

Prevalence of Vocal Fry in Young Adult Male American English Speakers

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Summary: The purpose of this study was to assess possible gender differences in the prevalence of vocal fry in the voices of young male college students. Results were compared with previously published findings derived from a matched sample of female speakers. Thirty-four male college students, native American English speakers, produced speech samples in two speaking conditions: (1) sustained isolated vowel /a/ and (2) reading task. Data analyses included perceptual evaluations by two licensed speech-language pathologists. Results showed that vocal fry was perceived significantly more frequently in sentences than in isolated vowel productions. When vocal fry occurred in sentences, it was detected significantly more often in sentence-final position than in initial- and/or mid-sentence position. Furthermore, the prevalence of vocal fry in sentences was significantly lower for male speakers than has previously been reported for female speakers. Possible physiological and sociolinguistic explanations are discussed.

Key Words: Prevalence of vocal fry–Perceptual judgments–Gender differences–Sociolinguistic factors.

INTRODUCTION

Vocal (glottal) fry is a vocal register characterized by a unique pulse-like vibratory pattern of low frequency and a distinctive popcorn-like perception.^{1–7} It has been the subject of numerous studies in the fields of speech-language pathology and psycholinguistics.^{1,2,4,5,8–14}

Although long recognized as a vocal register, vocal fry has been historically considered a sign (ie, “characteristic of the voice that can be measured and tested”) of a voice disorder in the field of speech-language pathology because it often co-occurs with other signs of abnormal vocal laryngeal outputs, such as hoarse, harsh, and rough voice qualities.¹⁵ (p.14)–20 Indeed, clinical studies often emphasize the co-occurrence of persistent vocal fry with other signs (ie, objective measures) of vocal pathologies, whereas linguistic studies stress the communicative roles of local and sporadic uses of vocal fry.^{4,8–10,13,14,16–26} This critical distinction between persistent and sporadic presence of vocal fry in the voice differentiates the pathologic use from the nonpathologic use of vocal fry. In a recent study, Gottliebson et al²⁷ analyzed perceptual judgments of specific voice characteristics of college students during conversational speech using the Quick Screen for Voice. They reported that 14% of speech-language pathology students, whose voices were judged to be outside of normal limits, showed persistence of glottal fry and two or more features indicative of disordered voice (ie, hoarse voice, creaky voice, strained phonation, and abnormally low pitch). They also noted that 18% of those who passed the screening assessment exhibited vocal fry. The finding that speakers with and without signs of vocal pathology produce vocal fry highlights the dual facet of this register.

Over 40 years ago, Hollien et al^{4,7} advised against viewing sporadic vocal fry solely as a sign of vocal pathology. They recommended that sporadic vocal fry be recognized as

a distinct normal physiological mode of laryngeal vibrations situated at the low-end of the modal register. They reported that sporadic vocal fry is frequently perceived in normal voices, adding that speakers without any vocal pathology have the ability to switch from modal register to fry register for communicative purposes.^{3–5,28}

In the field of speech-language pathology, several terms are used interchangeably for vocal fry: “pulse” register, “creaky” voice, or “strobass,” whereas in the field of psycholinguistic research, the terms “glottalization,” “irregular phonation,” “pulse phonation,” or “laryngealization” are the favored labels to describe this mode of phonation.^{4–6,13,22,24,29–32} This difference in terminology may simply reflect years of independent research in two distinct professional domains, namely speech-language pathology and psycholinguistics.

The presence of sporadic vocal fry in the speech of individuals devoid of any vocal pathology is in keeping with numerous findings in the field of psycholinguistics research, which reports that glottal fry/glottalization serves an array of linguistic (eg, phonological), pragmatic (eg, turn-taking), and metalinguistic (eg, emotions) purposes in American English.^{8–10,13,14,21–25} Vocal fry is not lexically contrastive in American English, whereas it is in some Chinese (eg, Mandarin), Mexican (eg, Tzeltal), and Chadic languages of West African (eg, Hausa) dialects but not in their standard forms.^{6,8–10,33–37}

In American English, vocal fry is believed to signal the beginning of intonational phrases and/or syntactic boundaries, as the rate of glottalization is highest at the end of paragraphs and at the end of sentences.^{10,12–14,22,23} Similar effects have been documented in British English, Swedish, Czech, Finnish, Serbian/Croatian, and Chinese.^{31,38–42} Dilley et al²² examined word-initial vowels in a corpus of radio news American English. They noted that the rate of glottalization was highest after a pause and after vowels. Slifka⁴³ reported that some speakers tend to glottalize more often in utterance-final position than in any other utterance position. Redi and Shattuck-Hufnagel¹³ used read sentences for which several factors were controlled (text, segmental context, position within utterances, and prosodic location). They found a high rate of glottalization of words at the end of utterances and at the boundaries of full intonation of phrases. Surana and Slifka¹⁴ used a phonetically

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balanced database (Texas Instruments/Massachusetts Institute of Technology or TIMIT) comprised of read and isolated utterances produced by speakers of two dialects of American English. They found that 78% of the irregular phonations were prevalent at word boundaries and 5% occurred at syllable boundaries. Furthermore, of those found at the syllable boundaries, 72% were positioned at the junction of a compound-word (eg, “outcast”) or at the junction of a base word and a suffix. Overall, these studies show that glottal fry serves as a phonologically contrastive marker in several languages.

