

WHERE ARE THE MOUN[ʔə]NS IN UTAH?

DAVID EDDINGTON

MATTHEW SAVAGE

Brigham Young University

ABSTRACT: One stigmatized feature of Utah speech is the “dropped *t*” in words such as *kitten* and *mountain*. We investigated three possible phonetic correlates of “*t*-dropping” by recording participants from Utah and other Western states reading a document containing several instances of /*t*/ followed by a syllabic nasal. The first possible correlate, actual deletion of /*t*/, was uncommon but occurred slightly more often in the mouths of Utahns. The second possible correlate was realizing /*t*/ as a glottal stop, which was actually done more often by non-Utahns than Utahns (89% versus 81%, resp.). The third correlate, releasing the glottal stop orally rather than nasally (e.g., [k^hɪʔən] and [mawʔən] vs. [k^hɪɾŋ] and [mawɾŋ]) is the most likely candidate for “*t*-dropping” since Utahns did this in 17% of the cases compared to less than 1% in non-Utahns. Logistic regression analysis of the data indicates that age, percentage of life lived in Utah, and gender were strong predictors of oral release; it was used most often by young females who had lived the majority of their life in Utah.

A NUMBER OF TRAITS could be cited as characteristic of Utah English. Among these are the widespread use of euphemistic expletives (e.g., *Oh my heck! What the fetch?*) and the use of the word *scone* to denote ‘fried bread’. Some of these traits have been the focus of linguistic investigation, such as use of proredicate *do* (e.g., *Do you ski? I used to do*; Di Paolo 1993) and monophthongization of [aɪ] (Morkel 2003). Much of the literature has focused on some near mergers among vowels, such as the *cord/card* merger (Bowie 2003) and the *caught/cot* merger (Di Paolo 1992). Vowels preceding tautosyllabic /l/ are also subject to a variety of near mergers (e.g., *fill/feel, pool/pull/pole, and fail/fell*; Di Paolo and Faber 1990; Baker, Eddington, and Nay 2009; Baker and Bowie 2010).

However, a characteristic often stigmatized by the general public is Utahns’ “dropped *ts*” in words such as *mountain* and *kitten*. *T*-dropping, for example, receives coverage in the local press in Utah (Hollenhorst 2011). *T*-dropping is usually noted in words in which /*t*/ is followed by a syllabic nasal, yet the pronunciation of *mountain* and *kitten* as [mawɾŋ] and [k^hɪɾŋ] is common in colloquial American English; therefore, exactly what constitutes *t*-dropping in Utah needs to be determined. It could be actual deletion of /*t*/

"dropped *t*" in words such as ... correlates of "t-dropping" ... states reading a document ... nasal. The first possible cor- ... slightly more often in the ... realizing /t/ as a glottal stop, ... Utahns (89% versus 81%, ... rather than nasally (e.g., ... most likely candidate for ... compared to less than 1% in ... that age, percentage of ... release; it was used most ... life in Utah.

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the general public is ... *T*-dropping, for ... Hollenhorst 2011). ... followed by a syllabic ... [kʰɪʔŋ] and [kʰɪʔŋ] is ... what constitutes ... actual deletion of /t/

or it could refer to the glottal pronunciation of /t/, which has already been documented in the United States and is influenced by factors such as age, gender, and region (Byrd 1994; Partin-Hernandez 2005; Levon 2006; Roberts 2006; Eddington and Taylor 2009; Eddington and Channer 2010).

In the course of our analysis, we discovered another phonetic property yet more salient than deletion or glottalization that may be the actual regional pronunciation people are describing as *t*-dropping. In words such as *kitten*, it is fairly common to release the glottal stop nasally yielding a syllabic nasal [kʰɪʔŋ]. However, the stigmatized pronunciation, although it is described as *t*-dropping, may actually involve an oral release of the glottal stop into a reduced vowel (e.g., [kʰɪʔən] and [mawʔən]), rather than a nasal release into a syllabic nasal. Again, this is not unique to Utah. Oral releases have been observed in the speech of a number of actors from other states. Kathleen Herles (born 1990), a Hispanic New Yorker who provided the voice of the cartoon character Dora the Explorer, often exhorted video game users to "push the [baʔən]." Comedian Chris Rock, an African American comedian born in South Carolina in 1965 but raised in New York, has a routine in which he refers several times to former President Bill [kɪʔən]. Reid Ewing, a white Floridian actor born in 1988, pronounced *mountains* as [mawʔənz] in an episode of the television program *Modern Family*. What is more, oral releases of this sort have been reported anecdotally in Connecticut, Michigan, New York, California, New Jersey, and Indiana.¹

