12 Fluency and disfluency in language disorders

Naohisa Furuta, Naomi Sakai, and Yuki Takakura

12.1 Introduction

In recent years, research on disfluency targeting normal native speakers has become increasingly common (Lickley 2015; Sadanobu 2019, 2024). These studies have pointed out that real speech contains many disfluent utterances that cannot be ignored. Such disfluencies exhibit certain regularities and can sometimes positively affect communication. The overall argument of this book is that "disfluency has not only an aspect that must be eliminated, but also a different aspect. It is something we learn and sometimes even utilize in conversation." The latter part of this argument, namely, "something we learn and sometimes even utilize in conversation," primarily focused on the disfluencies of normal native speakers mentioned above.

The disfluencies in speech disorders discussed in this chapter often reduce the quality of life (QOL) of people with language disorders. They deal with disfluencies in a variety of ways, and not all disfluencies in language disorders are considered to "must be eliminated." However, there are many cases who require some kind of solution (medical intervention, social change, etc.) to improve their quality of life. In that sense, the discussion in this chapter relates to the first half of the overall argument, namely, the "must be eliminated" aspect of disfluencies.

Thus, there are some differences in the aspects that are focused on in research on disfluency in normal native speakers and in research on disfluency in language disorders. Furthermore, in clinical settings for language disorders, the term "disfluency" is sometimes used in a unique way that differs from general terminology. These differences hinder the dialogue between the two fields. However, both were originally concepts expressed using the same word, "disfluency," so there should be some common ground. There should be great benefits to sharing methods and results between the two research fields, and dialogue between them is essential for a more universal discussion of disfluency.

This section discusses the clinical meaning of "disfluency (non-fluency)" in three speech disorders closely related to disfluency, namely stuttering, aphasia, and dysarthria, while comparing it with disfluency in normal native speakers. After discussing the similarities and differences between the two fields, we

DOI: 10.4324/9781003648369-16

sought a foothold for dialogue between research on disfluency in normal native speakers and speech disorders.

12.2 Disfluency in normal native speakers

When observing the actual speech of normal speakers, there are few fluent utterances similar to those of ideal speakers, and many disfluent utterances are included. From the perspective of linguistic form, Sadanobu (2019) classified disfluent utterances in Japanese into the following four categories:

1. Problems with the quantity of speech:
   (a) Redundancy
   (b) Lack
   (c) Loop
2. Problems with the quality of speech:
   (a) Mix-up
   (b) Mispronunciation
3. Reducing the processing size of speech
4. Stagnation of speech:
   (a) Filler utterance
   (b) Substitution
   (c) Obtaining stick
      (i) Pause (re-start and continuation)
      (ii) Prolongation (re-start and continuation)

The first category is "problems with the quantity of speech," which is further classified into redundancy, lack, and loop. Redundancy is the literal redundancy of the same word such as (1). However, lack is the absence of a word that is necessary such as (2). Loop refers to the repetition of the same word over and over again, such as (3).

(1)

暴れる	馬 =から	落馬	する[1]
Abareru	uma =kara	rakuba	suru
raging	horse =ABL[2]	fall.from.horse	do

"Falling from a raging horse"
["Uma," and "ba" in the word "rakuba," both mean "horse" and are therefore redundant].

(2)

彼=の	いい	ところ =は	やさしい =です
Kare =no	î	tokoro =wa	yasasî =desu
3SG =GEN	good	point =TOP	kind =COP

"His good point is that he is kind"
["tokoro (point)" is grammatically necessary after "yasasî," but it is missing].

(3)	やっぱり	ピッチャー =が	特にー	こー
	Yappari	picchâ=ga	tokuni:	kô
	after.all	pitcher=NOM	especially	like.this
	去年=まで	やっぱり	弱かった =の =が	やっぱり
	kyonen =made	yappari	yowa-katta =no =ga	yappari…
	last.year =until	after.all	weak-PST =NMLZ =NOM	after.all

"After all, the pitcher, especially, was weak until last year, after all…"
["yappari (after all)" is looped].

The second category is "problems with speech quality," sub-categorized into mix-ups and mispronunciation. A mix-up is when a different word is spoken than what should be spoken, such as saying "hiji [elbow]" instead of "hiza [knee]," and mispronunciation is when the pronunciation becomes distorted from what was originally intended, for example, saying "tokyo tokkyo kyokakyoku [Tokyo Patent Office]" as "tokyo tokkyo kyokyakyoku."

The third category is "reducing the processing size of speech," which results in words that should be spoken in one breath being spoken in small chunks, such as (4).

