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# Examination of Motor Speech Disorders

*"Perceptual sensorimotor examination . . . is a set of speech assessment procedures that are performed essentially with the examiner's eyes and ears . . . . Auditory-perceptual assessment remains the fundamental means by which the disability fingerprint (functional loss) of a motor speech disorder is determined."*[46]

***R. D. Kent***

*"Many researchers and clinicians agree that assessment of participation must include patient-report because only the person living with the health condition experiences the unique combination of physical, environmental, social, and personal factors that shape participation outcomes."*[3]

***C. Baylor et al.***

## OUTLINE



Identifying a speech problem as neurologic and then localizing it within the nervous system is similar to a neurologist's efforts to localize disease and establish a neurologic diagnosis. The differences between the two enterprises are that speech may be only one of a number of neurologic problems and that speech diagnosis is usually not diagnostic of specific neurologic disease. But these differences sometimes blur. Speech difficulty is sometimes the presenting complaint and the only detectable neurologic abnormality, and its diagnosis may localize and narrow disease diagnostic possibilities. Speech examination is thus an important component of many neurologic examinations.

This chapter discusses the examination of speech in people with suspected motor speech disorders (MSDs). It is not the intent here to discuss the interpretation or application of examination findings to diagnosis or management, beyond some illustrative examples. The relationship between examination results and specific speech diagnoses is addressed in each chapter on specific MSDs (Chapters 4 to 14) and in Chapter 15 (Differential Diagnosis). The relationship of examination results to management is addressed in Chapter 16.

## PURPOSES OF MOTOR SPEECH EXAMINATION

The purposes of the motor speech examination often vary as a function of practice site and the stage of care. Sometimes the priority is to establish the implications of the speech diagnosis for localization and neurologic diagnosis. In many circumstances, formulating treatment recommendations takes

precedence. The initial portions of this chapter will emphasize activities that are most relevant to diagnosis. These goals include description, establishing diagnostic possibilities, establishing a diagnosis, establishing implications for localization and disease diagnosis, and specifying severity. Keep in mind, however, that description and specification of severity are also crucial for management decision making.

### Description

Description characterizes the features of speech and the structures and functions that are related to speech. It represents the data on which diagnostic and treatment decisions are made. In some cases the diagnostic process ends with description because findings cannot establish a diagnosis or even a limited list of diagnostic possibilities. The bases for description derive from the patient's history and description of the problem, oral mechanism examination, perceptual characteristics of speech, and results of standard clinical and instrumental tests.

Once speech has been described, the clinician decides whether speech is normal or abnormal. This is the first step in diagnosis. If some aspects of speech are abnormal, their meaning must be interpreted. The process of narrowing diagnostic possibilities and arriving at a specific diagnosis is known as *differential diagnosis*.

### Establishing Diagnostic Possibilities

If speech is abnormal in some way, a list of diagnostic possibilities can be generated. Because the emphasis here is on MSDs, the list can grow out of answers to questions such as the following:

1. Is the problem neurologic?
2. If the problem is not neurologic, is it nonetheless organic? For example, is it due to dental or occlusal abnormality or a mass lesion of the larynx, or is it psychogenic?
3. If the problem is or is not neurologic, is it recently acquired or long-standing? For example, might it reflect unresolved developmental stuttering, an articulation disorder, or language disability?
4. If the problem is neurologic, is it an MSD or some other neurologic communication disorder (e.g., aphasia, akinetic mutism)? If an MSD is present, is it a dysarthria or apraxia of speech?
5. If dysarthria is present, what is its type?

### Establishing a Diagnosis

Once reasonable diagnostic possibilities have been recognized, a single diagnosis may emerge or, at the least, the possibilities may be ordered from most to least likely. For example, concluding that speech is abnormal, that it is not psychogenic in origin, and that it is a dysarthria but of undetermined type, is of diagnostic value. It implies the existence of an organic process and places the lesion within motor networks of the nervous system. If it also can be concluded that the dysarthria is not flaccid, the lesion is further localized to the central nervous system (CNS), which permits certain neurologic diagnoses to be eliminated or considered unlikely. If the characteristics of the disorder are unambiguous and compatible with only a single diagnosis, a single speech diagnosis can be given, along with its implications for localization.

### Establishing Implications for Localization and Disease Diagnosis

When an MSD is identified, it is appropriate to address explicitly its implications for localization, especially if the referral source is unfamiliar with the classification method. For example, if spastic dysarthria is the diagnosis, it is appropriate to state that it is usually associated with bilateral upper motor neuron (UMN) involvement. If a neurologic diagnosis has already been made, it is appropriate to address the compatibility of the speech diagnosis with it. For example, if the working neurologic diagnosis is Parkinson's disease but the patient has a mixed spastic-ataxic dysarthria, it is important to state that this mixed dysarthria is not compatible with Parkinson's disease. Finally, if neurologic diagnosis is uncertain or if speech is the only sign of disease, it may be appropriate to identify possible diagnoses if the MSD is "classically" tied to them. For example, a flaccid dysarthria that emerges only with speech stress testing and recovers rapidly with rest has a very strong association with myasthenia gravis (MG).

