

# Perceived Desirability of Vocal Fry Among Female Speech Communication Disorders Graduate Students

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**Summary:** Twenty-three female Speech Communication Disorders (SCD) graduate students rated the desirability of 25 adjectives used to describe perceived speaker's affect (including attitude, emotion, etc). A three-point weighted scale—desirable = 3, in-between = 2, and undesirable = 1—was used and a “desirability score” was calculated for each of these adjectives. Afterward, students were asked to use these adjectives to describe the perceived communication affect of female speakers with voices characterized by “vocal fry” as well as seven other vocal qualities (rough, breathy, strained, loud, high pitch, low pitch, and soft/weak). Proficiency of the students in identification of each of these eight voice qualities was determined before the survey. A desirability score for each voice quality, with a focus on vocal fry, was calculated by averaging the sum of the weighted counts for each adjective used to describe that vocal quality.

**Results.** Ten adjectives were rated as desirable (eg, cool), two were rated as in-between (eg, nonaggressive), and 13 were rated as undesirable (eg, vain). Thirty-two percent used only undesirable adjectives to describe vocal fry; 64% used a mixture of desirable, in-between, and undesirable; and 5% used only desirable adjectives and one in-between adjective. The relative order of the desirability scores of the vocal qualities was low pitch (2.13), high pitch (2.11), loud (1.89), vocal fry (1.82), breathy (1.77), soft/weak (1.68), rough (1.46), and strained (1.08). A vocal quality profile for each adjective was created. Vocal fry was the primary vocal quality associated with the adjectives vain (56%), apathetic/disinterested (48%), sleepy (38%), relaxed/chill (38%), and bored/unengaged (36%).

**Conclusions.** SCD graduate student participants rated the desirability of 25 adjectives used to describe the perceived speaker's affect (including attitude, emotion, etc), and a “desirability score” was calculated for each. Afterward, they used these adjectives to describe the perceived communication affect of female speakers with voices characterized by vocal fry. Most participants were undecided, 30% perceived it as undesirable, and only 5% perceived it as desirable. The desirability scoring system and the adjectives used in this study add to the growing literature focusing on how different vocal qualities influence the listener's perception of the speaker's affect.

**Key Words:** Vocal fry—Glottal fry—Perception—Description—Female.

## INTRODUCTION

### Background on vocal fry

In linguistics, vocal fry is considered a subclass of creaky voice phonation that has recently been differentiated from other forms of creaky voice; vocal fry being described as a constricted glottis, low fundamental frequency, and more often periodic with a high damping of pulses.<sup>1</sup> Throughout the media, in the performance world, and medically, vocal fry has been the predominant term used to describe all similar occurrences of this nonmodal phonation type. Acoustically, “vocal fry” and “creaky voice” are highly differentiated to determine the combination of correlates to produce the variable forms of creaky voice. For the purposes of this study, we use the term vocal fry to describe the spectrum of pulsed nonmodal phonation types generally below approximately 75 Hz as this is the general frequency

at which pulses occur. Aerodynamically, studies have found that those speaking with vocal fry present with a lower airflow rate of about 10–100 mL/s with a minimal abduction period, compared with an airflow rate of 70–180 mL/s when speaking in the modal register.<sup>2</sup> There is reduced subglottal air pressure and increased vocal fold thickness due to “unopposed thyroarytenoid muscle contraction.”<sup>2</sup> Modal register frequency ranges are significantly higher in both men and women than the frequencies noted in the fry register; average modal register frequencies for women were found to be in the range of 175–266 Hz, and 86–170 Hz for men.<sup>3</sup> Average vocal fry frequencies for women were 24–77 Hz and were 24–72 Hz for men, indicating a notable difference between female modal register frequency range and fry register frequency ranges, while nonsignificant for men.<sup>2</sup>

### Vocal fry in normal populations

Research on the subject has indicated presence of vocal fry in patients with contact granulomas.<sup>4</sup> It can also present comorbidly with other disordered qualities or be found in normal populations. It was first suggested in 1966 by Hollien et al that vocal fry may not always indicate a vocal pathology.<sup>5</sup> Gottliebson et al<sup>6</sup> screened the vocal qualities of 104 Speech Communication Disorders (SCD) graduate students. Fifteen failed, demonstrating more than one abnormal quality. All those who failed had vocal fry in addition to one other abnormal quality. However, vocal fry

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was also present in 16 participants who passed the screener. Linguistically, Wolk et al noted that authors internationally have reported that vocal fry is a linguistic style signifying the end of a spoken thought with various factors influencing rate of use.<sup>7</sup> Wolk et al added to Hollien et al's idea that vocal fry may not always indicate vocal pathology by positing that vocal fry can exist as "a physiologically normal laryngeal capability," commonly used by female adults, with over two thirds of Wolk et al's participants presenting with vocal fry in sentence reading.<sup>5,7</sup> This was controversial among the voice care world and the media. The questions arose: is this addressing a new phenomenon? What is the perception of graduate students trained in voice identification of the use of vocal fry by their peers? Is it positive or negative within a given context? Furthermore, what can be learned about the views of SCD students and what impact might it have on their future clinical decision-making for treatment of vocal fry and its various underpinnings?

### **Influence of the media**

In 2005, research by Pennock-Speck also suggested an increase in vocal fry use by young American women.<sup>8</sup> This may be attributed to increased models of vocal fry use in the media.<sup>7</sup> Furthermore, women have been noted to use vocal fry significantly more often than their male counterparts.<sup>9</sup> The exact degree to which vocal fry has increased is not clear, as researchers have found that vocal fry was present in "young and middle-aged women" without significant difference in prevalence.<sup>10</sup>

When further investigating the prevalence of vocal fry use by this population, Gibson<sup>11</sup> found that the majority of 50 American female undergraduate participants presented with at least one instance of vocal fry when repeating nonsense words. Such words were chosen to severely limit semantic, pragmatic, or syntactic influences on vocal fry use to better examine the influence of lexical stress. Vocal fry was present more often on unstressed syllables by both frequent and infrequent users. Infrequent users appeared to use vocal fry to mark the end of an utterance and therefore seemed linguistically motivated. However, frequent users appeared to use vocal fry to signal greater emphasis and therefore seemed pragmatically motivated.

Research alludes to the idea that vocal fry use is increasing or has changed. However, this has been disproved by at least one study.<sup>10</sup> Therefore, the present study seeks to explore the question, what do SCD graduate students perceive is the prevalence of individuals with vocal fry? Are their perceptions aligned with acoustic and aerodynamic definitions?

### **Cultural considerations**

Within Gibson's study<sup>11</sup> and in prior research, the race of participants was not reported. Some have indicated that prior research on the young American female speech has a "dimension of whiteness," noting less creaky voice in African-American women,<sup>12</sup> whereas others note differing "enregisterment," or the choice of use of a register (including vocal fry) linguistically, by Chicana gang girls in California

as compared with young white American women.<sup>13</sup> Yuasa<sup>14</sup> asked college-age American women's perceptions of fry in Northern California and Eastern Iowa. Her participants rated vocal fry as slightly "hesitant, not so 'confident,' casual or informal, compliant or non-aggressive, genuine or not pretentious, educated, urban-oriented and upwardly mobile." There were no differences between groups, perhaps meaning that the vocal fry register communicated the same thing between divergent regions of the country. Yuasa also found that fry was more frequently used by her American female speakers than by American male speakers, but also more often than by Japanese female speakers, indicating possible cultural-linguistic factors within the younger population. Given that race and gender are only beginning to be explored in this area, it is a consideration of the present study team.

In this context, this team sought to investigate the perceived purpose of vocal fry use by a young white American female population. Previous research has speculated that as women share more roles with men, their use of vocal fry may be an attempt at being more manly,<sup>8</sup> which may relate to perceptions of physical and social dominance<sup>15</sup> and leadership ability.<sup>16</sup> Use of fry to demonstrate dominance has been suggested by multiple authors through various descriptors: "authoritative,"<sup>17</sup> "assuming a position of power," or "authoritative stance,"<sup>12</sup> and a "wish to be seen as being in control while showing indifference."<sup>8</sup>

Perceptions of this quality within a work environment, race aside, reportedly differ. Anderson et al<sup>18</sup> asked 800 participants to listen to seven female and seven male young adults (between 19 and 30 years) say "Thank you for considering me for this opportunity," first in their "normal" voice and then with a vocal fry voice that they were trained to use. Vocal fry in young female adults was perceived as "less competent, less educated, less trustworthy, less attractive, and less desirable," particularly by female listeners. The researchers do admit that coached imitation of vocal fry was a limitation of the study.

