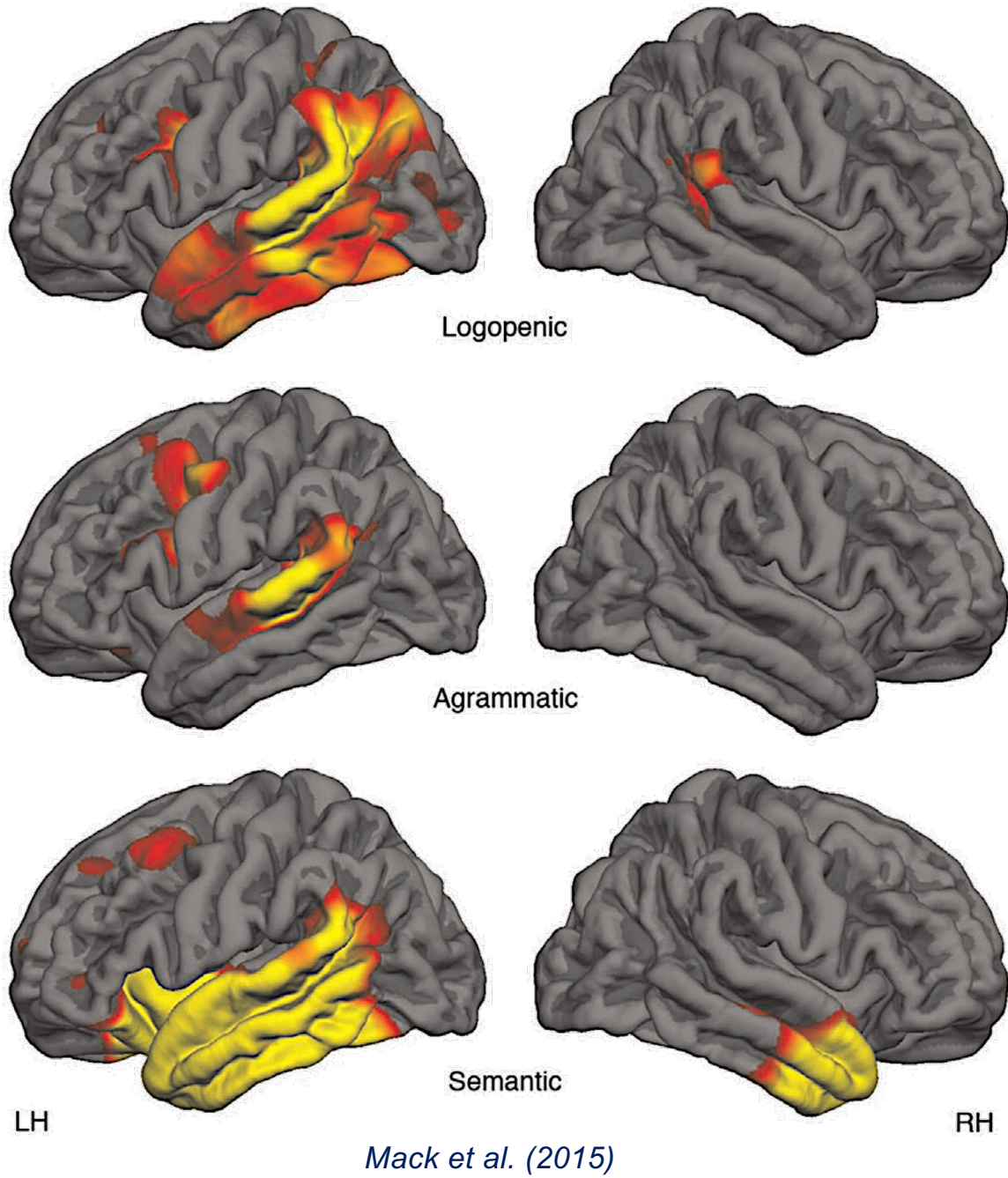


WHAT IS PRIMARY PROGRESSIVE APHASIA (PPA)?



