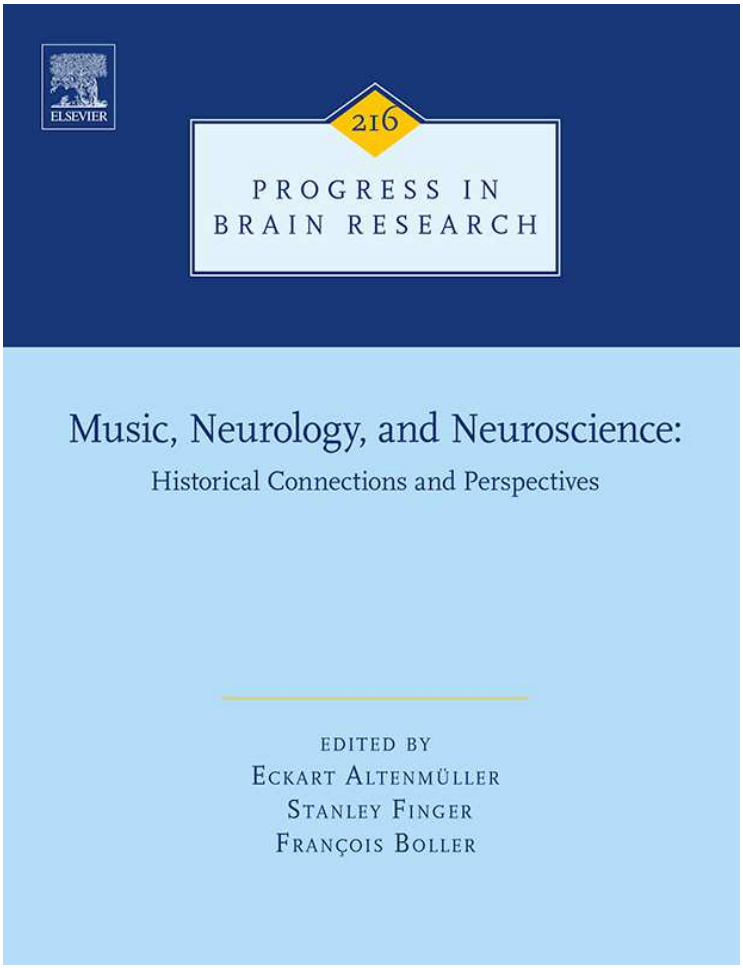

From Julene K. Johnson and Amy B. Graziano, Some early cases of aphasia and the capacity to sing. In: Eckart Altenmüller, Stanley Finger and François Boller, editors, *Progress in Brain Research, Vol. 216*, Amsterdam: Elsevier, 2015, pp. 73-89.
ISBN: 978-0-444-63399-6

Elsevier

CHAPTER

Some early cases of aphasia and the capacity to sing

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Abstract

This chapter examines early cases of aphasia that include observations of the capacity to sing. Although the majority of these cases were published in the late nineteenth century, earlier reports exist and provide insights into the early thinking about the capacity to sing in aphasia, a topic that continues to the present day. The observation that some patients with aphasia and limited speech output were able to sing the texts of songs inspired scholars to examine the relationship between music and language. Early ideas about the capacity to sing were provided by well-known neurologists, such as John Hughlings Jackson and Adolf Kussmaul. The work of Herbert Spencer about the origins and function of music heavily influenced Jackson and others in their thinking about aphasia. This work also led to an increased interest in understanding music abilities in persons with aphasia and, later, in the brain mechanisms of music. The chapter provides a background as to why there was an interest in the capacity to sing in persons with aphasia and what influenced early thinking on this topic.

Keywords

singing, aphasia, amusia, Jackson (John Hughlings), Kussmaul (Adolf), Spencer (Herbert), Falret (Jules), origins of music, origins of language, emotion, music cognition

1 INTRODUCTION

The fact that song, by definition, is a musical composition that commonly pairs a melody and text (lyrics) might have helped secure its place in discussions both about music and about language throughout history. An interest in the relationship between music and text in the context of singing can be traced through Western history, including back to antiquity and the medieval period. The importance of singing grew to new heights during the late sixteenth and early seventeenth centuries, when late Renaissance and early Baroque vocal music styles were developed and used in various

Progress in Brain Research, Volume 216, ISSN 0079-6123, http://dx.doi.org/10.1016/bs.pbr.2014.11.004

genres (e.g., monody and the several genres in which it appeared, such as opera; Bianconi, 1982; Stevens, 1960). The capacity to sing also was discussed in philosophy and language literatures (e.g., origins of language and elocution).

