

T-GLOTTALIZATION IN AMERICAN ENGLISH

DAVID EDDINGTON

Brigham Young University

MICHAEL TAYLOR

New York University

ABSTRACT: In word-final prevocalic position (e.g., *right ankle*), there are various possible phonetic realizations of /t/ in American English: [t], [ɾ], [ʔ]. The present study focuses on the linguistic and social factors associated with the use of the glottal stop. Data were gathered by having participants repeat sentences they were presented auditorily (e.g., *She twisted her right ankle*). The particular pronunciation of /t/ in the presented sentences was masked with a tone. Logistic regression analysis identified three significant factors: (1) glottal stops were favored by following front vowels; (2) younger female speakers were most likely to use glottal stops, which may indicate a change in progress; and (3) speakers from the Western United States glottalized more than speakers from other parts of the country.

T-GLOTTALIZATION REFERS TO THE PRONUNCIATION OF /t/ as a glottal stop, [ʔ]. Glottalization is a type of lenition in which the oral gesture of a stop is removed. It is a common phonetic evolution for oral stops to develop a glottal point of articulation. Glottal stops are common allophones of /t/ in most varieties of English; however, there is an impressionistic idea that their frequency in British varieties is much higher than in American varieties, so much so that Robinson (2009) asserts that *t*-glottalization is not “a feature of any US accent and thus one of the many examples that British English and American English, in terms of their pronunciation at least, are diverging rather than converging” (see also Wells 1982 and Holmes 1995).

Although glottal stops in English have arguably existed for many years, the first written documentation of them is from Scotland in the late nineteenth century (Andréson 1968); they are also attested in formal registers of speakers of Received Pronunciation who were born in the late nineteenth century (Collins and Mees 1996). In Great Britain, the glottal stop is generally associated with low prestige varieties (Trudgill 1974; Macaulay 1977; J. Milroy et al. 1994), although in Cardiff, Wales, it is more common in higher social classes (Mees 1987). While many varieties of English, including those spoken in the United States, have glottal stops before other consonants (e.g., *Ba[ʔ]man, ou[ʔ]put*), the idea that glottals are nonexistent in American speech may come from the abundance of glottals in British English prevocalically (e.g., *be[ʔ]er pu[ʔ] a lo[ʔ] of*), where American varieties tend to have a flap

(e.g., *be[r]er pu[r] a lo[r] of*). In fact, the prevocalic glottals found in certain low-prestige varieties of the Metropolitan New York City Regional Dialect have been branded as foreignisms (Wilson 1993, 283).

The use of glottal stops has been described in a number of varieties and in many different phonetic contexts. In word-final prevocalic context, our focus in this article, we have found them documented in both British and American varieties: Received Pronunciation (Wells 1997; Fabricius 2000), London (Wells 1982), Scotland (Reid 1978; Marshall 2003), Estuary English (Coggle 1993), Newcastle (Docherty and Foulkes 1999), Ipswich (Straw and Patrick 2007), Cardiff (Mees 1987), United States (Byrd 1994), New York City (Wells 1982; Levon 2006), Vermont (Roberts 2006), Appalachia (Wells 1982), and California (Partin-Hernandez 2005).

The literature on *t*-glottalization is quite extensive in British varieties. While it has been noted in American English, the only study we are aware of dedicated exclusively to this phenomenon in the United States is Roberts (2006), which found that *t*-glottalization was highest among adolescents. Other studies also report that younger speakers glottalize more (California: Partin-Hernandez 2005; New Zealand: Holmes 1995; London: Tollfree 1999; Scotland: Macaulay 1977, Marshall 2003). The tendency for women to use more glottal stops was previously observed in the United States (Byrd 1994), New York (Levon 2006), New Zealand (Holmes 1995), and Tyneside (J. Milroy et al. 1994), yet in Vermont, the trend is reversed with men favoring glottal stops more than women (Roberts 2006). While glottalization has been documented in several regions of the United States, only Byrd (1994) compared glottalization rates across regions. Her data indicate that speakers from the North and South glottalize more than those from the North Midland region, but no mention of the speech of the West is made.

