

Patterns of Connected Speech Features in Aphasia

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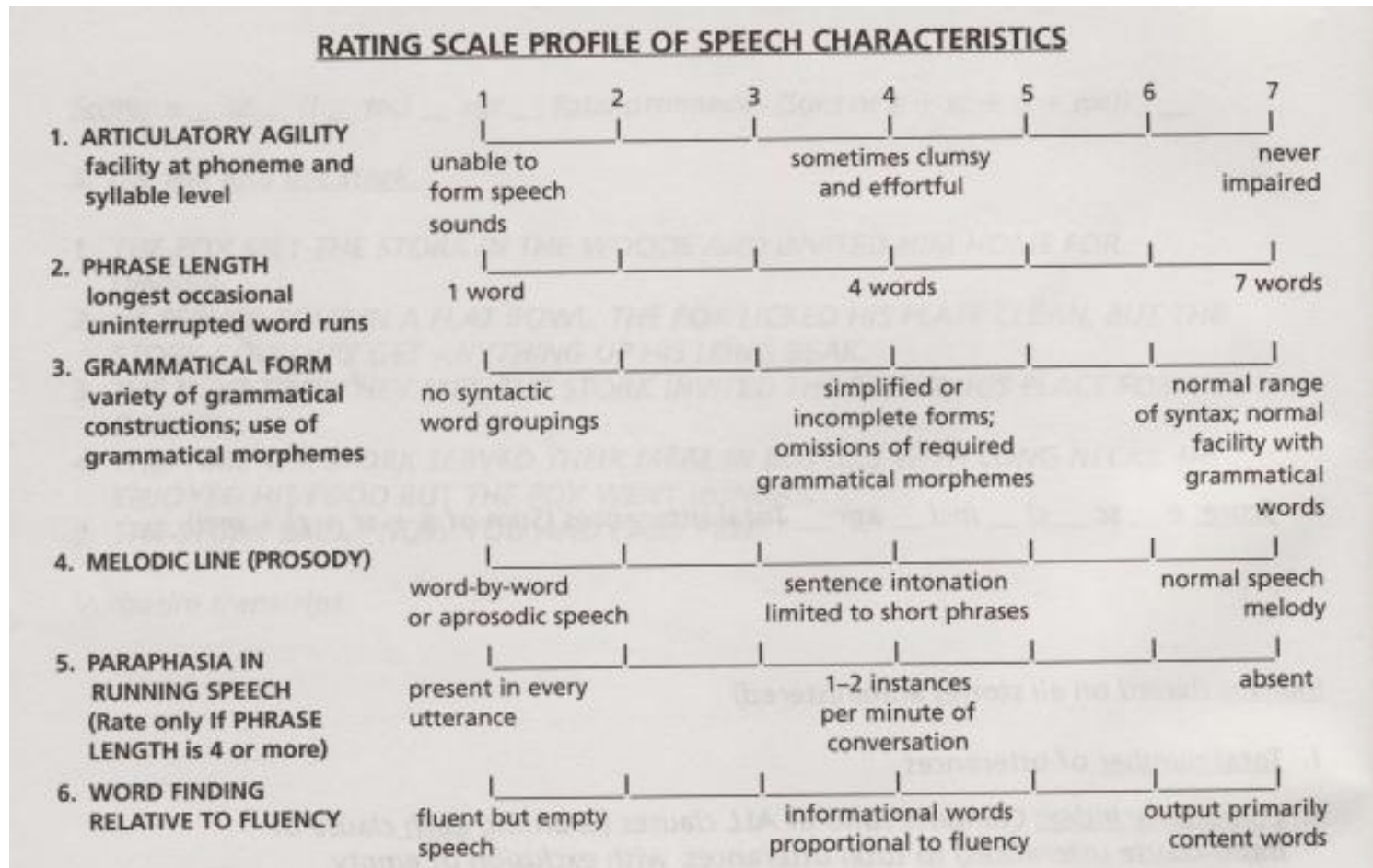
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Connected speech is sensitive to underlying impairments across language domains.

Qualitative rating scales lack detail, and presuppose which features are important.

Boston Diagnostic Aphasia Examination, 3rd Ed.



Quantitative linguistic analysis is labor-intensive.

CHAT transcription

*PAR: +" h:elp me .

%mor: v|help pro:obj|me .

%gra: 1|0|ROOT 2|1|OBJ 3|1|PUNCT

*PAR: and all_a_sudden [: all_of_a_sudden] is [//] &uh &=traces:line went back
&uh &uh (.) bedroom . [+ gram]

%mor: coord|and adv|all_of_a_sudden v|go&PAST adv|back n|+n|bed+n|room .

%gra: 1|3|LINK 2|3|JCT 3|0|ROOT 4|5|JCT 5|3|OBJ 6|3|PUNCT

*PAR: and &uh buckle up because &uh &=ges:left_side one [//] &=ges:right_side (.)
&uh right side is &uh nothin(g) &=ges:no. [+ gram]

%mor: coord|and v|buckle adv|up conj|because n|right n|side aux|be&3S pro:indef|nothing .

%gra: 1|2|LINK 2|0|ROOT 3|2|JCT 4|6|MOD 5|6|MOD 6|8|SUBJ 7|8|AUX 8|2|COMP 9|2|PUNCT

Auditory-perceptual rating scales balance detail with efficiency.

Mayo Classification System for Dysarthria

MSD RATING SCALE

Assign a value of 0-4 to each dimension listed below (0 = normal; 1 = mild; 2 = moderate; 3 = marked; 4 = severely deviant).

Pitch	Pitch level (+/-)____ Pitch breaks____ Monopitch____ Voice tremor____ Laryngeal myoclonus____ Diplophonia____	Respiration	Forced inspiration-expiration____ Audible inspiration____ Inhalatory stridor____ Grunt at end of expiration____
Loudness	Monoloudness____ Excess loudness variation____ Loudness decay____ Alternating loudness____ Overall loudness (+/-)____	Prosody	Rate (+/-)____ Short phrases____ Increased rate in segments____ Increased rate overall____ Reduced stress____ Variable rate____ Prolonged intervals____ Inappropriate silences____ Short rushes of speech____ Excess and equal stress____ Syllable segmentation____

(Darley, Aronson, & Brown 1969a,b, 1975; Bunton, Kent, Duffy, Rosenbek, & Kent, 2007; Duffy, 2013)

We identified 27 common and salient features of aphasia.

