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Review Article

A Brief History of Vocal Fry: Terminology, Definitions, and Sentiment

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ABSTRACT

Purpose: Definitions and opinions of "vocal fry" have varied over time. The purpose of this review is to examine the history of research on vocal fry, identify and define the terminology used to describe vocal fry in the clinical literature, and examine the history of sentiment regarding the use of vocal fry. This historical narrative review aims to establish a foundation to inform future clinical research by identifying both advances and evidence gaps in the literature on vocal fry.
Method: A historical narrative review was conducted.
Results: The term "vocal fry" initially appeared in the clinical literature in 1958, although some early work suggests that sentiment regarding this voice quality appeared at least as early as 1935. Vocal fry was considered a voice disorder until research in the 1960s found that it is acoustically and perceptually distinct from diagnosed "harshness." Based on acoustic and physiological evidence, vocal fry was defined as a normal phonation register through much of the work in the 1970s. Current descriptions of vocal fry vary. While it is known to occur in the phrase-final position to mark phrase boundaries in nonpathological speech, current sentiment regarding vocal fry is mixed. Some clinical works list it as an aberrant or potentially pathological voice quality and report negative perception of its use, while others report using it as a therapeutic task in the setting of voice rehabilitation. In addition to changes in sentiment, various terms have been associated with the voice quality either as a synonym or to describe a related quality.
Conclusions: The term "vocal fry" has had varying sentiments and multiple perceptual, physiological, and acoustic qualities associated with it. Additionally, terminology has varied over time and across researchers. Future research on vocal fry should clearly define the voice quality in order to allow for more direct comparison and make connections to clinical application.

Vocal fry has seen increased media attention over the last two decades, particularly following publications examining the use and social perceptions of vocal fry in women (Anderson et al., 2014; Wolk et al., 2012). Since then, the discussion on vocal fry[1] seems ubiquitous in the media, and the terms "vocal fry," "glottal fry," and "creaky voice" have occured more frequently in English texts (see Figure 1). Although popularized due to media coverage, it is well known among clinicians, researchers, and voice instructors that vocal fry was present in speakers long before the early 2000s. The concept of vocal fry appeared in the clinical literature in 1942, where it was referred to as "glottal fry" (Moser, 1942). The term "vocal fry" first appeared in the clinical literature in 1958 (Moore

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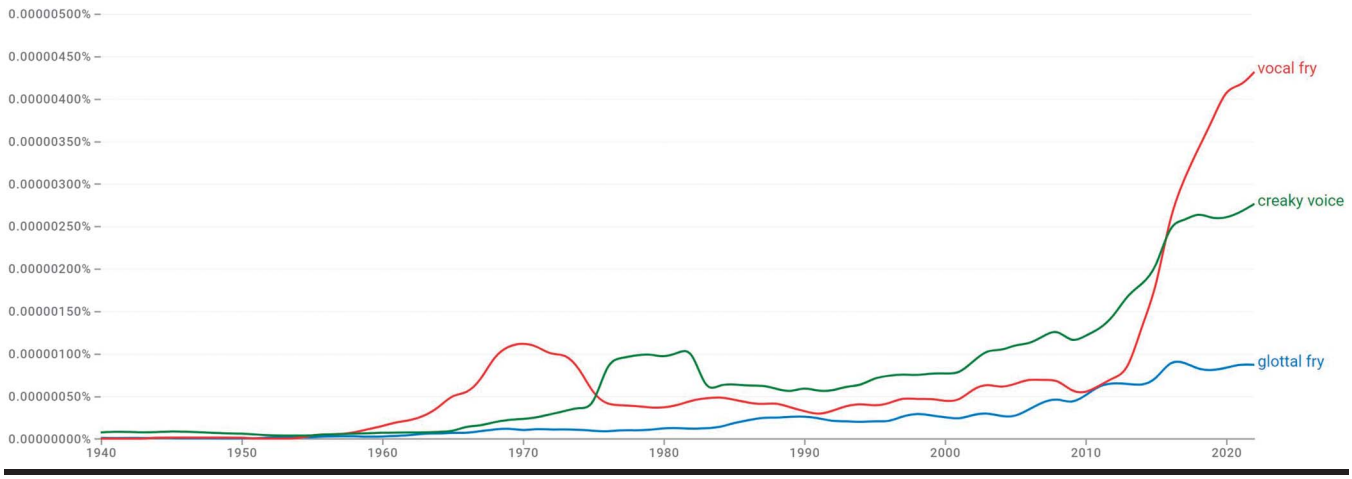
[1] Since the first reports on vocal fry, other terminologies have been used in various fields (e.g., singing voice, linguistics, speech science), including glottal fry, pulse register, laryngealization, glottalization, and creaky voice. For the purpose of this article, vocal fry will be used consistently, with references to authors' preferred terminology as necessary.