As far as the phonetic realization of /t/ in American English is concerned, flaps are firmly entrenched word internally in American English in words such as *better*, *utility*, and *decimated*. However, a great deal of variation between [ɾ] and [ɾ̥] is found prevocalically between words such as *put any*, *right ankle*, and *tablet in*. Roberts (2006) observes that this is the only phonetic environment in which glottal stops and flaps alternate in Vermont. In like manner, Straw and Patrick (2007, 390) cite the prevocalic position among those that "seem to allow the greatest play for social factors."

There are two reasons why *t*-glottalization in American English deserves more detailed attention. First, with the exception of Roberts (2006), it has received only passing mention in the literature. Second, we began noticing an apparent age difference in the pronunciation of word-final /t/ when followed by a vowel a few years ago. Our unsystematic observations were that flaps are more common for older speakers and glottal stops for younger ones. Moreover, glottal stops appeared to be more common in residents of

the Western United States. A systematic study was needed to determine if our impressions are valid. Therefore, we carried out an elicitation experiment to investigate *t*-glottalization in this particular phonetic environment. The goal of the study is to explore the social and linguistic factors that are associated with *t*-glottalization. At the same time, we want to follow Roberts's (2006) lead and provide more data for this phenomenon in the English of the United States.

SHADOWING AS AN ELICITATION TECHNIQUE

Our method for eliciting glottalized and nonglottalized tokens of /t/ was shadowing. Since shadowing is not a well-known technique in variationist studies, it deserves some introduction. The earliest shadowing experiments (e.g., Cherry 1953) were carried out in the field of psychology by simultaneously presenting different stimuli to participants' right and left ears and asking them to repeat what they had heard as fast as possible. This is known as dichotic listening. In the shadowing studies that interest us, participants hear an utterance and immediately repeat it several times. However, the crucial part of the utterance they hear has been masked with noise so that the participants are not merely mimicking what they hear, but producing utterances uninfluenced by the pronunciation in the presented speech.

This method of analyzing speech has been used by several researchers. For example, van Heuven (1988) asked whether stress plays a part in word recognition in Dutch. His participants repeated sentences containing words such as [órxəl] 'organ' and [orkést] 'orchestra' in which pink noise masked all but the initial [or/ór] of the test word. His participants were more likely to repeat the sentence with [orkést] when [or] was stressless and to say [órxəl] when [or] was stressed, which demonstrates the importance of stress in word recognition.

Van der Veer (2006) studied the variation between monophthongs and diphthongs in Italian, more specifically, the alternation between [wo] and [o], as in *b[o]nissimo/b[wo]nissimo* 'very good.' He embedded test words such as these in sentences and replaced the vowel or diphthong of the first syllable of the each test word with noise. The participants were asked to repeat the sentences they heard and in this way were forced to fill in the noised out section of the test words with their own pronunciation.

Rohena-Madrado, Simonet, and Paz (2006) elicited tokens of syllable coda /r/ in Puerto Rican Spanish by replacing them with noise in much the same way. However, their participants repeated each sentence as many times as they were able in a ten-second period. Lateralized pronunciations of /r/ are highly stigmatized in Puerto Rican Spanish and are more common

in colloquial registers (López Morales 1983; Paz 2005). Rohena-Madrado, Simonet, and Paz compared the pronunciations of /r/ resulting from their shadowing experiment with those collected during a casual conversation, sentence reading, and a task involving giving directions on a map, all of which were carried out in a controlled laboratory setting.

Unsurprisingly, few lateralized pronunciations occurred in the reading and map tasks when compared with casual conversation. Rohena-Madrado, Simonet, and Paz point out that their data corroborate the observations made by Labov (1966, 1972), that casual conversation will yield more vernacular variants than a more formal reading task, defined by an increase in the amount of attention paid to speech—even when this conversation occurs in the unnatural setting of a soundproof booth. The most telling finding is that the shadowing task elicited even more stigmatized tokens of /r/ than casual conversation. One possible interpretation of this finding, though one we will not pursue here given the scope of the present study, is that shadowing represents or elicits a style that is “less formal” (see Labov 2001) than casual conversation. Whatever the implications are for sociolinguistic style, shadowing appears to provide an ideal method for eliciting casual speech features, while allowing for the quality and control available only in a laboratory setting. We adopted a similar shadowing technique in order to study *t*-glottalization in American English.