### **Media influences on culture**

Today, the media are the driving force in pop culture. Prior research has begun to associate the media with the use of vocal fry by young American women.<sup>18</sup> The present study team asks, is this possible association one that is consciously perceived by young women using vocal fry?

Pennock-Speck<sup>8</sup> compared vocal fry use in the American versus British roles of three well-known actresses. Results indicated that all three used significantly more fry in their American movies than in their British movies to increase "desirability," suggesting its active use in American media. Wolk et al<sup>7</sup> anecdotally indicated that vocal fry has been "modeled to match popular figures." Dille et al<sup>17</sup> indicated that it was frequent in radio newscasters and in further research by Redi and Shattuck-Hufnagel<sup>19</sup> those female radio announcers with vocal fry were "dispreferred."

Since 2011, multiple media formats have addressed vocal fry and have indicated several prominent young women in the media who use it. The list of articles is vast with examples including "Are 'creaking' pop stars changing how

young women speak?"<sup>20</sup> "Get your creak on: is 'vocal fry' a female fad?"<sup>21</sup> "Do you have 'annoying' girl voice?"<sup>22</sup> "Why old men find young women's voices so annoying?"<sup>23</sup> and "I took my girlfriend to a speech therapist to cure her annoying vocal fry."<sup>24</sup> Ira Glass of National Public Radio's "This American Life" uses vocal fry but says that none of the negative comments about vocal fry used on the show have been directed at him.<sup>25</sup> Rather, comments have been directed at various female members of the show. It appears that much of the media carries a negative opinion of vocal fry even when many of its stars are using it<sup>26</sup>: Britney Spears, the Kardashians, Paris Hilton, Scarlett Johansson, Zooey Deschanel, Emma Stone, Hillary Clinton, Lady Gaga, and Ke\$ha. Meanwhile, "Can We Just, Like, Get Over the Way Women Talk?"<sup>27</sup> talks about simply accepting all female vocal qualities, including vocal fry.

### Aims

To investigate this possible connection between the media and vocal fry use and to determine the perceptions of participants on vocal fry use, the present study team sought:

1. To investigate if the participant's opinion was overwhelmingly positive or negative within this specified context. Positive and negative rating was established based on assessments given a variety of adjectives rated as positive or negative. These adjective profiles are presented for descriptive purposes.
2. To investigate the profiles of voice qualities associated with each adjective to understand the perceived uses of vocal fry more fully.
3. To determine prevalence and conscious awareness of vocal fry use in asking (a) whether the participants could identify vocal fry use easily in comparison to other vocal qualities, (b) if there was perceived media influence of its use on society, (c) which population is influenced the most, and (d) which population is perceived to use vocal fry most.
4. To discuss these items within the context of an SCD training program.

## METHOD

### Participants

Twenty-three female SCD graduate student participants from a large university located in a mid-Atlantic state volunteered. Although race was not reported in this dataset, demographics are thought to be typical of most SCD programs. Each completed a survey designed to capture information on media use, societal influence, and social desirability of eight different vocal qualities: vocal fry, rough, breathy, strained, loud, high pitch, low pitch, and soft/weak. SCD graduate students were selected due to motivation to learn the vocal qualities as enrolled students, though this survey was not graded, and the perceived prevalence of vocal fry being high in this population as compared with other populations. At the time they took the survey,

the participants were enrolled in an SCD course through which they had received nonbiased factual training in identification of vocal qualities. The voice identification training was facilitated using the interactive multimedia package, "A Sound Judgment" created by Oates and Russell.<sup>28</sup> The training package included a quiz that each participant completed after the training. The class average quiz score of 95% was taken as evidence of participant proficiency in voice identification.

### Training

Training occurred within the first two weeks of the voice disorders course, after reviewing anatomy. The participants were then asked to participate by completing the survey before continuing with instruction on vocal fry or all other vocal qualities. Of the participants, only one participant had a prior degree in vocal performance. All other participants were nonsingers and nonpedagogy or voice disorder-oriented participants.

### Instrument

Participants were asked to complete the survey before learning any information regarding voice disorders within their course. All participants were then asked to consider other female voices within the United States of America. The survey had a total of 140 questions. Participants were first asked to rate the desirability of 25 adjectives and then used these adjectives to describe eight vocal qualities.

Earlier studies have focused on the role that voice quality plays in signaling the speaker communication affect, broadly defined to include aspects of speaker attitude, mood, and emotion.<sup>29–31</sup>

The research team selected 25 different adjectives of communication attitude, mood, and emotion, based on an earlier pilot study and prior research on creaky voice and vocal fry,<sup>12,14</sup> to use these adjective ratings to describe different vocal qualities.

The first section asked the participants to rate each of 25 adjectives, selected based on a pilot survey performed in the previous year, as desirable = 1, in-between = 2, and undesirable = 3. This section was followed by eight sets of three questions each where, for each vocal quality, the participants were asked to select all the adjectives—from the 25 adjectives list—that applied to that vocal quality. They were then asked to explain their selections and asked if they wanted to mention any additional descriptors not found on the adjective list. The full survey is available from the authors.

## THEORY/CALCULATION

### Adjective desirability

The first step in calculating the desirability score for each adjective was to reverse code the scale used in the survey so that the higher numerical score category was associated with the more desirable outcome—that is, desirable = 3, in-between = 2, and undesirable = 1. Each response was then weighted by the value of its score category. The weighted

responses were then summed and divided by the total number of responses.

$$\text{Adjective desirability} = \frac{\sum \left( \frac{\text{category value} * \text{number of responses in the category}}{\text{total number of responses across all categories}} \right)}{\text{total number of responses across all categories}}$$

This results in a score for each adjective that can be evaluated using the reverse score three-point adjective rating scale from the survey. Additionally, this score is used in the calculation of vocal quality desirability.

### Vocal quality desirability

To avoid biases that the participants may hold regarding the eight different vocal qualities, they were not asked to directly rate the desirability of each vocal quality. Instead they were asked to select all of the adjectives from the list of 25 that they thought were descriptive of each vocal quality. Their responses for each adjective were summed and weighted using the adjective desirability scores. The weighted adjective scores were summed across all adjectives used to describe each vocal quality. Then this sum was divided by the total number of endorsements across all adjectives used to describe each vocal quality (where vocal quality desirability is VQD):

$$\text{VQD} = \frac{\sum \left( \frac{\text{adjective desirability} * \text{number of responses for the adjective}}{\text{total number of responses across all adjectives}} \right)}{\text{total number of responses across all adjectives}}$$

Calculating vocal quality desirability this way allowed us to indirectly assess the participants' perception of each vocal quality. The resulting score is comparable across all vocal qualities, regardless of the number of adjectives used to describe each quality or the number of endorsements each adjective received within any given vocal quality. Additionally, using this calculation, vocal quality desirability can be evaluated using the reverse score three-point adjective rating scale from the survey; although, the relative position of the vocal qualities on the scale may be more informative.

### Vocal quality profiles

A vocal quality profile for each of the 25 adjectives was created by dividing the number of times an adjective was endorsed within a vocal quality by the total number of endorsements of the adjective across all vocal qualities. These proportions were then multiplied by 100 for interpretation as percentages (where vocal quality profile is VQP):

$$\text{VQP} = \sum \frac{\text{number of adjective endorsements within a vocal quality}}{\text{total number of adjective endorsements across all vocal qualities}} * 100.$$

This allows the researchers to compare vocal qualities based on the adjectives used to describe them. Since the total number of endorsements for the adjectives across vocal qualities varies, raw numbers of endorsements are also reported.

### Analysis

To investigate the perception of media involvement, data were collected from eight sets of four questions each, one set for each vocal quality, that ask the participants to identify a woman in the media whose voice is representative of a vocal quality, this person's influence on society (1 = a lot to 5 = not any at all), how much this person's voice use has influenced the way others use their voices (1 = a lot to 5 = not any at all), and the age group this person has influenced the most (older population (50+ years), middle aged population (35–49 years), young population (20–34 years), young children and teenage population (10–19 years), and all equally. This paper also examines the data collected on which vocal quality the participants thought was most prevalent in the media and the percentage of time (0%, 25%, 50%, 75%, and 100%) they hear each vocal quality in themselves, their classmates, and the age ranges in the population listed above. The data are analyzed using comparisons of raw response rates and the calculation of correlation coefficients (Spearman's rho).