PPA is a neurological syndrome in which the language functions of individuals progressively degenerate. Three common subtypes of PPA include: **semantic variant PPA (svPPA)**, **nonfluent/agrammatic PPA (naPPA)**, and the **logopenic variant of PPA (lvPPA)**.

svPPA is accompanied by word and object identification deficits from a compromised long-term memory. Patients suffer from severe confrontation naming difficulty.

naPPA is characterized by slowed, difficult, non-fluent speech with poor use of grammatical features. Patients with naPPA produce speech at a rate of ~45 words per minute (~140 words per minute for healthy adults).

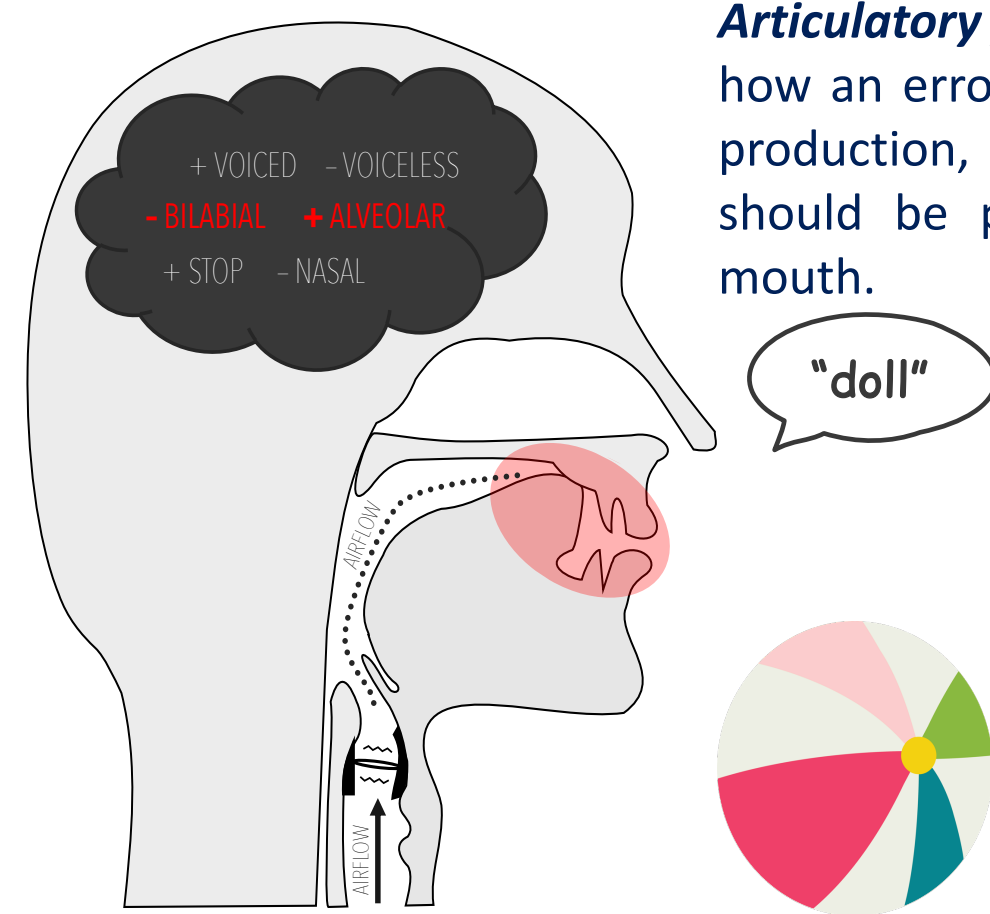
lvPPA is associated with a phonological loop dysfunction, which leads to impaired repetition. lvPPA patients may suffer from symptoms that overlap with svPPA and naPPA.

Historically, it has been difficult to differentiate lvPPA from other PPA subtypes. Delineating phonological error patterns may assist with lvPPA diagnosis and characterization.

PHONOLOGICAL SPEECH ERRORS

ARTICULATORY FEATURES

Place	Where the sound is produced in the vocal tract (e.g., /t/ vs. /k/)
Manner	How airflow is obstructed in the vocal tract (e.g., /t/ vs. /s/)
Voicing	Whether the vocal cords are vibrating (e.g., /s/ vs. /z/)



Articulatory features can be used to describe how an error physically differs from a target production, such as backing a feature that should be produced more forward in the mouth.