Such impressionistic evidence suggests that oral releases of glottal stops before nasals may be widespread in the United States, but perhaps not frequent enough to have drawn the attention of language researchers. As far as the linguistic literature is concerned, this phenomenon has not been documented or systematically studied in Utah or elsewhere, which suggests that it warrants closer scrutiny. To this end, the goal of the present study is to document the pronunciation (or deletion) of /t/ in words such as *kitten*, as well as whether it is followed by an oral or nasal release. We apply a variationist methodology to determine how factors such as age, proportion of life spent in Utah, and gender affect the realization of /t/ in this context.

PARTICIPANTS

All of the participants were native American English speakers from Western states who had lived in Utah for varying lengths of time. Many were recruited from classes in the College of Humanities at Brigham Young University via classroom announcement, while the oldest and youngest groups were obtained from referrals given by participants as well as from personal invita-

tions made to acquaintances of the authors. There were 56 participants in total. A breakdown of the participants based on age and gender appears in table 1.

PROCEDURE

During testing, participants were given a consent form that outlined, in general terms, the nature of the study. Consent was obtained from every participant or from a parent or legal guardian for those participants who were under eighteen years of age. Because *t*-dropping is often stigmatized in Utah, there was a risk that the participants would self-consciously avoid such pronunciations if made aware of the specific characteristic being researched. Therefore, participants who inquired about the particulars of the study were told that the experiment involved researching the differences in the voices of people of different ages. Participants were then fitted with a small clip-microphone and recorded reading the passage that appears in the appendix (which did not contain the emphasized test items during the study). The passages contains 24 instances of words, such as *mountain*, in which the realization of /t/ could be determined as well as the nature of the release.

DATA ANALYSIS AND RESULTS

Two dependent variables were measured: pronunciation of /t/ and release after /t/. Release was determined impressionistically by one researcher, while the other determined it by examining spectrograms of each instance using Praat (Boersma and Weenink 2001). The two methods concurred on 97% of the tokens, and the data from the spectrographic analysis was used in the statistical analyses. This yielded 1,344 potential tokens of the phone in question; however, in 34 cases the pronunciation could not be determined due to a misreading or omission by a participant or to the inability to clearly distinguish the realization either by ear or in the spectrograms. This reduced the number of items analyzed to 1,310.

TABLE 1
Participants by Gender and Age

	12-19	20-29	30-49	50+
Male	13	7	5	6
Female	9	6	5	5

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As others have noted (Ladefoged and Maddieson 1996; Levon 2006), glottal stops are not generally true occlusives, but most often appear as irregularly spaced striations, as in creaky voice. This can be seen in figures 1 and 2. Of the pronunciations coded as glottal stops, 79% appear with irregularly spaced striations, 10% appear with a period of silence as a true occlusive, and 11% have very brief occlusions or appear only as a lightening of the formants. All of these tokens give the auditory impression of being

FIGURE 1
Oral Release after the Glottal Stop in *fountain*

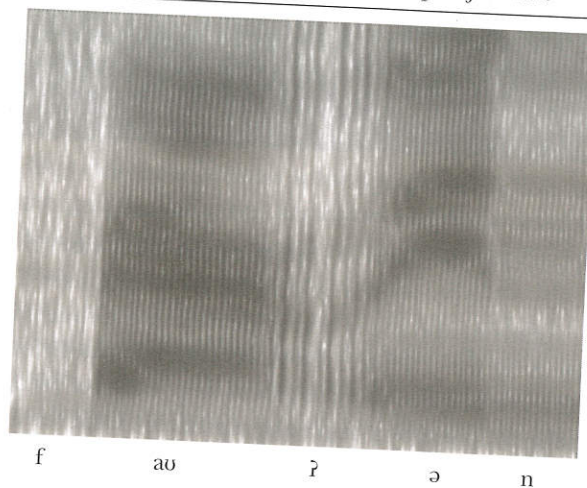
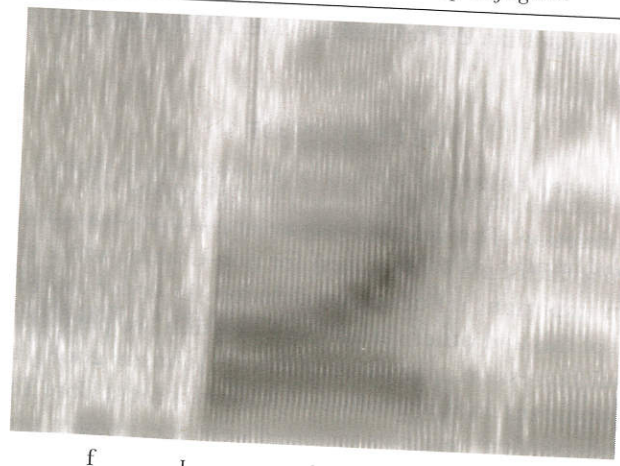