## RESULTS

### Desirability

The distribution of the weighted averages was taken. This is the first time this survey has been used to quantitatively measure perceptions of the adjectives. The authors created the breakdowns to aid in the interpretation of the results. The breakdowns were created by dividing the range of possible scores into three equal parts: desirable, in-between, and undesirable. Scores greater than 2.33 were considered desirable, 1.67–2.32 were in-between, and 1–1.66 were undesirable. Ten adjectives were rated as desirable (in order from most to least: confident, mature, engaged, lively, sophisticated, relaxed/chill, cool, sweet, feminine, sexy), two were rated as in-between (nonaggressive and flirtatious), and thirteen were rated as undesirable (in order from least to most: apathetic/disinterested, aggressive, sleepy, vain, bored/unengaged, manly, insecure/hesitant, uneducated, unhealthy/sick, tense/stressed, depressed, painful, obnoxious.). [Figure 1](#) shows the distribution of weighted averages for the adjectives.

The responses were tallied, weighted, and averaged based on the adjective desirability to find the relative order of desirability of vocal qualities in a female voice. Cutoffs were the same as were set for our adjectives, (ie, 2.32 and above were desirable, 1.67–2.31 were in-between, and 1–1.66 were undesirable). [Figure 1](#) demonstrates the relative order of desirability of vocal qualities. Based on the original scale, no vocal qualities were found to be desirable; low pitch and high pitch were in-between and all others were undesirable. However, since these values are based on averaging values that were weighted with an average value, the values for the relative desirability of vocal qualities are best interpreted in relation to other relative desirability values. [Figure 2](#) displays the relative desirability of the vocal qualities.

Descriptive analysis of the responses given for vocal fry use by women revealed that 7 of 23 participants used only

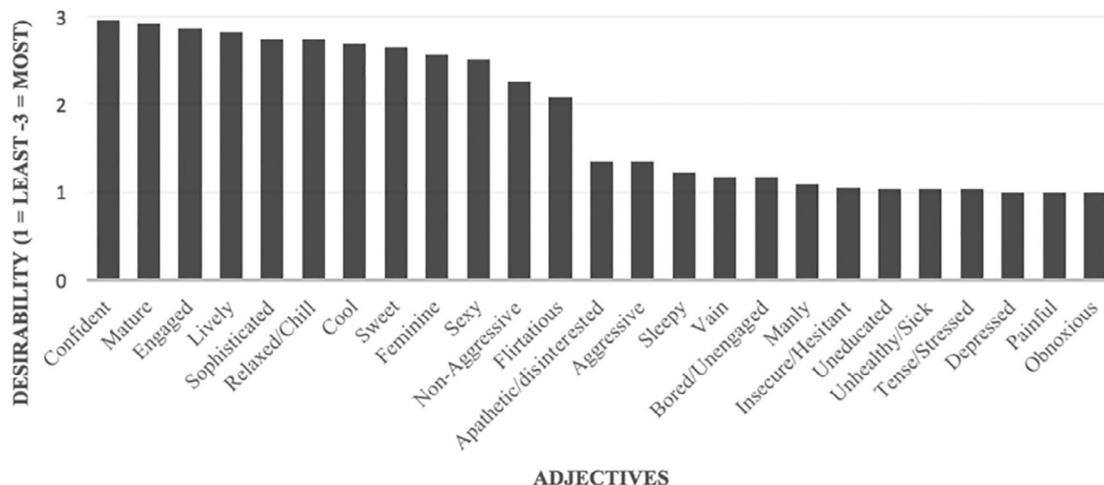


FIGURE 1. Distribution of the weighted averages from most to least desirable.

undesirable adjectives to describe vocal fry. The specific adjectives used were apathetic/disinterested, unhealthy/sick, bored/unengaged, sleepy, vain, depressed, and obnoxious. When asked why they chose these adjectives, commentary included “it’s the voice for when you just woke up or are falling asleep.” “It’s an ennu as if disconnected from the world,” and “feigning boredom and apathy in order to appear cool.” Other adjectives provided to describe it were “lazy, ditz, tired, valley girl.” Fourteen of the 23 participants used a mixture of desirable, in-between, and undesirable adjectives. The specific adjectives used were, obnoxious, nonaggressive, sleepy, apathetic/disinterested, relaxed/chill, bored/unengaged, unhealthy/sick, depressed, vain, painful, tense/strained, sexy, mature, flirtatious, manly, cool, and confident. When asked why they chose these adjectives, commentary included “female vocalists are using it and the perception is being changed to make it sexier.” “It drives me nuts and sounds so immature,” “Beautiful stars are using it, therefore it’s vain, mature, flirtatious, and sexy.” Finally, “It’s prevalent in NY especially and people seem to do it on purpose because it’s trendy like in the media.” Adjectives given were “matter-of-fact,” “exhaustion/fatigue,” “popular,” “annoying,” “trendy,” and “tired.” One participant used only desirable and one in-between adjective. Adjectives used here were, cool, confident, sophisticated, mature, flirtatious, sexy, and

relaxed/chill. When asked why, commentary stated “people do it to sound older and sexier.” An additional adjective stated was “trendy.” One participant seemed to have missed this question. No further explanation was elicited or given.

**Vocal quality profile**

A female vocal quality profile for each adjective was created based on the frequency the adjective was used to describe each vocal quality. Figure 3 shows the percentage of each adjective’s use in describing vocal qualities. For an alternate view, Table 1 gives the number of times each adjective was used to describe the vocal qualities that is depicted as a percent in Figure 3. Adjectives are reported in order from most to least relative importance of vocal fry. For each adjective profile reported, vocal qualities are ordered from most to least endorsements. The participants’ perceptions were as follows: each bar represents an adjective that was initially rated as positive or negative then used to describe each vocal quality, within the current context. Eighteen profiles contained vocal fry in varying amounts (Figure 3). “Obnoxious” was unique with added loudness, high pitch, and strain. “Manly” was similar to “sophisticated” and “mature” but has lower pitch, with rough, vocal fry, loud, and strain. The profiles for those adjectives not used for vocal fry were as follows: “lively” was novel and contained high pitch and loud.

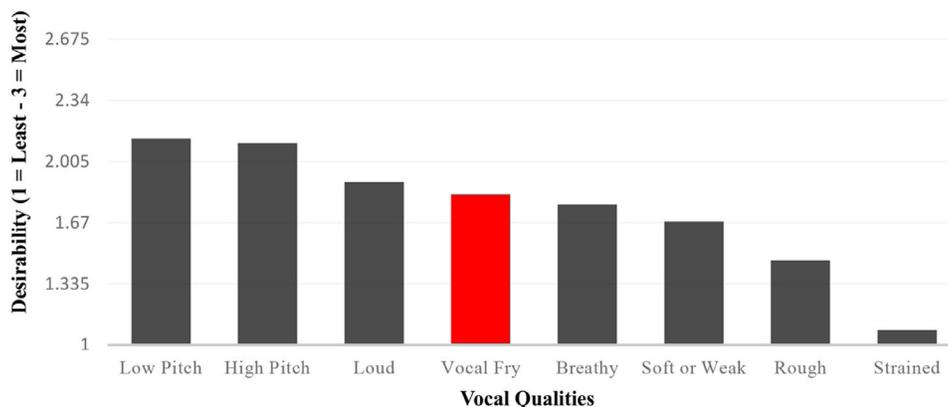
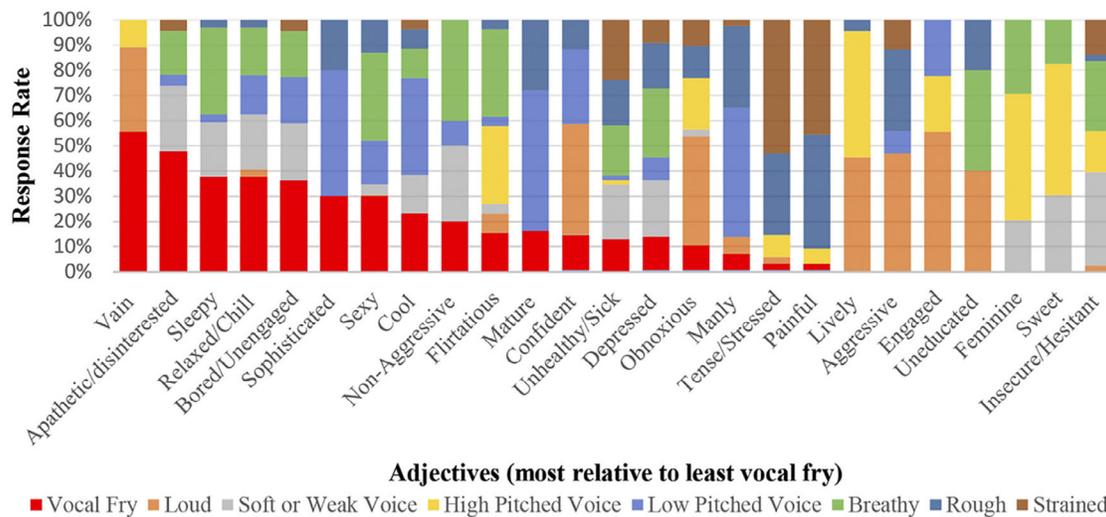


FIGURE 2. Relative desirability of vocal qualities.