<i>Lexical retrieval</i>	<i>Rate and timing</i>
Anomia	Pauses between utterances
Abandoned utterances	Pauses within utterances
Empty speech	Halting and effortful
<i>Selection of words and sounds</i>	Reduced speech rate
Semantic paraphasias	<i>Self-correction</i>
Phonemic paraphasias	Retracing
Neologisms	False starts
Jargon	Conduite d'approche
Perseverations	<i>Clarity</i>
Stereotypies	Target unclear
<i>Grammatical construction</i>	Meaning unclear
Short and simplified utterances	Off-topic
Omission of bound morphemes	<i>Diagnostic</i>
Omission of function words	Expressive aphasia
Paragrammatism	Apraxia of speech
	Dysarthria
	Overall communication impairment

(Saffran, Berndt, & Schwartz, 1989; MacWhinney, Fromm, & Holland, 2011; Wilson et al., 2010; Yagata et al., 2017; McCarron et al., 2017)

We then used a 5-point scale to rate the features.

Score	Severity	Description
0	Not present	Not present or within the range of healthy non-elderly speakers
1	Mild	Detectable but infrequent
2	Moderate	Frequently evident but not pervasive
3	Marked	Moderately severe, pervasive
4	Severe	Nearly always evident

The scale is based on Strand, Duffy, Clark, & Josephs (2014).

Auditory-Perceptual Rating of Connected Speech in Aphasia (APROCSA)

Name/identifier _____ Rater _____ Date _____

Rate connected speech using the following scales:

Not present (0) = not present or within the bounds of healthy, non-elderly speakers

Mild (1) = mild impairment or detectable but infrequent

Moderate (2) = moderate impairment or frequently evident but not pervasive

Marked (3) = moderately severe impairment or pervasive

Severe (4) = severe impairment or nearly always evident

FEATURES	0	1	2	3	4
Lexical retrieval					
Anomia	not present	mild	moderate	marked	severe
Abandoned utterances	not present	mild	moderate	marked	severe
Empty speech	not present	mild	moderate	marked	severe
Selection of words and sounds					
Semantic paraphasias	not present	mild	moderate	marked	severe
Phonemic paraphasias	not present	mild	moderate	marked	severe
Neologisms	not present	mild	moderate	marked	severe
Jargon	not present	mild	moderate	marked	severe
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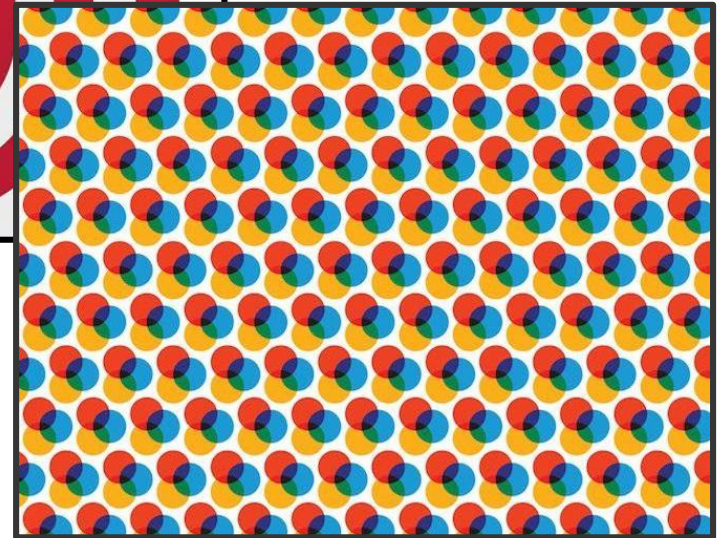
Our study had three aims:



(1) Reliability



(2) Validity



(3) Patterns

Source of data: Samples from AphasiaBank

- ✓ 24 individuals with chronic, post-stroke aphasia
- ✓ Aged 49 to 76 years, 12 females
- ✓ Varied aphasia severity and subtypes
- ✓ 5 minutes of videotaped spontaneous speech