Figure 1. Google Ngram (https://books.google.com/ngrams/) of the terms *glottal fry* (blue), *vocal fry* (red), and *creaky voice* (green) from 1940 to 2022. Notable time periods include a peak in references to vocal fry around 1970, addressed in this article, and an increasing trend in references to vocal fry and creaky voice from 2010 to 2022. The reader should note that references to creaky voice include references to voice quality in novels (e.g., "she said, with her creaky voice"), whereas references to vocal fry are primarily in nonfiction (e.g., textbooks and self-help public speaking guides).



& von Leden, 1958). Research interest on this voice quality then began increasing in the 1950s–1970s and continues today.

Despite extensive study and discussion of vocal fry, the field is still in disagreement as to whether vocal fry is a pathological or a normal voice quality. On the one hand, researchers and clinicians agree that vocal fry is a normal phonation register characterized by low pitch, irregular vibratory patterns, and often used at the ends of sentences among typical speakers. This is supported by research in linguistics, which has found that English speakers use it to signal phrase and utterance endings (Epstein, 2002; Garellek 2022; Garellek & Keating, 2015; Kreiman, 1982; Slifka, 2006). On the other hand, descriptions of dysphonia in research and clinical voice evaluations sometimes list vocal fry as an aberrant voice quality (Kempster et al., 2009; Spencer, 2015). Anecdotally, clinicians report treating vocal fry in voice therapy sessions to eliminate voice quality from patients' speech patterns. Even among those who feel that vocal fry is normal, there is a belief that use of vocal fry may *become* pathological under certain conditions, such as with "excessive" use (Van Houte et al., 2011). However, this hypothesis remains to be tested, and what is considered excessive is unknown. The differences in sentiment and limited evidence about vocal fry have led to a lack of clarity regarding clinical recommendations and varying practices among clinicians.

The goals of this review are threefold: (a) examine the history of research on vocal fry, (b) identify and define terminology used to describe vocal fry and related voice qualities in the clinical literature, and (c) examine the history of sentiments regarding the use of vocal fry. This historical review aims to establish a foundation to inform future clinical research by identifying both advances and evidence gaps in the literature on vocal fry.

Method

The current study is a narrative review. The goal of a narrative review is to provide a broad overview in a topic of interest and to synthesize what is known about that topic (Sukhera, 2022). Unlike systematic reviews, narrative reviews are not considered exhaustive reviews of all works that fit within narrow criteria. Instead, the review process is dynamic and may include works from a variety of fields while remaining focused around the research question.

The goal of this review is to examine the history of research on vocal fry with particular focus on clinical literature. A search of ASHAWire and Google Scholar was conducted using the key terms "vocal fry," "glottal fry," and "creaky voice." Handsearching, snowballing, and artificial intelligence–assisted literature search using Connected Papers and ResearchRabbit were conducted to find the earliest mentions of vocal fry and related voice qualities in the literature. Articles were chosen for review based on relevance. Articles were included if they consisted of original research that presented new information on the production of vocal fry, such as acoustic and physiological evidence. These papers were considered pivotal to our current understanding of vocal fry. Additionally, articles that present acoustic or physiological evidence and/or

definitions for voice qualities related to vocal fry (e.g., pulse register, period doubling, dicrotic dysphonia) were also included if they were considered clinical research or relevant to clinical practice. Finally, articles were also included if they characterized general sentiment or the author's sentiment regarding vocal fry in the clinical realm.

Articles were excluded if they did not present new information that advanced the understanding of the production of vocal fry or if they did not convey information about sentiment, definitions, or terminology associated with vocal fry. For example, the use of creaky voice as a phonological contrast is not discussed in this review article. Work that addresses the linguistic use of vocal fry is cited here only to highlight to our understanding of its use in the English language, but a comprehensive review of the linguistic use of vocal fry and related voice qualities was not undertaken as this is not the focus of the review article.

A historical timeline of the research on vocal fry was constructed from the included publications from earliest mention to present day. Given our focus on the historical development of research on vocal fry, priority was given to work published prior to the 21st century. Information was organized into major themes that emerged over the history of research in this topic: "first accounts," "technological advances," "changing sentiment," "aerodynamic and acoustic characteristics," and "present day."