### Specifying Severity

The severity of an MSD should always be estimated. This is important for at least three reasons: (1) it can be matched against the patient's complaints, (2) it influences prognosis and management decision making, and (3) it is part of the baseline data against which future changes can be compared.

Specifying severity is part of the descriptive process. It is highlighted here because of its relevance to estimating activity and participation restrictions imposed by the MSD, as opposed to determining the presence of impairment, which is more relevant to diagnosis. Limitations and restrictions are more relevant than diagnosis to decisions about management and must be based on patient judgments. Once severity is established, it is appropriate to address the implications of the findings for prognosis and management. These are considered in Chapters 16 to 20.

## GUIDELINES FOR EXAMINATION

The motor speech examination has three essential procedural components: (1) history, (2) identification of salient speech features, and (3) identification of confirmatory signs. With this information, a diagnosis is made, recommendations formulated, and results communicated to the patient, referring professionals, and others.

### History

Experienced clinicians often reach a diagnosis by the time greetings and amenities have been exchanged and a history obtained. Subsequent formal examination confirms, documents, refines, and sometimes revises the diagnosis. The history reveals the time course of complaints and the patient's observations about the disorder. It also puts contextual speech on display at a time when anxiety is generally less than during

formal examination, when the patient may not feel speech is the subject of scrutiny and when physical effort, task comprehension, and cooperation are not essential (see box).

> An anonymous sage said that 90% of neurologic diagnosis depends on the patient's history,[58] and a wise neurology colleague said that most clinical neurologic diagnoses are based on speech, either its content or its manner of expression. It is difficult to argue that the spoken history provided by the patient is less important to speech evaluation and diagnosis.

## Salient Features

Salient features are those that contribute most directly and influentially to diagnosis. They include deviant speech characteristics and their presumed substrates.

Six features of neuromuscular activity influence speech production.[13] They form a useful framework for integrating observations made during examination. They include strength, speed of movement, range of movement, steadiness, tone, and accuracy. Abnormalities associated with these features are summarized in Table 3.1.

### Strength

Muscles have sufficient strength to perform their normal functions, plus a reserve of excess strength. Reserve strength permits contraction over time without excessive fatigue, as well as contraction against resistance.

When a muscle is weak, it cannot contract to a desired level, sometimes even for brief periods. It may fatigue more rapidly than normal. Sometimes a desired level of contraction can be attained, but the ability to sustain it decreases quickly.

Muscle weakness can affect all three of the major speech valves (laryngeal, velopharyngeal, and articulatory), and it can be apparent in all components of speech production (speech breathing, phonation, resonance, articulation, and prosody). Weakness is most apparent and dramatic in lower motor neuron (LMN) lesions and therefore in flaccid dysarthrias. Consequences of it can be inferred from perceptual and acoustic analyses, observed visually at rest and during speech, detected during oral mechanism examination, or measured physiologically.

**TABLE 3.1 Salient neuromuscular features of speech and associated abnormalities commonly encountered in motor speech disorders**

| Feature | Abnormality Associated With Motor Speech Disorders |
|---|---|
| **Strength** | Reduced, usually consistently but sometimes progressively |
| **Speed** | Reduced or variable (increased only in hypokinetic dysarthria) |
| **Range** | Reduced or variable (predominantly excessive only in hyperkinetic dysarthrias) |
| **Steadiness** | Unsteady, either rhythmic or arrhythmic |
| **Tone** | Increased, decreased, or variable |
| **Accuracy** | Inaccurate, either consistently or inconsistently |

### Speed

Movements during speech are rapid, especially the laryngeal, velopharyngeal, and articulatory movements that modify expired air to produce the 14 or more phonemes per second that characterize conversational speech. These quick, unsustained, and discrete movements are known as *phasic movements.* They can be produced as single contractions or repetitively. They begin promptly, reach targets quickly, and relax rapidly. Phasic speech movements are mediated primarily through direct activation UMN pathway input to alpha motor neurons (see Chapter 2).

Excessive speed is uncommon in MSDs, but it can occur in hypokinetic dysarthria. Excessive speech rate in people with dysarthria is nearly always also associated with decreased range of motion (ROM).

Slow movements are common in MSDs. Movements can be slow to start, slow in their course, or slow to stop or relax. Single and repetitive movements can be slow. Reduced speed can occur at any of the speech valves and during any component of speech production. Slow movement strongly affects the prosodic features of speech because normal prosody is so dependent on quick muscular adjustments that influence the rate of syllable production and pitch and loudness variability. The effects of reduced speed are most apparent in spastic dysarthria but also are present in other dysarthria types. The effects of altered speed can be perceived in speech, visibly apparent during speech and oral mechanism examination, and measured physiologically and acoustically.