Paraphasias (errors) can be assessed based on the nature of their phonemic error patterns. These can be systematically detailed as processes, such as **backing** on a feature that is more forward in the mouth.

METHOD

SUBJECTS

- Native English speakers
- Ages 45-80 years old
- Diagnosed with PPA

PROCEDURE

Data obtained from the baseline speech measure of PPA patients participating in a larger treatment study involving language therapy combined with transcranial direct current stimulation (tDCS).

Western Aphasia Battery (WAB) administered to produce WAB-AQ score (primary outcome measure). A **Place-Voice-Manner (PVM) analysis** was performed on patient productions from the **WAB Object Naming Task**.

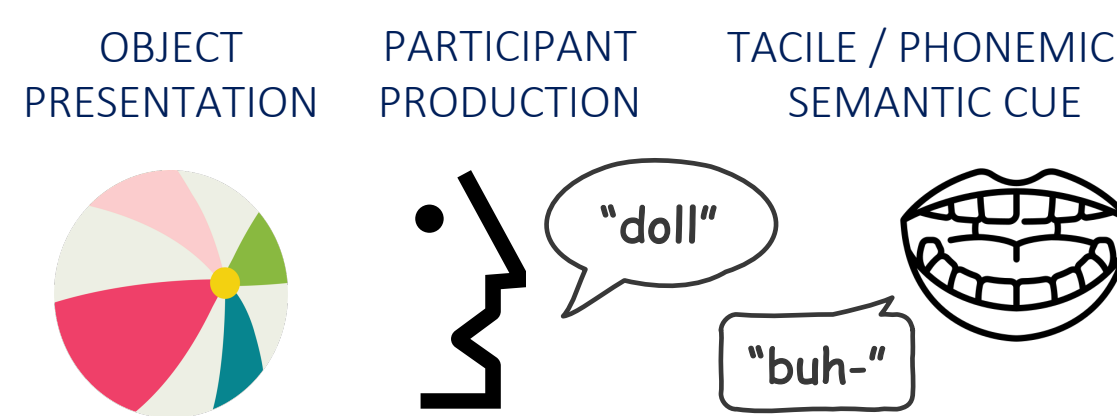


STIMULI

OBJECT	TARGET
book	bʊk
ball	bɔl
knife	naɪf
cup	kʌp
safety pin	'seɪf•tɪ pɪn
hammer	'hæ•mər
toothbrush	'tuθ•brʌʃ
eraser	ɪ•'reɪ•sər
lock	lɒk
pencil	'pen•səl
screwdriver	'skru•draɪ•vər
key	ki
paper clip	'peɪ•pər klɪp
watch	wɒtʃ
comb	koʊm
rubber band	'rʌ•bər bænd
spoon	spun
tape	teɪp
fork	fɔrk
matches	'mæ•tʃəz

