech corpora.

The results show that, in TrinE, /str/ is considerably retracted toward [ʃtɹ], while all other /sC(r)/ clusters are non-retracted and acoustically close to singleton /s/; less retracted realizations of /str/ occur across word boundaries. Although a statistically significant contrast is overall maintained between /ʃ/ and the sibilant in /str/, there is considerable overlap across many speakers. The comparison between TrinE and AmE indicates that, while sibilants in TrinE overall show acoustically lower values, both varieties have in common that retraction is limited to /str/ contexts and significantly larger in younger speakers. The degree of /str/-retraction, however, is overall larger in TrinE than AmE.

Index Terms: /s/-retraction, sound change, sociophonetics, Trinidadian Standard English, American English, New Englishes

1. Introduction

Variationist research on sound changes has traditionally focused on the changeable nature of vowels. More recently, however, sibilants have received considerable attention. Specifically, sociophonetic studies have increasingly been concerned with the retraction of /s/, especially in /str/ contexts. It is discussed as a sound change in which the sibilant in words like *street* is retracted and phonetically close to the postalveolar fricative [ʃ] [1]. While earlier studies were mainly concerned with the phonological nature of the sound change and the question of whether /s/-retraction could be explained by assimilation at a distance [2] or rather assimilation to affricated /t/ [3], more recent research relied on quantitative measurements of sibilant distances and their gradualness [1], [4] and the degree to which coarticulation and phonetic mechanisms as such would explain variability in /s/-retraction. Variability in the degree of retraction exists across /sC/ contexts, with /str/ generally being the most retracted [4]–[6]. The origin of the change is thus argued to be the triple consonant cluster with long distance anticipatory coarticulation to the following rhotic as underlying process[4],[5]. In addition to such phonetically conditioned effects on /s/-retraction, recent sociophonetic studies suggest that the factor age also contributes to the sound change indicating a change in apparent time with younger generations retracting /str/ as presented in studies on some American English (AmE) dialects [7][6], [8].

Several varieties of English across the world have been reported to show an increase in /s(tr)/-retraction patterns. This productive sound change has been investigated most notably in different regional varieties of AmE[1], [9], [10], but also Canadian (CanE) and Scottish English (ScotE) [10], Australian English (AusE) [4]. However, no research exists on this possibly universal sound change in New Englishes[11], [12], the nativized varieties of English spoken in postcolonial countries across South and South-East Asia, East, West, and Southern Africa, the South Pacific, and the Caribbean. Specifically, it is unclear

(1) to what extent the sound change is present in different New Englishes,

(2) in how far it is conditioned by phonetic and social factors in the respective varieties,

(3) if and in how far the sound change manifests similarly or differently compared to AmE, particularly in regions such as the Caribbean where AmE exerts strong cross-varietal linguistic influence[13]–[15].

Moreover, few comparisons of different varieties have been carried out. Stuart-Smith et al. [10], in a large-scale comparison of AmE, CanE, and ScotE, show that singleton /s/ in AmE is generally higher than in ScotE and CanE and /ʃ/ varies across different regional dialects. /str/ shows a substantial degree of variation across and within national varieties: while /str/ is not retracted in ScotE and only slightly so in CanE, there are large differences in retraction of /str/ across different AmE dialects, with degree of retraction being smaller in Northern and Western dialects, and larger in Midland and Southern ones. In all cases, however, /str/ is acoustically much higher than /ʃ/ and overall closer to /s/.

The present study takes up these research gaps and extends sociophonetic research on /s/-retraction to New Englishes. We present the results of a large-scale comparative acoustic analysis of /s/-retraction in two varieties: Trinidadian English, the nativized variety of English (as opposed to the locally coexisting English-based Creole) spoken in formal domains in the larger island of the twin-island country Trinidad & Tobago in the Caribbean and American English. The foundation of our analysis are two speech corpora that include 181 speakers from both countries. TrinE provides an especially interesting point of comparison, given that cross-varietal linguistic influence from AmE, especially across younger speakers, is generally high [15]–[17] and, from a phonological perspective, /t(r)/-

affrication is not uncommon in TrinE [16], [18]. The following research questions are addressed:

RQ1 Where and to what extent is /s/ retracted in TrinE?