### Range

The distance traveled by speech structures is precise for single and repetitive movements. Variation in the range of repetitive movements is normally present but usually small.

Consistent excessive ROM during voluntary speech is not common in neurologic disease. In contrast, decreased range is common and may occur in the context of slow, normal, or excessively rapid rate. For example, hypokinetic dysarthria is often associated with decreased ROM and sometimes with excessively rapid rate. In other instances, range can be variable and unpredictable. Abnormal variability in range is common in ataxic and hyperkinetic dysarthrias.

Abnormalities in ROM can have a major influence on the prosodic features of speech, sometimes resulting in restricted or excessive prosodic variations. Such abnormalities can occur at all of the major speech valves and in all components of speech production. They can be inferred from perceptual and acoustic analyses of speech, seen during speech and nonspeech movements of the articulators, and measured physiologically.

### Steadiness

At rest, there is a measurable 8- to 12-Hz oscillation of muscles. During rest and normal movement, there are usually no

visible interruptions or oscillations of body parts, but oscillation amplitude sometimes rises to visibly detectable levels in healthy people. This visible physiologic tremor can occur with extreme fatigue, under emotional stress, or during shivering.

When motor steadiness breaks down in neurologic disease, the results can be broadly categorized as *involuntary movements* or *hyperkinesias*. Tremor is the most common involuntary movement. It consists of repetitive, relatively rhythmic oscillations of a body part, generally ranging in frequency from 3 to 12 Hz. It can occur at rest (resting tremor), when a structure is maintained against gravity (postural tremor), during movement (action tremor), or toward the end of a movement (terminal tremor).

Mild tremor may not have any audibly perceptible effect on speech characteristics depending on respiration, resonance, or articulation. It commonly affects phonation and, when severe, can affect prosody and rate; its effects are most easily perceived during sustained vowel production. The effects of tremor on speech may be heard or seen during speech, may be seen during oral mechanism examination, and can be measured acoustically and physiologically.

Another major category of involuntary movement consists of random, unpredictable, adventitious movements that can vary in their speed, duration, and amplitude. These abnormal movements include dystonia, dyskinesia, chorea, and athetosis. They can be present at rest and during sustained postures or during movement, and they can be severe enough to interrupt or alter the direction of intended movement. They can affect any of the major speech valves and any component of speech production. They can affect accuracy and often alter prosody and rate. They are the primary source of abnormal speech in hyperkinetic dysarthrias. The effects of these unpredictable hyperkinesias can be perceived during speech, seen during speech and oral mechanism examination, measured physiologically, and inferred from acoustic measures.

### Tone

In neurologic disease, muscle tone can be excessive or reduced. It can fluctuate slowly or rapidly in regular or unpredictable ways. Alterations in tone can occur at any of the speech valves and at any level of speech production. Abnormal tone is associated with flaccid dysarthrias when consistently reduced, with spastic or hypokinetic dysarthria when consistently increased, and with hyperkinetic dysarthrias when variable. The effects of abnormal tone can be inferred from perceptual speech characteristics, seen during speech and oral mechanism examination, measured physiologically, and inferred from acoustic measures.

### Accuracy

Individual, repetitive, and complex sound sequences are normally executed with enough precision to ensure intelligible and efficient transmission of intent. They result from proper regulation of tone, strength, speed, range, steadiness, and timing of muscle activity. From this standpoint, accuracy is the outcome of well-timed and coordinated activities of all the other neuromuscular features. If strength, speed, range, steadiness, and tone have been properly regulated, speech movements should be accurate. If speech contains inaccuracies and neuromuscular performance is normal, it is possible that the linguistic plan or ideational content is defective, placing the source of the problem outside of the motor system; an alternative explanation is that the problem lies in the planning or programming of movements and not in neuromuscular execution.

Inaccurate movements can take different forms. For example, if force and ROM are excessive, structures may overshoot targets. If force and ROM are decreased, target undershooting may occur. If timing is poor, the direction and smoothness of movements may be faulty and the rhythm of repetitive movements may be maintained poorly.

Inaccurate movements resulting from constant defects of strength, speed, range, or tone can result in predictable degrees of articulatory imprecision or other speech abnormalities. If the source of inaccuracy lies in timing or in unpredictable variations in other neuromuscular components, errors may be unpredictable, random, or transient.

Inaccurate movements can occur in any of the major speech valves and at any level of speech production but are generally perceived most easily in articulation and prosody. Inaccuracy can occur in all dysarthrias, but when it is the result of inadequate timing or coordination, it is usually associated with ataxic dysarthria or AOS. When associated with random or unpredictable involuntary variations in movement, it often reflects hyperkinetic dysarthria.