It was not until later in the eighteenth and nineteenth centuries that discussion about the capacity to sing began to appear more frequently in medical literature (e.g., physiology, neurology, and psychiatry). Nineteenth-century physicians were struck by the observation that some persons who were unable to speak after brain damage were sometimes able to sing the text of songs. This dissociation inspired neurologists to explore the capacity to sing in more depth, in order to better understand aphasia. These efforts also led to an increased interest in understanding music abilities in persons with aphasia and, later, in the brain mechanisms of music.

This chapter examines early cases of aphasia that include observations of the capacity to sing and why there was an interest in this topic. Although the majority of these cases were published in the late nineteenth century, earlier reports exist and provide insights into the early thinking about the capacity to sing in aphasia, a topic that continues to the present day.

2 EIGHTEENTH-CENTURY OBSERVATIONS OF SINGING IN APHASIA

Although additional research into eighteenth-century literature might reveal more observations, we are aware of only two cases in which the capacity to sing was documented in persons with aphasia in the eighteenth century.

2.1 DALIN AND THE MUTE WHO COULD SING HYMNS

The Swedish historian and poet Olof von Dalin (1708–1763) likely provided the first observation in modern literature of the capacity to sing after a stroke (Fig. 1). In 1745, he published an article titled *Berättelse om en dumbe*, *som kan siunga* (*On a mute who can sing*) in the journal of the Swedish Academy of Sciences (*Kongliga Svenska Vetenskaps Academiens nya Handlingar*; Dalin, 1745). A translation of this short report can be found in Johnson et al. (2010). Dalin recounted a second-hand report by a priest, who described a farmer's son (JP) who had a stroke with loss of conversational speech and right-sided paralysis; JP was only able to verbalize one word (meaning "yes") in conversation. However, JP was able to correctly sing and whistle previously learned hymns, implying that he could produce both the melody and the text of the songs when singing. He apparently required some assistance getting started at the beginning of the song but was otherwise able to sing familiar songs. Dalin (1745) wrote:

> *. . .he can sing, whistle hymns, which he had learned before he became ill. And these so purely and explicitly like any other normal person: but one should notice that he in the beginning of the hymn had to be assisted a bit by another person who sings (as well).*
>
> **p. 115; translated by Arne Brun in Johnson et al. (2010, p. 18)**

FIGURE 1

Portrait of Olof von Dalin painted by Johan Henrik Scheffel (1690–1781). Private collection.
Photo: Patrik Hallberg, Falkenbergs museum, Falkenbergs, Sweden. Reprinted with permission.

Dalin also noted that JP was able to verbalize some prayers (without singing), suggesting that the ability to produce other memorized texts was also preserved. Dalin made an additional comment about the preserved ability to sing in persons who stutter, which was another condition in which the dissociation between speaking and singing texts was noticed. In the same report about JP and his singing abilities, Dalin (1745) noted:

> *I want to add to this story nothing else other than the remark that those who stutter, even if they cannot manage ten words in a row without interruption when they speak, however, can sing without impairment and with sense.*
>
> **p. 115, translated by Arne Brun in Johnson et al. (2010, p. 19)**

A preserved ability to sing in persons who stutter was occasionally mentioned by other authors later in the early nineteenth century (e.g., McCormac, 1828; Wright, 1835). This report by Dalin is noteworthy because it appears to be one of the earliest descriptions of the dissociation between verbalizing words in conversational speech and singing.

2.2 GESNER AND THE ABBOT WHO COULD NOT SING

In 1770, Johann Gesner (1738–1801), a German physician, recorded an observation regarding the dissociation between conversational speech and singing in his well-known, five-volume monograph, *Sammlung von Beobachtungen aus der Arzneygelahrheit und Naturkunde* (*Collection of Observations of the Pharmaceutical Erudition and Natural Science*; see Fig. 2). In the chapter about aphasia (*Die Sprachamnesie*, *The Language Amnesia*), Gesner described an abbot (case 3) who suddenly became unable to speak and had difficulty in understanding others (Gesner, 1770). Gesner documented that, although the abbot could recite a prayer, he was not able to recite Psalms (which are usually sung), sing songs, or read printed materials. Gesner also noted that the abbot had difficulty with calculation and a decline in judgment. Unfortunately, no further information about the abbot's singing ability was provided. This case description, however, suggests that eighteenth-century physicians were aware of dissociations between producing speech in conversation and memorized texts.