(4)	品川-駅 =で	新幹線 =に	乗り換え -て…
	Sinagawa-eki =de,	Sinkansen =ni,	norikae -te…
	Shinagawa-station =LOC	Shinkansen =DAT	change -CONJP

"At Shinagawa Station, change, to the Shinkansen…"

The fourth category is "stagnation of speech," further classified as filler utterance, substitution, and getting stuck. Filler is the utterance of seemingly meaningless "filler" such as "êto" or "anô" that is spoken in the middle of thinking. Substitution is the substitution of other forms for unclear part of the memory, such as saying "Buru nantoka Faso" ("nantoka" means "something") when the speaker cannot remember "Burukina Faso (The name of the country "Burkina Faso")." Being stuck is further classified into the pausing and prolongation types. A pausing type is when you try to say "Burukina Faso" but stop midway through, saying "Buru," and a prolongation type is when you stretch out part of the utterance, saying "Burû." After becoming stuck, speakers often recover the words that they leave. There are two ways to recover: the re-start method, in which you go back to the beginning and repeat, "Buru, Burkina Faso," or "Burû Burkina Faso," and the continuation method, in which you say the rest without going back, "Buru, Kina Faso," or "Burû kina Faso." There is also a special type of getting stuck, called the pausing prolongation method, which combines the pausing and prolongation types and will not be discussed in detail in this article.

In other reports, Maruyama (2022) listed examples of disfluency, such as "fillers at the beginning or middle of an utterance, prolongations, pauses, and

corrections or repetitions due to mistakes." Hayashi (2007) pointed out that when native speakers evaluate the speech of foreign language learners, a certain speaking rate is necessary for the speech to be assessed as fluent.

The disfluency mentioned above in normal native speakers indicates a gap between the speech of an "ideal speaker," which has been implicitly assumed in traditional linguistic research, and "real speech" (Lickley 2015; Sadanobu 2019, 2022, 2024). In this context, the disfluency of normal native speakers is considered "disfluent" because they are not ideal speakers like an announcer reading a news script, but it is often perceived as natural speech. While normal native speakers exhibit a certain regularity in their disfluencies, language learners do not. Acquiring the regular disfluencies of native speakers is also important in second language acquisition (Sadanobu 2019, 2022). Therefore, the disfluent speech of normal native speakers is sometimes called "disfluent and natural" speech (Lickley 2015; Sadanobu 2019, 2022).

12.3 Disfluency in stuttering

In the field of speech-language pathology, stuttering is classified as a fluency disorder. One definition describes it as:

> a speech disorder characterized by disfluencies such as the repetition of sounds, morae, syllables, or parts of words; the prolongation of sounds; and the blocking of airflow or voice. These disfluencies occur involuntarily, contrary to the speaker's intent, and exceed the typical range in both frequency and duration. In addition to these disfluencies, stuttering may be accompanied by secondary behaviors, including associated physical symptoms (e.g., unnecessary tension or body movements), avoidance strategies, and emotional reactions.
>
> (Sakata 2024)

12.3.1 Stuttering-like disfluency

Three stuttering-like disfluencies (SLDs) mentioned above—also referred to as core symptoms—are not entirely absent in individuals who do not stutter. These disfluencies are especially common during early childhood, when language is developing rapidly. Ozawa et al. (2013) analyzed the speech of 154 children (74 boys and 80 girls) aged 3 to 6 years who did not stutter, and reported that the frequency of SLDs—calculated using the formula (number of symptoms/number of utterance phrase [*bunsetsu*]) *100—was 1.36 ± 1.45 (mean ± SD). Based on these findings, a quantitative threshold of 3% has been proposed to distinguish stuttering from typical disfluency. This criterion is consistent with those commonly used in English-speaking countries (Yairi & Ambrose 2005). Stuttering is generally diagnosed when SLDs occur in more than 3% of speech. It is considered more severe when the frequency of

disfluencies is higher, the duration of individual symptoms is longer, or the disfluencies are accompanied by excessive physical tension or movements.

12.3.2 Typical (normal) disfluency

In *Kitsuon Kensa ho* (Stuttering Test, Ozawa et al., 2013), typical disfluencies that are not considered as SLDs are classified into five types: (1) whole-word repetitions, (2) interjections, (3) incomplete phrases or revisions, (4) breaks, and (5) pauses. These disfluencies are commonly observed in the speech of both people who stutter and those who do not. However, some individuals who stutter may exhibit more of these typical disfluencies. For example, when a word becomes stuck, the speaker may return to the previous word or phrase and repeat it in an attempt to regain fluency and produce the target word (e.g., yesterday...(block), yesterday, at work). Similarly, filler words such as "uh" or "well" may be inserted to manage speech timing or to give the impression of thoughtful hesitation. Although these features may appear to be "typical disfluencies" on the surface, if they are employed as a means to cope with or avoid stuttering, they should be understood functionally as secondary symptoms—specifically, postponement strategies. Furthermore, even in individuals not diagnosed with stuttering, an excessive number of typical disfluencies can disrupt the flow of information and create an overall impression of high disfluency. If typical disfluencies occur at a rate three times higher than core stuttering symptoms, the individual may be diagnosed with *cluttering* rather than stuttering. Cluttering is characterized by rapid speech and disorganized language output (Van Zaalen & Reichel 2015).