Raters: 3 researchers and 12 students



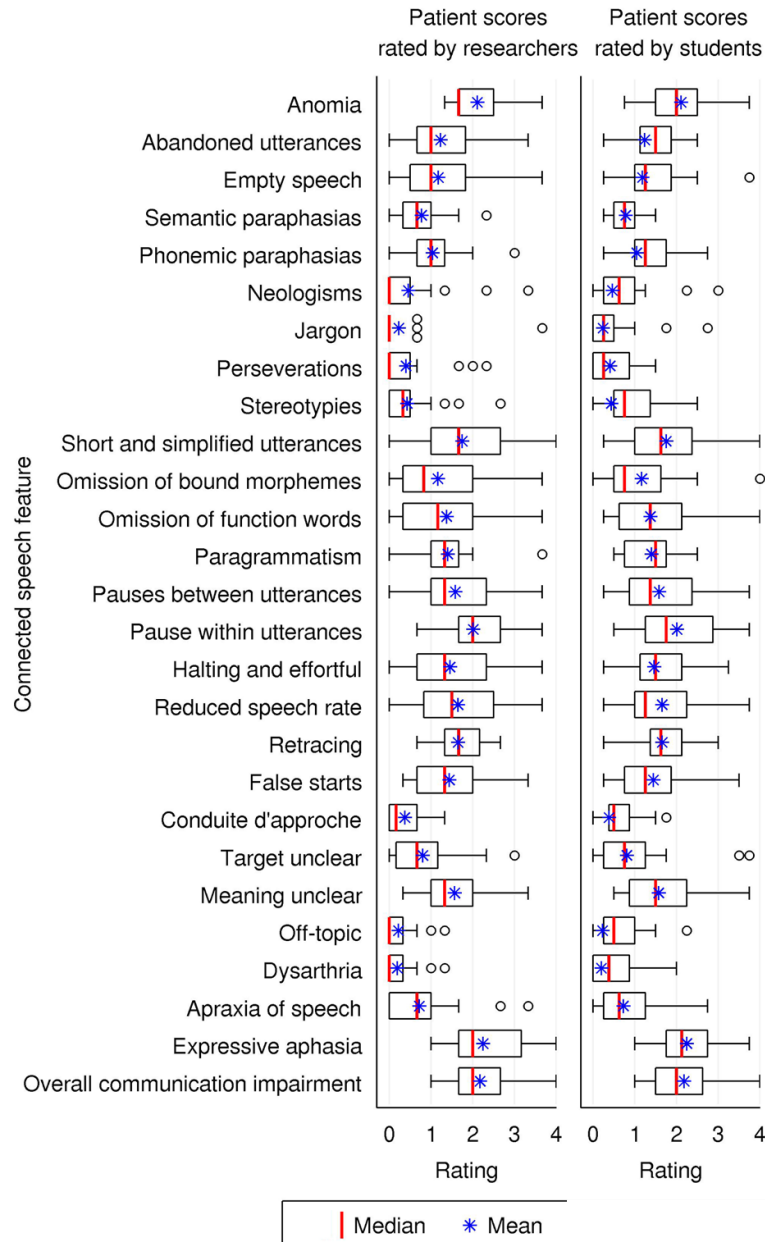
✓ 24 patients rated



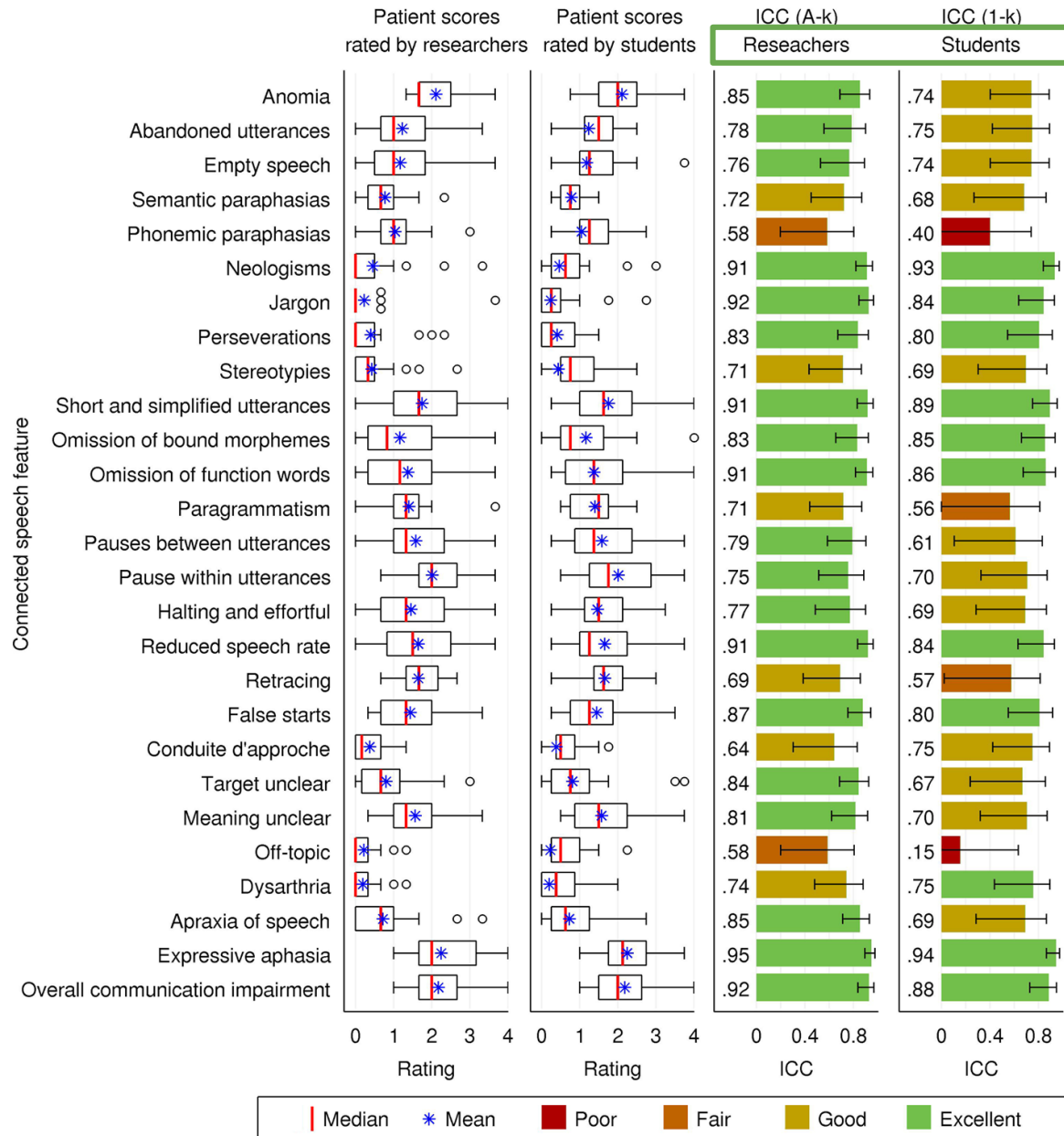
✓ 2.5-hr training session

✓ 8 patients rated in 2,
1-hr sessions

Feature scores were widely distributed.



Reliability was good-to-excellent for most features.



Researchers
> reliable

3 students
were highly
reliable

We assessed concurrent validity by correlating APROCSA features with AphasiaBank measures.