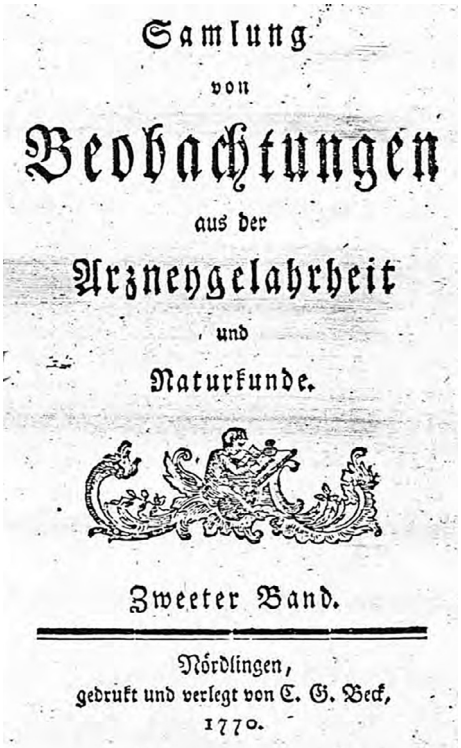
Samlung
von
Beobachtungen
aus der
Arzneygelahrheit
und
Naturkunde.
Zweeter Band.
Nördlingen,
gedrukt und verlegt von C. G. Beck,
1770.

FIGURE 2

Photograph of the cover of Gesner's (1770) monograph, *Sammlung von Beobachtungen aus der Arzneygelahrheit und Naturkunde*.

2.3 THE SINGING ORIGINS OF LANGUAGE

It is important to point out that singing was often included in late-eighteenth-century discussions about the origins of language. These authors did not discuss speech disorders and music, per se, but their work exemplifies how the topic of singing was included in discussions of language in the period that preceded the rapid expansion of interest in aphasia in the mid-nineteenth century.

For example, the German philosopher and theologian Johann Gottfried Herder (1744–1803) published a prize-winning essay about the origins of language in 1772 (Herder, 1772). Levelt (2013) noted that Herder criticized the prevailing thesis that language was a divine creation and, instead, proposed that language was a product of human nature. This dramatic shift led to consideration of language from an evolutionary perspective that could be traced to lower animal species and emotional expression. Levelt reflected on Herder's thoughts about the original languages having musical properties and linking it to song, writing: "It is a singing language rather than a talking one. And this feature of language was never fully lost" (p. 22). Levelt also quoted Herder who stated: ". . .it always remained kind of a song" (p. 22). Herder also had an interest in folk songs and published a collection of German folk songs in 1773 (Herder, 1773/1807); this interest in folk songs may have facilitated his ideas about the singing origins of language.

The Scottish scholar James Burnett (ca. 1714–1799) (also known as Lord Monboddo), however, doubted that, from an evolutionary perspective, there was a singing language prior to the development of a spoken language. He argued that the music of early people (savages) and the Greeks did not modulate (pitch) to a sufficient degree to be useful as a language. In his book, *Of the Origin and Progress of Language*, he wrote:

> *. . .and yet I dare not venture to affirm that there ever was a language of singing merely before there was a language of speaking. And I should rather incline to think that there was not. One thing at least is certain, that such a language would be altogether insufficient for the purposes even of savage life.*
>
> **Burnett (1774, p. 473)**

Instead, Burnett proposed that language developed from "inarticulate cries" of animals that expressed emotion and desires. These ideas are regarded as a precursor to the thinking of Darwin by some scholars (e.g., Gray, 1929). An interest in the singing origins of language continues in contemporary literature (e.g., Brown, 2000), and an expanded discussion about the origins of music is provided by Kleinman in this volume.

2.4 ADDITIONAL CONSIDERATION OF SINGING AND SPEAKING IN THE EIGHTEENTH CENTURY

The overlap between singing and speaking was discussed in other literature during the late eighteenth century. For example, the British theologian and vocalist Anselm Bayly (d. 1794), in his book, *A Practical Treatise on Singing and Playing. Being an*

Essay on Grammar, *Pronunciation*, *and Singing*, wrote about how singing was a melodic way of speaking and also linked singing with grammar and pronunciation (Bayly, 1771). He remarked:

> *For as singing is, or at least ought to be, a better and more melodious way of speaking; so should elocution resemble conversation, only more heightened and graceful.*
>
> **Bayly (1771, p. 23)**

Bayly's treatise included extended discussions about grammar, pronunciation, the art of speaking, and its application to singing. Discussion of singing in publications about elocution, cultivation of the speaking voice (e.g., Rush, 1827), and also philosophy of the voice (e.g., Lunn, 1874) became more common in the nineteenth century. The philosopher and composer Jean-Jacques Rousseau (1712–1778) also discussed the overlap between language and music, including singing, in several of his works. The extent to which this literature influenced scholars who later observed the capacity to sing in persons with aphasia is unknown, but it is important to acknowledge that discussions about singing and language took place in different contexts prior to the more common reports about the capacity to sing in aphasia in the later nineteenth century.

3 NINETEENTH-CENTURY OBSERVATIONS OF SINGING IN APHASIA

In this section, we review observations about the capacity to sing in aphasia from ca.1800–1880. 1880 serves as a natural cutoff point because observations about singing in neurology literature increased precipitously after this date, and several key developments in music and brain research occurred after ca. 1880. For example, the term "amusia" was coined in 1888 by Knoblauch to refer to the impairment in music ability (Knoblauch, 1888). See the chapter "Music, Neurology and Psychology in the 19th Century" by Graziano and Johnson for additional discussion about these developments in the later nineteenth century.