First Accounts of Vocal Fry (1935–1958)

Viewpoints about vocal fry appeared in clinical literature even before the term itself was used. In a 1935 opinion, Voelker (1935, p. 417) expressed concern regarding a highly prevalent voice quality among his student body. He characterized this quality as a "rumbling, rattling, cracking, ticker-like sound" that he described as "unpleasant." He noted that it was produced at a very low frequency and stated that it occurred in a considerable percentage of the male student body at the ends of sentences. Importantly, he described this voice quality as aberrant and in need of correction. He diagnosed it as "dysphonia ventricularis," a voice disorder identified earlier that same year by Jackson and Jackson (1935). Voelker's 1935 description appears to be the first in the clinical literature to document the widespread use of a low-pitch, "crackling" voice quality used frequently at the ends of sentences.

It is likely that Voelker misidentified the voice quality as dysphonia ventricularis due to his diagnosis being based solely on perception, not visualization of the larynx. As defined by Jackson and Jackson (1935), dysphonia ventricularis consists of a rough voice quality caused by use of the ventricular folds for phonation in place of, or in addition to, true vocal fold vibration. Using a laryngeal mirror to examine the vocal folds, the researchers identified fully adducted ventricular folds during phonation as the primary source of voicing, which completely obstructed the true vocal folds from view. In describing the presentation of dysphonia ventricularis, Jackson and Jackson observed "such a roughness to the voice that the observer does not expect to see normal cords and accepts the image as that of intensely inflamed and thickened cords." They further describe this voice quality as one with frequent voice breaks, pitch and loudness instability, and production of two tones at once with both true and ventricular fold phonation (what they refer to as "diplophonia"). This differs from Voelker's description of a voice quality that primarily occurred at the end of sentences and only at a low pitch. As a further point of contrast, the majority of Voelker's students were entirely unaware of their own use of it, while the patients described in Jackson and Jackson reported voice disturbance.

In 1937, Voelker again expressed concern that the student body did not speak "intelligibly." At the time, he estimated that only 30%–40% of the student body spoke in a manner that he deemed satisfactory (Voelker, 1937). Of the speech problems he noted, issues relating to voice quality were among the most frequent, and he recognized this voice quality to be the same as the one he identified in students in 1935. He later estimated that this voice quality occurred in 60 of 1,000 speakers, but only 12 of 1,000 complained of hoarseness (although these estimates may not have been from the same sample; Voelker, 1942). Throughout his career, Voelker characterized this quality as a voice disorder and recommended voice training for all students presenting with this voice quality, regardless of the students' own perception of their voice. While he believed this voice quality to be due to ventricular phonation, later analysis suggests that the quality he was referring to was what would come to be known as "vocal fry" (Moore & von Leden 1958; Timke et al., 1959; Whitehead, 1970).

It was not until 1942 that glottal fry appeared in the clinical literature. Moser (1942) described using "glottal fry attack" as a voice therapy technique in an abstract for a case presentation on treatment of puberphonia in a 19-year-old man. He states:

> The particular technique used to establish normal voice is the "glottal fry" attack. It is a method I have used with considerable success and one which I do not believe is well known. It is very easy to demonstrate but extremely difficult to describe. You may recognize it as the sound produced by many youngsters in imitating a motor boat but to me it more nearly resembles the sound of vigorously popping corn. (p. 174)

It is unclear where Moser learned this technique, and no further documentation was found on his use of glottal fry in therapy for other patients. After Moser's case presentation in 1942, glottal fry and vocal fry became the terms used for this "popping" quality in the literature.

Technological Advances in Describing Vocal Fry (1958–1963)

In-depth research on vocal fry began with Moore and von Leden's 1958 landmark paper "Dynamic Variation in the Vibratory Pattern in the Normal Larynx." The authors examined vocal fold physiology using a laryngeal mirror and high-speed camera to capture different vibratory patterns in a normal larynx, including laughter (*laugh–pulse*), inspiratory phonation, and vocal fry. In their paper, vocal fry is described as a type of harshness (i.e., dysphonia) with frequencies as low as 40 cycles per second (i.e., Hz). Physiologically, they found no evidence of vibration of the ventricular folds, demonstrating for the first time that the true vocal folds are responsible for phonation in vocal fry, not the ventricular folds. They identified the vibratory pattern as distinct from modal register with "the cords separat[ing] and approximat[ing] twice in a rapid succession and then remain[ing] in contact for a relatively long period" (p. 227). In addition to differences in the opening and closing patterns for vocal fry, the authors noted the differences in vibration between the anterior and posterior portion of the glottis, with phonation beginning posteriorly rather than anteriorly as it does with modal phonation. In an attempt to unify the diverse terminology used for this voice quality at the time, the authors proposed "dictrotic dysphonia," emphasizing the physiological characteristics of two glottal openings per vibratory cycle as well as defining the voice quality as a type of dysphonia. Although the authors defined it as an abnormal voice quality, they also state that it is likely that many people use vocal fry some of the time.

