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Acquired Apraxia of Speech

Definition

- Defined as a "neurologic speech disorder that reflects an impaired capacity to plan or program sensorimotor commands necessary for directing movement that result in phonetically and prosdically normal speech "(Duffy 2013, pg. 4)
- Also called verbal apraxia or dyspraxia.

(ASHA)

Incidence

- No reliable data on incidence and prevalence of AOS in adults.
- This is due to challenges associated with common co-occurrence of AOS with aphasia and dysarthria (Duffy 2006, Duffy et al 2014)

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- There are difficulties with collection of data secondary to distinguishing among those disorders.
  - I.e., distinguishing between AOS characteristics and phondogical errors that can occur in aphasia (McNeil et al, 2004)
- It is noted by McNeil et all (2009) that AOS in the absence of dysarthria or aphasia is very uncommon.
- Duffy (2013) was documented that on 6.9% of all motor speech disorders, that AOS was documented as the primary but not the only communication disorder.

(ASHA)

Symptoms / Characteristics

- These characteristics have derived a consensus for differential diagnosis (Allisyn et all, 2020; Ballard et al, 2014; Duffy, 2013; McNeil et al, 2009)
  - Phoneme distortions and distorted substitutions or additions
  - Reduced overall speech rate
  - Syllable segmentation with extended intra- and intersegmental durations
  - Equal stress across adjacent syllables
- The above may increase with greater syllable length and motoric complexity.

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- AOS can improve, remain stable or worsen depending on specific diagnosis and time from onset.

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Other Speech Characteristics

- May not be unique to AOS
- Can occur in the presence or absence of coexisting dysarthria or aphasia.

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Other Perceptual Speech Characteristics

Articulation

- Voicing Errors
  - Decreased distinctions between boundaries of voiced and voiceless consonants.
- Prolonged phonemes
- Inconsistent errors
- Telescoping of syllables (i.e., disaur vs. Dinosaur)

(ASHA)

Rate & Prosody

- Overall slow rate
- Alternating motion rates that may be characterized by manner or place errors
  - Configuration and interaction of the articulators
- Poorly sequenced, sequential motion rates

  Fluency disruptions with attempts at self correction
- Difficulty initiating articulation sequences which may be accompanied by silent or audible groping behaviors, false starts and re-starts.
- Sound and syllable repetition

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Other Disorders that can occur with Apraxia

- Aphasia
- Dysarthria
- Non-verbal oral apraxia
- Apraxia of swallowing
- Limb apraxia
- Varying degrees of unilateral (usually right side) weakness and spasticity

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Causes

- "AOS is caused by any condition or process that compromises the structures and pathways of the brain responsible for planning and programming motor movements for speech." (ASHA)
- Causes include:
  - CVA
  - TBI
  - Tumor
  - Surgical trauma (i.e., tumor resection)
  - Progressive disease
  - Sometimes AOS can be the first ,the only, or most prominent symptom in degenerative neurological conditions (i.e. Progressive supranuclear palsy)

(ASHA)

Assessment

- Screening:
  - There are no AOS-specific standardized tools available to date.
- Comprehensive Assessment
  - Standardized and/or non-standardized measures

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Diagnostic Classification

- The diagnostic classification of AOS was first used by Darley 1968.
  - Observed that subset of patients with aphasia following a stroke also had difficulty with articulatory movements that could not be explained by phonological errors or weakness.
  - He proposed the term AOS to discriminate the language impairment associated with aphasia and the movement disorders associated with the dysarthria from a third disorder which he believed to be a result of impairment in planning and programming movement gestures for speech (Strand et al 2014)

(ASHA)

Neuroanatomy of Pure Apraxia of Speech in Stroke

- Jonathan Graff-Radford, MD
- David T. Jones
- Edythe A. Strand, PhD
- Alejandro A. Rabinstein, MD
- Joseph K. Duffy, PhD
- Keith A. Josephs, MD, MST, MSc

- Subjects with pure AOS due to stroke are rare because the commonest cause of AOS, middle cerebral artery infarction, often results in aphasia.

