

Advance movement preparation in hemiparetic patients: Validity effects seen in a response priming task with the affected arm

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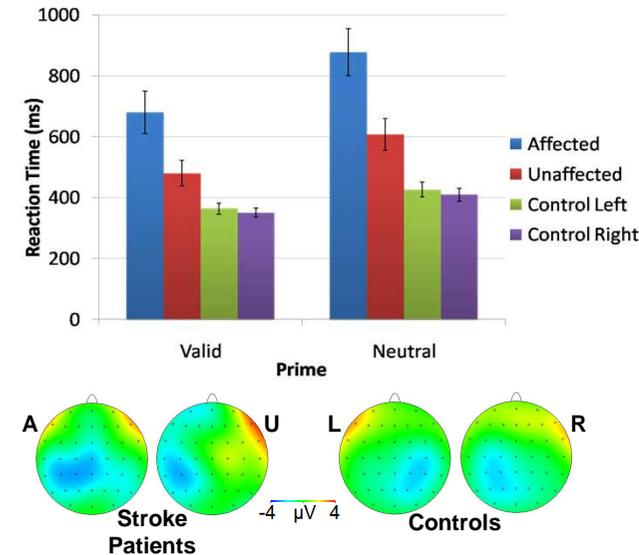
Background

- The motor impairments seen in those with hemiparesis could be due to a deficit in motor execution, advance movement preparation or a generalised slowing of the entire motor process.
- To investigate the role of movement preparation in the impairment, response priming paradigms were used.
- This paradigm produces a “validity effect”, whereby reaction time costs are seen for incorrect or uninformative (neutral) prime information and reaction time benefits for correct (valid) prime information in comparison.

Aim

To investigate whether movement preparatory processes are effected by hemiparesis.

Results



- Validity effect preserved in stroke patients in both affected ($p < 0.001$, 197ms) and unaffected ($p < 0.001$, 127ms) arms.
- Controls also showed validity effect (Left: $p < 0.001$, 62ms; Right: $p < 0.001$, 59ms).
- Stroke participants significantly slower than controls, even with the unaffected arm (Valid: $p < 0.01$, 129ms; Neutral: $p < 0.005$, 198ms).
- Affected arm slower than unaffected (Valid: $p < 0.001$, 200ms; Neutral $p < 0.001$; 270ms)
- Preliminary EEG findings reveal that the motor activity in the affected arm (A) is more comparable to right arm preparation (R) than typical left activity (L).

Methods

Participants

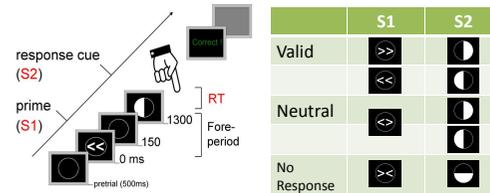
Stroke Patients

- 17 stroke patients with lower-functioning chronic upper-limb hemiparesis.
- 8 Male, 9 Female
- Aged 50.5 ± 14.8 [25-76] years
- Premorbid right handers
- Right hemispheric lesions (left upper-limb affected)

Controls

- 16 age-matched control participants (non-brain injured, non-hemiparetic)
- 5 Male, 11 Female
- Aged 50.1 ± 10.7 [35-64] years
- Right Handed

Response Priming Paradigm



EEG

- 64 electrode array in international 10-10 system
- Recorded at 500Hz
- Topography Maps represent average activity from 100 ms before S2 until S2, interpolation by spherical splines.

Conclusion

- The validity effect is preserved in hemiparetic participants for both the affected and unaffected arms, despite the overall slower response times.
- This suggests that the cognitive processes involved in advance motor preparation are still functioning even after the brain injury.
- However, slower reaction times seen even for the unaffected hand imply that the brain injury has made this process slower or more effortful.
- The preliminary EEG results reveal that the neural areas underlying movement preparation overlap, with competition for resources a putative mechanism for the observed slower responses.