SHADOWING EXPERIMENT

PARTICIPANTS. All of the participants in our study were from the United States and had at least some college education, which means that social class was held fairly constant. All but one were European Americans. The remaining participant was a bilingual English-speaking Hispanic woman with no traces of Spanish accent. The age and sex of participants is found in table 1. In total, there were 58 participants: 20 from Utah, 22 from other Western states (Arizona, California, Colorado, Idaho, Oregon, and Washington), and 16 from non-Western states (South: Louisiana, Mississippi, Texas, Virginia; North/Inland North: Iowa, Michigan, Minnesota; Midland: Illinois, Ohio, Oklahoma; and Mid-Atlantic: New Jersey). States were classified by region

TABLE 1
Participants by Gender and Age

	19–29	30–39	40–49	TOTAL
Female	11	7	9	27
Male	14	6	11	31
TOTAL	25	13	20	58

in accordance with dialect-feature boundaries delimited in Labov, Ash, and Boberg (2006).

STIMULUS MATERIALS. Twenty collocations were chosen in which the first word ends in /t/ and is followed by a vowel-initial second word (table 2). Typically, speakers of American English pronounce the final /t/ of the first word in these collocations as a flap, but glottalization is also a possibility.

The frequencies of all test items were taken from the British National Corpus (<http://www.natcorp.ox.ac.uk/>). It would of course have been optimal to use a corpus based on U.S. English, but when the experiment was carried out there was not one of the scope and size of the British National Corpus. However, we attempted to choose test items that did not seem to be particularly salient British or American usages. Half of the final-*t* words appeared in a collocation with a frequency of under 100, while the others had a collocational frequency of 460 or greater. Ten of the test words (i.e., the first word of the collocation) had frequencies of 7,249 or lower, and the remaining test words had frequencies of 18,865 or greater. Exactly where to place the cutoff points for high and low frequency items is, of course, arbi-

TABLE 2
Stimulus Materials
(A = frequency of first word in collocation)

Collocation	Frequency	A	Freq/A	Test Sentence
<i>foot away</i>	10	7,249	< 0.01	<i>It was only a foot away.</i>
<i>street outside</i>	21	18,865	< 0.01	<i>The street outside was quiet.</i>
<i>right ankle</i>	25	84,904	< 0.01	<i>She twisted her right ankle.</i>
<i>night off</i>	25	34,976	< 0.01	<i>Take the night off tomorrow.</i>
<i>without asking</i>	73	44,806	< 0.01	<i>They did it without asking.</i>
<i>not able</i>	460	449,595	< 0.01	<i>I'm not able to do it.</i>
<i>what on</i>	663	240,113	< 0.01	<i>What on earth are you doing?</i>
<i>about our</i>	670	190,615	< 0.01	<i>What about our friends?</i>
<i>that a</i>	744	1,086,692	< 0.01	<i>He said that a letter came.</i>
<i>that any</i>	2629	1,086,692	< 0.01	<i>They knew that any attempt would fail.</i>
<i>jet engines</i>	22	1,332	0.02	<i>The jet engines were loud.</i>
<i>treat a</i>	94	3,678	0.03	<i>Don't treat a dog like a human.</i>
<i>tablet in</i>	10	346	0.03	<i>The tablet in the bottle is aspirin.</i>
<i>helmet on</i>	22	662	0.03	<i>Put your helmet on first.</i>
<i>greet us</i>	25	536	0.05	<i>People came to greet us.</i>
<i>shut up</i>	983	4,785	0.21	<i>If he could just shut up.</i>
<i>portrait of</i>	713	1,714	0.42	<i>She painted the portrait of the president.</i>
<i>insight into</i>	723	1,406	0.51	<i>Science gives insight into nature.</i>
<i>lot of</i>	15,814	23,953	0.66	<i>A lot of people fit in here.</i>
<i>pursuit of</i>	843	1,252	0.67	<i>Everyone is in pursuit of happiness.</i>

trary. We looked for items with widely differing frequencies without including extremely low frequency words that would be unknown to the participants. At the same time, we left a large frequency gap between the high and low frequency items in hopes of attenuating any possible frequency effects.

By dividing the collocational frequency by the word frequency we arrive at the transitional frequency. Half of the collocations have a transitional frequency below 0.02 and the other half were at or above 0.02. A word with a high transitional frequency often appears followed by the other word in the collocation, while one with a low transitional frequency does not frequently co-occur with the other member of the collocation.

