

Supplemental Material S2. Definition of auditory speech characteristics (features).

Scale	Feature	Feature description
Speech breathing (BREATH)	Shortened breath groups (within-word-pauses and inappropriate between-word pauses)	result from frequent inspiratory pauses; inspiratory pauses may violate linguistic and prosodic boundaries (e.g., inspiration may be noted within multisyllabic words or within phrase boundaries)
	Speaking on residual air	parts of utterances are produced with residual air; typically characterized by a strained voice quality during speech production in conjunction with effortful inspiration; predominantly evident at the end of a phrase; in severe cases also during multisyllabic words
	Audible/strenuous inspiration	inspirations are characterized by frication noise and increased durations; may be associated with a clavicular breathing pattern and hyperextension of the neck and/or torso
Pitch and loudness (PL)	Low pitch	speaking fundamental frequency is perceived as too low or too high given the talker's gender and age
	High pitch	
	Low volume	vocal loudness appears inappropriate given the speaking conditions (distance between patient and examiner, one-on-one setting); low volume may be particularly evident at the end of phrases; high volume typically occurs with the onset of phonation
	High volume	
Vocal quality (VOQ)	Breathy	vocal quality is characterized by frication noise generated by air passing through the glottis as a result of incomplete or absent vocal fold adduction; voice is low in resonance and intensity; most severe form: aphonia (soft, voiceless phonation)
	Strained-strangled	voice sounds laborious; characterized by hard vocal attacks; pharyngealized vocal setting; most severe form: aphonia (strained voiceless whisper)
	Harsh	voice quality is harsh, rough, or diplophonic
Vocal stability (VOS)	Changes in voice quality	unpredictable, sudden changes in voice quality; may either fluctuate between normal and pathological voice (e.g., breathy) or between pathological patterns (e.g., fluctuating between breathy and strained-strangled); fluctuations may cause the impression of unstable, frail, or "whiny" voice

	Pitch/loudness changes	unpredictable changes in pitch and loudness; may be perceived as overall unstable and poorly controlled phonation
	Vocal tremor/vocal flutter	regular (periodic) fluctuations in pitch or loudness
	Devoicing, vocal decay, vocal stoppage	voiced segments or syllables are devoiced (devoicing) and/or vocal loudness decreases over time and becomes breathier and even aphonic (vocal decay) and/or phonation abruptly ceases (vocal stoppage); features may occur alone or in combination
	Involuntary vocalizations	sudden, involuntary vocalizations (e.g., groans, grunts, sighs); vocalizations are neither pragmatically nor affectively triggered/motivated
Sound production (SP)	Sound errors – phonemic type	inconsistently occurring sound errors perceived as proper sounds of the speaker’s native language (categorical sound error); includes phonemically perceived sound substitutions, additions, and omissions; if contextual origin is evident: anticipations, perseverations, or metatheses
	Sound errors – phonetic type	inconsistently occurring sound errors perceived as articulatory distorted, “ill-formed” sounds of a respective language (gradual aberration from a target sound, e.g., overaspirated, denasalized, retracted, less rounded); need not be limited to individual sounds but may also affect transitions between sounds (coarticulatory errors); distinguished from <i>overall</i> reduced articulatory precision (as it may occur in dysarthric speech)
	Open articulation	flexible jaw support is lacking while the jaw is fixed in a largely open position; tongue movements may be visible.
	Closed articulation	flexible jaw support is lacking while the jaw is fixed in a largely closed position; upper and lower teeth may be in contact during speech production
	Overall reduced articulation	phonetic contrasts are overall reduced; in extreme cases: phonetic features are only approximated or completely neutralized; distinguished from errors affecting single sound segments (errors of phonetic and phonemic type) or single sound transitions
	Fluctuating articulatory precision	sudden, unpredictable changes in speech precision (from unimpaired to reduced, in extreme cases: from reduced to excessive speech precision);

		distinguished from inconsistently occurring sound errors of phonetic and/or phonemic type
Nasal resonance (RES)	Hypernasality	vowels and oral consonants are produced with excessive nasal resonance; nasal emissions; in severe cases: oral consonants are substituted by nasal consonants (e.g., /b/ → /m/)
	Mixed nasality	intermittent episodes of increased and decreased nasality; episodes of hyponasality are characterized by insufficient nasal resonance in nasal consonants; in severe cases: nasal consonants are released as plosives (e.g., /m/ → /b/)
Articulation rate (RATE)	Reduced overall articulation rate	overall articulation rate appears abnormally slow due to prolonged durations of sounds, sound transitions (including intrusive schwa) and/or occlusion phases during plosive productions
	Prolongations of single consonants, vowels, and sound transitions	single sounds and/or sound transitions (including intrusive schwa) are audibly prolonged beyond a speaker’s possible overall reduced articulation rate
	Increased articulation rate	articulatory rate appears too fast or rushed
Speech fluency (FLU)	Unfilled speech disruptions (pauses)	speech fluency is disrupted by pauses (within-word-pauses and/or inappropriate between-word pauses); pauses can be caused by frequent/inadequate inspirations or silent articulatory groping; distinguished from (inaudible) speech blocks and delayed speech onsets. The feature is not to be confounded with delays caused by cognitive or linguistic processing deficits (e.g., lexical retrieval).
	Filled speech disruptions	speech fluency is disrupted by audible phenomena such as overt articulatory groping or phonemic conduite d’approche, including attempts to self-correct; distinguished from (audible) speech blocks
	Sound-/syllable repetitions	speech is disrupted by stuttering-like repetitions of sound or syllables; repetitions are iterative/oscillatory in nature (e.g., /tə tə tə tə to'ma:tə/; engl. tomato); distinguished from overt articulatory groping or phonemic conduite d’approche
	Speech blocks	involuntary cessations of sounds and airflow during speech; may occur in audible form (e.g., a sound is “stuck”) or in inaudible form (complete vocal tract closure, no sound or escaping air is audible).

	Reduced initiation/maintenance of speech	may be manifested by increased latencies in the initiation of speech (delayed speech onsets) or in fading of articulatory activity within utterances without or with delayed re-initiation. The feature is not to be confounded with delays caused by linguistic processing deficits (e.g., lexical retrieval) or articulatory groping. The feature is typically less pronounced when speech is preceded by prompts (e.g., in repetition)
Modulation (MOD)	Reduced pitch and loudness modulation	perceptual impression of flat intonation; reduced pitch / loudness modulation may not be sufficient to appropriately mark lexical-/sentence stress and adequately index the sentence type (e.g., interrogative)
	Syllabic (scanning) speech	syllable boundaries are clearly marked by pauses (syllable segregation) and/or prosodic modulation is characterized by equal stress across syllables (syllable isochrony)
	Blurring of syllable boundaries	the rhythmical pattern of utterances is diminished or even completely unrecognizable; syllable boundaries may no longer be discernible
Speech behavior (BEHAV)	Articulatory groping	difficulty in targeting the required articulation configuration; may manifest audibly (e.g. /pə...m::...p ^h ..pə..po..tə.. to'ma:tə) or silently (visible groping); is of apparent motor origin and may also include whole-word “trial-and-error” attempts (e.g., /ə::o'ma:tə..to'ma:tə)
	High articulatory effort	audible and/or visible effort in the production of speech movements expressed by exaggeratedly large speech movements and/or excessive orofacial constrictive forces; articulatory effort may also involve the respiratory and/or phonatory musculature