The salient neuromuscular features of movement interact and influence each other. For example, reduced strength is usually associated with reduced tone, ROM, accuracy, and sometimes steadiness. Increased or variable tone is usually associated with reduced or variable speed, ROM, steadiness, and accuracy. Reduced ROM is associated with variations in speed, tone, and accuracy. It is rare that only a single abnormal neuromuscular feature is present in someone with dysarthria.

## Confirmatory Signs *(Samples 58 to 80)*[a]

Confirmatory signs are additional clues about lesion locus or underlying neuropathophysiologic factors. For MSD diagnosis, they are signs other than deviant speech characteristics and the salient neuromuscular features that characterize them that help support the speech diagnosis. MSD diagnosis does not require that confirmatory signs be present. In fact, confirmatory signs in many instances may represent epiphenomena[b]; that is, they may not have any direct causal or explanatory relationship with the MSD. Therefore observations of a nonspeech nature, even of the speech muscles, must be considered circumstantial (confirmatory) evidence and not salient. Nonetheless, they can help support a confident diagnosis.

Confirmatory signs can be evident in speech or nonspeech muscles. Examples within the speech system are atrophy, reduced tone, fasciculations, poorly inhibited laughter or

[a]Sample numbers refer to audio and video samples in Parts I to III of the accompanying website.

[b]Epiphenomena are not uncommon in the neurologic examination. For example, although exaggerated tendon reflexes are associated with spasticity, they do not appear to explain functional movement deficits in people with limb spasticity.[14] Those who take the study of MSDs seriously should carefully consider Weismer's[72] critical review of oromotor nonverbal tasks to assess MSDs.

crying, reduced normal oral reflexes, or the presence of pathologic oral reflexes. Confirmatory signs from the nonspeech motor system come from observations of gait, muscle stretch reflexes, superficial and pathologic reflexes, hyperactive limb reflexes, limb atrophy and fasciculations, difficulty initiating limb movements, and so on. They also include observations of strength, speed, accuracy, tone, steadiness, and range of movements in nonspeech muscles (see box).

> Remember that confirmatory signs are not diagnostic of MSDs. For example, lingual fasciculations, without any perceivable impairment of lingual articulation, would not warrant a diagnosis of dysarthria. They might reflect a lesion of cranial nerve XII and require further neurologic investigation, but a diagnosis of dysarthria would require the presence of a perceptible *speech* deficit.

Confirmatory signs are discussed within each chapter on the specific dysarthrias and apraxia of speech and also briefly during the upcoming overview of the motor speech examination.

### Interpretation of Findings—Diagnosis

Once the history, salient speech features, and confirmatory signs have been established, they are integrated to formulate an impression about their meaning. This constitutes diagnosis (see following box).

No examination is complete without an attempt to establish the meaning of its findings. It is reasonable to state as principle that when the results of an examination cannot go beyond description, the reasons should be stated explicitly. Without such explanation, the implication is that, although a patient has been assessed, perhaps thoroughly, the results have been neither interpreted nor understood. Consistent failure to provide a diagnosis can suggest to a referral source that the clinician does not or cannot contribute to the localization or understanding of speech, language, and communication disorders.

> Terms used to introduce diagnostic statements vary in clinical practice, but headings most often include the words *Diagnosis* or *Impression*. The term *Summary* is not an appropriate heading because diagnosis represents an interpretation of findings, not just a simple restatement of them.

The manner in which diagnostic statements are expressed is influenced by examination findings plus the intended purposes of the evaluation, such as to provide an opinion about the nature of the speech deficit to a neurologist who is uncertain about the neurologic diagnosis or to determine the nature and severity of an MSD for the purpose of management planning. The certainty of diagnostic statements can vary considerably. In some cases, findings are so ambiguous that they permit only a statement that the diagnosis is uncertain. In others, they require a formulation of diagnostic possibilities, ideally in order from most to least likely. Sometimes they permit a confident statement about what the disorder is not, but not what it is. Not infrequently, a confidently stated, unambiguous diagnosis is justified. Finally, findings sometimes—perhaps often—lead to some combination of the preceding possibilities, such as "the patient has an unambiguous spastic dysarthria, possibly with an accompanying ataxic component. There is no evidence of apraxia of speech." The process of differential diagnosis is discussed in detail in Chapter 15.

## THE MOTOR SPEECH EXAMINATION

The examination can be divided into five parts: (1) history; (2) examination of the oral mechanism at rest or during nonspeech activities; (3) perceptual assessment of speech characteristics; (4) assessment of intelligibility, comprehensibility, and efficiency; and (5) estimates of functional communication, communication effectiveness, and psychosocial impact of the MSD. Instrumental analyses using acoustic, physiologic, or visual imaging instrumental methods also may be part of the clinical examination, but they are not essential in many cases. Their use during various portions of the examination is noted when appropriate (see box)

> This review of the motor speech examination is relatively detailed, as it should be. Keep in mind, however, the sage advice of Sackett et al., who said: "We hold the paradoxical position that all medical students should both be taught *how* to do a complete history and physical and, once they have mastered its components, be taught *never to do one*" (p. 14).[59]
>
> Exhaustive examination in clinical practice is rarely necessary. In fact, avoiding unnecessary standardized or informal testing is a sign of clinical maturity. Unfortunately, this often is not well-conveyed in many training programs (and texts!) and thus is not always embraced in clinical practice.