The collocations were placed into carrier sentences (e.g., *She twisted her right ankle*) and were recorded by a 45-year-old white male with a Western U.S. accent. The final /t/ in all the test words was pronounced with a flap. The flaps were then deleted from the sentences along with the vowel transitions on either side, and this was replaced by 100 ms of a 440 Hz sine wave tone.

PROCEDURE. Participants were seated in front of a computer monitor wearing a headset with earphones and a microphone. They read the following instructions on the screen:

In this study you will hear a series of sentences in the headphones. Your job is to repeat each sentence you hear three times in a row. Repeat them three times immediately after you hear them. Once the study starts you will see nothing on this screen until it's over. Each of the sentences you hear has a beep in the middle of it. Just ignore the beep and repeat the sentences. Before we start the study let's do some practice sentences so you know what to expect. As soon as you press the space bar the practice sentences will begin. READY? Press the space bar to start the practice sentences.

At that point the subjects responded to four practice sentences and had the opportunity to ask questions before proceeding on to the actual test items. DMDX presentation software (Forster 2009) was used to run the experiment.

Upon hearing each sentence, the participants repeated what they had heard three times. Their utterances were digitally recorded at a 22,000 Hz sampling rate. They were given six seconds following the end of each of the 20 stimulus sentences to say each sentence three times. Although the brief response window did result in a small minority of third responses not being completely recorded, our goal was to eliminate introspection and self-monitoring by forcing a quick response. Each test item was separated by a lag of 667 ms. The entire experiment lasted about ten minutes. A postexperiment interview revealed that the tone that interrupted the sentences did not distract the participants from the goal of the study. In fact, in no case did it appear to cause word misidentification. Participants who inquired about the

purpose of the experiment were told that it focused on voice differences in people of different ages.

RESULTS AND DISCUSSION. We performed separate impressionistic coding of the pronunciation of /t/ in the test words. We coded the /t/ in each test collocation as [r], [ɾ], [t], or "other," the last of which included deletion, failure to say the sentence, having a sentence produced after the six-second cut-off point, or our inability to distinguish between [r], [ɾ], or [t]. One of the test collocations (*portrait of*) proved extremely hard to code due to high levels of deletion and imprecise articulation. For this reason, we eliminated it from consideration.

We initially concurred on the pronunciation of 96.5% of the tokens (3,189 out of 3,305). To resolve the remaining 3.5% that we had coded differently, we recoded them together and in most cases resorted to spectrographic analysis to come to an agreement. In the spectrograms, a stop appeared as a period of silence; flaps had brief or almost no occlusion, but demonstrated falling first and second formant frequencies going into and coming out of the occlusion. A typical flap appears in *jet engines* in figure 1. Consistent with the observations of Ladefoged and Maddieson (1996) and Levon (2006), we found that glottal stops in intervocalic position are not true occlusives, but appear as irregularly spaced striations. An example of this is seen in *helmet on* (figure 2). Tokens we still could not agree on were coded as *other/indeterminate*. The final coding yielded 2,679 instances of [r], 357 of [ɾ], 172 of [t], and 97 "other/indeterminate" pronunciations. Only 10% of the tokens were glottal stops.

The independent variables used in the analysis were the following:

1. the sex of the speaker,
2. the age of the speaker (19–29, 30–39, 40–49),
3. the speaker's region of origin (Western vs. non-Western),
4. whether the speaker was from Utah or not,
5. the repetition number (first, second, third),
6. the individual collocation (see table 2),
7. the frequency of the collocation (low < 100, high ≥ 460),
8. the frequency of the test word (low ≤ 7,249, high ≥ 18,865),
9. the transitional probability of the test word in the collocation (collocation freq./word freq.; low < .02, high ≥ .02),
10. the quality of the vowel preceding /t/ (front or back),
11. the quality of the vowel following /t/ (front or back),
12. whether the syllable preceding /t/ is stressed or not,
13. whether the syllable following /t/ is stressed or not, and
14. the interaction of age by sex.