12.3.3 The SLDs and disfluency in normal native speakers

Sadanobu (2019) classified disfluent utterances in Japanese into the four categories mentioned in Section 2, some of which include disfluencies that appear to superficially resemble SLDs. For example, in the category (i) Pause under "4. Stagnation of speech," if a speaker loses pronunciation midway through a word and then restarts the word from the beginning (e.g., "Buru, Burkina Faso"), this can be appeared as corresponding to the "repetition" symptom of stuttering. Similarly, in the case of (ii) Prolongation, when a speaker extends a part of a word before continuing ("Bu---rukina Faso"), it seems to align with the stuttering symptom known as "prolongation."

Although the exact cause of stuttering remains unknown, researchers have identified several contributing factors—one of the most prominent being strong evidence for a genetic basis. This genetic component influences how a child's brain develops neural pathways for speech and language. Numerous studies have shown continuous differences in brain structure and function between people who stutter and those who do not, and Guitar (2019) described this organic background as "inefficient speech control." The term "inefficient" may be interpreted as the idea that certain SLDs—such as repetitions and

prolongations—exist on a continuum with similar disfluencies observed in fluent native speakers. As previously mentioned, the key distinction lies in the frequency and duration of these disfluencies: stuttering is defined by disfluencies that occur beyond the typical range. For example, in terms of duration, while an utterance like "Bu, Burkina Faso" may occasionally be heard in fluent speakers, an utterance like "Bubububububu Burkina Faso" would likely be judged as stuttering. These differences may be attributed to whether the neural activities involved in speech production function efficiently or inefficiently. As noted earlier, the disfluencies of fluent speakers and those who stutter may lie on a continuum, distinguished not by type, but by duration and frequency, as discussed in Section 3.1.

12.3.4 A two-stage model of stuttering

Guitar (2019) summarized and integrated various theories of stuttering etiology proposed to date, presenting a two-stage model of stuttering. This model explains the onset and progression of stuttering in terms of primary stuttering, which arises from those mentioned above, "inefficient speech control," and secondary stuttering, which develops as a result of "psychological learning." Secondary stuttering emerges when the speaker perceives their primary stuttering as uncontrollable and frightening. In response to simple repetitions and, at times, prolongations of sounds and syllables, behaviors such as increased speech rate, physical tension, struggle, escape, and avoidance may arise. As mentioned earlier, an increase in typical disfluencies is also among these reactions.

Most individuals whose stuttering has progressed to the secondary stage tend to develop a negative self-concept and/or experience difficulties in daily social life due to their lack of fluency. When such seek support, speech-language therapists, as professionals, address these fluency-related difficulties as disabilities. This form of "stuttering" is qualitatively different from the disfluencies observed in typical native speakers, thereby raising doubts about viewing them on a single continuum.

However, if both society and the individual can recognize primary stuttering as an "unavoidable" disfluency and accept it as a legitimate way of speaking, stuttering may not progress to the secondary stage and may instead remain situated on a continuum with the disfluencies of individuals who do not stutter. In other words, social acceptance of speech containing many SLDs as a different yet valid "dysfluent" mode of communication—different from fluent speech—may help prevent it from becoming a "disability."

12.4 Disfluency (non-fluency) in aphasia

12.4.1 The concept of "fluency/non-fluency" in aphasia

Aphasia is "impairment or loss of the ability to manipulate symbols of language once acquired, due to damage to the cerebrum" (Yamadori 1985). For a long

time, "fluency/non-fluency" has been positioned as an important criterion in classifying types of aphasia. However, the idea of "fluency/non-fluency" used to describe the speech characteristics of individuals with aphasia is entirely different from the meaning used to describe the speech characteristics of healthy native speakers, such as in the phrase "that person speaks fluently" (Yamadori 2011).

12.4.2 Fluency/non-fluency as a criterion for the Boston neoclassical classification system of aphasia

Today, the most commonly adopted aphasia classification is the "neoclassical classification" (Benson & Ardila 1996) refined by the Boston School. In the neoclassical aphasia classification, type classification is based on three axes: 1) whether speech is fluent or non-fluent, 2) whether repetition is relatively good or poor, and 3) whether comprehension is relatively good or poor (Figure 12.1).

The prototype for evaluating "fluency/non-fluency" in aphasia is based on ten speech characteristics proposed by Benson (1967) (Table 12.1). For instance, if many speech observations are biased towards the left side of the criteria, such as low phrase length, abnormalities in articulation and prosody, marked effort, and frequent pauses, one's speech can be easily determined as "non-fluent speech" (Otsuki 2009). These characteristics are also expected in the concept of non-fluency among healthy native speakers; however, caution is required when interpreting the counterpart concept of "fluency." In the context of aphasia, "fluent speech" means that the flow of speech is relatively maintained compared to "non-fluent speech" (Yamadori 2011). For example, in Benson's (1967) classification, frequent paraphasias are considered a "fluent speech" characteristic. However, this phenomenon corresponds to one type of non-fluency defined by Sadanobu (2019) as defects in speech quality. In other words, "fluent speech" in the context of aphasia is by no means "fluent" compared to the speech of healthy native speakers.