3.1 JACKSON AND SINGING AS AN EXPRESSION OF EMOTIONAL LANGUAGE

John Hughlings Jackson (1835–1911), a British neurologist who contributed to early discussions about aphasia, provided some of the first explanations as to why singing could remain preserved after brain damage even when conversational speech was impaired. He published several case reports that included descriptions of the preserved ability to sing and also used his observations of singing to help distinguish emotional and intellectual language.

In 1865, Jackson was appointed as a staff physician at the National Hospital for Paralysis and Epilepsy, which helped facilitate his access to a large number of

patients and possibly spark a new interest in aphasia (Lorch, 2004). In June 1864, Jackson delivered a lecture at the London Hospital where he discussed 70 cases with a loss of speech with right hemiplegia (in all but one case). Reports of this lecture appeared in *The Lancet* in 1864 and 1866 (Jackson, 1864, 1866). The 1864 report summarized Jackson's early thoughts regarding deficits in the expression of ideas beyond speech, different "modes" of language, and differentiating loss of speech from loss of voice. These are important concepts, which helped frame his ideas about the capacity to sing in aphasia. The 1866 report of the lecture summarized Jackson's early thoughts about the difference between emotional language and intellectual language and used his observations of the capacity to sing to help build his argument.

The 1866 report also provided some insights into prior work that influenced Jackson's ideas on this topic. For example, Jackson's ideas about singing were influenced by the British philosopher Herbert Spencer (1820–1903) and his essay, *On the Origin and Function of Music*, which was published in *Frazer's Magazine* (Spencer, 1857). Spencer put forth several important concepts that Jackson incorporated into his ideas about singing in persons with aphasia. Spencer believed first that "all music was originally vocal" and that "feelings demonstrate themselves in sounds as well as movements" (Spencer, 1857, p. 397). Spencer also noted: "That different qualities of voice accompany different mental states" (p. 398) and expanded on how emotional states are expressed in speech, using principles of music (e.g., pitch, intervals, timbre, and loudness). Spencer even used the term "emotional speech" and suggested that all vocal behaviors had a physiological basis.

In the 1866 report of the 1864 lecture, Jackson described three persons at the London Hospital who had limited speech output yet who could sing. He described two young boys with epilepsy and provided details about a woman with limited speech output and transient hemiplegia. Jackson reported:

> *She could sing, and readily sang a song her husband told her to sing "about Boney party," using the sounds "lor," "deah," "me," instead of words. She varied her voice properly.*
>
> **Jackson (1866, p. 175)**

From this example that referred to Spencer's essay, Jackson concluded that the vocal apparatus (e.g., vocal and articulatory muscles) could be used with two types of language: emotional and intellectual. He shared another example of how the woman could use her vocal muscles in "varying emotional conditions," which relates to Spencer's extensive discussion about how the qualities of voice (e.g., pitch, timbre, and loudness) vary with different intensities of emotional expression. Jackson (1866) continued:

> *In order to develop her gaggle, her husband said: 'Go and talk to the bird.' She went to the cage, which was hanging from the ceiling in one corner of the room, and, standing up, cried: 'Ah! ah! O deah! deah! deah! Pittymy, pittymy. Lor, lor, lor,' etc. She seemed quite delighted with her task, and varied her voice wonderfully, uttering one set of the gabble in one tone, and the others in other tones. At the*

> *same time she gesticulated incessantly, throwing her arms up and down, seeming to accompany her voice with a sort of dance of the arms (p. 175).*

Jackson also picked up on the rhythmic movements of this patient when she was in a heightened emotional state, again linking this observation to Spencer's statement that "feelings demonstrate themselves in sounds as well as movements" (Spencer, 1857, p. 397). In another passage, Jackson (1866) stated:

> *And dancing has all the world through been regarded as natural to an elevated state of mind. The woman would dance when a barrel organ was played in front of her house. Thus, then, she could use her laryngeal muscles not only to utter single sounds like "ah! oh!" but also in the complex process of singing. Again, she could not only use her hands in simple gesticulations, but could use her legs in the more cultivated movements of dancing (p. 176).*

Jackson concluded that the woman's clinical presentation suggested damage to the "convolutions near the left corpus striatum" of the brain and not hysteria (p. 176). Thus, Jackson used these examples to illustrate how (1) the voice can remain unaffected when speech is impaired and (2) intellectual and emotional language can be differentially affected by brain damage. This early example also shows the impact of Spencer's ideas about the origins of music on Jackson's early ideas about the capacity to sing in persons with aphasia. Jackson continued his discussion about the capacity to sing in two additional cases form the London Hospital and provided a much more extensive discussion of intellectual and emotional language in a series of three papers published in 1878–1879 (discussed below).

