Apraxia of Speech in Conduction Aphasia: A Clinical Reality

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AOS and CA

Apraxia of speech (AOS) is a motor speech disorder that can occur in isolation, but usually co-occurs with aphasia of varied language fluency. Speech production difficulties are evident in self-initiated speech as well as in repetition. Sound segments appear distorted to listeners and prosody is impaired, with slow speaking rate, syllable segregation, and equalized stress.

Conduction aphasia (CA) is a language disorder distinguished by word-finding difficulties, largely preserved language comprehension, and relatively high fluency in spontaneous speech. Speech production difficulties are most evident during repetition and confrontation naming tasks, and performance on these tasks can differ markedly from running speech. Although the speech output may include multiple sound errors, these errors are thought to be accurate executed. Prosody is relatively unaffected.

Can AOS and CA be diagnosed in the same person?

CA classification on the WAB-R

Aphasia type	Scores			
	Fluency	Auditory Verbal Comprehension	Repetition	Naming & Word Finding
Global	<5	0-3.9	0-4.9	<7
Broca's	<5	4-10	0-7.9	<9
Isolation	<5	0-3.9	5-10	<7
Transcortical Motor	<5	4-10	8-10	<9
Wernicke's	>4	0-6.9	0-7.9	<10
Transcortical Sensory	>4	0-6.9	8-10	<10
Conduction	>4	7-10	0-6.9	<10
Anomic	>4	7-10	7-10	<10

0	No words or short, meaningless utterances.
1	Recurrent, brief, stereotypic utterances with varied intonation; the emphasis or prosody may convey some meaning
2	Single words, often paraphasias, effortful and hesitant
3	Longer, recurrent stereotypic or automatic utterances without information, or mumbling
4	Halting, telegraphic speech; mostly single words; paraphasias; occasional propositional phrases; severe word-finding difficulty. No more than two complete sentences with the exception of automatic sentences (e.g. "Oh I don't know."); characteristic of agrammatic, nonfluent aphasia
5	Often telegraphic, but more fluent speech with some grammatical organization; marked word-finding difficulty. Paraphasias may be prominent; few, but more than two propositional sentences.
6	More propositional sentences with normal syntactic patterns; may have paraphasias; significant word-finding difficulty and hesitations may be present
7	Phonemic jargon with semblance to English syntax and rhythm with varied phonemes and neologisms. May talk excessively; must be fluent; characteristic of severe Wernicke's aphasia
8	Circumlocutory, fluent speech; moderate word-finding difficulty; with or without paraphasias; may have semantic jargon. The sentences are often complete but may be irrelevant.
9	Mostly complete, relevant sentences; occasional hesitations and/or paraphasias; some word-finding difficulty; near normal, but still perceptibly aphasic.
10	Sentences of normal length and complexity, without definite slowing, halting, or paraphasias.

Criteria for AOS vs. APP

Diagnosis	Speech Domain	
	Segmental	**Supra-segmental**
Apraxia of Speech (AOS)	Phonemic errors, Distortion errors	Slow rate, sound prolongations, intersegmental pauses
Aphasia & Phonemic Paraphasia (APP)	Phonemic errors (few distortion errors)	(Relatively unaffected)

Methods

Demographics, clinical tests	MEAN (SD)	Range
Age (years)	64.6(13.1)	30.9 – 90.7
TPO	5.3 (4.7)	0.8 – 24.7
Education	15.7 (3.6)	11.0 – 25.0
BNT-15	5.7 (3.6)	0.0 – 13.0
WAB AQ	69.1 (10.1)	49.0 – 90.0
Impression fluent	63.4%	na
Impression CA	29.3%	na
Impression AOS	29.3%	na
Impression Dysarthria	2.4%	na

Participants (N=41)

- 23 male, 18 female
- All CA on the WAB-R
- From AphasiaBank database
- (http://talkbank.org/AphasiaBank/).
- All had a WAB-R diagnosis of conduction aphasia after stroke and one had a clinical diagnosis of dysarthria.

BNT-15 (*for WSD)	
1	house
2	comb
3	toothbrush
4	**octopus***
5	Bench
6	**volcano***
7	Canoe
8	Beaver
9	Cactus
10	Hammock
11	**stethoscope***
12	**unicorn***
13	Tripod
14	sphinx
15	palette

Speech Sample

- Video recordings
- 15-item Boston Naming Test, BNT-15)
- Story telling narrative (Cinderella).

Narrow Phonetic Transcription

- From video
- Klattese and 12 numerical codes for diacritic marks.
- ➢ Phonemic errors, distortion errors, distorted substitution errors

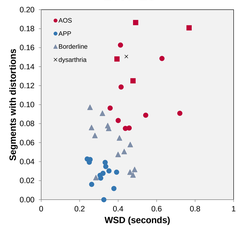
Acoustic Analysis

- Extracted audio files, Manual segmentation of the naming and story-telling speech samples, Praat
- ➢ Word syllable duration (WSD), Narrative syllable duration (NSD)

Discourse Analysis

- From available AphasiaBank transcriptions and codes for the Cinderella task through Clan's EVAL, global coherence, and main concepts analyses

Question 1: Do some people with a CA diagnosis (per the WAB-R) show quantitative evidence of AOS?

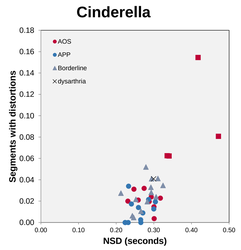


P-AOS based on BNT-15 (N=14)
- >7% segments w distortion errors AND
- >400 ms WSD

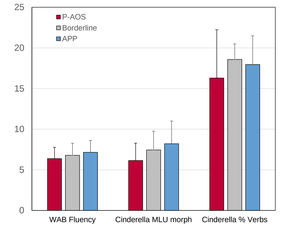
Borderline based on BNT-15 (N=14)

P-APP based on BNT-15 (N=13)
- <5% segments w distortion errors AND
- <400 ms WS

X **dysarthria (N=1)**



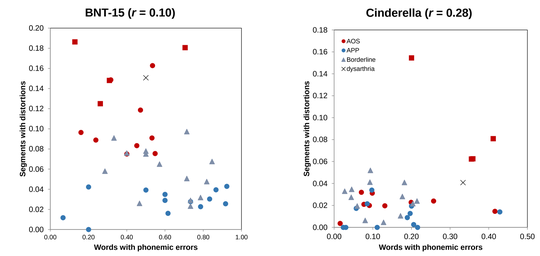
Question 2: Do speakers with probable AOS also have low language fluency or limited syntax?



No difference among groups on any of the discourse measures, but individual profiles had these features.

WAB Fluency score	P-AOS (%)	Undetermined (%)	P-APP (%)
5	28.6	21.4	15.4
6	42.9	35.7	23.1
7	0.0	0.0	15.4
8	21.4	28.6	23.1
9	7.1	14.3	23.1
10	0.0	0.0	0.0

Question 3: What is the relationship between distortion error and phonemic error frequency?



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