A priori correlations for 24 features

APROCSA features

Lexical Retrieval

- Anomia
- Abandoned utterances
- Empty speech

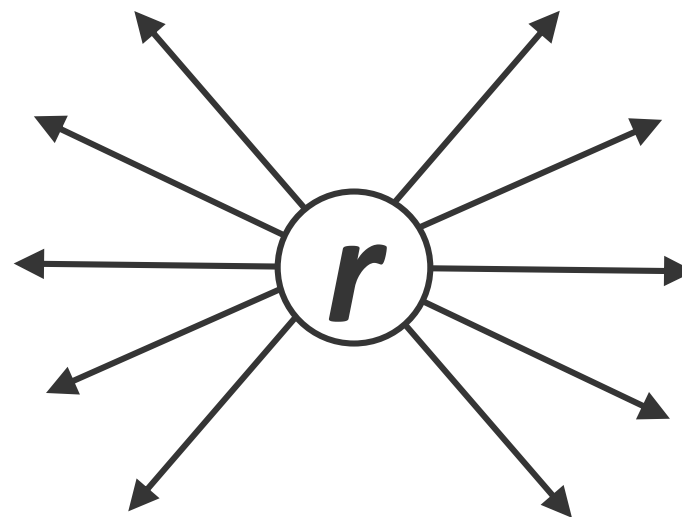
Selection of words and sounds

- Semantic paraphasias
- Phonemic paraphasias
- Neologisms
- Jargon
- Perseverations
- Stereotypies

Grammatical construction

- Short and simplified utterances
- Omission of bound morphemes
- Omission of function words
- Paragrammatism

...



AphasiaBank measures

Transcription measures

- Anomia (phw)
- Abandoned utterances (phw)
- Empty speech (phw)
- Semantic errors (phw)
- Phonological errors (phw)

Clinical diagnoses

- Apraxia of speech
- Dysarthria

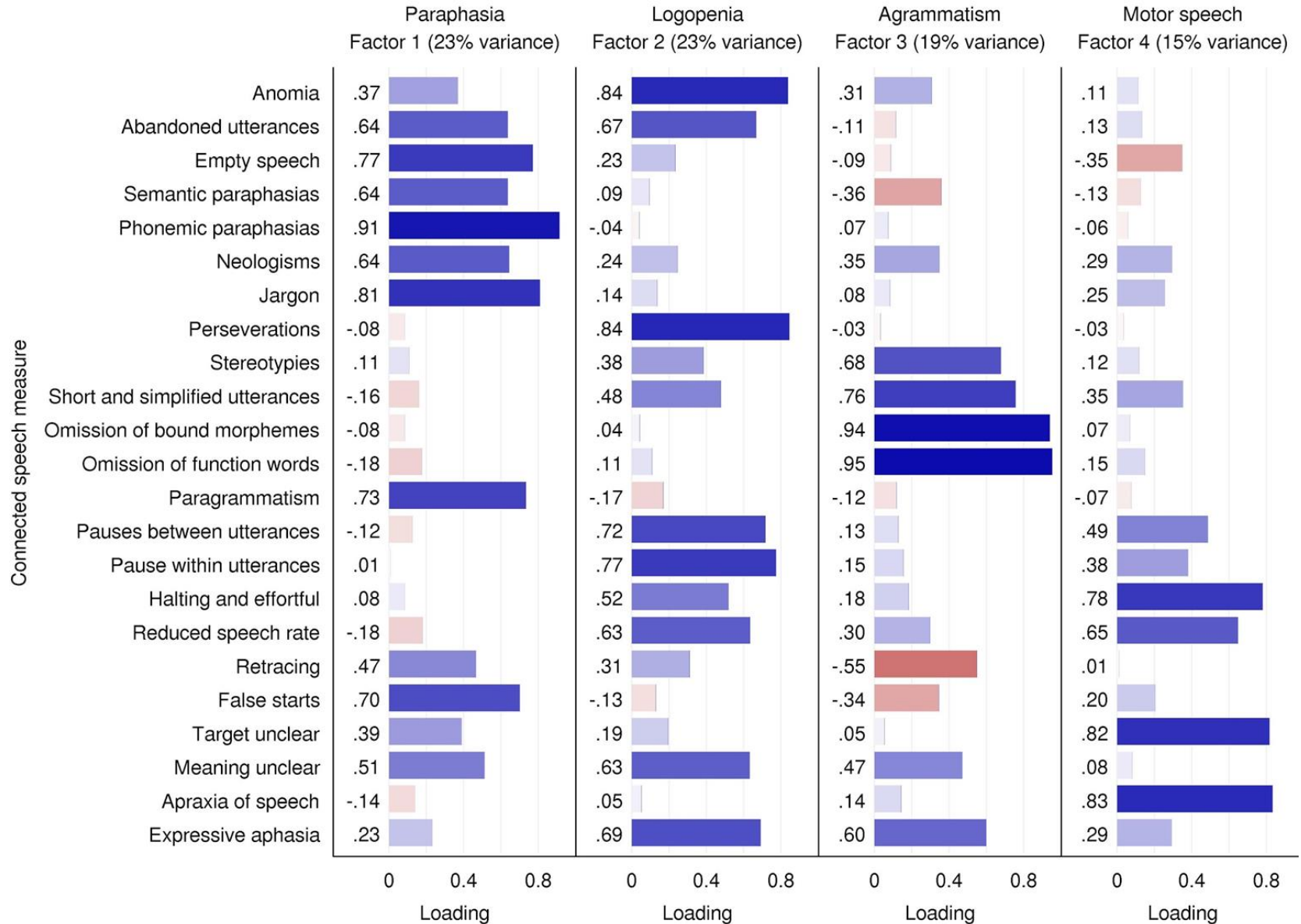
Western Aphasia Battery

- Information content
- Fluency
- Comprehension
- Repetition
- Naming
- Aphasia Quotient