In 1871, Jackson described two cases with minimal speech output in an article titled *Singing by speechless* (*aphasic*) *children*, again in *The Lancet* (Jackson, 1871). This paper is examined in detail in the chapter "Singing by Speechless (Aphasic) Children: Victorian Medical Observations" by Lorch and Greenblatt. Nevertheless, some of the important features of these cases merit some attention here. In this publication, Jackson pointed out that Langdon Down (1828–1896) had described children with intellectual disabilities who could not talk but could often sing or hum a tune. Jackson discussed a 10-year-old boy who had a history of seizures since the age of one that resulted in right-sided hemiplegia. The boy never developed language and was only able to verbalize a few words (e.g., here, there, and I won't). However, the boy had learned and could sing several children's songs (i.e., *Not for Joe* and *Heads or Tails*). Jackson noted that he could verbalize words in the songs that he was unable to use in other contexts. The following text is from the notes that Jackson made while observing the boy:

> *He walks about the room, he takes up a book, puts it down; then goes to a chair, which he moves. He comes next to the fireplace, and points to a bust; then gives his mother a push, under which she staggers, and breaks out singing 'Not for Joe,' 'Not for Joe.' He only sang these three words twice, and would not sing anything more. The word 'Joe' was uttered very clearly, the other two words indistinctly.*
>
> **Jackson (1871, pp. 430–431)**

Jackson also described an 8-year-old boy who had epilepsy and a severe intellectual disability but was able to sing, but without the words. The boy also had limited speech and could only verbalize a few words (e.g., "here" and "Eleanor"). Jackson was unable to convince the boy to sing during his examination. With these two case illustrations, Jackson further commented that speech and voice are distinct and that the power to vary the tone of the voice can be preserved:

> *Voice and speech are obviously very distinct things, and it is rare for loss of voice to occur with loss of speech. Nearly all patients who have lost speech can utter some word, as "yes" or "no," and they preserve the power of varying the tone of the voice. This is quite as conclusive, although not so striking, evidence as ability to sing is that the larynx and its nerves are interfered with.*
>
> **Jackson (1871, p. 431)**

In this article, Jackson referred to the 1866 publication by Falret. As discussed below, Falret described aphasics who could and could not sing and also reported the case of an aphasic musician who could neither read nor write text but who could write down the notes to a melody played for him. Jackson commented that this was a valuable observation because it was an example of a preserved ability to write symbols that were not merely copied; however, Jackson said that this was not surprising because "symbols of music have no relation to words" (Jackson, 1871, p. 431). Jackson also speculated about a parallel clinical syndrome (amusia) that would be named 17 years later by Knoblauch, stating: "A symptom corresponding to aphasia would be the loss of power to sing *tunes* previously acquired" (Jackson, 1871, p. 431). It is curious that Jackson's ideas about the capacity to sing in persons with aphasia were based, in part, on his observations of children, including those with intellectual disabilities and less so on adults with aphasia.

In his series of three papers titled *On affections of speech from disease of the brain* that were published in *Brain* in 1878–1879, Jackson used the example of singing to argue the differences between emotional speech and intellectual speech (Jackson, 1878, 1879). He again discussed the relationship between singing and emotional language and explained how singing and automatic speech could remain preserved in severe aphasia. In the first paper of the series, Jackson (1878) discussed the pattern of both impaired and preserved abilities in a typical presentation of "complete aphasia" where the patient is "speechless." He described the preserved abilities as follows:

> ***(1)*** *He can understand what we say or read to him.*
> ***(2)*** *His articulatory organs move apparently well in eating, drinking swallowing and also in such utterances as remain always possible to him (recurring utterances), or in those which come out occasionally.*
> ***(3)*** *His vocal organs act apparently well; he may be able to sing.*
> ***(4)*** *His emotional language is apparently unaffected. He smiles, laughs, frowns, and varies his voice properly. His recurring utterance comes out now in one tone and now in another, according as he is vexed, glad etc.; strictly we should say he sings his recurring utterance; variation of voice being rudimentary song (Spencer); he may be able to sing in the ordinary meaning of that term.*

> *As stated already, he may swear when excited, or get out more innocent interjections, simple or compound (acquired parts of emotional language)*
>
> **Jackson (1878, pp. 319–320)**

This list of preserved abilities in severe aphasia included intact language comprehension, normally functioning articulatory and vocal organs, and emotional language, which could facilitate the production of both automatic speech and singing. Jackson, therefore, provided one of the first explanations as to why persons with severe aphasia are often able to sing, his basic idea being that singing was a type of emotional language, similar to other automatic (nonpropositional) speech, and emotional language could remain preserved in severe aphasia.