### History

The history reveals information about the onset and course of the problem, the patient's awareness of it, and the degree to which it limits or alters activities or reduces participation in various aspects of life. The spoken history also puts on display the salient features, confirmatory signs, and severity of the problem. *(Samples 16, 35, and 97 and a number of the cases in Part IV of the accompanying website illustrate various aspects of the history as conveyed by patients with a variety of MSDs).*

No two histories are the same. Factors affecting how history taking is approached include the patient's cognitive ability and personality, whether the patient perceives a problem, what already has been established by other professionals, and the severity of the speech deficit. If a patient has cognitive limitations, significantly reduced intelligibility, or an inadequate augmentative means of communication, the history from the patient will be limited. The history sometimes must be provided, supplemented, or confirmed by someone who knows the patient well. History taking usually should be controlled by the clinician and not the patient, with questions strongly influenced by the facts provided by the patient and by his or her manner of doing so.

The format of history taking often includes the following.

### Introduction and Goal Setting

Once basic amenities have been exchanged, the examination often can begin with a simple but important question, "Why are you here?" Representative responses include: "to find out what's wrong with my speech," "to find out if you can help me with my speech," or "because my doctor told me to come here." Answers are an index of orientation, awareness, and concern about speech; the priority placed on speech versus other aspects of illness; the relative personal importance of diagnosis versus management; the ability to provide a history; the depth and manner in which the history will have to be taken; and the severity of the MSD. This introduction also lets the clinician discuss the purposes and procedures of examination and its place in the individual's overall medical care.

### Basic Data

Age, education, occupation, and marital and family status should be noted. It is important to establish whether the patient had a history of childhood speech, language, or hearing deficit; whether treatment for those problems was necessary; and whether the problems had resolved before the current illness began. This is essential when abnormalities are inconsistent with current medical findings but could be long-standing or developmental in nature. The most common long-standing speech deficits encountered in adults with suspected neurologic disease are persistent developmental articulation errors or stuttering, and articulatory distortions associated with dental or occlusal abnormalities.

### Onset and Course

Information about the onset and course of the speech deficit is useful to neurologic diagnosis, prognosis, and management decisions. It also reveals something about the patient's perception of the problem. Relevant questions often include the following:

- Do you have any problems with your speech? If not, has anyone commented on a change in your speech?
- When did the speech problem begin? Suddenly or gradually? Who noticed it first, you or someone else?
- Did you develop any other problems when your speech problem began? Were other problems present before the speech problem began? Did other problems develop after the speech problem began?
- Has the speech problem changed? Better, worse, stable, fluctuating?
- Has your speech ever returned to normal? If so, when and for how long?
- Are you taking any medications that affect your speech in any way? Are there any other factors that predictably affect your speech (e.g., time of day, stress, fatigue)?

### Associated Deficits

Questions about associated deficits that might represent confirmatory symptoms include the following:

- Have you had any difficulty with chewing or saliva control? When?
- Is it difficult to move food around in your mouth? Why?
- Does food get stuck in your cheeks or on the roof of your mouth? Do you have to remove it with your finger or a utensil?
- Do you have trouble moving food back in your mouth to get a swallow started?
- Do you have trouble swallowing food or liquid? Do you have trouble getting a swallow started? Do you lose food or liquid out of your mouth? Does food or liquid ever go into or out of your nose when you swallow? Does food or liquid go down before you start to swallow and cause coughing or choking? Do you gag or choke when swallowing? Do you cough after completing a swallow? Have you modified your diet because of these problems?
- Do you cry or laugh more easily or less easily than in the past?
- Are you aware of any abnormal movements of your jaw, face, tongue, or neck?

### Patient's Perception of Deficit

It is important to establish the patient's perception of the problem. This can provide useful confirmatory information.

- What was your speech like when the problem began? Did anything *feel* different when you spoke?
- Have you noticed any change in the appearance or feeling in your face or mouth?
- Describe your current speech difficulty. Is it faster or slower? Louder or quieter? Less precise? Is speaking effortful? If 100% represents your speech before the problem began, where is it now?

### Consequences of the Disorder

The following questions address some of the functional consequences of MSDs:

- Do people ever have trouble understanding you? If so, when? What do they or you do if that happens?
- Have you altered any of your work or social activities because of your speech? How? Does your speech problem prevent you from doing anything? How do you feel about this problem? Among the difficulties you are dealing with and your day-to-day responsibilities and goals, how important is your speech problem?