Table 1. WAB Naming Task Stimuli

WAB OBJECT NAMING TASK



PLACE-VOICE-MANNER (PVM) ANALYSIS

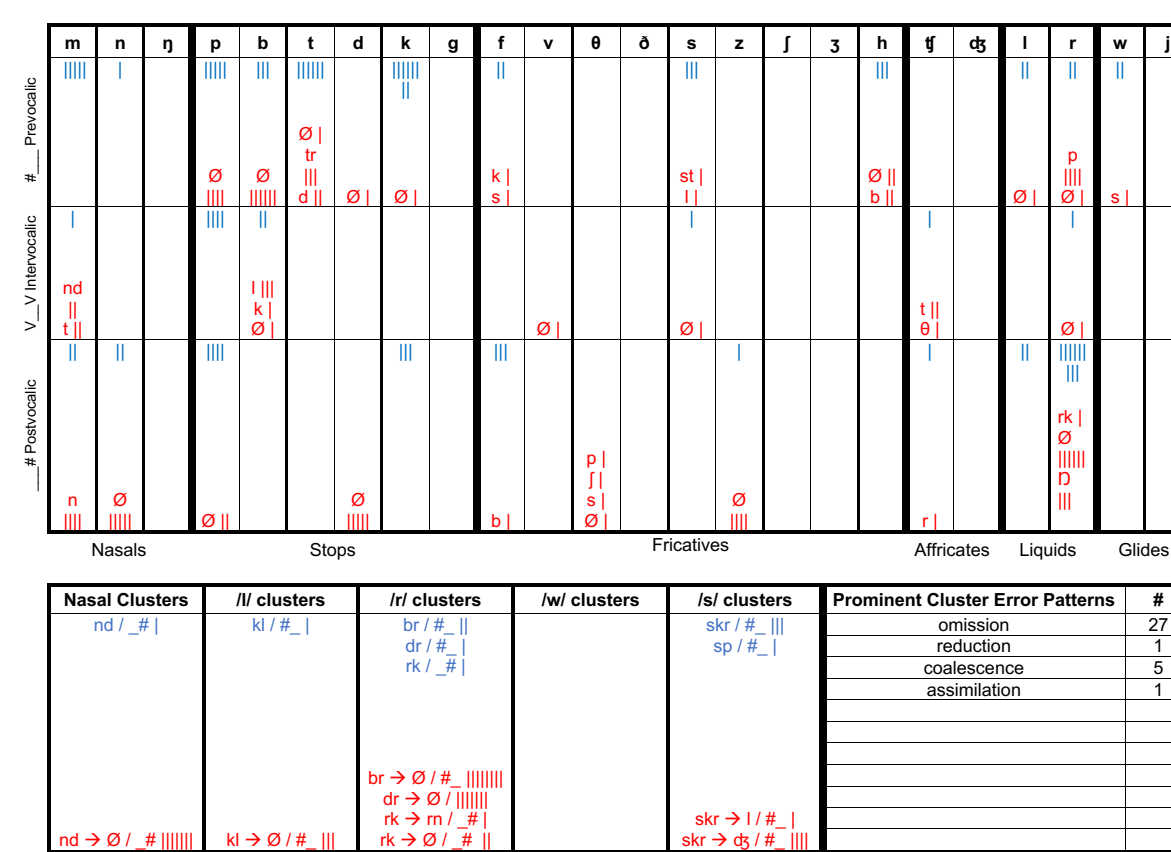


Figure 1. Place-Voice-Manner (PVM) Analysis Chart

PREDICTIONS

svPPA patients will have the greatest number of errors total due to severe difficulty with object naming. Errors are not expected to follow any phonological patterns.

naPPA patients will make the least amount of total phonological errors due to slowed speech production. Errors should reflect articulatory errors (e.g., over-shooting or under-shooting), rather than phonological errors.

lvPPA patients will have a significant amount of total phonological errors. Place and manner errors are expected to be the most common types of errors.

DISCUSSION

SUMMARY OF RESULTS

ERROR PATTERNS

- lvPPA: place > manner errors > voicing errors
- svPPA: manner > place errors > voicing errors
- naPPA: manner > place errors > voicing errors

TOTAL ERRORS PRODUCED

The svPPA patient produced the greatest number of phonological errors (564). This was due to more production attempts than both the lvPPA and naPPA patients.

The lvPPA patient produced the second greatest number of phonological errors (118).

The naPPA patient produced the least number of phonological errors (60), in line with their pattern of high accuracy on the WAB Naming Procedure.

IMPLICATIONS

Comparing subphonemic errors of PPA subtypes helps to identify specific patterns of errors which can be correlated with atrophied brain regions. Continued research can offer new insights and improve treatment options and outcomes.

LIMITATIONS

The current dataset does not control for the word-level linguistic environments that different speech sounds occur within. Statistical analyses are still needed to evaluate results.

FUTURE DIRECTIONS

We will evaluate if these results hold once more subjects are analyzed and statistical tests are introduced.

We will also investigate the neural and network-related underpinnings of specific phonological errors and will analyze whether these errors become less frequent after treatment.