FIGURE 1
Flap in *jet engines*

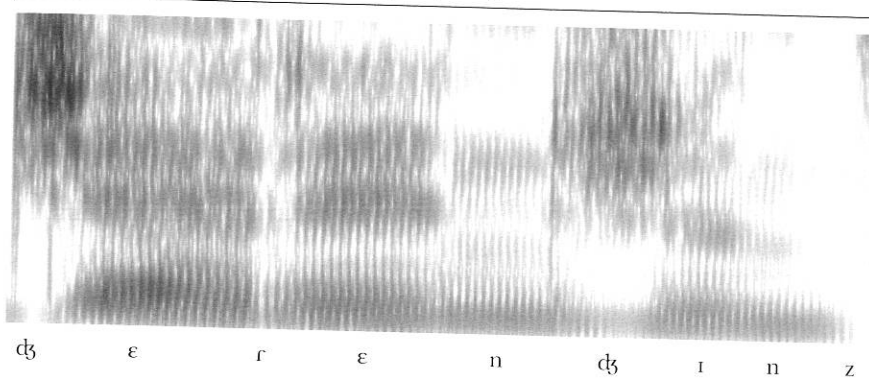
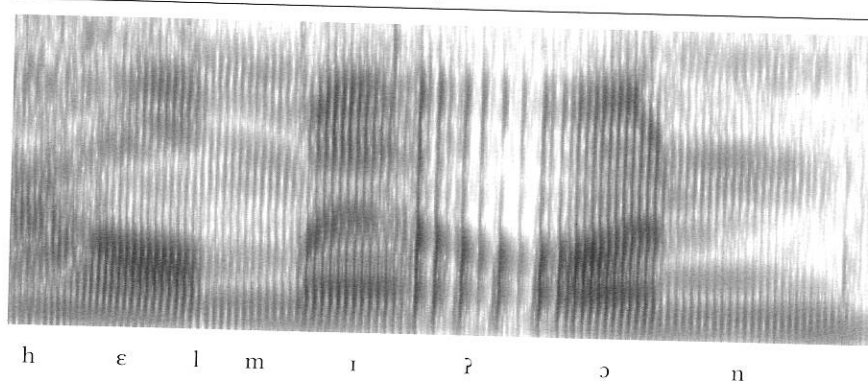


FIGURE 2
Glottal Stop in *helmet on*



Our particular pool of participants naturally fell into three groups: Utahns, other Westerners, and non-Westerners. We included measures of frequency since it has been shown to play an important part in language variation (e.g., Bybee 2001). Stress and vowel quality were included because along with frequency they are factors that may unite or contrast particular groups of test words.

We submitted the data to logistic regression analysis using the GoldVarb software package (Robinson, Lawrence, and Tagliamonte 2001). The analysis calculated the factors that favor [ʔ] over the other possible pronunciations (i.e., [r], [t], and "other/indeterminate"). Only the significant factor groups are reported in table 3. Factor weights above 0.5 indicate a variable that favors glottal stops, while weights under 0.5 disfavor glottal stops.

A number of findings are apparent from the study. The first is that a front vowel that follows /t/ highly favors glottalization. We are hesitant to put a great deal of emphasis on this finding because it is ultimately based on only 8 test words containing front vowels and 11 with back vowels. Data gathered with a more traditional interview method result in a larger variety of words, which would make the influence of vowel backness less word-specific. It is possible that this finding is tied more to particular words or collocations than to vowel backness per se, but further research is needed to test this more rigorously.

Other influences apparent in the data are age and sex (see figure 3). Glottalization is favored by women ages 19–39 and by the youngest group of males ages 19–29—though a factor weight of 0.53 for the men suggests only a slight preference for the glottalized variant. It is disfavored by the oldest women and by males 39–49 years of age. In other words, women outglottalize all but the youngest group of men. With the exception of Roberts (2006), previous studies of glottalization in the English-speaking world have documented higher rates of glottalization among women (Byrd 1994; J. Milroy, et al. 1994; Holmes 1995; Levon 2006), a tendency that our study corroborates.

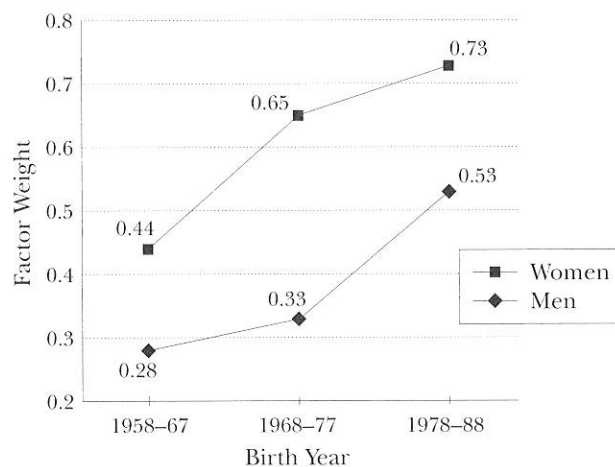
TABLE 3
Significant Factors Resulting from a Multivariate Analysis
of Factors Favoring the Glottalization of /t/
(input = 0.057; log likelihood = -898.269; $N = 3,305$)