**FIGURE 3.** Profile of voice qualities for each adjective.

“Aggressive” was loud, rough, strained, and low pitch. “Engaged” was similar to lively with loud, high pitch, or low pitch. To sound “uneducated,” the vocal profile was loud, breathy, and rough. To sound “feminine” and “sweet,” the profiles were nearly identical with high pitch, breathy, and soft/weak. Finally, “insecure/hesitant” added strain, loudness, and roughness to the “feminine” or “sweet” profiles.

**Media influence**

In the examination of our eight-part media analysis, participants’ responses varied in number and gender. Participants could not consistently name a woman in the media depending on the quality (Table 2). Vocal fry was the only vocal quality for which nearly all participants (91%) could name a corresponding female performer in the media. Breathly was

**TABLE 1.**  
**Number of Times Each Adjective Was Used to Describe a Vocal Quality**

	Vocal Fry	Loud	High-Pitched Voice	Low-Pitched Voice	Soft or Weak Voice	Breathy	Rough	Strained
Vain	5	3	1	0	0	0	0	0
Apathetic/disinterested	11	0	0	1	6	4	0	1
Sleepy	12	0	0	1	7	11	1	0
Relaxed/chill	12	1	0	5	7	6	1	0
Bored/unengaged	8	0	0	4	5	4	0	1
Sophisticated	3	0	0	5	0	0	2	0
Sexy	6	1	0	4	1	8	3	0
Cool	6	0	0	10	4	3	2	1
Nonaggressive	4	0	0	2	6	8	0	0
Flirtatious	4	2	8	1	1	9	1	0
Mature	4	0	0	14	0	0	7	0
Confident	5	15	0	10	0	0	4	0
Unhealthy/sick	7	0	1	1	12	11	10	13
Depressed	3	0	0	2	5	6	4	2
Obnoxious	4	17	8	0	1	0	5	4
Manly	3	3	0	22	0	0	14	1
Tense/stressed	1	1	3	0	0	0	11	18
Painful	1	0	2	0	0	0	15	15
Lively	0	10	11	0	0	0	1	0
Aggressive	0	16	0	3	0	0	11	4
Engaged	0	5	2	2	0	0	0	0
Uneducated	0	2	0	0	0	2	1	0
Feminine	0	0	17	0	7	10	0	0
Sweet	0	0	12	0	7	4	0	0
Insecure/hesitant	0	1	7	0	16	12	1	6

**TABLE 2.**  
**Women in the Media Named for Each Given Vocal Quality**

Quality	Names
Rough	Lindsay Lohan, Kelly Ripa, Kardashians Sisters, Amy Winehouse, Rachel Ray, Joan Rivers, Scarlett Johansen, Pink, Blythe Danner, Adele
Breathy	Marilyn Monroe, Kim Kardashian, Giada Delaurentis, Norah Jones, Live Tyler, Kathleen Turner, Sarah Jessica Parker, Diane Rehm, Janis Joplin
Strained	Adele, Mariah Cary, Nicki Minaj, Roseanne, Demi Moore, Joan Rivers, Diane Rehm, Kim Richards, Zooeey Deschanel, Fran Drescher
Vocal fry	Melissa Block, Ke\$ha, Britney Spears, Nina Dobrev, Paris Hilton, Scarlett Johansen, Kourtney Kardashian, Kim Richards, All Kardashians, Everyone
High pitched	Cristin Milioti, Kristin Chenoweth, Selena Gomez, Reese Witherspoon, Fran Drescher, Amy Adams, Jennifer Lawrence, Miley Cyrus, Lea Michele, Victoria Jackson, Cameron Diaz
Low pitched	Emma Stone, Cher, Lady Gaga, Anny Lee Miller, Jessica Biel, Hillary Cinton, Bea Arthur, Demi Moore, Giada Delaurentis, Lauren Bacall, Kathleen Turner
Loud	Sandra Bullock, Sofia Vergara, Kathy Griffin, Kelly Ripa, Chelsea Handler, Queen Latifa, Rosie O'Donnel, Miley Cyrus, Joan Rivers
Soft or weak	Lady Gaga, Scarlett Johansson, Amanda Seyfried, Phyllis from "The Office," Katherine Hepburn, Kristen Stewart, Meryl Streep, Zooeey Deschanel, Giada Delaurentis, Kim Kardashian, Janet Jackson, Victoria Beckham, Nicole Kidman, Dido, Kate Beckinsale

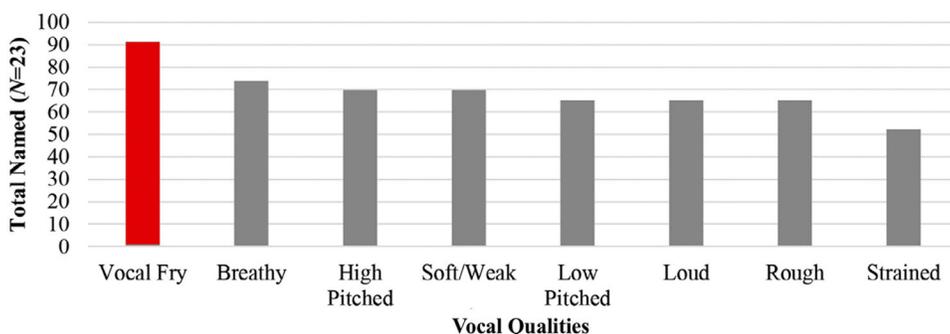
the next highest with 74%, then high pitched with 70%, soft/weak with 70%, low pitched with 65%, loud with 65%, rough with 65% and strained with 52% (Figure 4).

After naming a woman in the media, the participants rated performers' influence on society. The rating was on a scale from 1 = not any at all to 5 = a lot (Figure 5). Their rating of general influence indicated that women in the media using vocal fry were fourth behind soft/weak, loud, and breathy voices. Marilyn Monroe was named most often for soft/weak or breathy voice. No one in the media earned an average above 3 on the rating scale for influence. Those

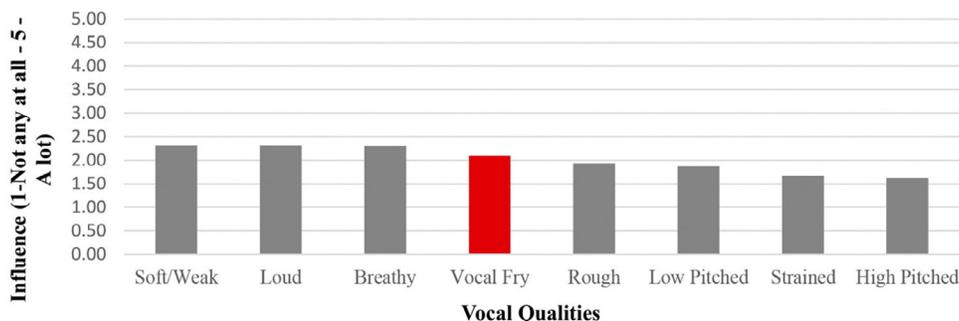
using a high-pitched voice had the least amount of reported relative influence on society.

When asked to rate the influence their voices have had on how others use their voice, on average, vocal fry use by a woman in the media had an influence score of 2.28 of 5 (Figure 6). Notably, results were split with nearly half reporting that vocal fry has had a lot of influence on how others use their voice, whereas the other half reported that it had "not any at all."