### Management

Information about what the patient and others have done to manage the MSD is important to prognosis and management recommendations.

- What have you done to compensate for your speech difficulty? Have you had any help for your speech? If so, when and for how long? What was done? Did it help?
- Do you think you need help with your speech now?

### Awareness of Medical Diagnosis and Prognosis

It is important to know what patients understand about their medical diagnosis and prognosis because it influences the manner and depth to which the speech diagnosis and management issues should be discussed. For example, patients who are in the process of evaluation to determine the nature of their disease or who have just received a diagnosis with

a poor prognosis may be neither interested nor emotionally ready to discuss management of their speech problem.

- What have you been told is the cause of this problem?
- What does the diagnosis mean is going to happen?

## Examination of the Speech Mechanism During Nonspeech Activities

Observations of the speech mechanism in the absence of speech can be very informative. In general, they provide information about the size, strength, symmetry, range, tone, steadiness, speed, and accuracy of orofacial movements, particularly of the jaw, face, tongue, and palate. The observations are primarily visual and tactile, but also auditory. The observations can be made (1) at rest, (2) during sustained postures, (3) during movement, and (4) reflexes. These observations may support conclusions drawn about speech. Even if not confirmatory of a speech diagnosis, they may nonetheless be important. *(Samples 58 to 80 are relevant to abnormalities that may be evident during this aspect of the examination. Many of them are also evident among the 39 cases in Part IV of the accompanying website).*

### The Face at Rest *(Samples 64 to 69, 72)*

At rest, the normal face is grossly symmetric and exhibits little spontaneous movement. It is neither droopy nor fixed in a posture associated with strong emotion (e.g., smiling, on the verge of tears).

To observe the face at rest, the patient should be instructed to relax, look forward, let the lips part, and breathe quietly through the mouth. Some people can maintain this relaxed posture more easily with their eyes closed.

The following questions should then be answered:

- Is the face symmetric?
- Are the angles of the mouth symmetric?
- Is asymmetry due to a drooping of the entire face on one side, a droop at the corner of the mouth, or flattening of the nasolabial fold?

Recognize that some asymmetry is the rule rather than the exception; a slight difference in the length and prominence of the nasolabial folds is not abnormal. Some asymmetry often can be seen at rest or during voluntary and spontaneous or emotional responses (Fig. 3.1).

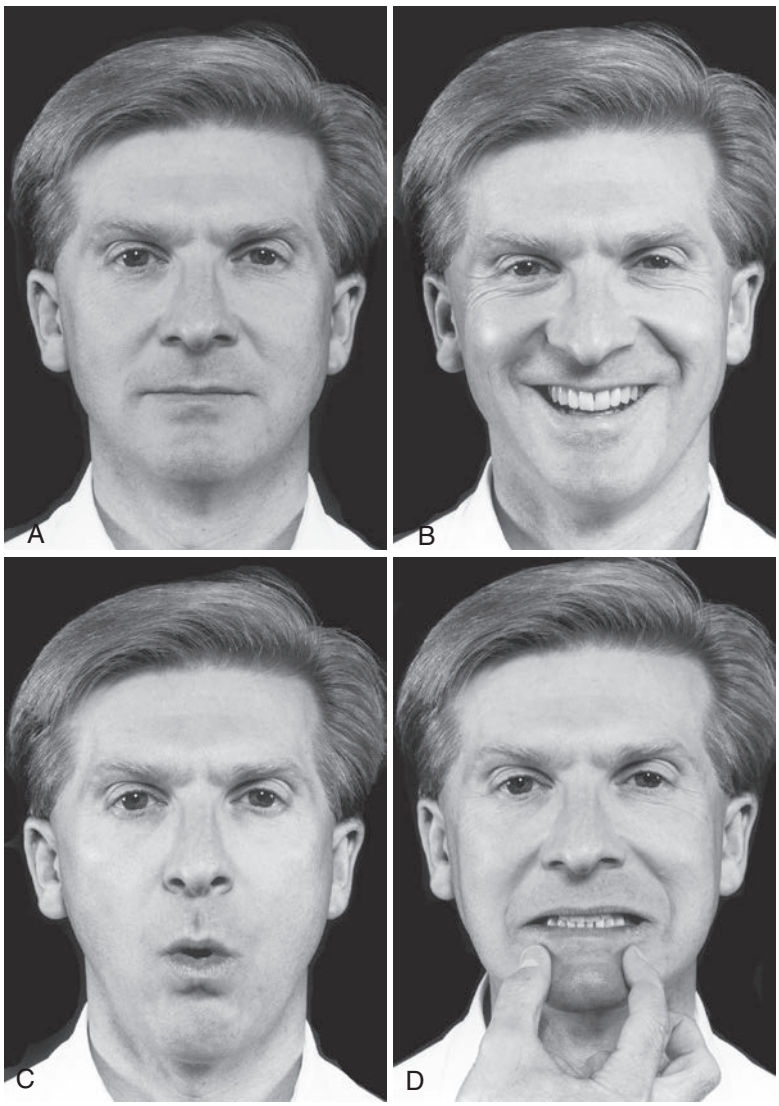


**Fig. 3.1** (A) The normal face at rest, (B) during spontaneous smiling, (C) lip rounding, (D) lip retraction against pressure, (E) mouth opening, (F) cheek puffing, and (G) cheek puffing against pressure.