	<i>Factor Weight</i>	<i>Percentage</i>	<i>n</i>
Following Vowel			
Front	0.80	18	1,391
Back	0.27	2	1,914
range	54		
Age by Gender			
19–29 females	0.73	20	627
30–39 females	0.65	15	399
19–29 males	0.53	11	797
40–49 females	0.44	7	513
30–39 males	0.33	6	342
40–49 males	0.28	5	627
range	45		
Region (West/non-West)			
West	0.55	12	2,393
Non-West	0.37	8	912
range	18		

The literature on sociolinguistic change in progress is replete with studies in which young women are on the cutting edge of language change. However, like any generalization, a number of counterexamples have been discussed in the literature (e.g., Labov 1972; Trudgill 1972; J. Milroy and L. Milroy 1978). Despite this, a general consensus persists that women tend to be more conservative in their use of stable variables and more advanced in the usage of innovative forms (L. Milroy 1980; Labov 1994, 2001; Gordon and Heath 1998). For example, of the 19 worldwide sociolinguistic variables surveyed by Haeri (1997) in an attempt to synthesize the relationship between sex and language change, women were found to be leading in 13. Labov (2001) vastly extends this survey of literature noting that for all changes in progress recorded thus far, there is a consistent pattern for women to be in the lead, for changes from both above and below. So, while not bulletproof as a diagnostic, the fact that women have higher rates of *t*-glottalization in our current study suggests a possible change in progress worthy of further investigation.

The finding that younger speakers use more glottal stops than older speakers corroborates the same finding in other parts of the English-speaking world (Macaulay 1977; Holmes 1995; Tollfree 1999; Marshall 2003; Partin-Hernandez 2005). This trend has two possible interpretations. The first is that the apparent-time difference indicates that glottalization is on the rise in U.S. English. Under ideal circumstances, we could corroborate the apparent-time interpretation by comparing our data with the data from

FIGURE 3
Factor Weights for Glottalization by Sex and Age (Birth Year)



earlier studies. If this revealed the hypothetical trends in figure 4, it would allow us to assert that a glottalization is becoming more frequent.

Alternatively, if we found data similar to that in figure 5, it would suggest an age-grading effect on *t*-glottalization. Chambers (2003) and Sankoff (2005) interpreted Macaulay's (1977) account of *t*-glottalization in Glasgow as an example of age-grading. Macaulay shows that glottalizing is highly stigmatized in Glasgow and is associated with working-class speech. As such, rates for *t*-glottalization decrease as speakers get older, across all classes, which are stratified by occupation. Usage drops the most dramatically for managers (middle class) and clerks (working class) as opposed to a more conservative drop for trade workers (working class). It appears that as speakers grow older, they learn to restrict their use of the stigmatized variant of /t/ in response to social demands. The difference between the clerks and trade workers can be attributed to the fact that the clerks' occupation requires more use of language and as a result is modeled after the middle class, presumably the makeup of their customers.

Unfortunately, we are unaware of comparable data for speakers of American English, particularly speakers living in the Western United States, that would shed more light on the change-in-progress versus age-grading hypotheses. As far as the social stigmatization of *t*-glottalizing is concerned, we can only rely on our informal observations. People appear to stigmatize glottal stops only when they appear before a schwa plus nasal combination word-finally (*Brenton* [b.ɪɛʔən], *fountain* [fæwʔən]). Glottalizing /t/ in words such as *football*, *output*, *put on*, and *but a*, on the other hand, seems to go unnoticed, or at least not commented on.