RQ2 To what degree do phonetic and social factors condition the retraction of /str/ in TrinE?

RQ3 Which similarities and differences exist in the production of sibilants, especially /str/, between AmE and TrinE?

RQ4 To what extent do phonetic and social factors exert similar and/or different effects on the production of /str/ in both varieties? Which pan-variety trends can be observed?

2. Method

2.1. Data

Sibilants produced by a total of 181 speakers from two speech corpora were analyzed in the current study. Both corpora contain recordings of sociolinguistic interviews with Trinidadian and American speakers that also involved a variety of elicitation tasks, such as the production of isolated words, reading and controlled free speech. While spontaneous speech from all American speakers was analyzed, for some Trinidadian speakers, spontaneous speech style data was not available. Recordings were made in the field while controlling for background noise and other potentially confounding variables. The Trinidadian data includes recordings from 100 speakers, 35 teachers and 65 upper level students from 12 different secondary schools throughout the entire island. The American sample consists of interview recordings from 81 speakers, who were mostly born in Texas and currently live in the city of Austin. Table 1 summarizes corpora-specific metadata.

Table 1: *Corpora-specific metadata.*

	TrinE	AmE
N	100	81
Gender	female 63%	female 48.1%
	male 37%	male 51.9%
Age	14-65 years	18-90 years
Ethnicities	Afr. Trin. 44%	Afr. Am. 19.8%
	Indo. Trin. 24%	Euro. Am. 53.1%
	Mix. Trin. 27%	Hisp. Am. 19.8%
	Other 5%	Other 7.3%

2.2. Processing

Following methodological procedures of recent sociophonetic studies on (AmE) /s/-retraction[6], [8], [10], the data was first automatically force-aligned using FAVE [19] for the AmE sample and a version of FAVE recalibrated to TrinE [20] for the TrinE corpus, and subsequently subjected to a Praat script that extracted spectral Center of Gravity (CoG) measurements of each sibilant, which were based on power spectra calculated from a 25ms Hamming window centered around the midpoint of each token after pre-emphasis filtering of 750Hz. CoG has previously been shown to be a reliable metric to quantify degree of retraction acoustically [21]. Although FAVE has been shown to provide high-quality alignments for AmE [22], [23], British English [24], and TrinE [20], different ways of post-hoc data reduction were used to remove likely erroneous measurements of CoG as result of the automatization: first, tokens with a duration smaller than 40ms were excluded. Secondly, Tukey's method was used to remove remaining outliers on a per speaker and item basis; measurements outside the 1.5^{th} multiple of the interquartile range were removed. Subsequently, to control for physiologically conditioned effects, each token was normalized in relation to the speaker's sibilant space via Lobanov z-transformation of the raw Hz values. Finally, each token was coded according to a variety of sociolinguistic as well as linguistic factors, such as place of articulation of the preceding sound or whether /sC(r)/-clusters occurred across word boundaries.

2.3. Analysis

A total of 23,602 z-scored CoG measurements form the database of this study. Table 2 summarizes the token counts according to variety and sibilant cluster.

Table 2: *Overview of final token count.*

Cluster	TrinE	AmE
/s/	9595	2920
/ʃ/ (sh)	1573	1625
/sk/	262	134
/skr/	31	429
/sp/	901	19
/spr/	140	3
/st/	2855	1645
/str/	247	1223
Σ	15604	7998

The data was analyzed using a series of mixed-effects linear regression models. Final models were obtained through manual variable selection while striving for model parsimony (Bates et al. 2018).