FIGURE 2
Nasal Release after the Glottal Stop in *frighten*



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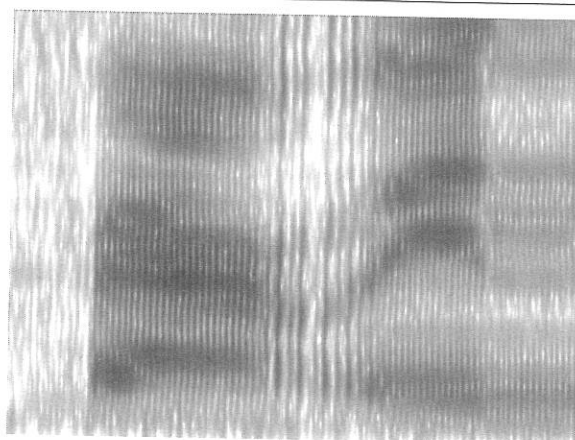
Oral Release after the Glottal Stop in *fountain*

FIGURE 2

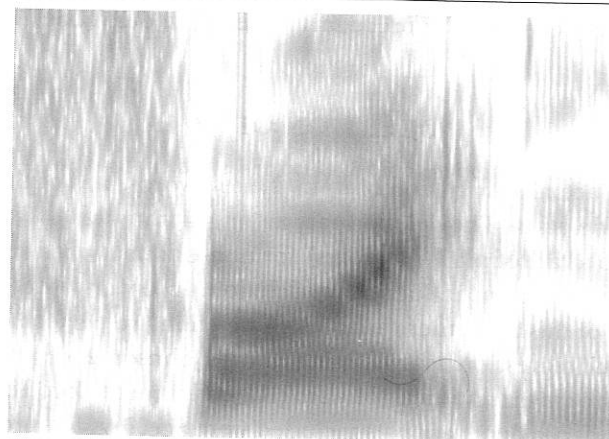
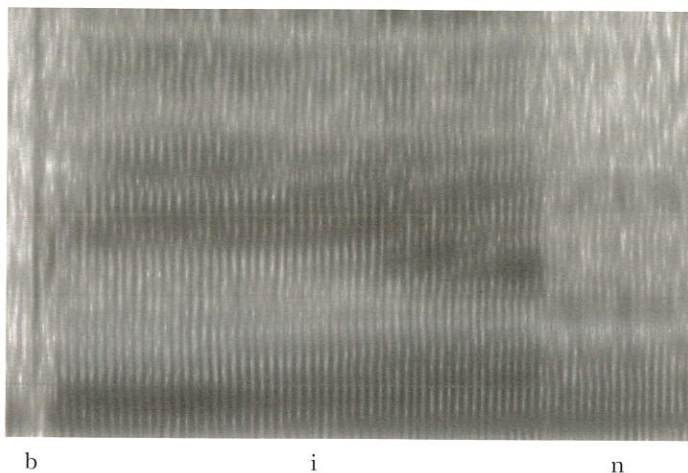
Nasal Release after the Glottal Stop in *frighten*

FIGURE 3
Deleted /t/ in *beaten*



glottal stops; however, the method used does not allow cases of glottal stops with and without a linguoalveolar gesture to be distinguished. Cases of /t/-deletion were apparent auditorily and appeared in the spectrograms as the test item *beaten* in figure 3. There, the vowel is immediately followed by the nasal with no intervening occlusive or glottal stop. Cases of [t] appeared with a visible occlusion followed by a degree of aspiration. Oral releases appeared as a discernible vowel between the glottal stop and nasal, as can be seen in *fountain* in figure 1. In contrast, nasal releases transition from the glottal directly into the nasal, as in *frighten* in figure 2. Here, the syllabic nasal is not evident only auditorily, but because it has the acoustic characteristics of a nasal (less energy than the preceding vowel, F1 around 200 Hz, etc.).