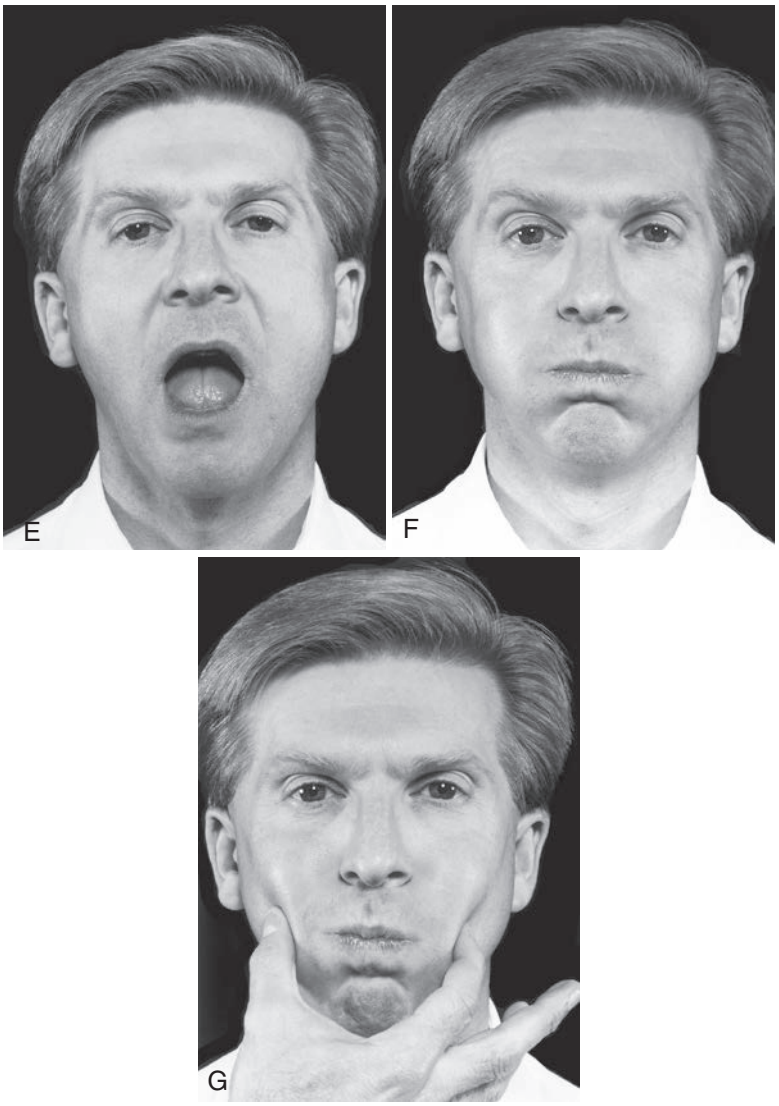


**Fig. 3.1 cont'd**

Additional questions include the following:

- Is the face expressionless, masklike, or unblinking? Is it held in a fixed expression of smiling, astonishment, or perplexity? Does the upper lip appear stiff?
- Are abnormal spontaneous, involuntary movements present? Do the eyes shut tightly and uncontrollably? Is there quick or slow symmetric or asymmetric pursing or retraction of the lips? Are there spontaneous smacking noises of the lips? Can the patient inhibit these movements on request? If so, do they reappear when inhibitory efforts cease?
- Are the lips tremulous or are there tremor-like rhythmic movements of the lips? Are fasciculations present in the face, especially around the mouth or chin?

### The Face During Sustained Postures *(Samples 64, 66, 68, 69, 72)*

Observing the face during sustained postures allows additional observations of symmetry, ROM, strength and tone, and the ability to maintain a sustained posture.

Useful sustained facial postures include retraction of the lips, rounding or pursing of the lips, puffing the cheeks, and sustained mouth opening. The patient should be asked to sustain each posture after it is demonstrated by the examiner (see Fig. 3.1).

The following questions should be answered:

- Are lip retraction, rounding, and puffing symmetric? Is their range of movement normal or restricted? When opening the mouth, is the arch of the upper lip symmetric or does one side hang lower?
- Can the patient resist the examiner's attempt to push the lips toward the midline when the lips are retracted, or resist the examiner's attempt to spread the lips when they are rounded? Does air escape through the lips during attempts to puff the cheeks or can the seal be broken with less than normal pressure when the examiner pushes in on the cheeks?
- Does tremulousness appear or disappear during sustained facial postures? Are additional movements present that distort or alter the ability to maintain the sustained posture?