3.2 FALRET AND THE CAPACITY TO SING IN APHASIA

In 1866, the French psychiatrist Jules Falret (1824–1902) suggested that it was already well known that some patients with the loss of speech could sing the text of songs, while others could not. He wrote a section about music, drawing, and calculation in the section on aphasia in the *Dictionnaire Encyclopedique des Sciences Medicales* (*Encyclopedia of Medical Sciences*) (Falret, 1866). In this section, he considered various patterns of preserved and impaired nonlanguage abilities, writing:

> *These diverse manifestations of human thought can equally be conserved or destroyed in aphasics, separately or simultaneously. Song, the intermediary between a scream and spoken language, can persist even in aphasics who have almost completely lost the use of speech; but it is necessary to distinguish, among these instances of the retaining of song, two very distinct categories. Certain individuals, in effect, although unable to speak words in the usual manner, have kept the ability to hum them [lyrics] with the help of some words or monosyllables which remain with them; there are others, on the other hand, who can truly pronounce, in song, words which they are incapable of pronouncing through normal speech.*
>
> **Falret (1866, p. 620), translated by Clare Homan**

In the same section, Falret referenced a patient observed in 1836 by Louis-Jules Behiér (1813–1876), a professor of clinical medicine at the Hôtel-Dieu de Paris. Falret recounted the observation:

> *Professor Behiér told me about a very interesting example of the first category that he observed in 1836 and recorded in his memory for internal prizes. It concerned a patient afflicted with syphilis, who was in a true aphasic state, equivalent to those recently observed instances. Like M. Broca's patient, he could only say the syllable tan. He tried to express his thoughts by using this syllable, supplemented by gestures where his speech was insufficient. And so! This patient, who could no longer speak, very distinctly sang the* Marseillaise *and the* Parisienne *without articulating each of the words, instead modulating his breaths, again using that same monosyllable,* tan, tan, tan, *repeated indefinitely.*
>
> **Falret (1866, p. 620), translated by Clare Homan**

It is unclear whether this case report was ever published by Behiér or just relayed through word of mouth; a citation has not been located. Falret provided more details in this section than most other accounts of this case. Although it appears that he did not contribute any new case observations, Falret was aware of two common patterns of singing in aphasia: those who could sing with the words and those who could only sing the melody. It is also noteworthy that comments about singing in aphasia were included in this important medical encyclopedia in the 1860s.

3.3 KUSSMAUL'S SYNTHESIS IN 1877

Adolf Kussmaul (1822–1902), a German physician and chair of clinical medicine in Strasbourg, wrote one of the first comprehensive monographs on the disorders of language. His 1877 *Disturbances of Speech. An Attempt in the Pathology of Speech* was published both in German in Hugo von Ziemssen's well-known *Handbuch der Speziellen Pathologie und Therapie* (*Handbook of Special Pathology and Therapeutics*) (Kussmaul, 1877a) and in English in Ziemssen's *Cyclopaedia of the Practice of Medicine* (Kussmaul, 1877b). Levelt (2013) regards this monograph as the first neurolinguistic textbook. It covers a variety of topics, including language development, origins of language, disorders of speech and language, and the neuroanatomical structures involved in language. Kussmaul also included a fair amount of discussion related to singing, the voice, and music.

Kussmaul presented the broad argument that music is an expression of emotion and used a variety of evidence to argue for the modularity of music, in his monograph. One line of evidence stemmed from discussions about the origins of language (also discussed above), which was a popular topic in the mid-nineteenth century (Levelt, 2013). In his chapter on interjectional and emotional speech (chapter 17), Kussmaul cited Charles Darwin's (1809–1882) thesis that emotions lead to expression in both lower, nonhuman animals and humans (Darwin, 1872). He also agreed with Darwin that the expression of "articulate sounds" in the form of speech is unique to humans. Kussmaul described the unarticulated sounds used by nonhuman animals for calls, warnings, and attracting a mate as either "melodious" or "unmelodious." Kussmaul also remarked that:

> *of all the arts, music, which by its harmonies can stir up the ocean of feeling to the greatest depth. . .and hence, the voice, although primarily but the interpreter of the feelings aroused through hearing, is, nonetheless, peculiarly adapted to express also the feelings of all the other senses.*
>
> **Kussmaul (1877b, p. 589)**

Kussmaul was impressed by the way in which vocal sounds in both speech and music were an ideal mode to express feelings. Under conditions of "cerebral excitation," the vocal apparatus could become the vehicle to express a range of emotions. Kussmaul explained:

> *Conditions of cerebral excitation causing a feeling of comfort and enjoyment lead a frog to croak with unvarying monotony on one evening as another. The same condition of cerebral excitation in man draws from his organs of voice the most diverse forms of joyful song or pleasant words of banter; but if sad news be announced, both song and joke are silenced until perhaps a cheering word is spoken in the circle and the same joyful frame of mind is restored.*
>
> **Kussmaul (1877b, p. 623)**

As discussed above, Jackson argued almost a decade earlier that music was an expression of emotion, also basing his thoughts on Darwin and Spencer.