DELETION OF /t/

As far as the actual elimination of /t/ in the test words, 106 of the 1,310 instances had deletion. The deletion rate among Utahns was 11% (93 cases), compared to a rate of 2.8% (13 cases) for non-Utahns, which suggests that it may be an important influence on deletion. In order to determine the significance of this and other variables on deletion, we performed a mixed effects logistic regression analysis using Rbrul (Johnson 2008), an interface to the R environment statistical software (R Development Core Team 2011).² The fixed independent variables included were age, gender, proportion of life spent in Utah, and where the test word appeared in the passage the sub-

jects read. Word order was included to test the idea that participants could have become more comfortable with reading the test letter and, as a result, produced fewer deletions toward the end of the passage. Educational level was found to be collinear with age and was eliminated from the analysis. Test items and participant were included as random variables.

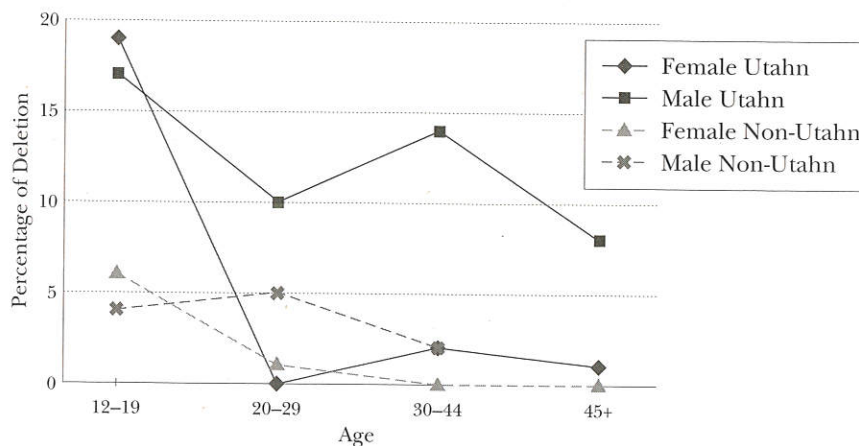
In table 2, predictor variables are ordered according to their level of statistical significance. Therefore, age is the most significant variable, followed by proportion of life spent in Utah and gender, while the order in which a test item appeared in the letter the participants read did not significantly affect the rate of /t/-deletion. For continuous variables, the log-odds must be multiplied by the unit by which the variable is measured in order to be interpreted. For instance, the log-odds for age is -0.046 ; therefore, the predicted log-odds for a 20-year-old is 20 times that or -0.92 , and for a 50-year-old it is even smaller at -2.3 . That is, younger participants favor deletion more than older ones. The larger a log-odds, the more that value favors deletion, while the smaller a log-odds the more that value disfavors deletion. Log-odds close to zero indicate that the value neither favors nor disfavors deletion. Therefore, the positive log-odds for proportion of life spent in Utah indicates that participants who have lived a higher proportion of their life in Utah favor deletion more those who have lived less of their life in Utah.

There was also a gender effect: males deleted 10% of the 1,310 instances of /t/, and females only 6%. In addition to the small difference in deletion rate by gender, two other things suggest that this may be an artifact of the data. First, while the difference is statistically significant, it barely dips below .05 and would be insignificant if a lower alpha threshold, such as .01, were set in the study. Second, only 106 of the 1,310 instances in the data have deletion, which warrants some degree of skepticism as to how generalizable the findings may be outside these particular data.