Patients

- All patients who underwent evaluation by a SLP between January 1, 1998 – February 1, 2012 were identified through a database kept by the SLP's.
- Identified a subgroup of patients with AOS resulting from ischemic stroke
- By chart review they identified those with "pure" apraxia of speech (i.e., absent or equivocal aphasia). Patients with hemorrhagic stroke were excluded.

Speech & Language Testing

- AOS diagnosis was based in perceptual features of the disorder.

Slow rate	**7/7**
Distorted substitutions	7/7
Vowel distortions	7/7
Increased sound errors with increased complexity	5/7
Segmentation of words and/or syllables	4/7
Self-correction of sound level errors	5/7
Articulatory groping	5/7
Verbal comprehension errors	7/7 normal
Naming (semantic or phonemic paraphasias)	7/7 normal
Reading comprehension errors	7/7 normal
Writing errors	4/7 normal 1. self-generated uniting was normal, but written sentences to dictation contained spelling errors. 2. Normal to dictating but some mild difficulty starting self-generated sentence.
Word retrieval delays	6/7 normal 1/7 occasional

- MRI studies performed closest to the date of infarction were used.

Results

- 7 patients
- Median age 68 (range 49-72)
- Evaluated at median of 3 days after stroke by SLP
- No patients had non-verbal oral apraxia or significant dysarthria
- 5 had “pure” AOS
- 2 had AOS and equivocal evidence of aphasia

MRI Findings

- All strokes occurred in the (L) hemisphere with an area spanning the motor and premotor cortices being the region of maximum overlap.
- 6/7 strokes involved premotor cortex and 7/7 involved the primary cortex.

Conclusions

- In stroke induced acute AOS with equivocal or no aphasia, an area involving the left premotor and motor cortices is the region of greatest overlap.
- Important note: Subjects with pure AOS due to stroke are rare because the commonest causes of AOS is middle cerebral artery infarction which often results in aphasia.

Screenings

- There are no AOS-specific standardized tools at this time.
- SLP looks for signs of comorbid language, cog-comm and swallowing deficits associated with the neurological insult
- Hearing function is important.

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Comprehensive Assessment

- Both informal and formal assessment can be used.
- Can use both standardized and non-standardized measures.

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- When doing a comprehensive assessment we should look at:
  - Impairments in body function and structure
  - Comorbid deficits such as aphasia and dysarthria
  - Limitations in activity and participation
    - Functional communication, self-care, interpersonal interactions and learning
    - Environmental and personal factors that are barriers or facilitators of successful communication and functional participation in life
    - Quality of life issues due to communication deficits

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- Comprehensive assessment focuses on functional aspects of speech generation:
  - Intelligibility
  - Understandability
  - Efficiency– the rate at which the person communicates an intelligible utterance

(ASHA)

Other Considerations

- Complete case history
- Reports of areas of concern
- Sensory and motor status
- Oral motor mechanisms and non-speech oral apraxia
- Perceptual speech characteristics
- Voice and resonance assessment
- Language assessment

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Motor Speech Planning

- Assessment of motor speech planning includes producing stimuli with differing motoric complexity
  - Phonemes
  - Syllables
  - Monosyllabic/multisyllabic words
  - Sentences
  - Conversation

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Also looks at…

- Contextual speech to assess combined functioning of all speech sub-systems
- Vowel prolongation to assess respiratory, phonatory coordination and vocal quality
- Diadochokinetic rate – (alternating motion rates, assesses speed and regularity of movement of articulators (i.e., papapa)
- Sequential motion rates – assess the ability to move quickly and consecutively from one articulatory placement to another (i.e., pataka)

(ASHA)

Differential Diagnosis (ASHA)

- Other Factors to consider:
  - Dysarthria
  - Aphasia
  - Progressive neurological disorders

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Comparison between characteristics of these disorders (ASHA)