Darwin also put forth the idea that these vocal expressions by nonhuman animals represented the earliest developmental stage of the voice, a concept that was also embraced by Kussmaul in his monograph. Kussmaul linked the ideas about the origins of language and music with the development of language in children by referencing not only Darwin but also the British biologist Richard Owen (1804–1892) and explaining: "The fact mentioned above, that musical feeling awakes much earlier in children than sense for words, is probably connected with the early existence of musical feeling in the animal world" (Kussmaul, 1877b, p. 643). Kussmaul was also aware of the work of German physician Berthold Sigismund (1819–1864), who described in his 1856 book *Kind und Welt* (*The Child and the World*), that children can often sing before they can speak (Sigismund, 1856). The idea that musical expression develops before speech (expression) was used by Kussmaul and others as another explanation as to why the capacity to sing could remain preserved in persons with aphasia.

In addition, Kussmaul wrote about how children with intellectual disabilities, who could only speak a few words but could often sing. Kussmaul observed that children with acquired intellectual disabilities (acquired idiotism) sometimes have a good "musical ear" and "memory for melodies," which remained preserved even when speech was "impossible" (Kussmaul, 1877b, p. 824). He referenced Jackson's (1871) case (described above) and also used the term "melody trillers" (*Melodienträller*) to refer to those children with a preserved ability to sing despite their intellectual disability. Kussmaul also cited work by Austrian physician Franz Valentin Zillner (1816–1896) who differentiated children with intellectual disabilities who could "modulate their voice" and were able to produce "high, clean notes" with those who could only "utter a few sharp, harsh sounds" (Kussmaul, 1877b, p. 824). He was also aware of several prior reports of stutters who could sing without impediment (e.g., Wyncken).

Kussmaul framed his ideas about the capacity to sing in aphasia in a section about asymbolia and the broader spectrum of symptoms in aphasia. Interest in the broader variety of symptoms can be seen as early as 1870, when Karl Finkelnburg (1832–1896) presented a paper at the meeting of the Society of the Lower Rhine in Bonn, Germany, where he discussed five cases and proposed the new term "asymbolia." In this presentation, Finkelnburg described both verbal and nonverbal

deficits in persons with aphasia. Duffy and Liles (1979) provided a translation of Finkelnburg's (1870) publication based on this presentation and also pointed out that Finkelnburg was one of the first to suggest that the syndrome of aphasia was not limited to a deficit in speech production. Finkelnburg proposed the term "asymbolia" to refer to the impairment in the understanding or production of symbols, which included phonetic symbols, mathematical formulas, musical notation, and other symbols. Kussmaul agreed with Finkelnburg that it was important to consider a broader variety of symptoms in aphasia, writing:

> *Finally it has come to this at the present day that under aphasia we no longer understand merely the disturbances in speech alone but also the collective symptomatic phenomena whether abundant or scanty under which the execution or comprehension of any given signs by which It Is sought to communicate conceptions or feelings is impaired.*
>
> **Kussmaul (1877b, p. 609)**

Kussmaul also discussed different types of asymbolia where some people were unable to speak (using "phonetic symbols") yet were able to express the symbols in writing. With regard to his thoughts about singing, Kussmaul cited the German philologist and philosopher Heymann Steinthal (1823–1899) who used the Greek term **ἀμουσία** to refer to individuals who lose both the capacity to sing the melody and vocalize the text of a song (Steinthal, 1871). In addition, Kussmaul noted that some individuals could lose the capacity to sing the text but retain the melody. Kussmaul also referred to Falret's (1866) report of Behiér's patient (discussed above) who could only verbalize "tan" but could sing the *Marseille* and the *Parisienne*. Kussmaul (1877b) stated: "Indeed, it sometimes happens that, under the influence of musical stimulus, words will make their appearance which could not otherwise be uttered" (p. 648–649). In one of his strongest statements about the modularity of music, Kussmaul wrote: "the power of expressing musical feeling is independent of phonetic speech" (p. 648). He also speculated that different brain regions (central organs) existed to support different symbolic functions, adding: "there also exist central organs for the plastic art, for painting, music, dancing, and for the forms of thought which do not give employment to words, but to numerical signs and other pictorial formulae" (p. 614). In his diagrammatic model of language, Kussmaul included a branch of the acoustic nerve that would relay melodies. However, he did not develop his ideas on this topic.