Following Moore and von Leden (1958), much of the research on vocal fry sought to identify its physiological and acoustic properties (Coleman, 1963; Timcke et al., 1959; Wendahl et al., 1963). Timcke et al. (1959) described properties of vocal fry that include multiphasic vibration, low fundamental frequency ($F0$), and varying amplitudes between vibratory phases. They concluded that multiphasic vibration, as seen in vocal fry, occurred during normal voicing as well. This finding was later supported by Wendahl et al. (1963). In addition to multiphasic vibration, a period of damping of the waveform by about 40 dB from the maximum amplitude in between each cycle was also found to be important in the perception of vocal fry (Coleman, 1963). These studies suggested that these vibratory characteristics give vocal fry its unique perceptual characteristics.

Changing Sentiment: Vocal Fry as a Normal Register (1963–1970)

Beginning with Michel (1964), researchers began to present evidence identifying vocal fry as a normal voice quality, distinguishing it from harshness or a subtype of harshness. In his dissertation, Michel compared productions of vocal fry in typical speakers to harshness in speakers diagnosed with dysphonia. He found that harshness produced by patients with dysphonia was perceptually distinct from vocal fry produced by speakers without diagnosed dysphonia (Michel, 1964; Michel & Hollien, 1968). Additionally, the two qualities could be differentiated on the basis of $F0$ (Michel, 1964, 1968). Finally, with the publication of Hollien et al. (1966), the authors argued that vocal fry is a physiologically normal mode of voicing with a frequency range below modal phonation. They further describe vocal fry as follows:

> Vocal fry results from a train of discrete laryngeal excitations or "pulses" at low frequency. A further criterion that must be met for such production is nearly completely damping of the vocal tract between successive excitations. It appears necessary … for the damped wave to decay nearly to zero before the next glottal [pulse]. (p. 246)

In addition, they state that while vocal fry is a normal register, exclusive use of vocal fry may be considered disordered just as exclusive use of falsetto would be considered abnormal. The authors also put forth a set of hypotheses regarding physiological and aerodynamic characteristics of vocal fry that spurred further research in this area into the 1970s. They predicted that vocal fry is produced with thick, compressed true vocal folds; partially adducted ventricular vocal folds; and reduction of the ventricular space such that the ventricular folds come into contact with the true vocal folds. They also note that compressed vocal folds do not necessarily equate to increased tension. Zemlin (1968) also noted an increased amount of vocal fold approximation, but with relaxed "free borders" (p. 197) in his high-speed photography evidence (this was later confirmed and expanded upon by Edmondson & Esling, 2006; Esling et al., 2019; Ladefoged, 1971). With respect to aerodynamic predictions, Catford (1964) and Hollien et al. (1966) hypothesize that creak (vocal fry) is produced with low subglottal pressure and low airflow during phonation. These hypotheses were explored in a work beginning in the 1970s, described below.

The definition of vocal fry as a unique, normal register was further supported by Hollien and Michel (1968) and Whitehead (1970), who found little to no overlap in the $F0$ range of vocal fry and modal phonation, which the

authors took as evidence to suggest that the voice consists of three registers: falsetto in the highest *F*0 range, followed by modal, and then vocal fry (up to 78 Hz). No difference in *F*0 of vocal fry between males and females was found (Hollien & Michel, 1968). While these studies involved analysis of nonspontaneous speech in only a few participants, there was little disagreement regarding vocal fry being a normal mode of voicing in the subsequent research on vocal fry through the 1970s.