ACKNOWLEDGEMENTS & REFERENCES

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PRELIMINARY RESULTS

TOTAL ERRORS ON WAB NAMING SECTION

lvPPA PATIENT			
	Place Errors	Manner Errors	Voicing Errors
WAB 1	14	15	12
WAB 2	37	24	16
Total (N)	51	39	28

Table 2. lvPPA patient PVM error frequency

PLACE-VOICE-MANNER ERROR FREQUENCY

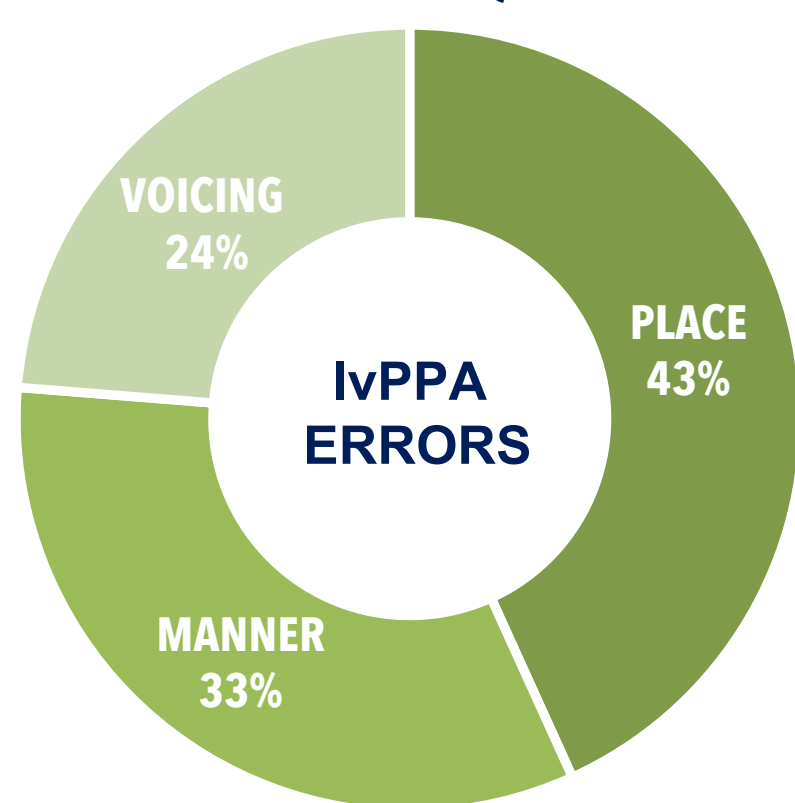


Figure 2. lvPPA Error Frequency

PROMINENT ERROR PATTERNS

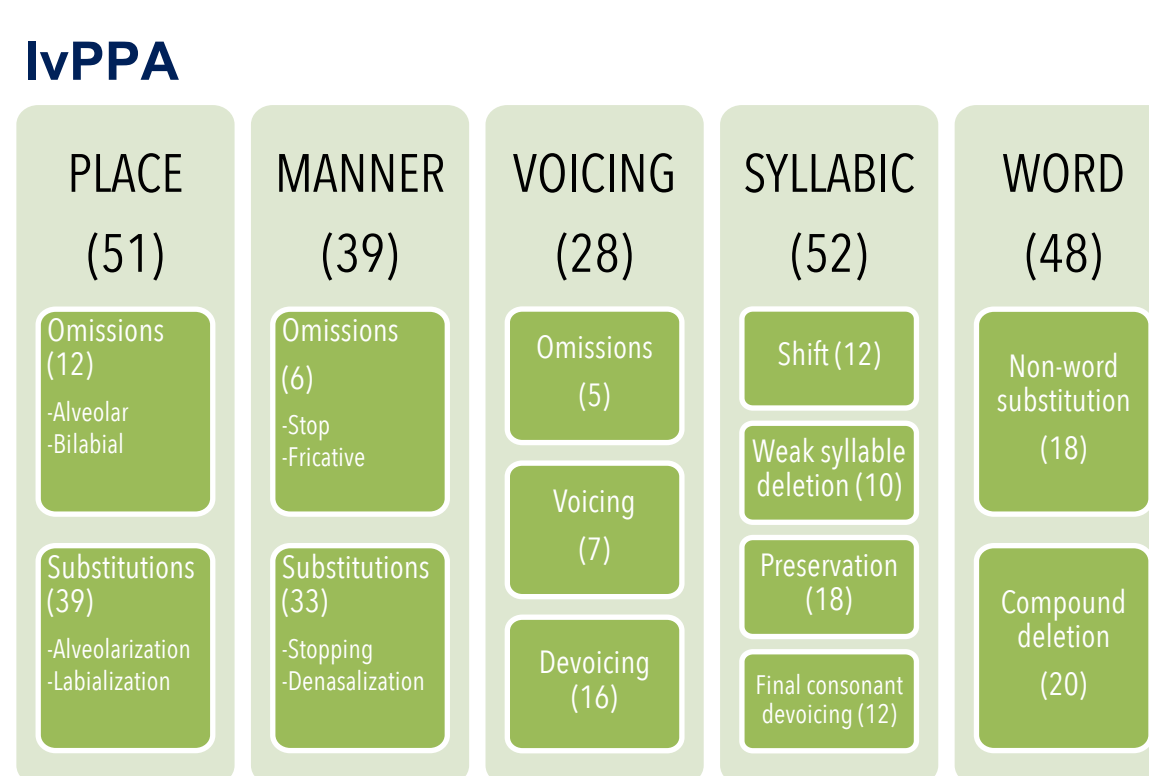


Figure 5. lvPPA Prominent Error Pattern

svPPA PATIENT			
	Place Errors	Manner Errors	Voicing Errors
WAB 1	103	107	84
WAB 2	91	97	82
Total (N)	194	204	166