Characteristic	AOS	Dysarthria	Aphasia
Muscle weakness	No	Yes	No
Articulatory deficits	Yes	Yes	No
Prosodic deficits	Yes	Yes	No
Language processing deficits	No	No	Yes
Consistent error patterns	No	Yes	No
Groping for articulatory postures	Yes	No	No

(ASHA)

Apraxia Battery for Adults

- Barbara L. Dabul, 2nd edition
- 6 subtests
  - Takes approximately 20 minutes to administer
- Assess
  - Diadochokinetic rate
  - Increasing word length
  - Limb apraxia and oral apraxia components
  - Latency time and utterance time for polysyllabic words
  - Repeated trials test
  - Inventor

Apraxia of Speech Rating Scale (ASRS-V1)

(Strand et al, 2014)

Name: _____ #: _____ Date: _____ Examiner: _____

Total of Ratings: _____ **# of items rated present:** _____

Aphasia present Y N Severity (0-4)_____ AOS present Y N Severity (0-4)_____

Dysarthria present Y N (type=_____); Severity (0-4)_____

1	**AOS - primary distinguishing features[a] (no overlap with dysarthria or aphasia). One or more must be present for diagnosis of AOS.**	**Score (0-4)**
1.1	Distorted sound substitutions	
1.2	Distorted sound additions (not including intrusive schwa)	
1.3	Increased sound distortions or distorted sound substitutions with increased utterance length or increased syllable/word articulatory complexity	
1.4	Increased sound distortions or distorted sound substitutions with increased speech rate	
1.5	Inaccurate (off-target in place or manner) speech AMR's (alternating motion rates, as in rapid repetition of "puh puh puh")	
1.6	Reduced words per breath group relative to maximum vowel duration	
2	**Distinguishing features unless dysarthria present[b]**	**Score (0-4)**
2.1	Syllable segmentation within words > 1 syllable	
2.2	Syllable segmentation across words in phrases/sentences	
2.3	Sound distortions	
2.4	Slow overall speech rate	
2.5	Lengthened vowel &/or consonant segments	
2.6	Lengthened intersegment durations (between sounds, syllables, words, or phrases; possibly filled, including intrusive schwa)	
3	**Distinguishing features unless aphasia present[c]**	**Score (0-4)**
3.1	Deliberate, slowly sequenced, segmented, &/or distorted (including distorted substitutions) speech SMRs in comparison to speech AMRs	
3.2	Audible or visible articulatory groping; speech initiation difficulty; false starts/restarts	
4	**Distinguishing features unless dysarthria &/or aphasia present[d]**	**Score (0-4)**
4.1	Sound or syllable repetitions	
4.2	Sound prolongations (beyond lengthened segments)	

0 = not present
1 = detectable but infrequent
2 = frequent but not pervasive
3 = nearly always evident but not marked in severity
4 = nearly always evident and marked in severity

ASRS

- May provide an additional tool for quantifying the presence and severity of AOS during spontaneous conversation narrative picture description and repetition tasks.
- Highlights
  - The ASRS quantifies the frequency/severity of characteristics associated with AOS
  - ASRS correlates with clinical diagnosis and severity of AOS
  - Overall intra judge and interjudge reliability is acceptable
  - Felt the sensitivity and specificity of the ASRS are acceptable

Category of Treatment Approaches

- Articulatory-Kinematic Approaches
- Sensory Cueing Approaches
- Word & Phrase Focused Approaches
- Rate & Rhythm Control Approaches

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Articulatory-Kinematic Approaches

- Based on principles of motor programming / planning
- Practice of speech targets frequent and intensive practice of speech targets
- Focus on accurate speech movement
- Includes sensory input for speech production
  - i.e., visual, tactile, auditory, and cognitive cues
- Provides schedules and types of feedback on patient performance

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Types

- Multiple input phoneme therapy
- Sound production treatment
- The speech motor learning treatment approach (AA)

(ASHA)

Sensory Cueing Approaches

- Sensory input
  - i.e., auditory, visual, proprioceptive and tactile cues
- Integral stimulation
- Tactile cueing
- PROMPT – prompts for restructuring oral muscular phonetic targets – finger placements on the individuals face and neck to cue aspects of speech production. PROMPT requires specialized training.