Defining the Acoustic and Aerodynamic Characteristics of Vocal Fry (1970–1994)

Research in the 1970s was focused on further defining acoustic and aerodynamic characteristics of vocal fry, with a relatively neutral sentiment attached to its descriptions. It was found that vocal fry has lower airflow and greater thyroarytenoid activity compared to modal phonation (McGlone & Shipp, 1971). However, there was conflicting evidence regarding subglottal pressure. While Murry (1971) and McGlone and Shipp (1971) found increased subglottal air pressure during vocal fry production, decreased subglottal air pressure was later found by Blomgren et al. (1998). Moore's (1971) and Hollien's (1972) laminographs demonstrated that the ventricular folds press down on the true vocal folds during vocal fry production. Together, these findings supported the hypotheses put forth by Hollien et al. (1966) that were summarized above.

Changes in terminology were also seen during this period. Hollien (1974) introduced the term "pulse register" to refer to phonation that consists of a pulse-like vibration pattern at low frequencies. He considered the term "pulse register" to include vocal fry, glottal fry, creak, and *strohbass*[2] ("straw bass"). Monsen and Engebretson (1977) examined phonation types acoustically and used the term "creaky voice," which they equated with vocal fry. Acoustically, creaky voice was defined as having an *F*0 between 30 and 90 Hz with high jitter (period-to-period variation in frequency). They also note period doubling in some instances of creaky voice, in which two different period durations repeat. Evidence for period doubling was further demonstrated in electroglottograph signals, in addition to a longer closed-phase duration in creaky voice compared to modal voice (Childers & Lee 1991). Dejonckere and Lebacq (1983) describe vocal fry as the voice being a "sequence of separate chaotic impulses" and maintain that it is distinct from diplophonia (p. 48). In the third edition of his textbook on the anatomy of speech mechanisms, Zemlin (1988) notes that glottal fry is often equated with or accompanies harshness, roughness, and period doubling. He also notes that because it is often found at the end of sentences, it should be considered normal phonation and "as a vocal register in the true sense of the word" (p. 167), but becomes "objectionable" when it is used elsewhere in an utterance. Klatt and Klatt (1990) use "creaky voice" to refer to a perceptually low pitch with audible pulses. They use the term "pressed voice" to refer to "some percentage change below a speaker's normal *F*0 range (or perhaps when the glottal pulse becomes very narrow such that H1 is reduced in amplitude)."

Current Usage of "Vocal Fry" (1994–Present): Competing Definitions and Mixed Sentiment

At the turn of the century, there was general agreement about the nonpathological status of vocal fry when used at the ends of phrases and utterances. In addition, some techniques for improving the voice in clinical practice included the use of vocal fry, suggesting a somewhat neutral or positive sentiment in these uses of vocal fry. However, disagreements about terminology remained, particularly regarding differences in the acoustic signal. Moreover, while some progress had been made to clarify terms and definitions, the following decades also saw an increase in confusion surrounding vocal fry's status as a pathological voice quality outside of the phrase-final position. Concurrent research on the social evaluation of its use has accompanied, and perhaps amplified, public awareness of the voice quality. The resulting sentiment among the general public is that vocal fry is a negative and undesirable voice quality.

In 1994, Titze used "pulse register" to describe *strohbass* and vocal fry but distinguished these terms from creaky voice (note that this differs from Hollien's use of pulse register described above, which includes creaky voice). He claims that, although creaky voice is perceptually similar to vocal fry, it is not a register. The difference, he states, is that that creaky voice has "more of a perception of roughness than pulses" (p. 306). He adds his own sentiment about creaky voice in the form of a limerick (which may also suggest a difference between vocal fry and creaky voice as the presence or absence of period doubling):

Now when the frequency is low

When the glottal puffs of air are slow

[2]The term *strohbass* itself has its own history prior to the use of vocal fry. It appeared as early as 1895, in Sweet's description of this voice quality as a process of laryngeal narrowing, in the context of voiced glottal and pharyngeal fricatives. This was later expanded by Gutzmann (1909) as being produced by "very flabby, thick vocal cords ... It becomes particularly noticeable when the vocal cords have experienced permanent thickening and hardening due to chronic catarrh: the rough bass of old drunkards" (p. 61).

