

Clinical use of event-related potentials in diagnostic and therapeutic evaluation of phonological input processes: A one year follow-up case study

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Introduction

Neuroanatomical imaging and behavioural language testing give no insight in

- Neurophysiological language processes.
- Neuroplasticity changes.

Event related potentials (ERP)

- Timing and amplitude of neural activity (Pettigrew et al., 2005).
- Seem to be more sensitive for detecting deviations than behavioural testing (Elting et al., 2008).

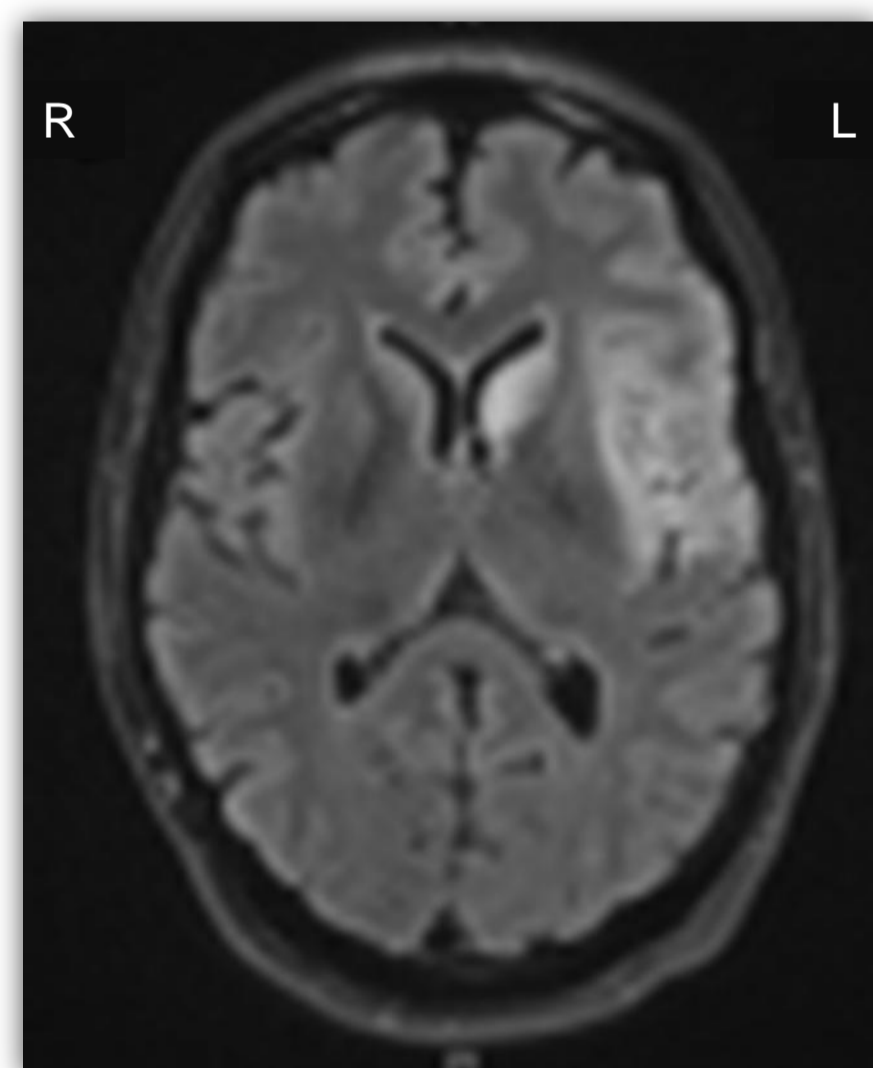
Aim

- A description of the behavioural and electrophysiological evolution of the phonological input processes of a single subject during the first year after stroke, in timeframes with and without therapy.

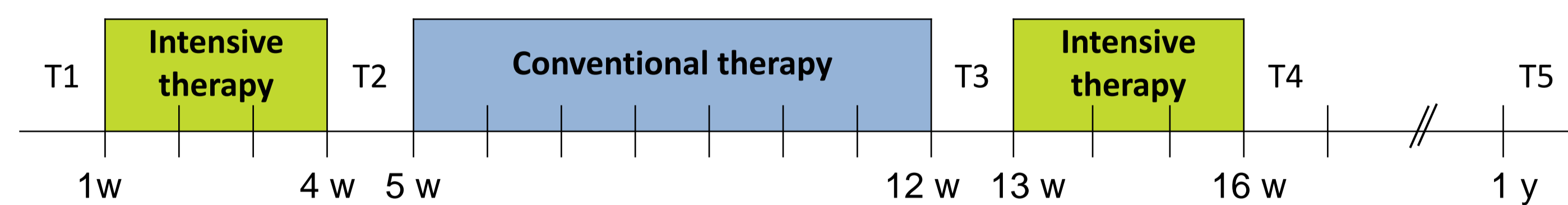
Method

Patient

- A 46-year-old right-handed male patient
- Ischemic cerebrovascular accident of the left middle cerebral artery
- No neurological antecedents



Linguistic tests and therapy



Behavioural testing		Neurophysiological testing	
Auditory discrimination		Phoneme discrimination	
PALPA 1 & 2		6 oddball paradigm	
		<ul style="list-style-type: none"> • Unattended (MMN) and attended (P300) • based on 3 distinctive features: <ul style="list-style-type: none"> - Place of articulation (PoA) - Voicing - Manner of articulation (MoA) 	
Auditory lexical decision		Word recognition	
PALPA 5		1 oddball paradigm (MMN)	