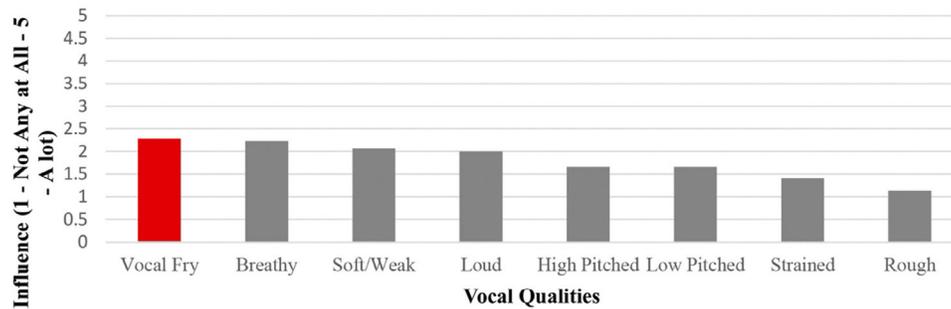
When graduate student participants were asked "What generation is most influenced by this person?" endorsements



**FIGURE 4.** Distribution of the weighted averages from most to least desirable.



**FIGURE 5.** Average reported societal influence of named women with a given voice quality.



**FIGURE 6.** Average reported influence on societal voice use of named women with a given voice quality.

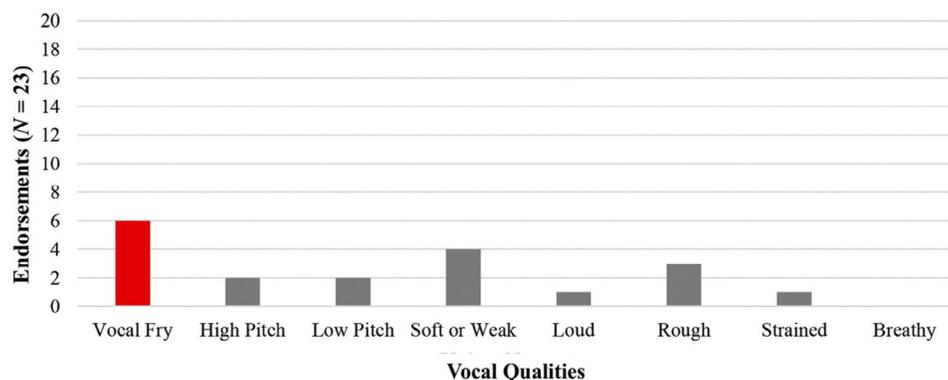
are reported as follows. The children and teenage population (10- to 19-year-olds) was most relatively influenced by those named for using vocal fry (six endorsements) (Figure 7). The young population (20- to 34-year-olds), was most relatively influenced by those named for using vocal fry (14 endorsements) (Figure 8). The middle-aged population (35- to 49-year-olds) were most influenced by those named for using rough (five endorsements) and breathy (five endorsements) voices (Figure 9). The older population (50+ years of age) was influenced most by those named for using a breathy voice (Figure 10). Nonsignificant endorsements were given (one or two) for the influence being equal across the generations (Figure 11).

Graphed in Figure 12, our participants reported that vocal fry is the most predominant vocal quality in the media ( $n = 14$ ). The next most predominant quality was loud with six endorsements.

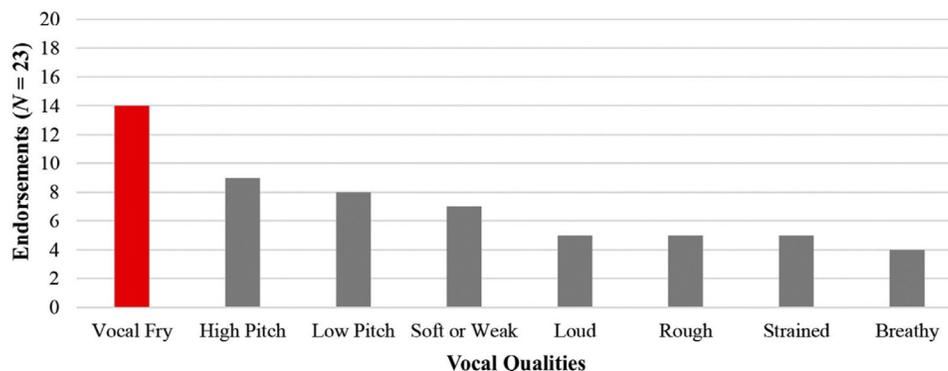
### Generational differences

Generationally, a profile of perceived voice quality prevalence was surveyed. Vocal fry was perceived 25% of the time in the participants' own voices, yet 75% of the time in the voices of the 13- to 19-year-olds, 20- to 34-year-olds, and their own classmates. Positive correlations among the latter three groups, in the current context, indicate that a strong relationship in the perceived percent of time vocal fry is used in these groups. In the aged 50+ group, all vocal qualities were rated as more prevalent; however, there was no consensus as to how prevalently they were heard. In the 35- to 49-year-old group, no vocal qualities were perceived to be predominant with all being heard 25% of the time.

In the aged 50+ population, the majority of participants felt that they heard rough and soft/weak voices 50% of the time with breathy, strained, vocal fry, high pitched, low pitched, and loud being heard 25% of the time. In the 35- to



**FIGURE 7.** Perceived influence named women in the media have had on the young children and teenage population (aged 10–17).



**FIGURE 8.** Perceived influence named women in the media have had on the young population (aged 20–34).

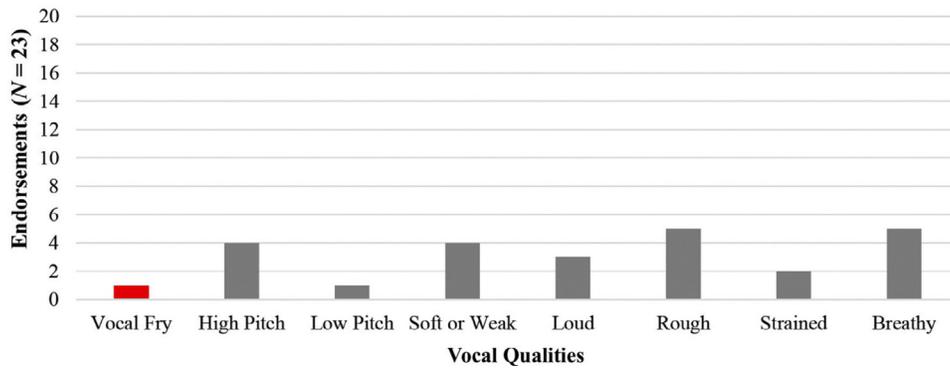


FIGURE 9. Perceived influence named women in the media have had on the middle-aged population (aged 35–49).

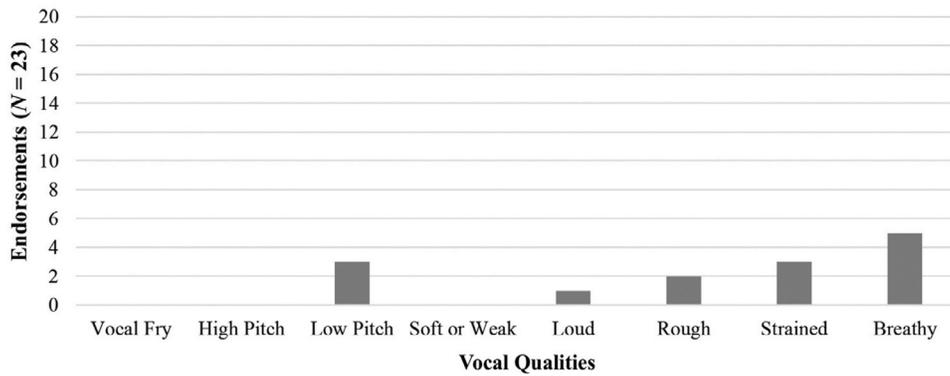


FIGURE 10. Perceived influence named women in the media have had on the older population (aged 50+).

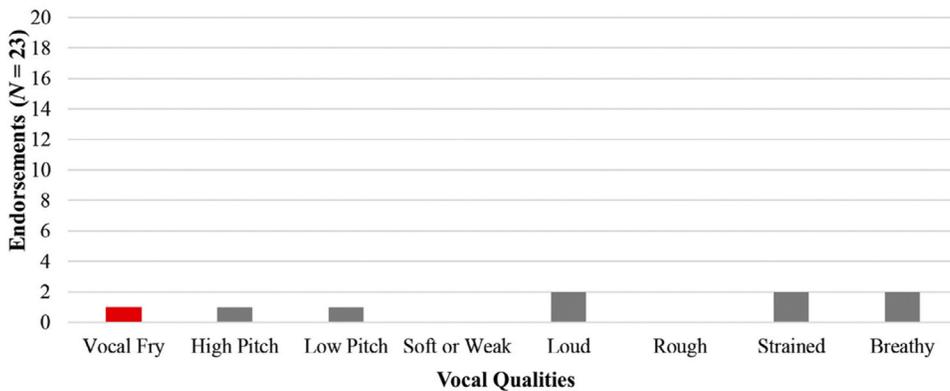


FIGURE 11. Perceived influence named women in the media have had on all equally.