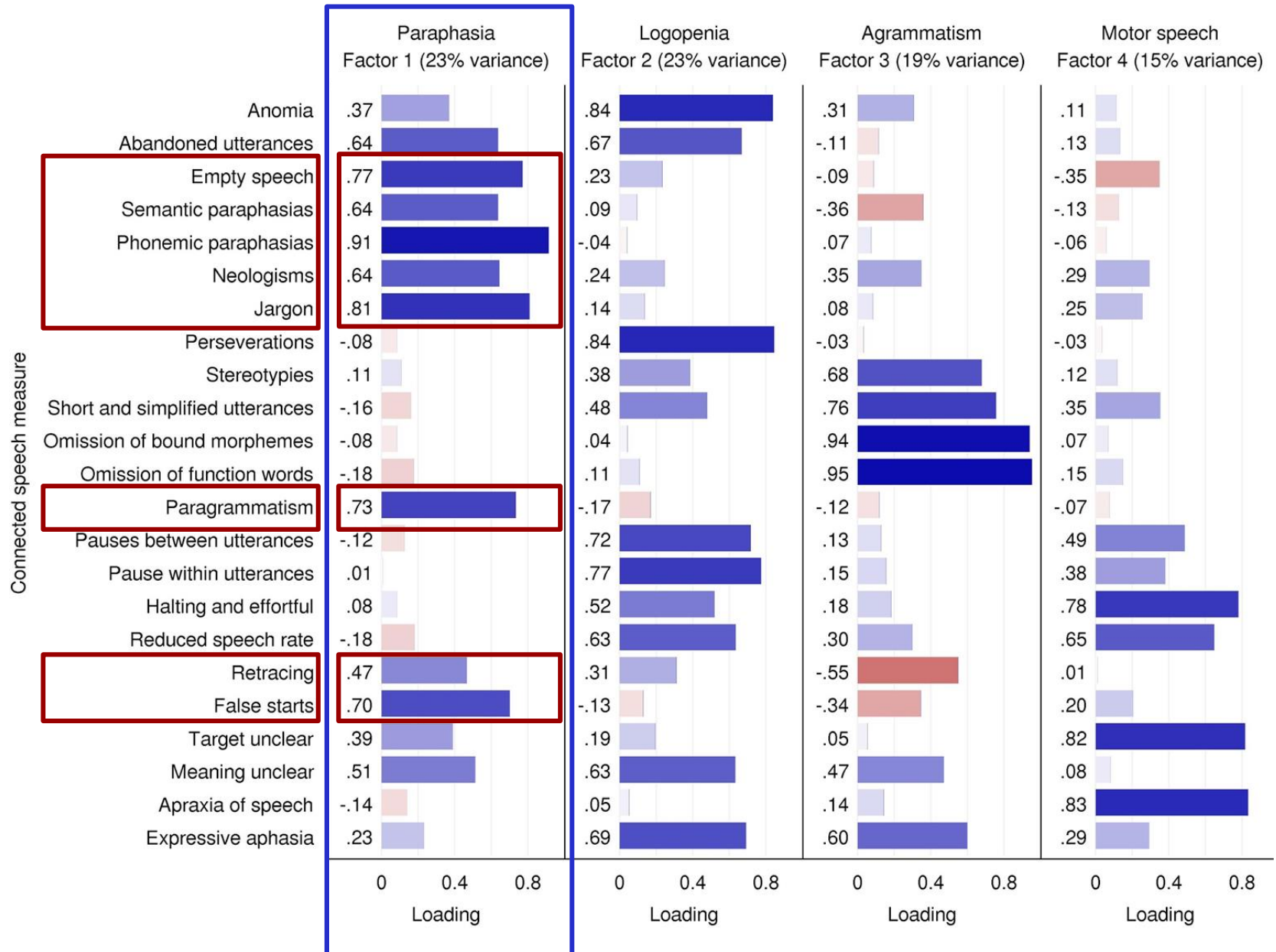
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Pairwise Pearson correlations

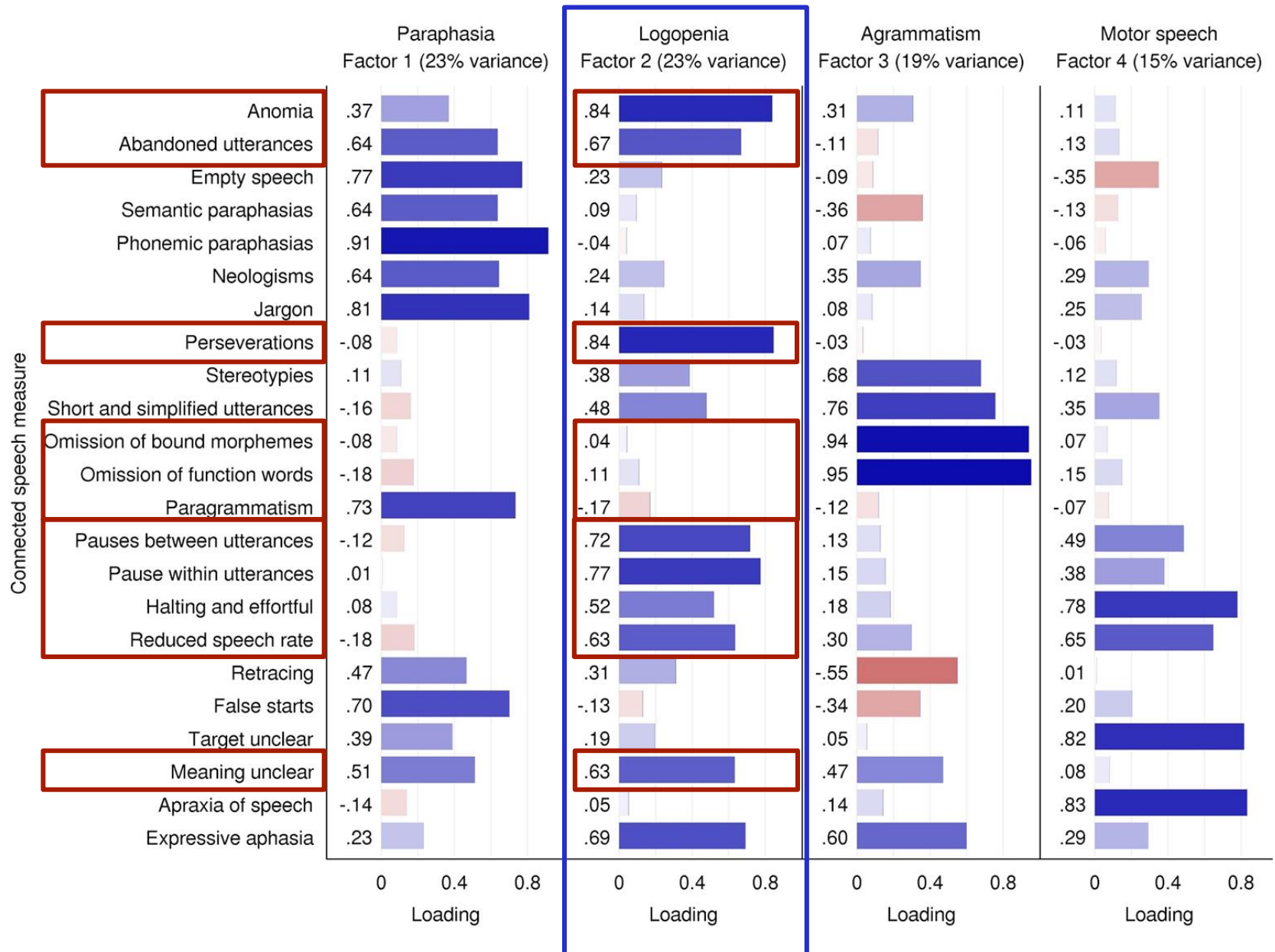
4 factors emerged from the features.