3. Results

3.1. Sibilants across /sC(r)/-clusters in Trinidadian English

Figure 1 provides an overview of the z-scored CoG measurements across /sC(r)/-clusters as well as singleton /s/ and /ʃ/ (sh).
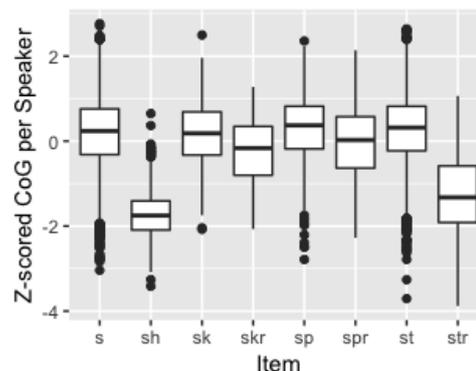

Figure 1: *zCoG by /sC(r)/-cluster in TrinE (N=15,604).*

A mixed-effects linear regression model shows significant differences in z-scored CoG across the different /sC(r)/-clusters and singleton sibilants (F(7, 1702.23)=552.547, p<.001), while controlling for the possibly confounding effect of preceding

phonetic context, which is also significant (F(7, 4599.54)=8.89, p<.001; zCoG is significantly lowered when preceded by postalveolar sibilants or affricates).

The pairwise comparisons of the estimated means for each item reveal: the only item that is considerably retracted is (str). zCoG of the (str)-cluster is significantly different from that of singleton /s/ and all /sC(r)/-clusters (each at p<.001). However, zCoG in (str) is also significantly different than that of /ʃ/ (sh) (p<.001).

As regards the other consonants, retraction is overall very limited or non-existent. From a descriptive perspective, a very small degree of retraction can be observed in (skr) and (spr)-clusters, while (sk, sp, st) are non-retracted and have zCoGs close to that of /s/. The pairwise comparisons show that there is no significant difference between singleton /s/ and all other /sC(r)/-clusters, the only exception being /skr/ whose zCoG is slightly lower (p<.01).

3.2. /str/-retraction in Trinidadian English

Almost all tested sociolinguistic fixed effects failed to reach statistical significance in the prediction of degree of retraction in (str). The final model only contains one significant fixed effect, i.e. the position of (str) in a word (F(1, 25.71)=21.45, p<.001): zCoG in (str) is 1.01 z-scored units (95% CI 0.56 to 1.46) higher when the cluster occurs across word boundaries rather than word initially.

3.3. Comparing Trinidadian and American English sibilant spaces and /sC(r)/-clusters

Figure 2 shows the z-scored CoG measurements per variety and /s/-consonant-cluster-type (item). It indicates that the sibilant space between /s/ and /ʃ/ (sh) is similar in distance in both varieties, but the production of both sibilants has a lower zCoG in Trinidadian English. While /sC(r)/-clusters in TrinE except for (str) are largely not acoustically lowered and on the same level as singleton /s/, there is a tendency in AmE toward a slightly larger degree of acoustic lowering in /sC(r)/-clusters.
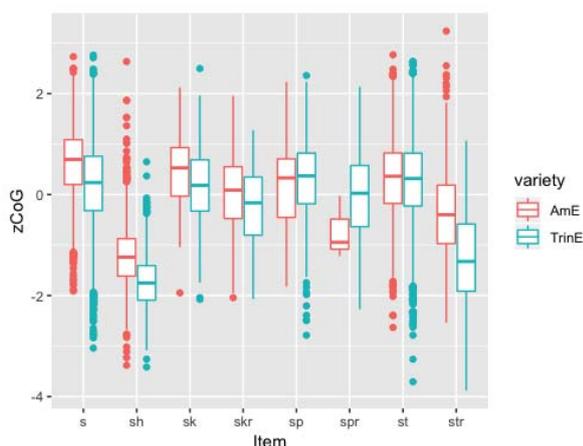

Figure 2: *zCoG by /sC(r)/-cluster in AmE and TrinE*

A mixed effects regression model with an interaction of item and variety, while controlling for age category, a binary word-boundary judgment, the preceding environment, and duration as fixed effects as well as random intercepts for speaker and word, was used to evaluate the patterns visible in the figure. The model was chosen based on likelihood ratio

tests, in which the interaction was significant at χ^2=156.74 and p=0.000.

Generally, all item types except for (skr) are significantly lowering the intercept in the model with the alveolar sibilant as reference category, indicating that the z-scored frequencies decrease in comparison with /s/ . The interaction shows that the z-scored CoG measurements are significantly lowered for (str) compared to singleton (s) in both varieties, while the Trinidadian items (skr), (sp), (spr), and (st) have significantly higher intercepts than the same items in American English.