FIGURE 4
Hypothetical Factor Weights If Glottalization Were Increasing

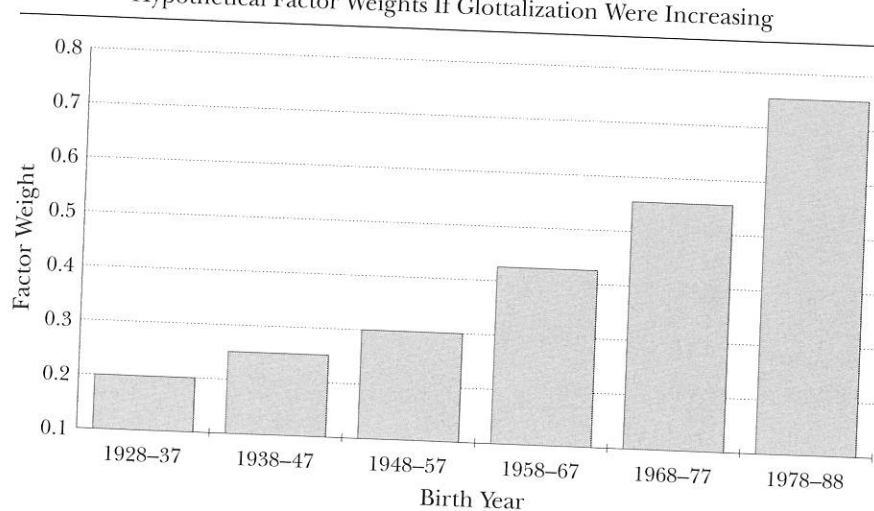
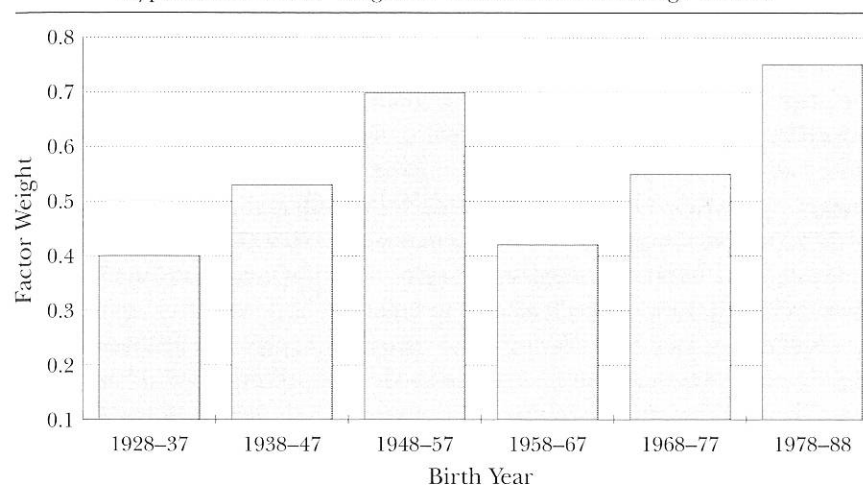


FIGURE 5
Hypothetical Factor Weights If Glottalization Were Age-Graded



The last trend apparent in our data relates to the geographical distribution of glottalization. Our data suggest that glottalization is more common in the Western states when compared with non-Western states. This must be considered in light of its documented existence in the eastern half of the United States (Wells 1982; Levon 2006; Roberts 2006), along with the fact that even in that part of the country there is significant regional variation in glottalization rates (Byrd 1994). Further studies that include the geographic distribution of glottalization should provide better insight into the origin of the innovation in the United States, as well as its direction of spread.

READING TASK

Most studies of glottalization have something to say about the degree of social stigma attached to the use of the glottal variant. As mentioned before, our sense is that there is a stigma associated with glottal stops when they appear before a schwa-plus-nasal combination word-finally (*Colton* [k^hɔlʔən]), but we have no data to indicate whether this also applies in the word-final position we have focused on. To get a sense of how stigmatized glottalization is, we elicited pronunciations in a more formal register. People tend to suppress stigmatized variants when reading sentences aloud (Labov 1972); therefore, a drop in glottalization rates when reading would indicate that people are self-conscious about their use of glottal stops.

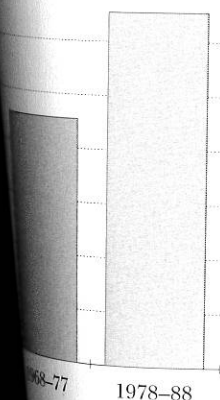
We asked 11 speakers to read each of the 19 sentences from the shad-

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plus nasal combination
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er hand, seems to go un-

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presented on a separate sheet of paper. None of these 11 speakers had participated in the shadowing experiment. We chose only female participants in their 20s for this task, since they appear to lead the change and would be the most likely ones to have suffered social stigma as a result. We determined the pronunciation in the same way as in the shadowing study. The results are surprising. In the shadowing experiment, the 20-year-old females produced glottal stops in 20.4% of the cases. In the reading task this increased to a staggering 55.8%. This high degree of glottalization in a task that tends to elicit very formal language clearly demonstrates that the use of the glottal is not stigmatized. It also suggests that glottalization may be more prevalent than the shadowing results lead one to believe.