12.4.3 Issues with "fluency/non-fluency" in Aphasia

The classification of "fluency/non-fluency" is a fundamental aspect of aphasia assessment; however, its problems have also been highlighted. Specifically, there is a lack of operational definitions that specify what constitutes "fluent" or "non-fluent" speech (Otsuki 2009). In clinical practice, it is common to encounter patients for whom distinguishing between "fluency" and "non-fluency" poses significant challenges. For instance, in clinical settings, despite limited speech output and short phrases, no abnormalities in articulation or prosody are observed; conversely, despite abundant speech output and long phrases, abnormalities in articulation or prosody are prominent (Otsuki 2009; Takakura & Otsuki 2018; Izawa & Kojima 2018). It becomes difficult to distinguish between "fluency/non-fluency" when speech findings

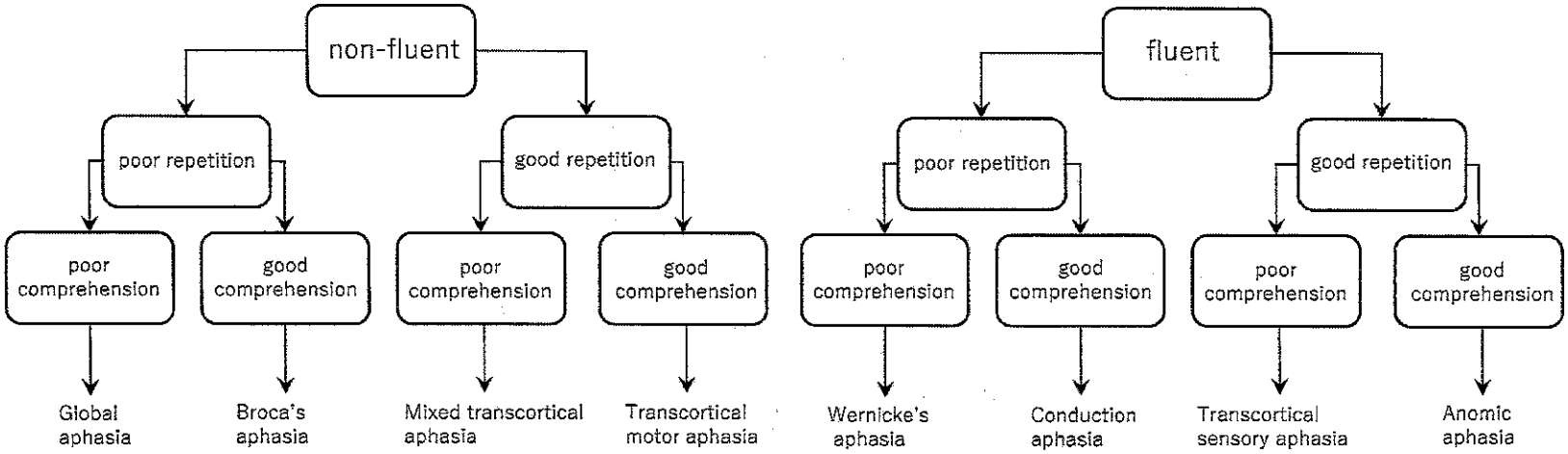

Figure 12.1 Flowchart of classical aphasia classification (based on Benson et al. 1996).

Table 12.1 Clinical characteristics of speech in aphasia by Benson (1967)

Characteristic	*Rating Scale*		
	1	*2*	*3*
Rate	Low (<50 Words Per Minute)		High (>150 Words Per Minute)
Prosody	Abnormal		Normal
Pronunciation	Abnormal		Normal
Phrase Length	Low		High
Effort (initiation of speech)	Marked		Minimal
Pauses	Frequent	Occasional	Rare
Press of Speech	Absent	Some Augmentation	Present
Perseveration	Frequent (syllable or word)	Present (word or phrase)	Rare (syllable or word)
Word Choice	Substantive		Relational
Paraphasia	Absent	Occasional	Frequent

(Benson DF. Fluency in aphasia: correlation with radioactive scan localization. Cortex 1967; 3: 373–394.)

are dispersed between the left and right items. Additionally, there are items for which quantitative evaluation is complex, such as "effort" and "press of speech," where it is challenging to establish clear criteria for what constitutes "marked." Furthermore, among patients who might equally be considered to have "non-fluent speech," the manifestation varies. For example, in patients with abnormalities in articulation and prosody, the abnormality in articulation may be more pronounced in some, whereas the abnormality in prosody may be more prominent (Otsuki 2005) in others.

12.4.4 How should we confront disorders of "verbal expression"?

Speech-language pathologists evaluate a patient's speech not to determine the aphasia type by distinguishing between "fluent/non-fluent" but to obtain clues for therapeutic intervention and support (Takakura & Otsuki 2013). To achieve this, it is essential to accurately identify the "elements" that constitute the overall picture related to the patient's "verbal expression" beyond the dichotomy of "fluent/non-fluent."