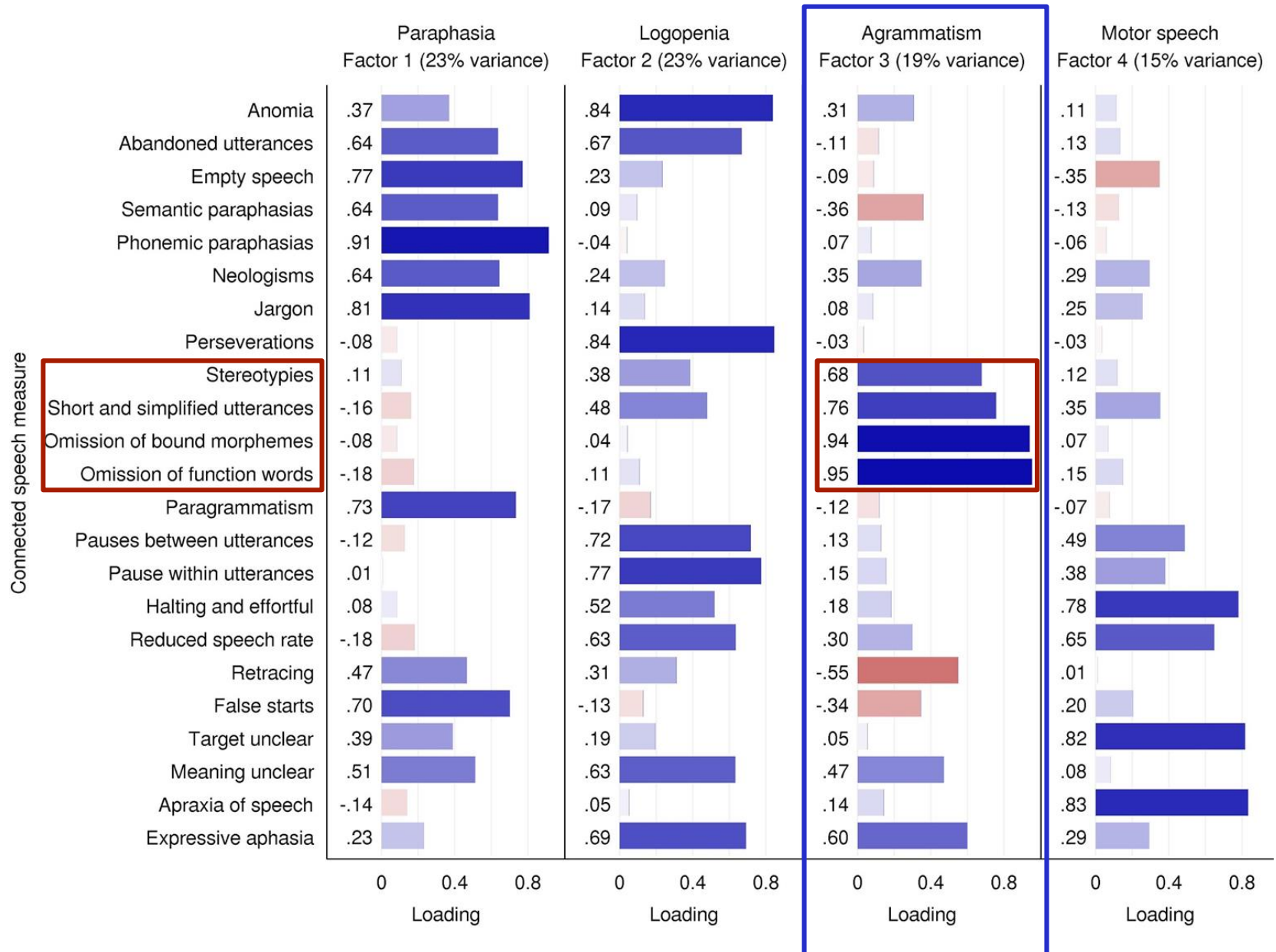
4 factors emerged from the features: **Paraphasia**