Although Kussmaul did not provide particularly new ideas about the capacity to sing, he synthesized the contemporary discussions from the different perspectives, including language development, origins of language, and observations of singing in persons with aphasia, children with intellectual disabilities, and those who stutter. He agreed with Spencer, Darwin, Jackson, and others that singing was an expression of emotion. He also discussed music in a broader sense and included the perception of music in his diagrammatic model of language. Jackson called Kussmaul's monograph "highly original" and "worthy of most careful study" (Jackson, 1878, p. 305).

3.4 OTHER OBSERVATIONS ABOUT SINGING IN APHASIA PRIOR TO 1880

In addition to the cases discussed above, there are a few other observations about the capacity to sing in aphasia prior to 1880, including some from several of the most influential thinkers about aphasia in the nineteenth century. For example, in his *Der aphasische Symptomencomplex* (*The Aphasic Symptom Complex*), Carl Wernicke described a woman with aphasia (Susanne A.) who could sing but without the song text (Wernicke, 1874). He wrote: "Without text, she correctly sings the Tyrolean song (*When I Go to My Child*) after it happened to be sung by another patient" (p. 40). Wernicke did not provide any more details or ideas about this observation. Although he did not appear to examine musical abilities in persons with aphasia, Paul Broca reflected on music in his discussion about memory for words and whether or not various mental faculties are independent from one another. As recorded by Parrot (1863), Broca remarked:

> *As for me, I do not consider memory to be a simple faculty, nor even a complex faculty, but rather a state or, if you will, a property belonging to each of our faculties and unevenly developed in each. Each faculty has its memory, which is more or less complete and has nothing to do with other memories. I do not know whether there are brains that are well enough balanced to remember everything equally well. I quite doubt that, and I must say I have never known one. Many a one who can sing an opera score from beginning to end without missing a single note, after a single hearing, is unable to learn by heart ten lines of prose.*
>
> **Parrot (1863); translated in Eling (1994, p. 53)**

Thus, Broca questioned whether or not a person with an exceptional music memory could also have the talent for memorizing prose, thereby suggesting the relative independence of different cognitive abilities.

In 1865, Jean-Baptiste Bouillaud documented the capacity to sing in two patients with aphasia (Bouillaud, 1865). He outlined the symptoms of a 50-year-old composer with loss of speech and difficulty in writing (aphasia and verbal agraphia), who was able to compose a new tune and write down the notes. The patient was also able to sing or "modulate his voice," as Bouillaud described it. He included another patient (case 9, Madame V), who had complete loss of speech and right hemiplegia and was unable to read or write verbal text, music notation, or numbers. However, she was able to sing a familiar song and also play a familiar song on the piano. Bouillaud noted that the memory of some things remained. In an earlier lecture, Bouillaud also discussed how different types of coordinated movements are required for speaking, writing, drawing, painting, and playing a musical instrument. Both of these cases were included in a series of debates about the localization of language at the *Académie Impériale de Médecine* (*Imperial Academy of Medicine*), which took place in 1865. Adrien Proust described an aphasic musician who could read and write music notation, compose, and recognize tunes but was unable to sing a familiar melody (Proust, 1872). The British neurologist William Gowers made a brief mention of

the preserved ability to sing in a 30-year-old carpenter who had severe aphasia and right-sided paralysis (Gowers, 1875). See the chapter "Franz Joseph Gall and Music: The Faculty and the Bump" by Eling and colleagues where they discuss Franz Joseph Gall's early-nineteenth-century observation of an intellectually disabled 14-year-old girl who could sing 40 songs from memory, which illustrates the dissociation between general intellectual ability and the capacity to sing. Gall did not, however, name an organ specifically for the capacity to sing; instead, he focused on a more general faculty of perceiving the relations of tones and talent for music (*Ton-sinn*) in his theory of phrenology.

4 SUMMARY

In conclusion, it appears that there were multiple influences on early thinking about the capacity to sing in persons with aphasia. Although the majority of these cases were published in the late nineteenth century, earlier reports exist. An interest in singing throughout history from a number of different disciplines was probably fueled by the fact that songs are composed of both music and language and, thereby, offer insights into both. Jackson was clear about the influence of Spencer's ideas about the origins of music on his early thinking about aphasia. Interactions between music and the emotions also figured heavily into these early discussions. The capacity to sing was also considered in a number of clinical syndromes, including aphasia, stuttering, and intellectual disability. Kussmaul provided an important early synthesis of this clinical work. Observations of singing were important to early ideas about the extent of cognitive functioning in persons with aphasia and supported investigation into the broader syndrome of aphasia. It is also important to note that many of the prominent nineteenth-century thinkers about aphasia included observations of singing in their discussions. As interest in music was passed from teachers to students, the number of publications that considered music increased during the late nineteenth century. Additional historical work with literature prior to the nineteenth century could provide further insights into why the capacity to sing was included early on in scholarly thinking about language and the brain.

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