"Verbal expression" is assumed to involve multiple stages, even if broadly classified, including the "lexical-semantic processing" responsible for word retrieval, the "phonological processing" responsible for selecting and sequencing phonemes that constitute words, and the "speech motor processing" responsible for programming and executing speech movements (Otsuki 2016). If there is a malfunction in any part of these processing stages, it will affect "verbal expression." Specifically, disorders of lexical-semantic processing result in "anomia," disorders of phonological processing result in

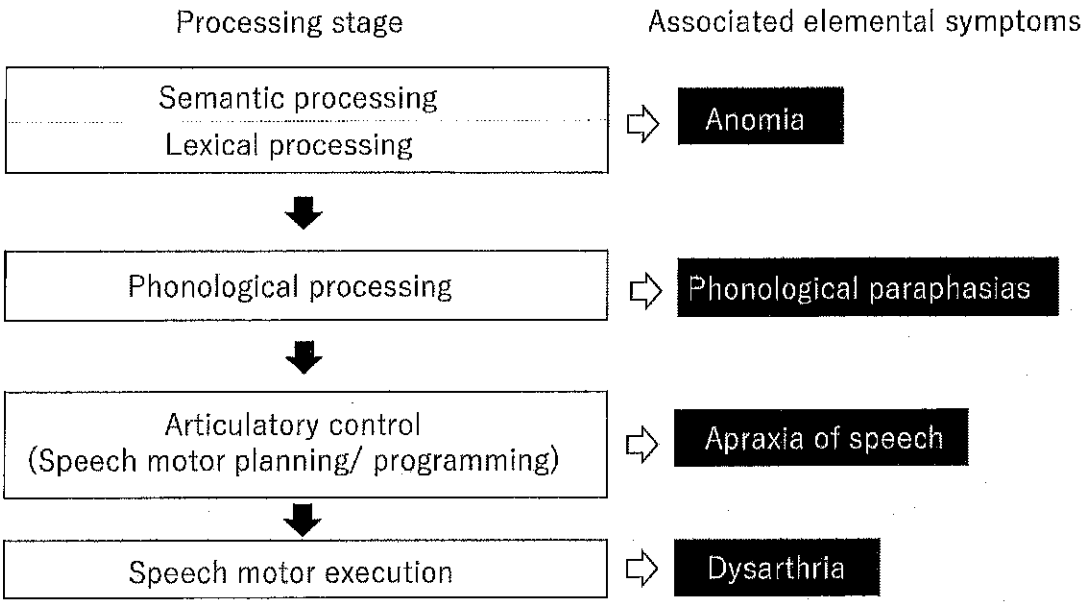

Figure 12.2 Processing stages of "verbal expression" and their associated elemental symptoms.

Source: Mika Otsuki: Neuropsychology of language. Based on Japanese Journal of Neuropsychology, 32: 104–119, 2016.

"phonological paraphasias," disorders of articulatory control result in "apraxia of speech" and disorders of speech motor execution result in "dysarthria" (Figure 12.2). These symptoms are positioned as the smallest symptomatic units that can be confirmed by clinical evaluation, known as "elemental symptoms" (Otsuki 2007).

12.4.5 Grasping the "contrasts" of elemental symptoms

These elemental symptoms rarely occur in isolation and vary in combination according to the extent of the brain lesion. Furthermore, even with the same combination pattern, the method of therapeutic intervention differs depending on the most prominent symptom. Therefore, evaluating the "contrasts" of each symptom is crucial.

Careful evaluation is necessary when "apraxia of speech" and "phonological paraphasias" occur simultaneously. This is because the "substitution of sounds" resulting from speech motor programming disorders (apraxia of speech) and the "substitution of phonemes" resulting from phonological selection disorders (phonological paraphasia) have fundamentally different mechanisms and require different methods of therapeutic intervention. Specifically, the "substitution of sounds" in apraxia of speech is considered a state where the timing of movement in various speech organs has been disrupted, resulting in distorted sounds that go beyond the category of phonemes, causing the listener to perceive them as different sounds (Kojima 2004). However, phonological

paraphasias are considered errors when selecting phonemes in the brain. Nevertheless, distinguishing between the "apparent substitution of sounds" caused by "apraxia of speech" and "phonological paraphasias" based solely on speech sounds has its limitations (Otsuki 2005). If kana writing is preserved, it can serve as evidence that phonemes can be selected in the brain, and the substitution can be evaluated as originating from the apraxia of speech. However, evaluation is difficult when writing disorders are also present. Therefore, analyzing the "manner of errors" in speech is necessary to grasp the "contrasts" of both. While a definitive method has not been established, in apraxia of speech, the differences in "distinctive features" between the error and target sounds are smaller (Monoi et al. 1979). The performance difference between words and non-words is also small in apraxia of speech (Otsuki et al. 1999). Interestingly, the apraxia of speech group interrupts speech with the error syllable and tends to correct only the error syllable (e.g., "hitsuri... ji"), while the group with phonological selection disorders (conduction aphasia group) tends to make corrections involving multiple syllables, including the error sound (e.g., "hichi... hitsuji") (Haruhara & Uno 1996).