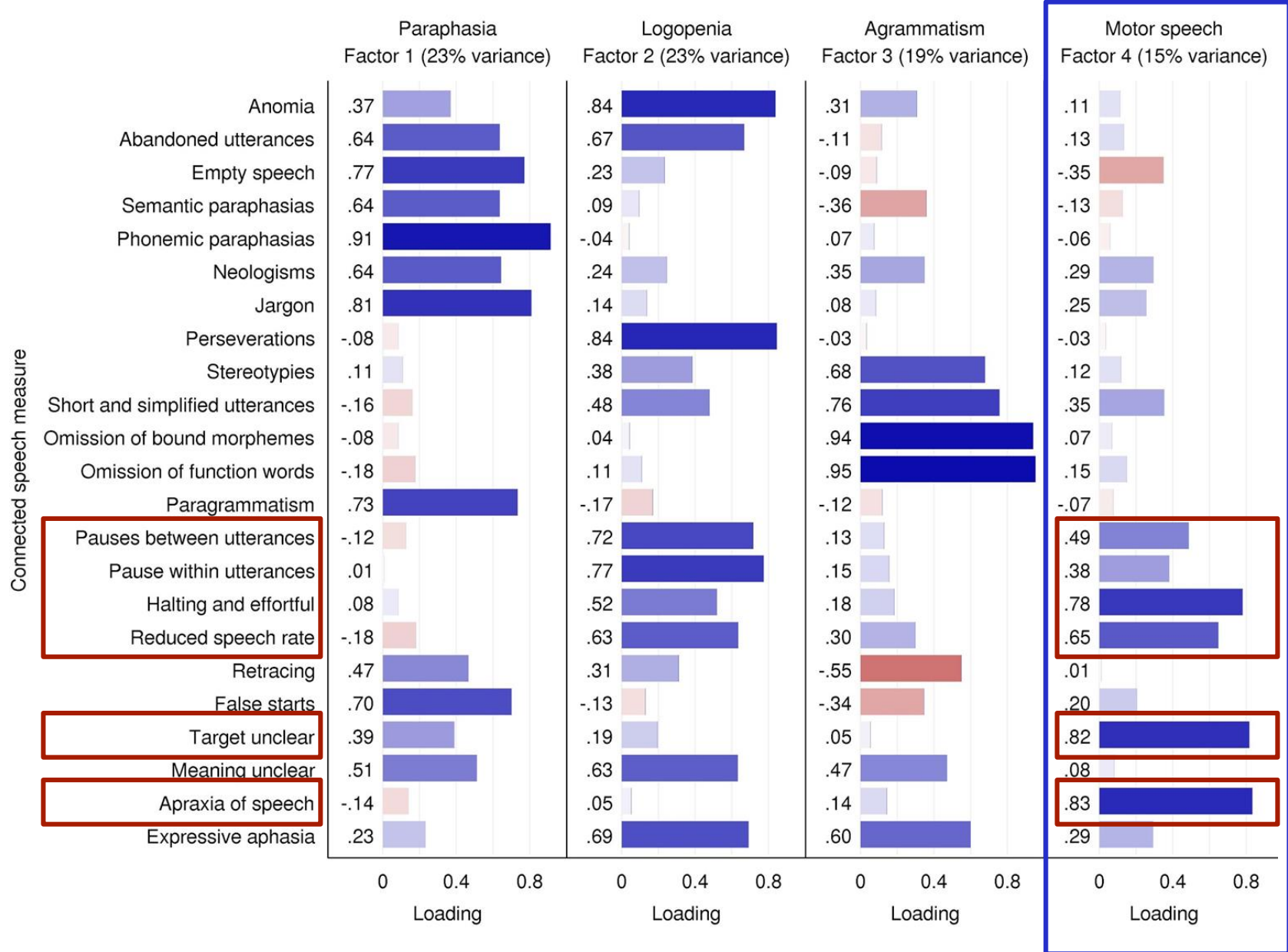
4 factors emerged from the features: **Logopenia**



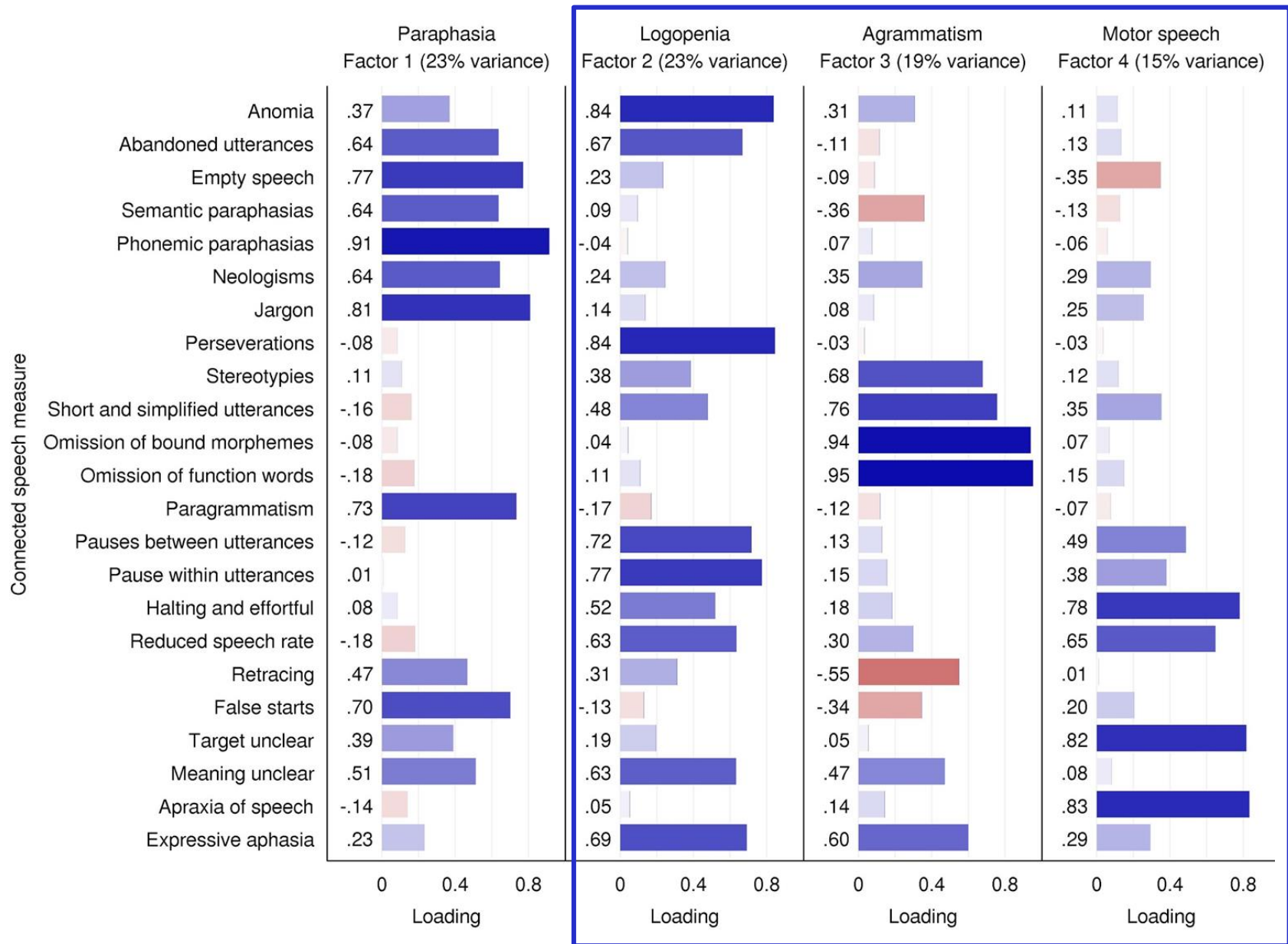
4 factors emerged from the features: **Agrammatism**