TABLE 2
Results of the Mixed-Effect Logistic Regression Analysis
of Variables That Favor Deletion of /t/

	Log-odds	Percent Deleted	N
Age ($p = .00111$)	-0.05		
Proportion of life spent in Utah ($p = .00516$)	2.47		
Gender ($p = .0436$)			
male	0.49	10	597
female	-0.49	6	713
Word order ($p = .356$)	[-0.04]		

FIGURE 4
Deletion Rate of /t/ by Age, Gender, and State



The raw data are illustrated in figure 4, in which participants are grouped into four age categories. The amount of time spent living in Utah was coded as a continuous variable for the purposes of the statistical analysis, but for the purposes of figure 4, Utahns were defined as people who had lived 67% or more of their life in Utah. When organized in this manner there appears to be a Utahn by age interaction; however, no statistically significant two-way interactions between independent variables were obtained using the method described by Sigley (2003).³ Nevertheless, it appears that Utah males are most likely to delete /t/ along with teenage female Utahns, so the existence of *t*-dropping in Utah has some validity, but the trends that are observed in figure 4 should be considered with a healthy dose of suspicion given the overall small number of deleted tokens and marginal statistical significance of gender. Further investigation into this topic will ultimately paint a much clearer picture of /t/ deletion in Utah English.

GLOTTALIZING /t/

What is somewhat surprising in regards to *t*-dropping by Utahns is that when people discuss it and imitate it, they invariably pronounce /t/ with a glottal stop rather than actually deleting it completely. Deletion would result in *button* being realized as [bʌ:n] and *mountain* as [maʊ:n]. Of all tokens of /t/ that were analyzed, 83.6% were realized as glottal stops. Therefore, it may be the use of glottal stop rather than actual deletion that is perceived as a Utah

shibboleth. To test this, the glottal pronunciation was used as the dependent variable, and the same independent variables as in the previous analysis were included to determine their influence on glottalizing.

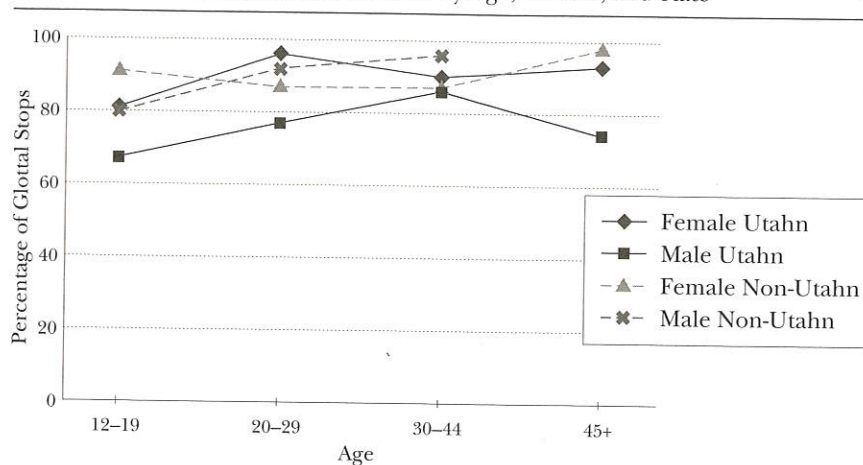
As table 3 indicates, age, gender, and word order were not significant predictors, and no significant interactions were observed.⁴ Although gender did not yield significant differences, the fact that women produced numerically more glottal stops supports a number of other studies that have documented higher levels of glottalization among English-speaking women (Byrd 1994; Milroy et al. 1994; Holmes 1995; Levon 2006; Eddington and Taylor 2009; Eddington and Channer 2010). On the other hand, previous research has often found young English speakers using the glottal pronunciation more than older speakers (Holmes 1995; Macaulay 1997; Tollfree 1999; Marshall 2003; Partin-Hernandez 2005; Roberts 2006), something that was not observed in the present study.

The only significant predictor of glottalization is the proportion of life spent in Utah, although this barely reaches significance. It is important to note that the glottalization rates are in the opposite direction from what was expected; participants who had lived more of their lives in Utah were less likely to use a glottal stop pronunciation of /t/. This is seen in figure 5, in which dotted lines, which represent non-Utahns, are often above the solid lines representing people who have lived 67% or more of their lives in Utah. Non-Utahns gave glottal stop pronunciations to /t/ 89.3% of the time compared to Utahns at 80.5%. Clearly, glottalization of /t/ does not explain what is thought to be the unique pronunciation of words such as *kitten* and *mountain* in the mouths of Utahns.