12.4.6 Points of contact with adjacent research fields

The perspective of evaluating speech, as mentioned by Haruhara and Uno (1996), is consistent with the classification methods of the "continuation method" and "re-start method" used in analyzing the speech by Japanese speakers (healthy individuals) (Sadanobu et al. 2018). This fact suggests the possibility that new perspectives for evaluating speech in aphasia can be brought about by adopting the "ways of looking at speech" and "classification methods" from adjacent research fields that study "fluency/non-fluency." Future interactions with clinicians and researchers in adjacent research fields are expected to deepen the discussion on the multifaceted study of "fluency and non-fluency."

12.5 Disfluency in dysarthria

12.5.1 What is dysarthria?

Dysarthria is a neurological motor speech impairment characterized by slow, weak, imprecise, and/or uncoordinated movements of speech musculature (Yorkston et al. 1999). The number of patients with dysarthria in Japan is estimated to be at least 350,000 (Kariyasu 2017) or approximately 650,000–700,000 (Nishio 2022). The speech characteristics of patients with dysarthria vary depending on the underlying neurological disease and are classified as spastic, unilateral upper motor neuron (UUMN), atonic, ataxic, hypokinetic, or hyperkinetic (Table 12.2). A classification called Mixed dysarthria, which is a combination of multiple diseases with speech characteristics, is occasionally used.

Table 12.2 Neurological disorders and types of dysarthria

Motor System	*Nerve Disorder*	*Types of Dysarthria*
1. Central Nervous System		
a) Pyramidal system	Spastic paralysis (bilateral)	Spastic Dysarthria
(corticospinal tract)	Spastic paralysis (unilateral)	UUMN Dysarthria
b) Extrapyramidal system	Parkinson's disease	Hyperkinetic Dysarthria
	Parkinsonism	
	Involuntary movement syndrome	Hypokinetic Dysarthria
c) Cerebellar system	Ataxia	Ataxic Dysarthria
2. Peripheral Nervous System	Flaccid paralysis	Flaccid Dysarthria
3. Muscular (Bone) System	Flaccid paralysis	Flaccid Dysarthria

Note: Translated by the first author based on Nishio 2022, p25.

12.5.2 Speech characteristics of dysarthria

The effects of dysarthria on speech extend to all speech movements, including breathing, phonation, resonance, articulation, and prosody. Speech characteristics differ depending on the type of dysarthria. Research on perceptual analysis of speech for each type of dysarthria includes studies by Darley et al. (1969), Fukusako et al. (1983), and Nishio (2004). Darley et al. (1969) used 38 evaluation items, Fukusako et al. (1983) used 25 items, and Nishio (2004) used 18 items to assess perceptual features. These studies reported results broadly similar to those reported by Darley et al. (1969).

Nishio (2022) summarized the results of these perceptual studies in Table 12.3. Table 12.3 provides an overview of the speech characteristics of each type, considering previous studies (Darley et al. 1969; Duffy 2020, etc.).

First, the common features of all types of dysarthria include short phrases, rough hoarseness, distorted articulation, rate abnormality, mono loudness, and monopitch (Nishio 2022). Although these features are important in dysarthria, they are not useful for differentiating between types of dysarthria.

Next, we introduce the key features for differential diagnosis of each type (ibid.). Peripheral nerve or musculature disorders cause flaccid dysarthria. It is characterized by breathy hoarseness, asthenic hoarseness, and hypernasality. Spastic dysarthria is caused by damage to the bilateral upper motor neurons, characterized by strained or asthenic hoarseness and hypernasality; these types of speech disorders are generally severe. UUMN dysarthria is caused by damage to unilateral upper motor neurons. Most cases are moderate to mild, and articulation is often the main problem. Ataxic dysarthria is caused by damage to the cerebellar system and is characterized by strained hoarseness, voice tremors, variable rates, and excessive loudness variation. A sudden increase in loudness is sometimes called "explosive loudness" or "explosive speech." Slow speech, interrupted by syllabic segments and having excess and equal stress, is called "scanning." Hypokinetic dysarthria is caused by extrapyramidal system

Table 12.3 Summary of speech characteristics by type

	Flaccid	*Spastic*	*Ataxic*	*Hypokinetic*	*Hyperkinetic*	*UUNM*
Short phrases	++	++	++	++	++	+
Loudness decay				++		
Rough hoarseness	+	+	+	+	+	+
Breathy hoarseness	++			++		
Asthenic hoarseness	+	+		+		
Strained hoarseness		+	+		+	
Pitch level abnormality		+	+	+		
Voice tremor			+	+	++	
Hypernasality	++	++				
Distorted articulation	++	++	++	++	++	++
Rate abnormality	+	++	++	+	++	+
Variable rate			++		++	+
Repeated sounds				++		
Monoloudness	++	++	++	++	+	+
Monopitch	++	++	++	++	+	+
Excess loudness variation			++		++	

Note: Translated by the first author based on Nishio 2022, p61.
(++, Severely acknowledged; +, Tends to acknowledge to some extent).

disorders and is characterized by loudness decay, breathy hoarseness, voice tremors, and repeated sounds. Repeated sounds are sometimes described as a "stuttering-like symptom." This type of dysarthria is characterized by a rapid speech rate and a limited range of movement, which can result in unclear speech. Disorders of the extrapyramidal system also cause hyperkinetic dysarthria, and the involuntary movement of speech organs causes irregular speech abnormalities. Strained hoarseness, voice tremors, and excess loudness variation characterize this type. Speech characteristics vary depending on the underlying disease and the type of involuntary movements.