Initially we used a shadowing task because it has proven effective in eliciting stigmatized pronunciations (Rohena-Madrado, Simonet, and Paz 2006); most likely it directs the participants' focus from their own pronunciations to the task of comprehending and repeating the sentences as quickly as possible. However, glottalization does not appear to be stigmatized—simple sentence reading yielded even more glottalized tokens, even more than shadowing. Perhaps future studies of glottalization should include this simple task.

Why reading produced more instances of glottal stops than shadowing is somewhat of a mystery. One possible explanation is that reading involves a higher degree of orthographic activation than shadowing. People may feel uncomfortable pronouncing the grapheme *t* as a flap because flaps are phonetically closer to [d], which has its own grapheme. Note the common expression "saying ones *ts* like *ds*." On the other hand, [ɾ] may be perceived as more strongly linked to *t*. This may be due to two things: its voicelessness and the lack of a grapheme that is associated with [ɾ]. Our intuition is that in the participant's minds, they were correctly pronouncing *ts* rather than "less correct" *ds*.

CONCLUSIONS

The realization of /t/ as a glottal stop is found throughout the English-speaking world. While there is an abundant literature on *t*-glottalization in the United Kingdom, investigation into the linguistic, geographic, and social factors that influence it in American English is in its infancy. *T*-glottalization is quite common in English preconsonantly; however, before vowels there appears to be more variation. For this reason, we chose to study glottalization of word-final, prevocalic /t/ in American English.

Data were gathered through an experiment in which participants were asked to repeat sentences they were presented auditorily (e.g., *She twisted her right ankle*). The pronunciation of /t/ in the presented sentences was masked

with a tone, which precluded the participants from merely parroting the pronunciation they heard. This method allowed the variable under study to be elicited under laboratory conditions.

We performed a logistic regression analysis on the resulting data and found three factors that significantly influence *t*-glottalization. First, glottalization is more prevalent before front vowels than back vowels. The fact that this is the only linguistic variable that was significant may be due to the experimental paradigm in which only 19 test words were used. This means that the possible phonetic environments in which /t/ appeared were severely limited. Analysis of casual conversation would provide a more diverse range of phonetic environments, which may ultimately show that other linguistic variables influence glottalization as well. For example, although they were not statistically significant, two trends are evident that further research ought to consider. Of the high frequency words, 11.7% were glottalized compared with 9.8% of the low frequency words. Stress may also be an influencing factor; when /t/ occurs before a stressed syllable, glottal stops are the result in 17.3% of the cases. This contrasts with a glottalization rate of only 7.0% following a stressless syllable.

The second principal finding is that younger females use glottal stops much more often than older speakers and males. Women used more glottal stops than men in every age group except one, the youngest group of males. This is consistent with a large body of sociolinguistic evidence which shows that young women tend to be on the forefront of innovative linguistic change. Whether the age-related differences indicate a change in progress or merely reflect age-grading will need to be answered by future research.

Finally, we found that speakers from the western U.S. glottalized more than non-Westerners. Whether this indicates a west-to-east spread of this phonetic feature is difficult to determine without more data, especially in light of the differences in glottalization rates that have been observed east of the Mississippi (Byrd 1994). *T*-glottalization has occurred in English for quite some time, but it appears to have been commandeered as a social marker of sex, age, and regional affiliation. Young women who are on the forefront of the change have no qualms about using it over half of the time in the formal context of reading aloud, which demonstrates that glottalization is not overtly stigmatized, a factor which may allow it to spread more quickly.

One of the most salient differences between American and British varieties is the phonetic realization of /t/. However, the idea that glottal stops are absent in American English is an oversimplification. In fact, our study suggests that American English is moving toward a more British pronunciation, at least in the phonetic context under study. We hope that the present study will spark further sociolinguistic research into *t*-glottalization in American English.

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