TABLE 3
Results of the Mixed-Effect Logistic Regression Analysis
of Variables That Favor Glottal Stops

	Log-odds	Percent Deleted	N
Proportion of life spent in Utah ($p = .0495$)	-1.53		
Gender ($p = .0546$)			
male	[-0.43]	78	597
female	[0.43]	89	713
Age ($p = .0661$)	[0.02]		
Word order ($p = .248$)	[-0.02]		

FIGURE 5
Glottalization Rate of /t/ by Age, Gender, and State



ORAL RELEASE AFTER GLOTTAL STOP

If the stigmatized pronunciations do not involve widely differing rates of deletion of /t/ or a higher degree of the glottal stop realization of /t/, the question that remains is what aspect of the pronunciation is being referred to as *t*-dropping. The answer may be whether the speaker releases the glottal stop in *kitten* and *mountain* nasally, as in [k^hɪɾŋ] and [mawɾŋ], or orally, as in [k^hɪɾən] and [mawɾən]. Release was included as the dependent variable in the analysis that is summarized in table 4 where age, proportion of life spent in Utah, and gender are all highly significant. No statistically significant interactions were found between predictor variables using the method described by Sigley (2003). It is clear that oral releases are more highly favored by younger speakers. In addition, women favor oral releases more than men.

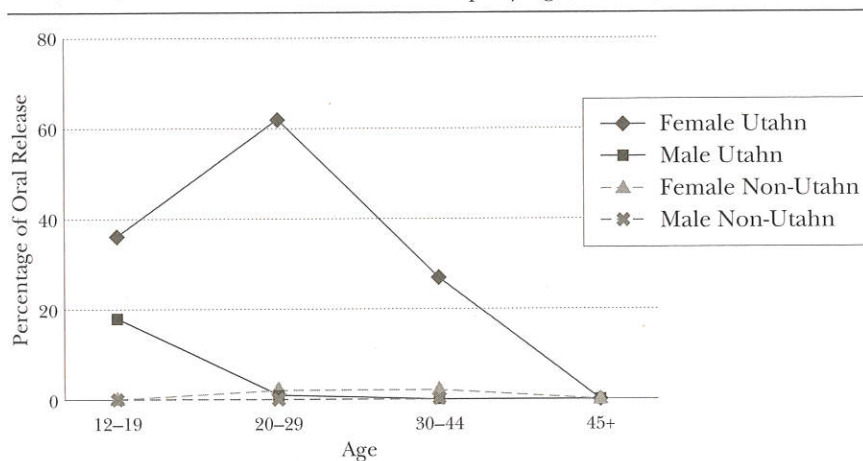
However, the most important finding is that release sharply divides Utahns from non-Utahns. Although the percentage of life spent in Utah was entered into the statistical analysis as a continuous variable, in order to illustrate the data graphically, Utahns were defined as participants having lived 67% or more of their life in the state. This percentage was obtained by ordering the 1,310 tokens by percentage of time spent in Utah, then splitting them into two groups such that one group contained no instances of oral release. All of the participants in the resulting group had lived less than 67% of their life in Utah. A downside to using percentage of life spent in Utah is that older speakers who may have spent their childhoods and adolescence years in another state are counted as Utahns.

TABLE 4
Results of the Mixed-Effect Logistic Regression Analysis
of Variables That Favor Oral Releases after Glottal Stops

	Log-odds	Percent Deleted	N
Age ($p = .000215$)	-0.12		
Proportion of life spent in Utah ($p = .000326$)	6.79		
Gender ($p = .00372$)			
male	-1.57	5	597
female	1.57	16	713
Word order ($p = .248$)	[-0.04]		

Non-Utahns generally release the glottal stop nasally (e.g., [k^hɪɾŋ] and [mawɾŋ]), only releasing it orally (e.g., [k^hɪɾən] and [mawɾən]) in 0.6% of the cases. Utahns, however, use oral releases in 16.7% of the cases. Figure 6 contains a graphic representation of the data when participants are grouped into four age categories. A number of trends are obvious. First, oral releases are virtually nonexistent among non-Utahns. Second, Utah males 20 and older rarely produce oral releases. Among male Utahns, it is found only among those in the 12–18 age group. Finally, oral releasing is predominantly a characteristic of Utah women's speech for all but the oldest age group members and is most widespread among the 20-year-olds.