12.5.3 Disfluency in dysarthria

The "short phrase" in dysarthria can be considered to correspond to the disfluency of "reducing the processing size of speech" in normal native speakers (Sadanobu 2019), and the "distorted articulation" can be considered to correspond to "mispronunciation" in normal native speakers (ibid.). Considering the knowledge that a certain speaking rate is necessary for speech to be evaluated as fluent (Hayashi 2007), "abnormal speech rate" and "variable rate" can be considered as disfluent characteristics. "Repeated sound" can also be said to be a common feature with the disfluency of the re-start method, of getting stuck in normal native speakers (Sadanobu 2019) and the "sound,

mora, syllable, and part-word repetitions" in stuttering (Section 3). Based on these facts, it can be said that there are various disfluencies in dysarthria.

Despite these corresponded features, the term "disfluency" is not often used in clinical practice for dysarthria. For example, a survey of seven Japanese textbooks on dysarthria with indexes (Hirose et al. 2001; Kumakura et al. 2001; Kariyasu 2017; Nishio 2006a, 2006b, 2006c, 2022) found that only one book included the terms "fluency" or "disfluency" in the index (Kariyasu 2017). Lickley (2015) comprehensively covered disfluency among normal native speakers with language disorders and language learners. Although this study addresses disfluency in aphasia, stuttering, and cluttering, it does not address disfluency in dysarthria.

However, the term "disfluency" is not completely unused in dysarthria. The so-called "stuttering-like symptoms" of hypokinetic dysarthria, such as repetition of initial syllables and word prolongation, are sometimes expressed as "disfluency" (Duffy 2020). One item on the International Cooperative Ataxia Rating Scale (ICARS), a clinical scale for measuring ataxia symptoms, is "fluency of speech" (Trouillas et al. 1997). In the ICARS, the "fluency of speech" is rated from 0 to 4 (0 = normal, 1 = mild modification of fluency, 2 = moderate modification of disfluency, 3 = considerably slow and dysarthric speech, 4 = no speech). Namba (2024) has suggested that the abnormal speech rhythm of dysarthria generally corresponds to "disfluency." Kariyasu (2017) stated that disfluency in dysarthria is evaluated based on speech initiation, continuity, and effort.

12.5.4 Disfluency as a symptom and disfluency as a compensation strategy

When considering the disfluency of dysarthria, it is necessary to consider "disfluency as a symptom" of the speech disorder and "disfluency as a compensation strategy" that compensates for "disfluency as a symptom."

There is a trade-off between the accuracy and speed of speech movements in patients with dysarthria (Kariyasu 2017; Duffy 2020). Methods have been devised to improve speech intelligibility by intentionally dividing speech into segments or slowing the speech rate. For example, the mora-by-mora method with finger-counting gesture is a method in which speech is divided into mora segments while folding one's fingers (Fukusako et al. 1991). This method has been reported to improve speech intelligibility and vowel and consonant errors, cause sounds and syllables to sound disjointed, and slow down the speech rate. A pacing board is a device with slots separated by edges painted in several colors. This device improves speech intelligibility by forcibly slowing down the speech rate by having the speaker point at each slot with a finger for each mora, word, segment, or other speech unit (Helm 1979; Nishio 2006c). These can be interpreted as ensuring speech intelligibility by replacing "disfluency as a symptom," such as "mispronunciation" (Sadanobu 2019), with "disfluency as a compensation strategy," such as "slow speech rate" (Hayashi 2007) and "reducing the processing size of speech" (Sadanobu 2019).

Whether a certain disfluent speech characteristic should be regarded as "disfluency as a symptom" or "disfluency as a compensatory strategy" is an important clinical issue because the appropriate approach differs depending on which interpretation is chosen. However, the speech of dysarthria patients often contains a mixture of "disfluency as a symptom" and "disfluency as a compensatory strategy," it is difficult to distinguish clearly between the two just by observing the phenomenon.

12.6 Dialogue between normal speaker research and language disorder research

12.6.1 Overall judgment of speech and individual speech features

Thus far, we have discussed disfluency in stuttering, aphasia, and dysarthria, comparing them with those of normal native speakers. Although "disfluent" speech characteristics exist in each language disorder, the meaning and usage of "disfluency" differ between fields. Conflicting opinions may exist within the same language disorder field, such as aphasia. In addition, as mentioned earlier, the term disfluency was used differently between research on each language disorder and normal native speakers. However, as already discussed, by comparing the individual disfluent language forms listed in the studies of normal native speakers with the individual disfluent speech features of each language disorder, it became possible to make a concrete comparison between the two fields.