In addition, the occurrence of vocal fry at the end of sentences may serve a pragmatic function. In Finnish, Ogden⁴² analyzed radio speech and showed that creak signals turn yielding in conversational speech, whereas glottal stops signal turn holding. Laver⁸ reported that speakers of Received Pronunciation (RP), also called Queen’s (King’s) English, Oxford English, or BBC English, use a combination of vocal fry and falling intonation to cue the end of a speaker’s turn during conversation. Local et al⁴¹ reported that speakers of London Jamaican use vocal fry in combination with other features (ie, loudness and prosody changes) to signal turn taking. However, glottalization is not used to cue turn-endings in the Tyneside dialect of British English, suggesting dialectal variations in the use of vocal fry.⁴⁰

There is also evidence of dialectal variations in the rate of laryngealization in American English.⁴⁴ In Byrd’s study, the production of glottal stops, which was determined based on phonetic transcription, qualified as laryngealization, vocal fry, or creak. She used read sentences from the TIMIT database. Male and female participants, mostly Caucasian between the ages 20 and 30 years with different education levels, were speakers of eight different American English dialects. She reported that some dialects (North and South) also used more glottal stops than others (North Midland and “Army Brats”) in some word positions only (initial and final position only).

Additional findings further suggest that the rate of glottalization varies within a language as a function of gender.^{13,22,44} Using a combination of perceptual and/or acoustic measures of glottalization, Dilley et al²² as well as Redi and Shattuck-Hufnagel¹³ examined the prevalence of creak in professional and nonprofessional voice users. In American English, Dilley et al²² observed that the rate of laryngealization was higher in the three female radio news announcers (40%, 44%, and 38%) than in the two male radio announcers (24% and 13%) when asked to read stories. Redi and Shattuck-Hufnagel¹³ had professional and nonprofessional voice users read sentences. They showed that the three female radio news announcers glottalized systematically more often (68%, 88%, and 64%) than three male professional radio speakers (13%, 49%, and 37%). In the nonprofessional sample, results were mixed perhaps, due to the fact that this sample included American and Canadian English speakers and more female than male speakers. These studies suggest that vocal fry is used more frequently by female speakers than by male speakers in AE. However, these studies have a small number of participants and most often are limited to voice professionals (ie, radio news announcers). Using a completely different measure of vo-

cal fry (ie, production of glottal stops), Byrd⁴⁴ also reported that women systematically used more glottal stops than men in all word positions considered (initial, medial, and final). She added, however, that the smaller number of women than of men in the study limited the conclusions.

Overall, studies suggest that the rate of glottalization varies with a number of factors (ie, dialects, prosodic structure, and location in the utterance). It is, therefore, imperative to use a standardized procedure in which there is tight control over several variables. Hence, in this study, all participants read a phonetically balanced and controlled passage and no conversational speech was used as there is evidence that the rate of glottalization differs with the use of different texts.⁴⁵ In addition, the present study examined the prevalence of vocal fry in a sample of male college students and compared the findings with those of a previous study of matched female speakers using an identical protocol and identical number of participants for each gender.⁴⁶ The goal of this study was to assess possible gender differences in the prevalence of vocal fry in AE speakers, not contemplated in our previous work. Past studies have shown that vocal fry might be a gender marker in various languages.^{13,22,31,40,41,44,45,47}

METHOD

As stated earlier, this study follows the protocol described in Wolk et al.⁴⁶ Although that study made an important contribution, it did not anticipate the importance of analyzing a gender effect. Hence, a second, follow-up study based on the first one was subsequently envisioned to address gender as a different aspect of the research problem. All the data from both the previous and the current studies were collected over the span of about 11 months, and each of those separate data collection efforts themselves spanned several months. We have no reason to believe that the few months that occurred *between* data collection efforts had a greater effect on differences between the effects found for the male participants in the second stage than the few months *within* the separate data collection efforts had on the separate cohorts of female and male participants. It was further decided that the research would be conducted in the same location (a specific college campus), would follow exactly the same protocol, and would use the same instrumentation and analytic techniques. The development of a completely new sample, however, of both new female and male participants would have represented both an unnecessary and avoidable inconvenience on and burden to the female subjects. Given that the second female sample would be a replication of the original sample of female subjects from the previous experiment (conducted only a few months before in the same site), and, further, given that no additional information would be expected from a different female sample (beyond variation due to sampling error), and, finally, given the fact that the new male sample would participate in an experiment essentially identical in design, location, instrumentation, and analysis to the previous female sample, the research team concluded that it was both legally and ethically obligated to minimize the inconvenience and burden to the female subjects by collecting

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