3.4. Comparing effects on /str/-retraction in Trinidadian and American English

Figure 3 shows the mean z-scored CoG distance between (str) and the item (sh) in AmE and TrinE according to different age groups. A similar overall pattern can be observed across both varieties: while in the older age groups the distance between (str) and (sh) is generally larger, the distance between (sh) and (str) decreases in the younger age groups. In TrinE, however, the two oldest age groups slightly diverge from this trend. The variety-specific regression lines fitted to the data indicate, moreover, that age effects seem to be stronger in AmE than in TrinE overall. Moreover, the distance measures show that /str/ in TrinE across all age groups is acoustically lower than (str) in AmE in the same age groups; (str) in TrinE is generally more retracted than in AmE.
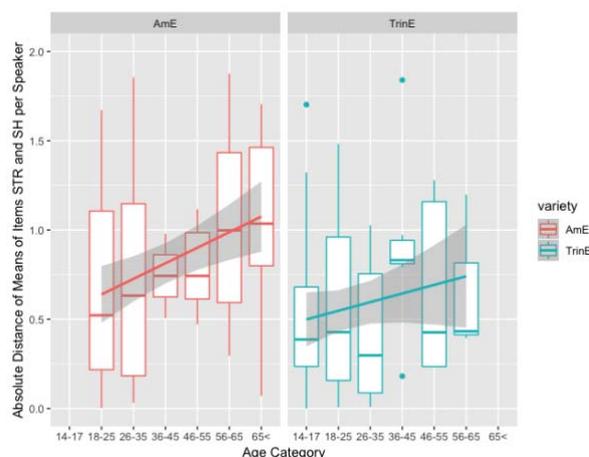

Figure 3: *Absolute distance between mean (sh) and (str) productions across age groups.*

A linear mixed-effects regression model was computed to test for the effects of age across both varieties on the acoustic lowering of (str), while controlling for other factors. Based on likelihood ratio tests the following fixed effects were retained in the final model on (str): variety (χ^2=50.416, p=0.000), age (χ^2=1.752, p=0.001), word boundary (χ^2=13.554, p=0.000) and duration (χ^2=8.8719 and p=0.003). However, while age contributed to the model overall, differences across individual age groups failed to reach statistical significance. In an analysis of the predicted intercepts in the model, age groups 14-35 range around 0.05 while they are higher than 0.3 for age groups older than age 36.

4. Discussion

This study set out to conduct a comparison of /s(Cr)/ retraction in Trinidadian and American English based on a large-scale acoustic analysis of sibilants in two speech corpora.

With regard to the first research question (RQ1), the analysis shows that /s/-retraction is a common feature of Trinidadian English that is, however, restricted to (str), which is significantly lowered acoustically compared to singleton /s/ and other /sC(r)/ clusters. Other /sCr/-clusters show a very small degree of acoustic lowering compared to /s/, perhaps indicating pre-conditions for /s/-retraction in these cluster types, but these differences were not statistically significant. While, on average, Center of Gravity measurements for (str) are significantly different from those for /ʃ/, there is also considerable overlap for a large number of tokens, suggesting that a substantial number of realizations of (str) are phonetically close to [ʃ]. Similarly, overlap with /sC(r)/ is limited.

The results indicate further that the retraction of /str/ in Trinidadian English is largely conditioned phonetically (RQ2): (str)-clusters that occurred across word boundaries are significantly raised acoustically compared to tokens that occur word initially and are overall much closer phonetically to [s]. The analyses suggest that acoustic lowering of (str) is not conditioned by the preceding environment. Social factors were not significant in the TrinE dataset, suggesting that the retraction of (str) is relatively homogenous across different styles, ethnic groups, as well as teachers and students. It was also investigated as to whether speakers who had lived several years abroad showed diverging patterns in the acoustic lowering/raising of (str). Against our expectations, however, even speakers who had lived in the United States, did not show any different trends. Overall, (str)-retraction is relatively stable in Trinidadian English. Some age differences were additionally observed, which were however not significant overall (see below).