Hadano et al. (1985) highlighted that the concept of non-fluency in aphasia is an "Overall judgment of speech," but that judgment is based on an assessment of "individual speech symptoms." As mentioned in Section 4, the concept of non-fluency as an "Overall judgment of speech" in aphasia has a unique meaning for the classification and diagnosis of aphasia. It is difficult to compare disfluency in other fields. Soma (2000) pointed out that, given that aphasia is understood as an undifferentiated syndrome, it is difficult to communicate with different fields, and breaking it down into individual speech symptoms is necessary. From the perspective of dialogue between research on normal native speakers and research on aphasia, attention should be focused on "individual speech symptoms (features)." Although the above discussion focuses on aphasia, it can be considered extendable to general disfluency research, including research on other language disorders.

12.6.2 Exploring the relationships between individual features

Focusing on individual speech features makes it possible to discuss the relationships among multiple disfluent speech features, which may lead to discovering possibilities for dialogue across various fields.

Individual disfluent speech features are not independent of each other but rather have aspects that influence each other. For example, filler insertion,

rephrasing, and repair often occur before and after anomia and paraphasia in aphasia and distorted articulation in dysarthria. Disfluencies in speech disorders such as anomia, paraphasia, and distorted articulation, as well as fillers, paraphrases, and repairs, are all features of disfluent speech, and the former disfluencies are factors that lead to the latter. Similarly, in "disfluency as a symptom" and "disfluency as a compensatory strategy" of dysarthria mentioned in Section 5, the former is thought to cause the latter.

Furthermore, Sadanobu (2022) pointed out that if foreign language learners have not reached a certain level of language proficiency, a momentary disfluency expressing surprise, such as "Ma, Macedonia," will not be interpreted as an utterance expressing surprise but will likely be interpreted as a pronunciation problem. Speech features equivalent to getting stuck mentioned here can also be seen in the "repetition of sounds, mora, syllables, and parts of words" in stuttering and the "repetition of sounds" in hypokinetic dysarthria. Even with these speech disorders, getting stuck may no longer function as an utterance expressing surprise, just as it does in language learners (Hayashi 2022).

The conditions for the emergence of disfluent features and these communicative functions can be explored by examining the relationships between multiple disfluent features. This could be considered a possibility for further advances in interdisciplinary disfluency research.

12.6.3 A framework for comparing disfluencies between normal native speakers and speech disorders

Sadanobu (2024) stated that although clues for determining disfluency can be obtained from the perspective of communication behavior (utterances), they are ultimately determined or negotiated in actual communication situations. The "clues" mentioned here include redundancy in information transmission (redundant utterances are disfluency) and deviations from linguistic norms (utterances that deviate from the standards of each language society are disfluency). Although these can serve as clues to disfluency, there are limitations to using them alone to determine disfluency, which is ultimately determined or negotiated in actual communication situations. According to this framework, disfluency in language disorders can ultimately be determined or negotiated in actual communication situations.

As seen in this study, there are differences between disfluency in normal native speakers and those with language disorders. This is because disfluency in language disorders is easily linked to difficulties in daily and social life for speakers and listeners. However, this difference can be positioned as a difference caused by the "actual communication situation" described by Sadanobu (2024). More specifically, it can be viewed from a unified perspective as a "relative difference in the degree of difficulty in daily and social life" in the "communication situation." Arguably, by using the framework of Sadanobu (2024) mentioned above, it is possible to view natural disfluencies in normal native speakers and disfluencies in language disorders from a unified perspective.

12.7 Conclusion

This study outlined disfluencies in stuttering, aphasia, and dysarthria and considered ways to compare them with disfluencies in normal native speakers. It was thought that distinguishing disfluency as an "overall judgment of speech" from "individual speech features" that are clues supporting that judgment and focusing on the latter could serve as a starting point for dialogue between research on normal native speakers and research on language disorders. In order to grasp the difference of both from a unified perspective, it is useful to consider the relative difference in the degree of difficulty in daily and social life in the "communicative situation" within Sadanobu's (2024) framework.

Notes

1 The Japanese data cited in this paper have been translated into English by the author. The data are presented in four lines. The first line shows the Japanese characters, the second line is its phonological representation, the third line shows the morpheme-by-morpheme glosses, and the fourth line shows the English translation. In some cases, supplementary explanations are provided in brackets. For short Japanese data of one or two words, the above four lines are not always used. In such cases, the phonetic notation is given in double quotation marks, and the English translation is given in a blank.

2 Abbreviations are as follows: ABL (ablative), CONJP (conjunctive particle), COP (copula), DAT (dative), GEN (genitive), LOC (locative), NMLZ (nominalizer), NOM (nominative), PST (past), SG (singular), TOP (topic).

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