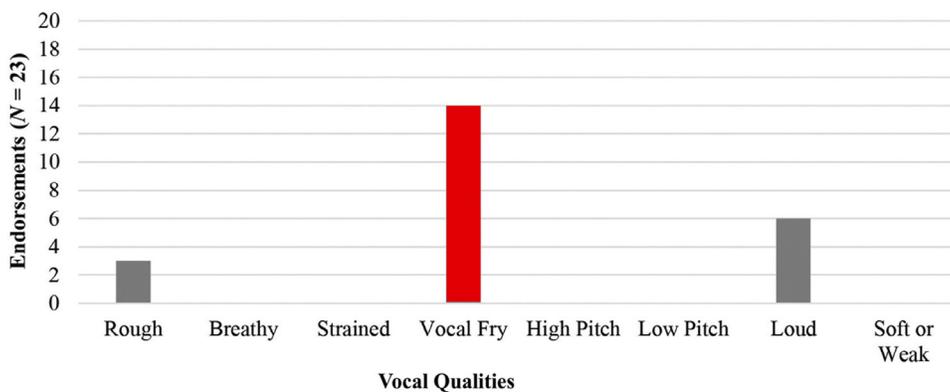


FIGURE 12. What voice qualities are most predominant in the media?

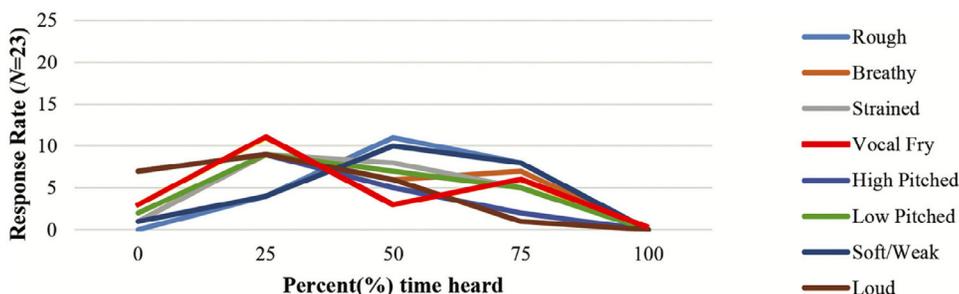


FIGURE 13. Perceived prevalence of voice qualities in aged 50+ generation.

49-year-old population, the majority felt that they heard all vocal qualities 25% of the time. In the 20- to 34-year-old population, the majority felt that they heard rough, breathy, strained, high pitched, low pitched soft/weak, and loud voices 25% of the time, and vocal fry 75% of the time. In the 13- to 19-year-old population, the majority felt that they heard rough, breath, strained, soft/weak voice 0% of the time, high pitched and low pitched 25% of the time, and

vocal fry 75% of the time—with a larger response rate than in the 20- to 34-year-old range. From the 5- to 12-year-old range, the majority felt that they heard rough, breathy, strained, vocal fry, low pitched 0%, loud 50%, and high pitched 75% of the time. In their classmates, participants rated that they heard rough, breathy strained voices 0%, high pitched, low pitched, soft/weak, and loud voices 25%, and vocal fry 25% of the time. In themselves, the majority

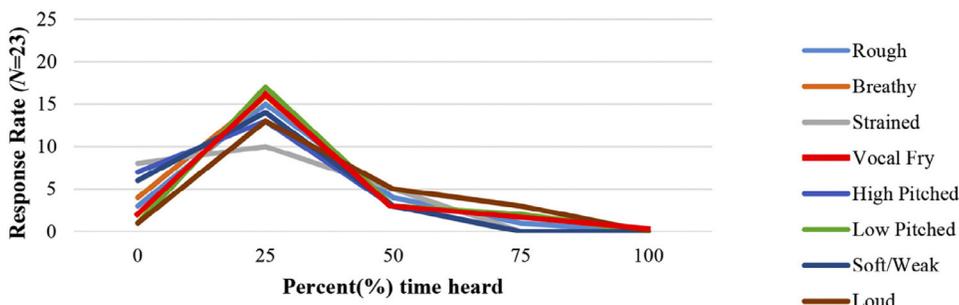


FIGURE 14. Perceived prevalence of voice qualities in aged 35-49 generation.

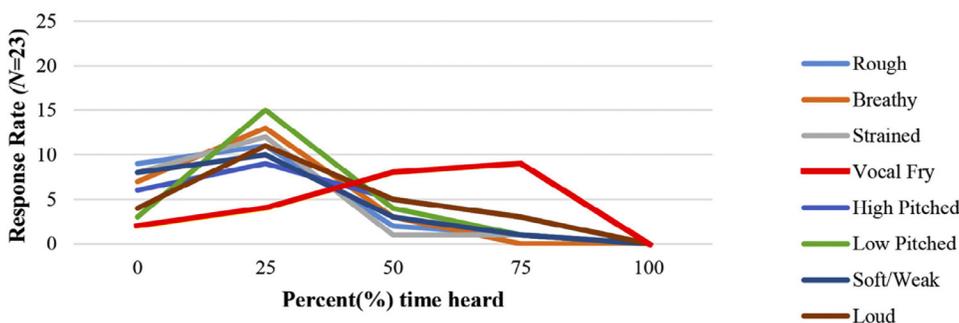


FIGURE 15. Perceived prevalence of voice qualities in aged 20-34 generation.

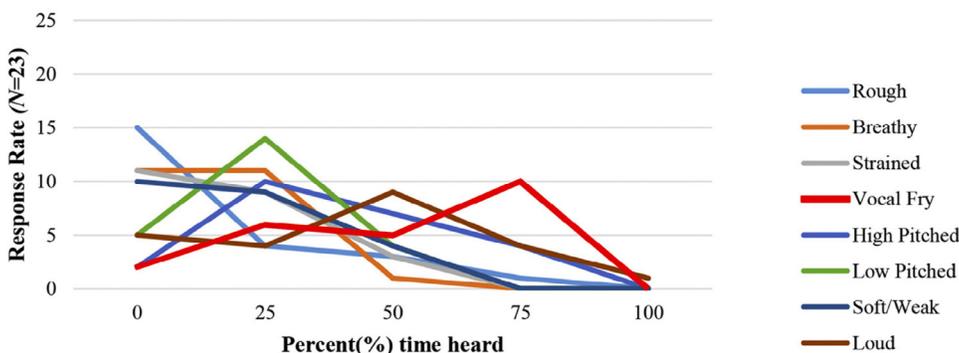


FIGURE 16. Perceived prevalence of voice qualities in aged 13-19 generation.

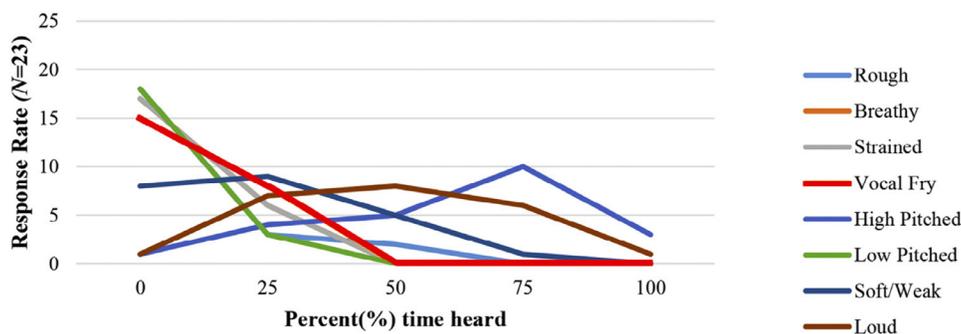


FIGURE 17. Perceived prevalence of voice qualities in aged 5–12 generation.

reported that they heard roughness, breathiness, strain, high pitch, low pitch, soft/weakness, and loudness 0% of the time. They reported that they heard themselves using vocal fry 25% of the time (Figures 13–19).

Correlations as reported in Table 3 were found to be significant,  $P < 0.001$ , between “influence others” and “influence society,” “% VF 20–34” and “% VF class,” “% VF 13–19” and “% VF class,” and “% VF 13–19” and “% VF 20–34.”

**DISCUSSION**

**Desirability of vocal fry**

In weighing the adjectives selected to quantify desirability, vocal fry was reported as more undesirable than desirable on average and in relation to the other vocal qualities and was fourth behind a low pitched, a high pitched, and a loud voice (all more undesirable than vocal fry). This was unexpected given its reported increase in use.