The comparison of the sibilant spaces and the different /sC(r)/-clusters (RQ3) show both variety-specific and universal trends. The sibilant spaces in both varieties are overall similar in distance, but sibilants in TrinE are generally lower acoustically compared to their AmE equivalents. Both varieties have in common that (str) is considerably retracted and approaching [ʃ]. However, the degree of acoustic lowering of (str) in TrinE is larger than in AmE. A potential reason for the larger degree of lowering in TrinE may be that /s/ is approaching an already affricated and retracted /t/, considering that /t/-affrication has been reported to be a feature of TrinE [16], [18]. Given that evidence for /t/-affrication in TrinE has so far largely been anecdotal, further research is required to provide more conclusive evidence for this hypothesis. Furthermore, the findings at hand suggest that TrinE differs from non-American Englishes, e.g. Scottish, Australian, and also Canadian English, in the degree of acoustic lowering of (str). These non-American Englishes show considerably smaller acoustic lowering of /str/ than American English [4], [10] and, in turn, Trinidadian English; while in other non-American varieties (str) still resembles [s], the cluster is approaching [ʃ]. Another difference between Trinidadian and American English, as observed here, as well as Australian English [4] and the Englishes observed in Stuart-Smith et al. [10] concerns the retraction of /sC(r)/-cluster other than (str): while these Englishes show acoustic lowering due to anticipatory coarticulation, especially to the following rhotic,

retraction is largely restricted to (str) in TrinE. This provides additional arguments for the hypothesis that /t/-affrication in TrinE is a catalyst in conditioning /str/-retraction.

Finally, it was examined in how far phonetic and social factors exert (similar/different) effects on the production of (str) in both varieties and whether universal effects occur. Given descriptive findings and previous research [6], [8], we particularly focused on age effects. A similar overall pattern was observed: the distance between (sh) and (str) decreases in the younger age groups, which was however not statistically significant, possibly because, in TrinE, the trend did not hold for the older age groups. In sum, therefore, it is currently doubtful whether (str)-retraction is a current sound change in TrinE. Although further research is necessary and desirable, the results at hand rather show that (str)-retraction is a variable sociophonetic feature. Considering that (str)-retraction in TrinE is lower than in AmE overall, and also in the older age groups, both these observations also cast doubt on the assumption that (str)-retraction may be a sound change brought about by (recent) AmE influence. Phonetically-conditioned variation and change due to a following affricated /t/ are more likely overall.

5. Conclusion

This paper presents the results of the first study on /sC(r)/-retraction in New Englishes by comparing sibilant variation in Trinidadian and American English. Our analysis has shown that /s/-retraction extends to New Englishes, and that there are several aspects in Trinidadian English that make a comparison particularly worthwhile.

While there is a significant lowering of /s/ in (str)-clusters in apparent time in AmE, the TrinE data may be taken to indicate that the retraction of /s/ in (str)-clusters is further progressed than in AmE. As a result, we can assume that features present in TrinE such as /t/-affrication may increase the likelihood for /s/-retraction in addition to general effects of long-distance anticipatory co-articulation. We thus interpret the pattern as a linguistically conditioned one that was possibly not brought about by the influx of American English. We conclude that cross-varietal investigations are necessary not only to show that the pattern observed here is a highly productive pronunciation pattern in the phonotactics of English, but also that further research is necessary to look at other linguistic patterns in varieties of English (such as /t/-affrication) to explain differences in the status as sound change.

6. References

[1]   B. Rutter, "Acoustic analysis of a sound change in progress: The consonant cluster /stɹ/ in English," *J. Int. Phon. Assoc.*, vol. 41, no. 01, pp. 27–40, 2011.

[2]   M. Shapiro, "A Case of Distant Assimilation: /str/ → /ʃtr/," *Am. Speech*, vol. 70, no. 1, pp. 101–107, 1995.

[3]   W. P. Lawrence, "/str/ -> /ʃtr/: Assimilation at a distance?," *Am. Speech*, vol. 75, no. 1, pp. 82–86, 2000.

[4]   M. Stevens and J. Harrington, "The phonetic origins of /s/-retraction: Acoustic and perceptual evidence from Australian English," *J. Phon.*, vol. 58, pp. 118–134, 2016.