> The chest will change to vocal *fry*
>
> A crackling sound, like *straw* that's dry.
>
> At times the vocal fry goes *creaky*
>
> This makes a nasty sound—so freaky
>
> That it's used by demons and by witches
>
> It raises havoc with the pitches
>
> 'Cause single *pulses* turn to doubles
>
> That gives our ears tremendous troubles. (p. 307, italics in original)

This sentiment is perpetuated to this day in some recent works. Several studies have investigated the social perception of vocal fry, which have largely found negative attitudes toward speech containing vocal fry compared to speech not containing vocal fry (Anderson et al., 2014; Ligon et al., 2019; Pointer et al., 2022; Stewart et al., 2024; Taylor et al., 2022; Venkatraman & Sivasankar, 2018; but cf. Gobl & Ní Chasaide, 2003; Yuasa, 2010). Most relevant for clinical practitioners is that of Gallena and Pinto (2021). In their study, speech samples that contained more vocal fry from speech-language pathology graduate students were rated as less hirable, professional, competent, educated, and pleasant by practicing speech-language pathologists compared to speech samples that contained less vocal fry. However, these results should be interpreted with caution due to statistical inaccuracies and limitations in experimental design (see Gallena & Pinto, 2022; Theodore, 2022; Winn et al., 2022).

Several studies also note a possible connection between the use of vocal fry and vocal pathology. In a study of vocal fry use in young women, Wolk et al. (2012) suggest, but do not test, that vocal fry use could cause pathologies. Stemple et al. (2020), who use the terms "pulse register" and "glottal fry," state, but do not test, that persistent use often causes vocal fatigue or laryngeal tension. Evidence that vocal fry use causes vocal pathology is lacking; however, the use of vocal fry in conjunction with other symptoms is well documented as a perceptual correlate to specific vocal pathologies (e.g., contact granulomas in Ylitalo & Hammarberg, 2000; laryngo-pharyngeal reflux disease in Ross et al., 1998; adductor laryngeal dystonia in Langeveld et al., 2000; muscle tension dysphonia in Morrison et al., 1986). Only one study has reported evidence for increased vocal effort following continuous production of vocal fry (Venkatraman & Sivasankar, 2018), but it should be duly noted that this production was not spontaneous and that speakers were asked to continuously produce vocal fry for 30 min of reading aloud. That is, the results of the study may have limited generalizability since vocal fry produced in spontaneous conversation may have different physiological properties (namely, decreased tension) than that which is nonspontaneously produced in a controlled, experimental setting.

During this time, vocal fry continued to be used as a technique in clinical and singing voice settings. As previously stated, the use of vocal fry in the treatment of puberphonia can be dated back to at least Moser (1942). Since then, the use of vocal fry has also been described as a treatment technique for hyperfunctional voice disorders (Boone & McFarlane, 1994). In recent years, some studies have demonstrated improvements in voicing with the use of vocal fry in conjunction with other voice therapy strategies, such as yawn–sigh, loudness variation, and chant talk; however, these studies did not examine the effect of vocal fry on its own (Aghadoost et al., 2020; Khoddami et al., 2023). Studies examining the effects of vocal fry as a treatment technique in isolation have found mixed results. One study of vocal fry in healthy individuals found decreased perturbation measures in females and increased glottal closure in males (Pimenta et al., 2013). However, another study comparing the effects of yawn–sigh and vocal fry found greater intensity range and reduced perturbation and noise following training with yawn–sigh compared to glottal fry (Meerschman et al., 2017). In addition to the ongoing scientific investigation of the treatment effects of vocal fry in clinical settings, vocal fry is also used as a technique in singing pedagogy. It has been advocated as a technique for extending the lower range of bass and baritone singers (Brown, 1996) as well as a corrective technique for overly breathy vocalists (Vennard, 1967). Its utility in warm-up (Van Lierde et al., 2011) and cooldown exercises (Ragan, 2018) has also been demonstrated.[3]

Advances in the acoustic descriptions of vocal fry have also provided insight into the variability of its production and perception. Proctor et al. (2024) describe six patterns of vocal fry produced by five females based on waveform characteristics: single pulse, double pulse, multiple pulse, period doubling, inaudible, and indeterminate. These patterns of vocal fry were not found to occur in isolation, rather multiple patterns could be seen in quick succession within the same utterance. Some of these patterns overlap with Keating et al.'s (2015) description of subtypes of creaky voice (i.e., prototypical fry and multiply pulsed voicing). While it may be the case that some of these subtypes are not perceptually distinct (Davidson,

[3]For further reading on the role of vocal fry in singing pedagogy, the reader is referred to Nix et al. (2005).

2019), the clinical potential of these descriptions remains to be explored.