Portions of our descriptive analysis are consistent with prior research and anecdotal perception that vocal fry

has a mixture of desirable and undesirable expressions. In particular, it was consistent with reports of “nonaggressive,” “informal,” “educated,” “professional,” “graduate student,” and “urban,”<sup>12,14</sup> as well as findings that vocal fry expresses “authoritative” voicing when “assuming an authoritative stance.”<sup>17</sup> Furthermore, research indicates vocal fry as expressing more “manly” and “desirable” qualities while expressing “indifference.”<sup>8</sup> Our findings agree that vocal fry use was perceived to sound “nonaggressive,” “cool,” “relaxed/chill,” “confident,” “sophisticated,” and mature,” while “manly,” with additional commentary noting it as “trendy,” “common in NYC,” “people do it to sound older,” and “matter-of-fact.” However, “sophistication” can be related to being “pretentious.” Given this relationship, our data disagree with findings that vocal fry indicates that a person is “not pretentious,” or “genuine.”<sup>14</sup> “Genuine,” however, could relate to our participants’ added commentary that vocal fry sounds “matter-of-fact.” Here, it is difficult to discern clear antonyms and synonyms semantically between studies. Our findings disagree with

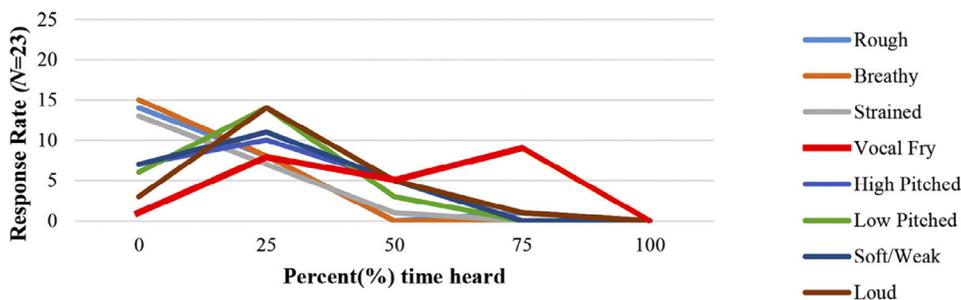


FIGURE 18. Perceived prevalence of voice qualities within participants' classmates.

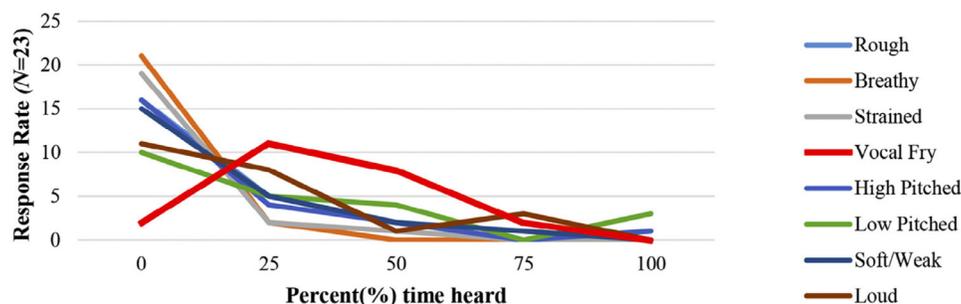


FIGURE 19. Perceived prevalence of voice qualities within self.

**TABLE 3.**  
**Spearman's Rho ( $\rho$ ) Rank Order Correlations Between Influence Questions and Participants Perceived Percent Use of Vocal Fry (VF) in Themselves, Their Class, and Social Age Groups ( $n=21$ )**

	Influence Society	Influence Others	% VF Class	% VF (aged 20–34)	% VF Me	% VF (aged 50+)	% VF (35–49)	% VF (13–19)	% VF (5–12)
Influence society	1								
Influence others	0.758*	1							
% VF class	0.228	0.294	1						
% VF (20–34)	0.256	0.192	0.767*	1					
% VF me	0.290	0.062	0.454	0.548	1				
% VF (50+)	0.020	0.012	-0.164	-0.167	0.033	1			
% VF (35–49)	0.489	0.296	0.350	0.335	0.274	0.592	1		
% VF (13–19)	0.224	0.338	0.907*	0.822*	0.333	-0.271	0.271	1	
% VF (5–12)	0.593	0.312	0.416	0.464	0.363	0.155	0.525	0.325	1

\*  $P < 0.001$ .

some reports that it was perceived to be slightly “hesitant,”<sup>14</sup> as we found that “insecure/hesitant” did not contain vocal fry. Dilley et al<sup>17</sup> and Yuasa<sup>14</sup> both report generally neutral to positive perceptions. Pennock-Speck<sup>8</sup> indicates “indifference.”

Variation in the literature was encompassed by three subgroups’ descriptions defined in the present analysis (desirable, undesirable, both). The description held by only one participant in the present study most closely related to Yuasa’s<sup>14</sup> “image of educated urban professional women capable of competing with their male counterparts.” However, the largest margin, 64% ( $n=14$ ), of this study’s population sees a split perception of vocal fry, selecting varying combinations of both desirable and undesirable adjectives. This is in agreement with Yuasa.<sup>14</sup> Additional commentary from this subgroup (ie, “valley girl,” “popular,” and “trendy”) and mixed opinions of vocal fry from the majority of participants may relate with pragmatic use.<sup>11</sup> Furthermore, this commentary is consistent with Wolk et al,<sup>7</sup> in relating use to the media, given the assumption that the media typically influence popular trend.

### Perceptions of vocal fry

Prior research and these present findings do not wholly agree with Anderson et al’s<sup>18</sup> study of the perceptions of fry in a workplace environment. Anderson’s team reported that use expressed less competence, education, trustworthiness, attractiveness, or desirability. The present study noted perceptions of confidence, maturity, and sophistication with vocal fry use and uneducated and insecure/hesitant without vocal fry use. Additionally, raters were asked for their opinion based on use within the labor market versus general use desirability. However, construct limitations were noted. In Anderson et al’s study, vocal fry stimulus recordings were produced by individuals with “normal voices” using videos from “<http://youtube.com/>” “Normality” of the voices was not described, and the reported “<http://youtube.com/>” videos used to teach vocal fry to subjects were not specifically identified. Video selection bias could have been introduced in subject training, and imitation may have introduced bias

through exaggeration. Finally, “Thank you for considering me for this opportunity,” the stimulus phrase used, is one that we would argue, a natural speaker with vocal fry may not produce with vocal fry. As previously discussed, Gibson<sup>11</sup> found that a subgroup of infrequent and frequent users used vocal fry differently. Frequent users were pragmatically motivated, meaning that they would purposefully emphasize using this register. Vocal fry is perceived to have multiple pragmatic functions; however, gratitude has not been found to be one of them. In the context of parting after a job interview, speakers that use vocal fry pragmatically may choose to sound livelier. Vocal fry in this situation may be perceived as vain or disinterested. Vocal fry may occur at other times during an interview to express a relaxed, nonaggressive, detached, authority on a subject, and/or matter-of-factness. If the population being imitated was within Gibson’s lexical group, his research asserts that those infrequent users produced vocal fry outside of pragmatic influences, instead of being influenced lexically, given the distance away from a stressed word or syllable. The further away, the more likely they were to use fry. Therefore, at the end of a statement of gratitude, vocal fry produced by an infrequent user could have appeared on the last word of the target phrase. The amount of vocal fry imitated in the vocal fry group versus the “normal” voice group, however, was not reported to this detail. Furthermore, Gibson reported that while 86% of their participants used vocal fry, there was a “broad range in frequency of use.” Redi and Shattuck-Hufnagel<sup>19</sup> also indicated that generally, “normal speakers exhibit glottalization (vocal fry) in association with the boundaries of intonational phrases of spoken American English utterances.” Therefore, with variation of natural use, it is unclear what subgroups were being compared within Redi and Shattuck-Hufnagel’s study.

In agreement with Anderson et al,<sup>18</sup> our results indicate that vocal fry is perceived to be used when a person is “sick,” “depressed,” “strained,” “tired,” “apathetic/disinterested,” and “bored/unengaged.” This may relate to their perceptions of use as less desirable or attractive (professionally). We argue that these uses of vocal fry are not a

pragmatically motivated type, and specifically not the one that is being anecdotally seen in a younger female population, as reported here and in prior research.<sup>14,15,18</sup>

This discussion does not intend to imply that perceptions, representative of Anderson's<sup>18</sup> findings, are not present in the general population, but instead that these construct limitations should be considered in further investigation of this register. In fact, within our descriptive analysis, the third subgroup of participants with predominantly undesirable perceptions of vocal fry indicates a clear self-awareness of the negative aspects of vocal fry, which are technically in congruence with Anderson et al's<sup>18</sup> findings on perceptions within a labor market. Our sample of SCD students, embarking on their graduate careers is of interest when combined with these labor market findings. Furthermore, this subset of 32% of our participants selecting only undesirable adjectives appeared to relate significantly to a mental state or medical status. Prior study has not investigated vocal fry use in the context of mental, acute, or chronic illness. Voice disorders and these various illnesses, however, are certainly noted comorbidly within research,<sup>6,14</sup> and anecdotally within voice clinics, although their etiological relationship is unknown and may vary by individual. Nevertheless, this is an important component of the discussion in counseling patients, who may present with other illness in combination with vocal fry. Further research is warranted to determine if SCD students later in their graduate careers have differing perceptions of vocal fry.