[5]   R. Janda and B. Joseph, "Reconsidering the Canons of Sound Change:: Towards a ' Big Bang ' Theory," *... 2001 Sel. Pap. from 15th ...*, 2003.

[6]   D. Gylfadottir, "Shtreets of Philadelphia : An Acoustic Study of / str / -retraction in a Naturalistic Speech Corpus Shtreets of Philadelphia : An Acoustic Study of / str / -retraction in a," *Univ. Pennsylvania Work. Pap. Linguist.*, vol. 21, no. 2, pp. 89–97, 2015.

[7] D. Durian, "Getting [(esh)]tronger Every Day?: More on Urbanization and the Socio-Geographic Diffusion of (str) in Columbus, OH," *Univ. Pennsylvania Work. Pap. Linguist.*, vol. 13, no. 2, pp. 64–79, 2007.

[8] E. Wilbanks, "Social and Structural Constraints on a Phonetically-Motivated Change in Progress : (str) Retraction in Raleigh , NC Social and Structural Constraints on a Phonetically-Motivated Change in," vol. 23, no. 1, 2017.

[9] A. Baker, D. Archangeli, and J. Mielke, "Variability in American English s-retraction suggests a solution to the actuation problem," *Lang. Var. Change*, vol. 23, no. 03, pp. 347–374, 2011.

[10] J. Stuart-smith, M. Sonderegger, M. Mcauliffe, and R. Macdonald, "Dialectal and social factors affect the phonetic bases of English /s/-retraction," in *NWAV 47*, 2018.

[11] J. Platt, H. Weber, and M. L. Ho, *The New Englishes*. London: Routledge, 1984.

[12] S. Mufwene, "New Englishes and criteria for naming them," *World Englishes*, vol. 13, no. 1, pp. 21–31, 1999.

[13] I. Buchstaller, A. Krause, A. Auer, and S. Otte, "Levelling across the life-span?: Tracing the face vowel in panel data from the North East of England," *J. Socioling.*, vol. 21, no. 1, pp. 3–33, 2017.

[14] P. Meer, M. Westphal, E. C. Hänsel, and D. Deuber, "Trinidadian secondary school students' attitudes toward accents of Standard English," *J. Pidgin Creole Lang.*, vol. 34, no. 1, pp. 81–122, 2019.

[15] P. Meer and D. Deuber, "Standard English in Trinidad: Multinormativity, translocality, and implications for the Dynamic Model and the EIF Model," in *Modelling World Englishes: A joint approach towards postcolonial and non-postcolonial varieties*, Edinburgh: Edinburgh University Press.

[16] V. Youssef and J. Walker, "The creoles of Trinidad and Tobago: Phonology," in *Varieties of English: The Americas and the Caribbean*, E. Schneider, Ed. Berlin: De Gruyter, 2008.

[17] G. Stell, "Representing Variation in Creole Continua: A Folk Linguistic View of Language Variation in Trinidad," *J. English Linguist.*, vol. 46, no. 2, pp. 113–139, 2018.

[18] J.-A. Ferreira and K.-A. Drayton, "Trinidadian English," 2017.

[19] I. Rosenfelder, J. Fruehwald, K. Evanini, and J. Yuan, "FAVE." 2011.

[20] P. Meer and J. A. Matute Flores, "Making FAVE ready for New Englishes: Applying and modifying FAVE for semi-automatic acoustic analyses of Trinidadian English vowels," in *NWAV 47*, 2018.

[21] A. Jongman, R. Wayland, and S. Wong, "Acoustic characteristics of English fricatives," *J. Acoust. Soc. Am.*, vol. 108, no. 3, p. 1252, 2000.

[22] J. Yuan and M. Liberman, "Speaker identification on the SCOTUS corpus," *J. Acoust. Soc. Am.*, vol. 103, no. 5, 2008.

[23] K. Evanini, S. Isard, and M. Liberman, "Automatic formant extraction for sociolinguistic analysis of large corpora," pp. 1655–1658, 2009.

[24] L. MacKenzie and D. Turton, "Crossing the pond: Extending automatic alignment techniques to British English dialect data," in *NWAV42*, 2013.