Summary of Reviewed Literature

A review of the history of the literature on vocal fry reveals evolving terminology and sentiment, which perhaps contributes to the controversy and confusion surrounding vocal fry today. What exactly is vocal fry? That answer seems to depend on who answers and whether they are referring to a linguistic, perceptual, physiological, or acoustic phenomenon. The term "phrase-final creak" has been used in the linguistics literature to refer to the voice quality that is perceptually low pitch, irregular, and often marks phrase and utterance boundaries in varieties of English (Davidson, 2021; Garellek, 2022). This corresponds to many of the descriptions of vocal fry in the clinical literature described herein. The phrase-final use of vocal fry seems to have been widely accepted as normal in the clinical literature as well (Abdelli-Beruh et al., 2013; Blum, 2016). Much of the acoustic and physiological evidence seems to suggest that what was referred to as vocal fry in research throughout the 1900s may also be described as period doubling (Childers & Lee, 1991; Monsen & Engbretson, 1977; Moore & von Leden, 1958; Proctor et al., 2024; Timcke et al., 1959; Wendahl et al., 1963), which may be acoustically distinct from what is described as prototypical vocal fry or single pulse fry (Keating et al., 2015; Proctor et al., 2024). Some clinical researchers have equated vocal fry with other terms, such as creaky voice (Monsen & Engbretson, 1977) or pulse register (Hollien, 1974; Stemple et al., 2020), while others differentiate these terms based on perceptual or acoustic characteristics (Keating et al., 2015; Titze, 1994). Garrett and Kreiman (2001) call for a need for specificity when referring to this voice quality, especially in the clinical realm, with terms such as vocal fry, creak, creaky voice, and pulse register all ostensibly referring to the same perceptual phenomenon. A notable point of development in the acoustic description of vocal fry is the identification of multiple subtypes based on acoustic characteristics (Keating et al., 2015; Proctor et al., 2024). In short, given the varying use of "vocal fry" and related voice qualities, the field lacks a clear and consistent definition of the term.

Initially, vocal fry may have been erroneously diagnosed as dysphonia ventricularis, with reports of this voice quality being pervasive in college-aged students in the 1930s (Voelker, 1935, 1937). Vocal fry was considered a voice disorder until research produced by Michel, Hollien, and colleagues in the 1960s, which found that it is acoustically and perceptually distinct from diagnosed harshness (Hollien et al., 1966; Michel, 1964, 1968). Based on acoustic and physiological evidence, vocal fry was defined as a normal phonation register with *F*0 ranges below the *F*0 range for modal phonation. Subsequent work in the 1970s supported this view (Hollien, 1974; Monsen & Engebretson, 1977). Current sentiment regarding vocal fry tends to be mixed. Some clinical work lists it as an aberrant or potentially pathological voice quality or report negative perception of women who use vocal fry (e.g., Anderson et al., 2014; Gallena & Pinto, 2021). On the other hand, clinicians acknowledge its use in normal speech and in singing pedagogy and also make use of it as a therapy technique. Anecdotally, however, some clinicians report treating it as part of voice therapy, even when it only occurs phrase-finally.

Clinical Implications

Should clinicians stop treating vocal fry in therapy if previous work has suggested that it could be normal? The available evidence does not provide a clear answer. Of course, there is the very real possibility that patients who present to clinic with voice complaints produce vocal fry in a way that contributes to the perception of disordered voicing, while typical speakers do not. As clinicians, we know all too well the need to make clinical decisions based on our expertise when evidence is lacking, and this is certainly an area of practice where the available evidence provides no clear clinical guide. Anecdotally, many voice specialists report treating vocal fry only if it is associated with patient-reported symptoms—in other words, vocal fry is perceived as abnormal in these cases based on clinical expertise and patient report.

There is also concern expressed in the literature regarding the frequency with which patients use vocal fry and its potential to contribute to dysphonia. As previously stated, there is an assumption that excessive use of vocal fry may become pathological; this belief is echoed throughout the literature (Hollien et al., 1966; Oliviera et al. 2016; Van Houte et al., 2011) with limited supporting evidence. In addition, there may also be the assumption that vocal fry can be a contributing factor to a person's voice disorder, although not the primary source of the disorder itself. Here, too, the underlying hypothesis is that vocal fry is a suboptimal mode of voicing that has the potential to exacerbate dysphonia, while other forms of voicing do not. However, evidence for this hypothesis is similarly lacking. This belief may stem from previous work, suggesting that vocal fry tends to be produced with thick vocal folds and increased subglottal pressure (McGlone & Shipp, 1971). However, it should be noted that evidence also suggests that phrase-final creak may be produced without increased medial compression (Duarte-Borquez et al., 2024; Keating et al., 2015, 2023; Slifka, 2006) and with decreased subglottal pressure (Blomgren et al., 1998), further challenging this assumption.