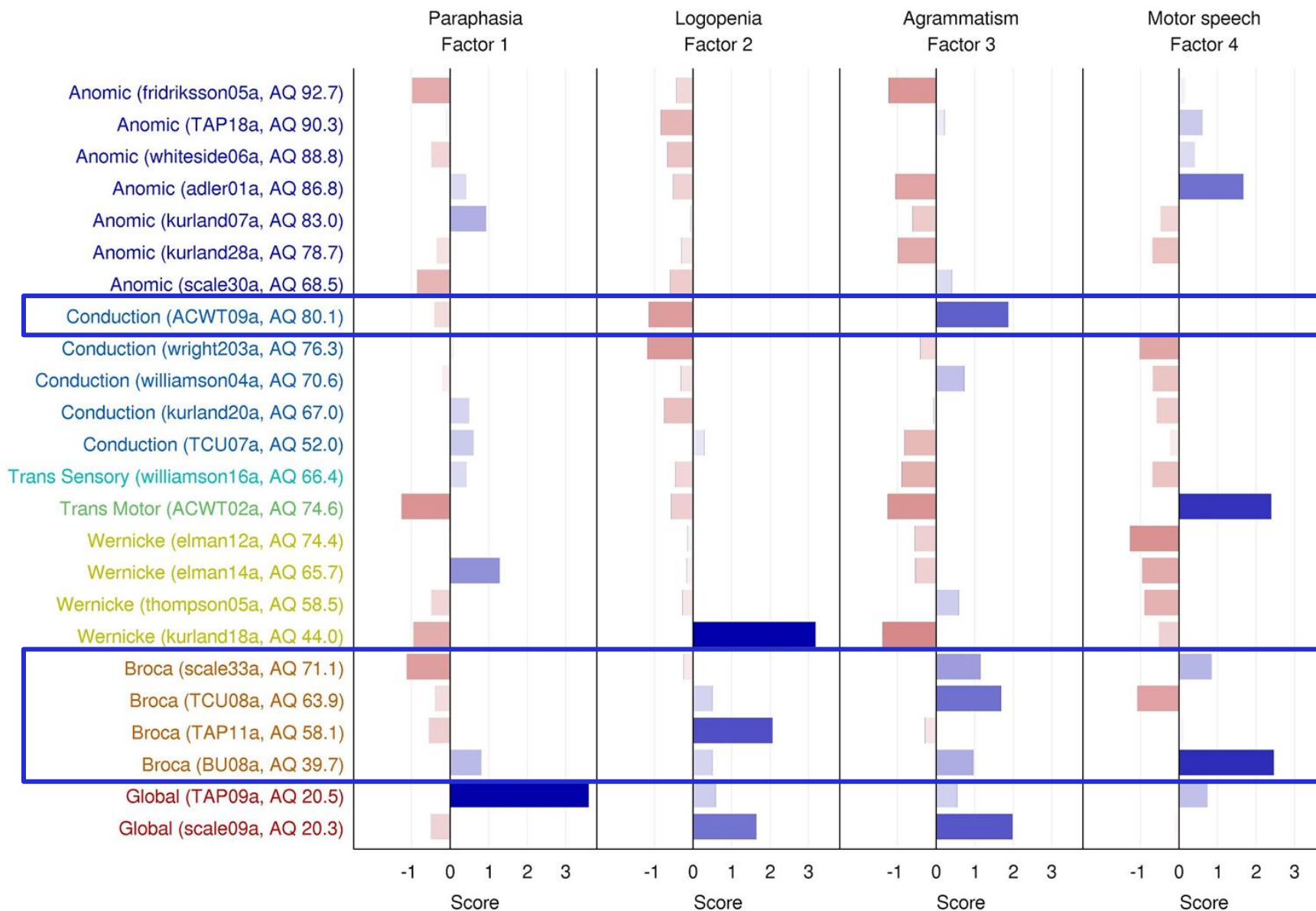
4 factors emerged from the features: **Motor speech**



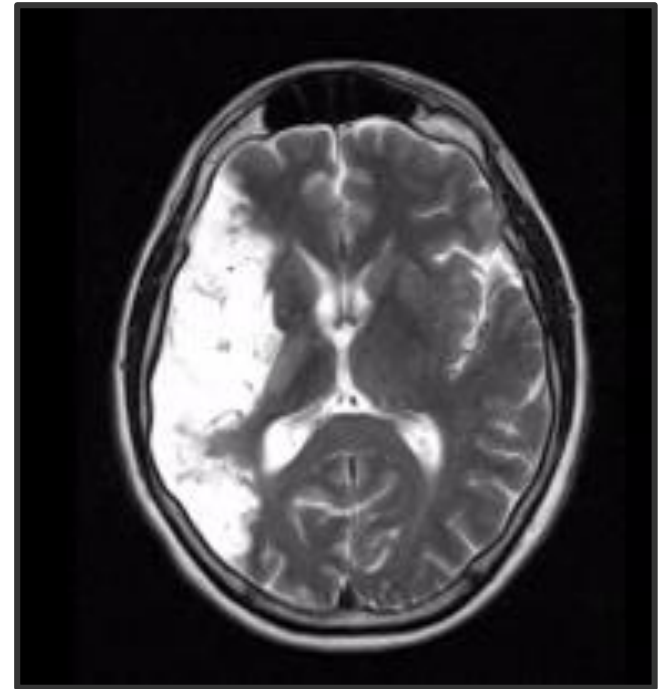
Nonfluent aphasia dissociated into 3 profiles.



Factors were diverse among each WAB subtype.



The APROCSA is an efficient, reliable, and valid tool...



... that shows how features pattern together.

National Institutes of Health

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patients & researchers

**Thank
you!**

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