Table 3. svPPA patient PVM error frequency

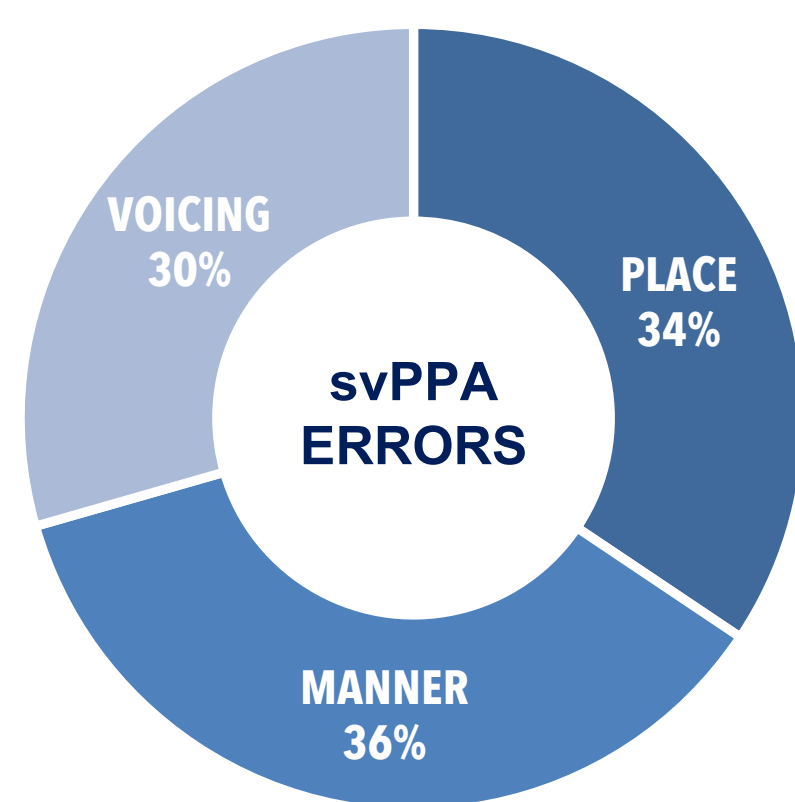


Figure 3. svPPA Error Frequency

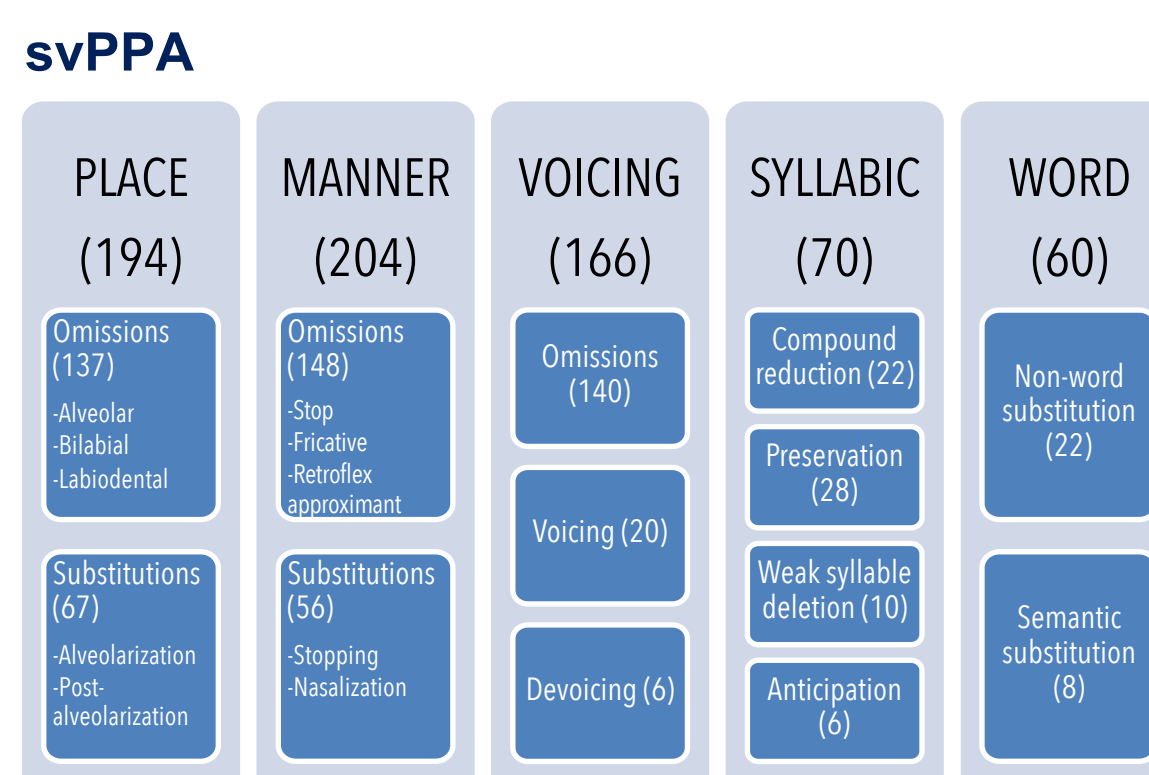


Figure 6. svPPA Prominent Error Pattern

naPPA PATIENT			
	Place Errors	Manner Errors	Voicing Errors
WAB 1	14	14	8
WAB 2	6	10	8
Total (N)	20	24	16