- Can a facial posture be maintained for several seconds, or does the patient stop the effort even when instructed to maintain it?

### The Face During Movement *(Samples 64, 67, 68)*

The face should be observed during speech, emotional responses, and volitional nonspeech tasks. During speech and emotional responses, range and symmetry of facial movement and expressiveness should be noted.

Substantial literature exists on normal facial asymmetry and its determiners. Evidence suggests that the left side of the face is, on average, more active than the right in the expression of facial emotion, implying that the right hemisphere, with its predominant control over innervation of the lower left face, is dominant for emotional facial expression.[4] However, data from neurologically intact people show that asymmetries can be seen in favor of the right or left side of the face and that differences are not necessarily compatible with hypotheses about hemispheric specialization[24,66]; differences in facial morphology, independent of asymmetric neural innervation, may explain some of the differences among people without neurologic disease and between the sexes.[26] Some studies that have found differences in facial asymmetry between the sexes have argued that they are driven by gender-related differences in cognitive processing by the two cerebral hemispheres.[63] Others have concluded that there are no systematic asymmetry patterns, at least during emotional expression, as a function of gender.[5] Finally, it has been reported that the right side of the mouth opens to a greater degree than the left in most people during single word repetition, presumably reflecting left hemisphere dominance for language or speech programming.[28] In light of these interesting but probably less-than-reliably-predictable clinical differences for individuals, what seems important for basic clinical examination is to remember that mild facial asymmetries—at rest and during speech and nonspeech emotional expression—are not uncommon, but the direction of the asymmetry is not highly predictable.

It is equally important to remember that the control of voluntary facial movement differs from that for movement during spontaneous expression. For example, patients with lower facial paresis resulting from CNS lesions sometimes reflexively smile symmetrically in response to a joke, but asymmetry may become evident when they smile voluntarily; the opposite pattern is seen in some patients with Parkinsonism.[51] Thus it is of value to compare a spontaneous emotional smile to a volitional smile or lip retraction. Observations of symmetry and the occurrence of regular or irregular involuntary movements also should be made during speech and emotional responses.

Does the patient have difficulty inhibiting laughter or crying? This loss of inhibition can become apparent at any time during examination, but one of the simplest ways to trigger disinhibition is simply to ask patients if they have any difficulty controlling laughter or crying. Be aware that it can be difficult to distinguish crying that reflects a pathologic loss of motor control from crying that may occur as a normal response to the psychological distress, sadness, and depression that can be expected in people who are coping with disease.

### The Jaw at Rest

The jaw is usually lightly closed or slightly open at rest. The following questions should be answered:

- Does the jaw hang lower than normal?
- Are there spontaneous, involuntary quick or slow movements of the jaw, such as clenching, opening or pulling to one side, or tremor-like up and down movements? Has the patient learned any postural adjustments or tricks that inhibit involuntary movements (e.g., clenching the teeth, holding a pipe in the mouth, touching a hand to the side of the jaw or neck)?

### The Jaw During Sustained Postures (Fig. 3.2)

The jaw can be observed during sustained facial posture tasks, especially during mouth opening (see Fig. 3.1, *E*). The following questions should be answered:

- Does the jaw deviate to one side when the patient opens it as widely as possible? Is the patient able to open the mouth widely or is excursion limited?
- Can the patient resist the examiner's attempt to open the jaw when told to clench the teeth? Can the jaw be closed against resistance from the examiner? Do the masseter and temporalis muscles bulge normally when the patient bites down? Does the jaw shiver when it is relaxed after clenching the teeth (jaw clonus)?
- Can the patient resist the examiner's attempt to close the jaw when told to keep it open?

### The Jaw During Movement *(Sample 90)*

The jaw should be observed for symmetry of opening and closing and for ROM during speech and spontaneous movements. The patient should be asked to rapidly open and close the mouth; the speed and regularity of movements, as well as involuntary movements that interrupt the course of jaw alternating motion rates (AMRs), should be noted.

### The Tongue at Rest *(Samples 28, 63, 66)*

The tongue should be examined at rest (see Fig. 3.1, *E*). The patient should be asked to open the mouth, breathe easily, and let the tongue relax on the floor of the mouth with the tongue tip resting on the lower anterior teeth. The degree to which the normal tongue is still at rest varies considerably; some low-amplitude spontaneous movement is common. With this in mind, the following questions should be answered:

- Is the tongue full and symmetric? If symmetric, is its size normal? Are there symmetric or unilateral grooves or furrowing in the tongue representing atrophy? (Indentations along the tongue's lateral side edges may represent teeth marks and not atrophy.) Are *fasciculations* present? They are best observed when the tongue is at rest inside the mouth; with the tongue protruded, normal spontaneous movements can be mistaken for fasciculations.