### Media considerations

No current research has directly linked media use of vocal fry with use outside of the media. This is arguably difficult to assess directly. Since 2011, the media have discussed their use anecdotally. Our data were collected a year and a half after the seminal Wolk et al<sup>7</sup> paper was published. This paper spearheaded a nationwide debate on vocal fry with its mention of use by "popular figures." The media picked up on it quickly, using titles such as "more college women speak in creaks, thanks to pop stars."<sup>32</sup> To minimize bias, participants were asked to look at all vocal qualities and their use in the media. Understanding a possible influence, nevertheless, our results are not only consistent with, but provide a larger picture of vocal fry use by the media versus use of other qualities and their perceived influence on specific generations.

Vocal fry was reported as the most used vocal quality by women in the media (Figure 9). Participants could identify more women in the media who use vocal fry than women who use the other selected vocal qualities (Figure 4). This is consistent with prior research that shows that vocal fry is an easily identifiable quality.<sup>5</sup> Those using vocal fry were not perceived as influential generally upon the public, and their vocal influence was the greatest relatively, although the average was not above a negligible level (Figure 2, Figure 3). This average result, although it was more noninfluential than influential, was notably split with 12 stating that they have had "no influence" or nearly no influence, and 9

stating "a lot" or just below a lot. No one selected "neutral." The split may indicate a lack of personal perception that media using vocal fry influenced personal use of vocal fry, or may represent the portion of the population that uses vocal fry linguistically. Our participants did report that the young children and teenagers as well as the young adult population have been the most influenced by media using vocal fry (Figure 4, Figure 5). Those named for using a breathy voice quality were inversely more influential on the middle-aged (35- to 49-year-olds) and older population (aged 50+) (Figure 6, Figure 7).

### Age considerations

Generationally, significant correlations (Table 3), were found between 20- to 34-year-old and 13- to 19-year-old groups ( $\rho = 0.822$ ,  $P < 0.001$ ) that were all perceived to use vocal fry proportionally more than all other vocal qualities by this sample of SCD graduate students. The relationship between self-reported use and perceptions of others' use was interesting due to the participants stating that their own vocal fry use was 25% of the time, not 75%, as they had reported among the other generations, indicating that our participants' negative perceptions of vocal fry and self-awareness reported in part one of our two-part survey may have influenced how they rated their own prevalence of use. Evidence to support this is the report of frequent use of vocal fry (75% of the time) by their classmates which furthermore resulted in a significant correlation with the representative generation, that is, the 20- to 34-year-olds and the 13- to 19-year-olds.

Correlations were not found between the younger 5- to 12-year-old generations and the teenage or young adult generations as vocal fry use was not reported; and in the 5- to 12-year-old generation, high pitch and loudness were instead proportionally greater. This could indicate that our participants are aware that vocal fry is a learned quality during the time when peers and other external influences, such as media figures, have a larger influence on behavior. In addition, correlations were not found between the younger generations and the aged 35–49 and 50+ generations. This is not consistent with Oliveira et al<sup>10</sup> who determined that vocal fry use in the middle-aged population was not significantly different from a young adult population. However, there is a wide range in frequency of use as reported by Gibson and Redi and Shattuck-Hufnagel.<sup>11,19</sup> The use by an older generation may be different in function (ie, pragmatic vs lexical), which may be why our participants perceived the older population as not using it as frequently. This finding, however, is consistent with anecdotal reports that vocal fry use is absent or at least not greater as compared with other vocal qualities in the aged 50+ generation where age and vocal injury may increase the incidence of vocal fry along with the incidence of established disordered vocal qualities.

Vocal fry is perceived by our participants as used by young adults, but not young children and not middle-aged or older adults. This indicates that the current generation

perceives vocal fry to be a learned trait. However, based on how little our participants reported hearing vocal fry in what would be their parents' generation, their parents are likely not the source of education on this quality. As a child, vocal and linguistic patterns are influenced by parents, however, as a teen, there are transitions. Peers and media become a larger influence. Therefore, we posit that the media are likely the main educator on use of this vocal quality. This population perceives vocal fry as the most predominant vocal quality in the media, indicating awareness of it in the media and that women using vocal fry in the media have a greater influence on how other women use their voices, more than any of the media individuals using any other vocal quality. Further study is warranted to determine what, if any, influence this perception of vocal fry may have on SCD students as they embark on their clinical experiences.

### CONCLUSIONS

This study adds to the wealth of perceptual data through analysis of voice qualities necessary to express a specific adjective or emotion. Patterns and similarities were noted in vocal quality profiles indicating that vocal fry in combination with other voice qualities expresses the wide variety of adjectives or emotions noted above in prior research. This population demonstrated that they would expect to hear vocal fry to represent a variety of positive, neutral, and negative adjective correlates. These positive, negative, and neutral correlates cannot be applied directly to the adjectives as they are semantic correlates of perception, and any of these adjectives may be assigned in varying contexts as "positive" or "negative" or "neutral." However, when vocal fry was absent, "vain" becomes "lively" or "engaged." "Confident" without vocal fry and roughness became "aggressive." "Flirtatious" without vocal fry became "feminine" and "sweet," but with strain, it was perceived as "insecure/hesitant." Is it then probable that women are employing vocal fry in the context of some social situations to avoid being called lively and aggressive, too feminine and sweet, or worse yet, insecure/hesitant?

Application of this sample's perceptions of voice in a work environment may include that women attempting to sound confident and engaged, may use vocal fry to pull away from possibly sounding aggressive or obnoxious, but, if used incorrectly, the cost is that the women may sound vain, bored/unengaged, or apathetic/disinterested. This continues to agree with prior research indicating nonaggression as a reason for vocal fry use<sup>14</sup> and adds that use expresses manliness while maintaining a flirtatious sexuality without sounding too sweet, feminine, or on a stressful day, hesitant/insecure.

As a professor or clinician, a discussion on the use of vocal fry may focus on self-identification with vocal fry voicing, possible peer influence, and code-switching ability. Currently, there is a dearth of information on the incidence of organic voice disorders with increased duration of this

population's pragmatic use of vocal fry. In addition, prevalence of vocal injury prior to its increase in pragmatic use is not known. Thus, vocal instruction should be provided on a case-by-case basis depending on the vocal lesion, history of depression/anxiety, motivation, self-awareness of their purposes for vocal fry use, and vocal demands. In treatment, reduction of vocal fry may also include teaching vocal fry use with less strain, roughness, or loudness. Resonant phonation strategies may eliminate vocal fry while maintaining confidence, and addressing language may reduce the possibility of sounding aggressive, insecure, or obnoxious. Vocal coaching with insights from prior research and the vocal quality profile may aid women in learning a more comfortable and confident female voice. Care should be taken not to assume social/pragmatic context, however, by too quickly assigning a "positive," "negative," or "neutral" association with these perceptions, as care should be taken in inferring perception to other contexts.

### Limitations

Limitations to this study were noted. The adjective list was selected for our participants, which may have limited our quantitative analysis by creating selection bias. Race was not reported formally without our dataset. Twenty-three SCD graduate student participants, early in their training, were surveyed, indicating that the generalizability to other samples is limited.

### Future directions

Further research is indicated to address a more diverse sample. Expanding to different levels of education within SCD training programs, to the profession of speech-language pathology, or to a more general sample are all valid directions. In addition, research investigating participant social standing and prevalence of vocal fry may reveal additional insights into pragmatic use of vocal fry. The changing landscape of the media, their influences, and semantic, pragmatic, and linguistic variations over time should be considered in future studies. The relationship between pragmatic use of vocal fry and organic voice disorders is in need of further exploration.

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### Author Contributions

Claire Ligon collected and processed the data and was engaged in drafts of this manuscript. Carrie Rountrey reviewed data and contributed critically to drafts and to the final product. Noopur Vaidya Rank assisted with survey construction and initial drafts. Michael Hull contributed statistical analysis for this project. Aliaa Khidr created the

research idea and methodology and engaged in data collection, data analysis and critical review of all stages of this project. None of the authors have any competing interests to declare.

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