Given the lack of evidence on the necessity for treatment of vocal fry in clinical practice, we provide no recommendation in favor of or against the treatment of vocal fry in clinical populations. Instead, we suggest clinicians consider a series of questions to guide their clinical decision making: (a) What is the linguistic environment in which the patient is producing vocal fry? (b) What are the acoustic and aerodynamic characteristics associated with the patient's vocal fry? (c) Does the patient report worsened symptoms (e.g., increased pain, strain, or effort) during or following production of vocal fry? (d) Does the clinician have any bias for or against vocal fry? In addition, we make recommendations below for future research that may provide clearer clinical direction.

Future Directions

The ideas addressed above raise a few questions that merit further investigation: Is there such a thing as "excessive use" of vocal fry? If so, what is considered excessive? Current research investigating vocal dosimetry may begin to answer this question. Ambulatory voice monitors, such as accelerometry, quantify voice use and measure acoustic features of voice quality (*F*0, spectral tilt, measures of harmonics-to-noise ratio, among others). A wearable accelerometer measures neck skin vibration during voicing. Acoustic measures are then derived from this signal (Mehta et al., 2012). This may provide an opportunity to examine the relationship between amount of voice use, voice quality, vocal fatigue, and the influence of predisposing and precipitating factors in the development of a voice disorder. For example, a recent study examining voice use in patients with nonphonotraumatic hyperfunction and matched controls made use of accelerometry to record participants over the course of 1 week. This allowed for collection of over 80 hr of data per participant and comparison of voice measures including *F*0, cepstral peak prominence, and H1–H2, among others (Van Stan et al., 2021). These same measures may be used to identify the acoustic characteristics associated with vocal fry and related voice qualities. Therefore, a similar methodology may be employed to examine the relationship between frequency of vocal fry (as determined by acoustic features) and participant-reported voice symptoms (e.g., vocal fatigue, vocal effort).

The treatment of vocal fry in clinical settings also calls into question how we define disordered voicing. If a person uses vocal fry exclusively (likely falling within the range of "excessive") but does not report symptoms associated with voice use and is not limited by their voice, is this considered pathological? The answer may be "it depends." Perhaps it is possible that what is a normal, default mode of voicing for one person may become pathological for another given individual predisposing or precipitating factors (Hillman et al., 2020). If that is the case, what are those factors? Additionally, given the evidence that vocal fry is used by typical speakers and may be used as a therapeutic tool, what differentiates typical from pathological uses of vocal fry? It may be the case that differences between typical and dysphonic uses of vocal fry are related to physiology or simply related to frequency of use. The findings of Michel's (1964) dissertation, which demonstrated qualitative differences between typical use of vocal fry and dysphonia, have yet to be replicated or extended with larger sample sizes or new technology. These and other questions remain to be answered in future research.

Finally, given the varying terminology in the field for vocal fry and related voice qualities, we suggest that the use of the term "vocal fry" in future research be accompanied with defining perceptual, acoustic, and physiological characteristics (where applicable) in order to more easily interpret and compare findings across studies and across disciplines. We again draw attention to the call given by Gerratt and Kreiman (2001) for "a common theoretical framework for the description of vocal quality, which may eventually eliminate impediments to a unified description" (p. 379). Given the relatively advanced acoustic descriptions of vocal fry (as compared to its aerodynamic and physiological characteristics), researchers are strongly recommended to use the relevant acoustic descriptions of vocal fry and related voice qualities, such as those described in Keating et al. (2015) and in Proctor et al. (2024). For example, in addition to writing, "we measured vocal fry at the ends of sentences," researchers should also include the acoustic characteristics that they used for identifying instances of vocal fry, such as "evidence of low *F*0 and low spectral tilt." It may be the case that descriptions of vocal fry and related voice qualities vary in large part because there is no one-to-one relationship between physiology, acoustics, and perception. What is perceived as "vocal fry" may be acoustically characterized by period doubling, low *F*0, aperiodicity, or some combination of these characteristics (e.g., Davidson, 2019). Additionally, as previously found in Proctor et al. (2024), subtypes of vocal fry may not occur in isolation but in quick succession within a single utterance. It is therefore paramount that researchers specify characteristics of vocal fry on the relevant dimensions (physiological or acoustic) when possible.

Data Availability Statement

All data generated or analyzed during this study are included in this published review article.

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