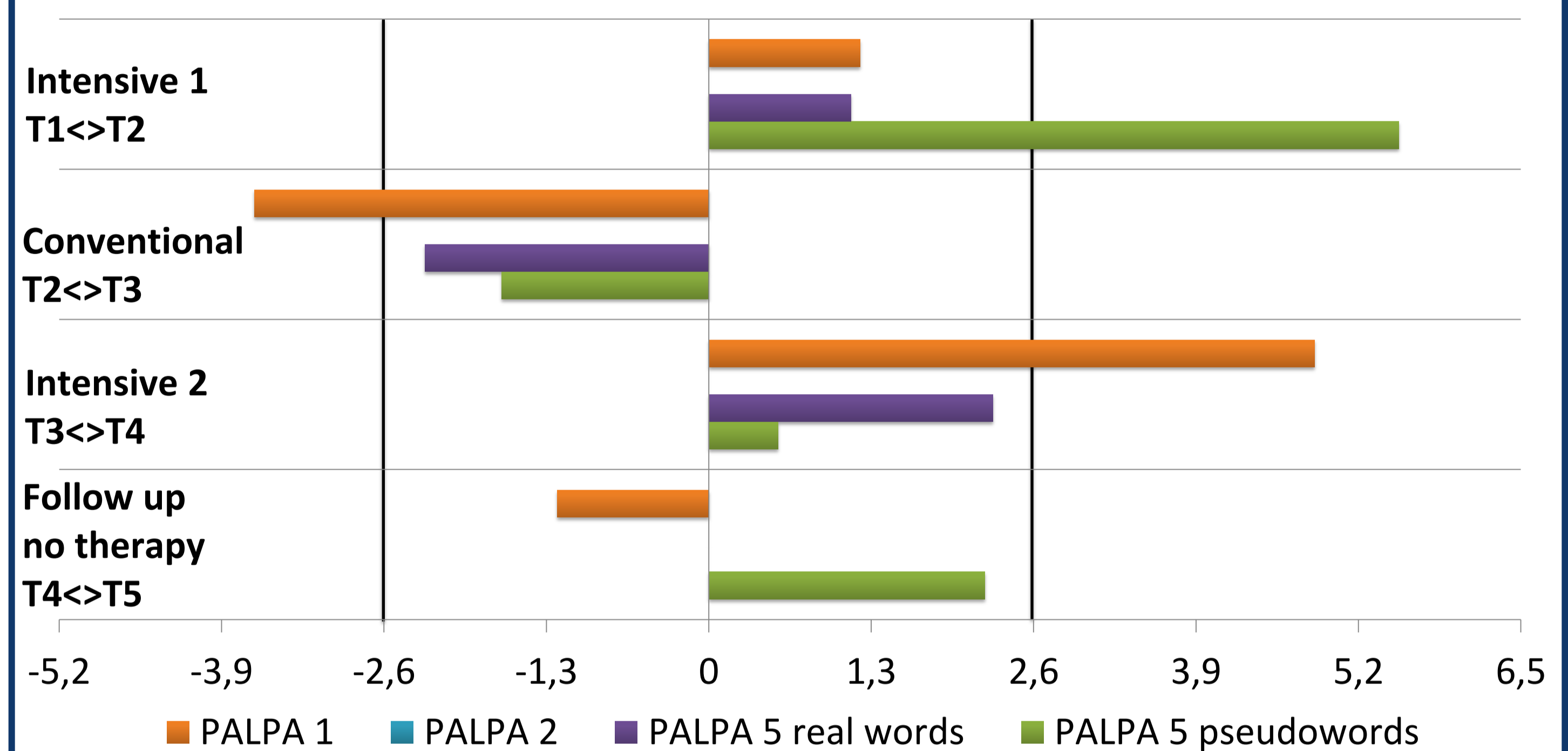
References

- Elting, J. W., Maurits, N., van Weerden, T., Spikman, J., De Keyser, J., & van der Naalt, J. (2008). P300 techniques in cognitive impairment after brain injury: Comparison with neuropsychological and imaging data. *Brain Injury*, 22(11), 870-881.
- Pettigrew, C. M., Murdoch, B. E., Kei, J., Ponton, C. W., Alku, P., & Chenery, H. J. (2005). The mismatch negativity (MMN) response to complex tones and spoken words in individuals with aphasia. *Aphasiology*, 19(2), 131-163.

Results

Behavioural evolution

Size effects of behavioural results



Neurophysiological evolution

Amplitude changes of neurophysiological results

	MMN			P300			N400	
	PoA	Voicing	MoA	PoA	Voicing	MoA	RW	PW
Intensive 1 T1<->T2	↑			↓		↑	↑	↑
Conventional T2<->T3			↑	↑	↑	↑		↓
Intensive 2 T3<->T4			↓	↑	↓	↓		↑
Follow up no therapy T4<->T5	↓		↓	↓	↓	↓		↓

↑ Significant amplitude increase ↓ Significant amplitude decrease

Discussion & conclusion

Benefits of neurophysiological examination:

- Higher sensitivity than behavioural testing, obviating ceiling effects.
- Identification of underlying neuronal activation patterns of certain behavioural improvements.
- The alterations of the N400 are very sensitive for mapping the evolution of therapy progression.

Challenges:

- Interpretation of fluctuating P300 in recovery of aphasia