FIGURE 6
Oral Release Rate after Glottal Stops by Age, Gender, and State



CONCLUSIONS

An often cited characteristic of Utah English is that speakers drop their *ts*. The purpose of the present study has been to investigate this phenomenon acoustically and evaluate the social factors associated with it. We analyzed the realizations of 24 different words, all of which contain the phonetic context in which *t*-dropping is purported to occur: /t/ followed by a nasal. Fifty-six speakers pronounced each of these 24 words. Actual deletion of /t/ was observed in only 8% of the cases. It was more prevalent among males, participants who had lived longer portions of their lives in Utah, and younger participants. However, deletion of /t/ may not be what people perceive as *t*-dropping. Perhaps it occurs so infrequently that it has not yet reached the status of a regional pronunciation. And perhaps this is why, when people imitate Utah *t*-dropping, they do not delete /t/ but pronounce it as a glottal stop instead. However, analysis of glottalized pronunciations does not support the idea that Utah *t*-dropping equates to glottalization either since non-Utahns glottalize more than Utahns.

The most likely candidate for what is referred to as *t*-dropping in Utah is releasing the glottal stop orally rather than nasally (e.g. [k^hɪɾən] instead of [k^hɪɾŋ]). Participants who had lived 67% or more of their lives in Utah produced oral releases after glottal stops in 16.7% of the words, while those who had lived less than two-thirds of their lives in Utah only produced them 0.6% of the time. This large difference in glottalization rates is much more in line with what one would expect to find in a regional difference, especially given the fact that non-Utahn participants were from other Western states. The finding that oral releases are more strongly favored by women is consistent with a general trend found in sociolinguistic studies; women tend to be on the cutting-edge of language change in that they adopt and use innovations more often (Milroy 1980; Labov 1994, 2001; Haeri 1997; Gordon and Heath 1998).

The fact that younger Utahns produce more oral releases after glottal stops than older speakers suggests that oral releasing is a characteristic that is on the rise in Utah. The fact that it has been observed in speakers from other states could have a number of interpretations. It could be a widely occurring yet infrequent pronunciation adopted as a social marker among younger, especially female Utahns. Or, it may be much more prevalent in U.S. English but not yet stigmatized or commented on enough to attract the attention of linguists. Another possibility: it may be a regional characteristic in several parts of the United States, including Utah, but one not common in the other Western states contrasted with Utah in the present study. In any case, researchers should keep an ear open for this usage, as it may prove to be a fertile topic of research in American English.

APPENDIX

Passage Read by Participants

Dear Mom,

I know it's been a while since I've WRITTEN. In the last letter I told you about the KITTEN I found that looked like it hadn't EATEN for a month. Well, it's living in my apartment now. He was in pretty bad shape, and looks like he'd been BEATEN and was pretty FRIGHTENED of people at first. I've named him KEATON and my goal is to FATTEN him up a bit and show him people aren't so bad. There are good things and bad things about having a cat. The bad thing is that he's started to climb up the drapes which made the CURTAIN rods wobbly so I had to TIGHTEN them. He has a CERTAIN fascination with BUTTONS, and has torn a few off my clothes. Now, I make sure to keep the closet door closed and not use the expensive SATIN sheets. He also likes to shred toilet paper. I went into the bathroom one day and it looked like the floor was covered with COTTON balls. Yesterday when I came home from work he'd done a number on the carpet. I about FLATTENED him but then realized that I'd FORGOTTEN to let him out in the morning, so it really wasn't his fault.

In spite of the problems it's fun to have him. He seems to know when it's dinner time because when I go toward the kitchen at about 4, his face BRIGHTENS up, he STRAIGHTENS his tail and starts to flick it back and forth, then he tries to beat me to the kitchen. I usually take him outside and let him sniff around while I sit on the edge of the FOUNTAIN and study for my economics or LATIN class. A guy from my building saw me sitting there with KEATON. He sat down and started playing with him. His name is Lance PATTON. He's an English major and is COLTON Smith's roommate. They met on a study abroad trip to Great BRITAIN. We got into a conversation and I think he may be interested in me. He actually put my number in his cell phone. What a way to SWEETEN my day!

I can't wait to be home for Thanksgiving.

Love your daughter,
Candace

NOTES

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2. We are grateful to Daniel Ezra Johnson for his help with the Rbrul analyses.
3. This entails combining each pair of variables into a new interaction variable. The fit of the model with the interaction variable is compared to that of the model without by means of a loglikelihood ratio test.
4. Only participant was included as a random factor since the model failed to converge when word was included as well.

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