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Visual Cueing

- Visual cues for placement, shape or movement of the articulators
- Electropalatography
  - Palatal device that uses electrodes to record and visualize contact on the palate when a person makes various speech sounds.

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Word & Phrase Focused Approaches

- Script training
  - A variety of phrases are practiced so that they can become an automatic phrase that the patient can use in conversational speech.

(ASHA)

Rate & Rhythm Control Approaches

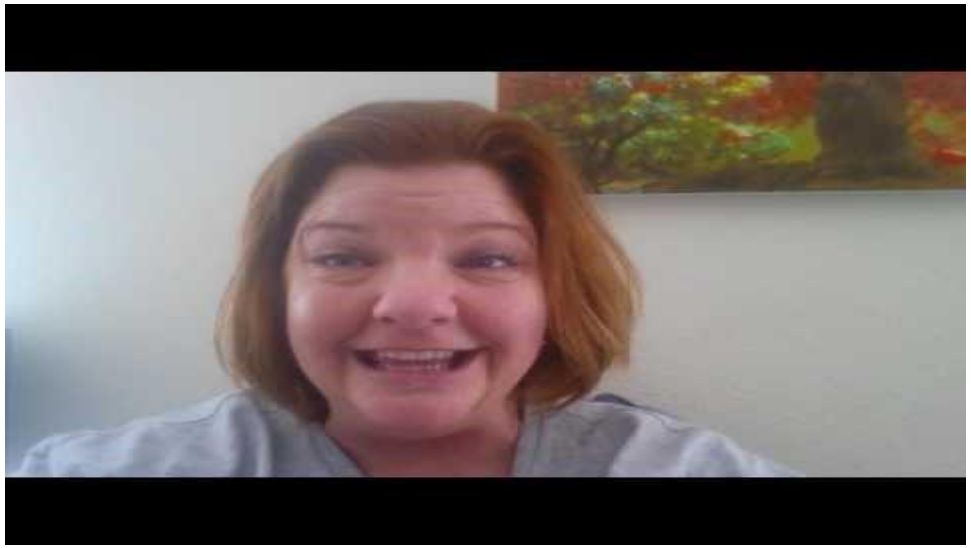
- Uses melody, rhythm and stress to improve speech production. (ASHA)
- Contrastive Stress
  - Melodic Intonation Therapy
  - Metrical Pacing Treatment
  - Rhythmic Pacing Strategies
  - Transcranial direct current stimulation (experimental)
    - Current delivered to the left frontal gyrus to modulate cortical activity
    - Marangolo, P. et al 2011 Electrical stimulation over the left inferior frontal gyrus (IFG) determines long-term effects in the speech apraxia in three chronic aphasics.
    - Behavioral Brain Research 225 (2) 498-504
  - AAC- low and high tech

(ASHA)

References

- The apraxia of speech rating scale: a tool for diagnosis and description of apraxia of speech. Edythe A. Strand, Joseph R. Duffy, Heather M. Clark, Keith Josephs. Journal of Communication Disorders 51 (2014) 43-50.
- Alexandra Basilakos MA; Chris Rorden PhD; Leonardo Bonilha MP PhP; Dana Moser PhP; Julius Fridricksson PhD. Patterns of Post-Stroke Brain Damage that predict speech production errors in apraxia of speech and aphasia ?? Stroke, 2015; 46:1561-1566 DOI: 10.1161 Strokeaha 115.009211.
- Jonathan Graff-Radford MP; David T. Jones; Edythe A. Strand PhD; Alejandro A. Rabinstein MD; Joseph R. Duffy PhD; and Keith A. Josephs MD MST MSC. The Neuroanatomy of pure apraxia of speech in strokes brain language. 2014 February; 129; 43-46.
- https://www.asha.org/practice-portal/clinical-topics/acquired-apraxia-of-speech/

https://youtu.be/bZ7pnmd9UHI



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