Table 4. naPPA patient PVM error frequency

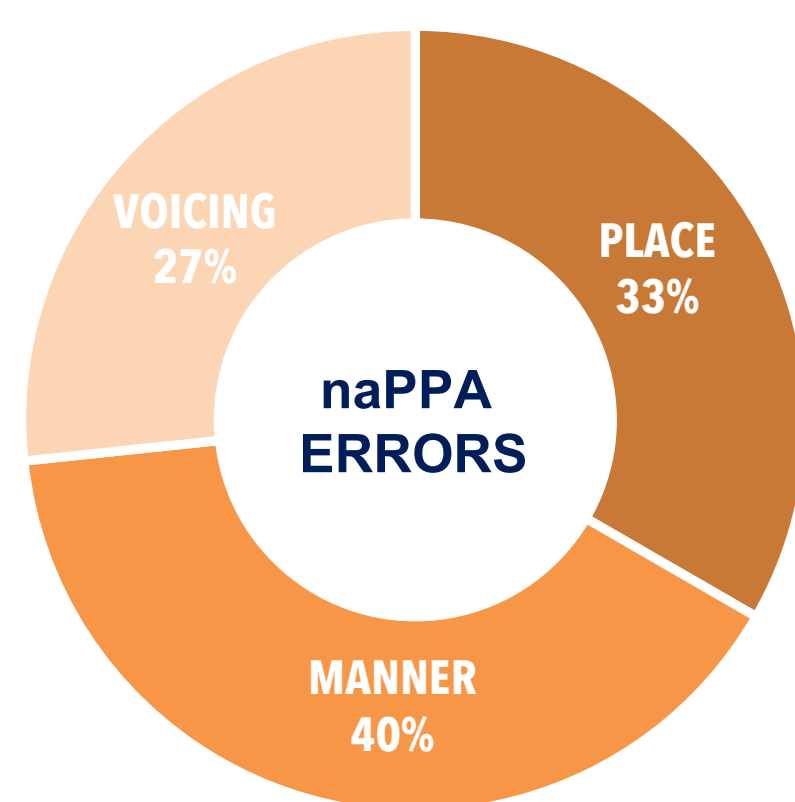


Figure 4. naPPA Error Frequency

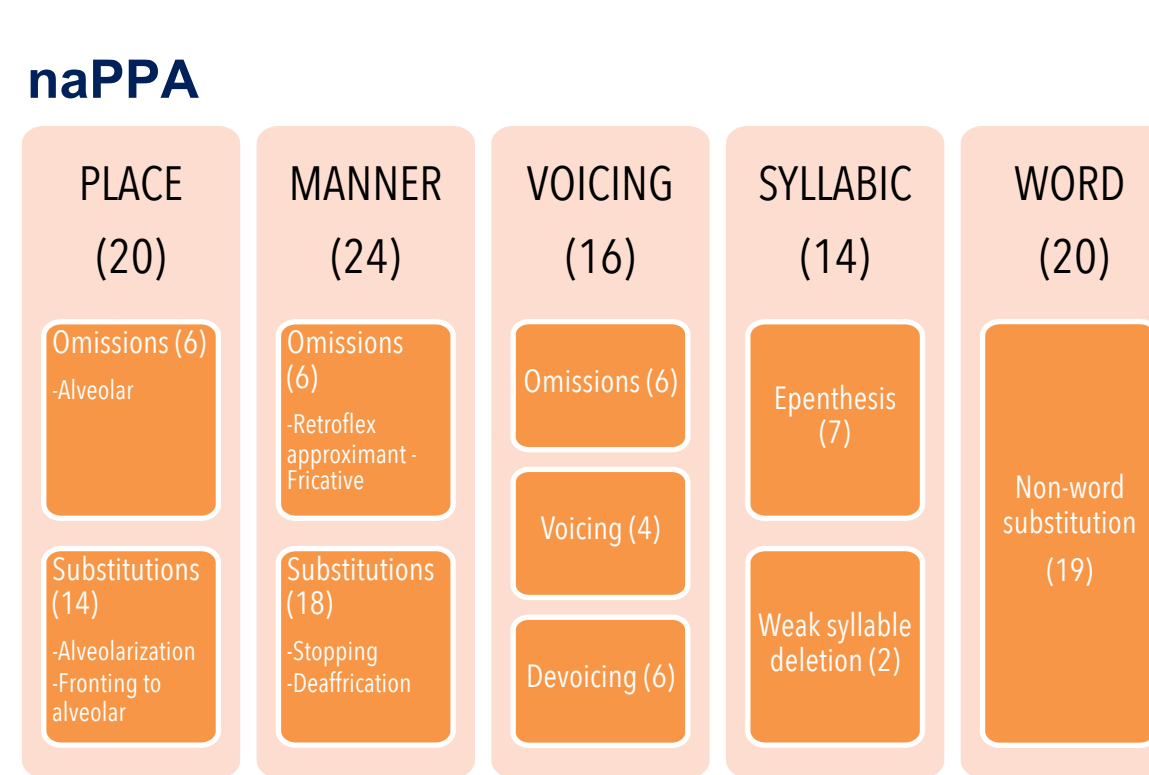


Figure 7. naPPA Prominent Error Pattern