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

Auditory discrimination

- PALPA 1 & 2
  - 6 oddball paradigm
    - Unattended (MMN) and attended (P300)
    - based on 3 distinctive features:
      - Place of articulation (PoA)
      - Voicing
      - Manner of articulation (MoA)

Auditory lexical decision
- PALPA 5
  - 1 oddball paradigm (MMN)

Behavioural evolution

Size effects of behavioural results

<table>
<thead>
<tr>
<th></th>
<th>Intensive 1</th>
<th>Conventional</th>
<th>Intensive 2</th>
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<tbody>
<tr>
<td>T1→T2</td>
<td>↑</td>
<td></td>
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<tr>
<td>T2→T3</td>
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<td>T3→T4</td>
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<tr>
<td>no therapy</td>
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Neurophysiological evolution

Amplitude changes of neurophysiological results

<table>
<thead>
<tr>
<th></th>
<th>MMN</th>
<th>P300</th>
<th>N400</th>
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<tbody>
<tr>
<td>PoA</td>
<td>RW</td>
<td>PW</td>
<td></td>
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<tr>
<td>Voicing</td>
<td>MoA</td>
<td>MoA</td>
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<td>T1→T2</td>
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<td>T2→T3</td>
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<td>T3→T4</td>
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<td>Follow up</td>
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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

References