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Electrophysiological Correlates of Naming Facilitation in Aphasia

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Introduction

Cueing the semantic or phonological properties of a target word can improve naming accuracy in people with aphasia, however the mechanisms underlying such naming facilitation effects are currently a matter of debate. Recent event-related potential (ERP) research has revealed distinct patterns of electrophysiological abnormality associated with different forms of anomia (Laganaro et al., 2009), as well as electrophysiological changes post therapy (Laganaro et al., 2008). The present study utilised ERP recordings to investigate the electrophysiological correlates of semantic versus phonological facilitation in aphasia.

Methods

One person with chronic aphasia and 12 healthy controls participated in the study. All participants were right handed, native speakers of English. Two hundred and twenty four line drawings were divided into three sets of items (facilitated, unfacilitated and fillers), with each set matched for naming reaction time, frequency, percentage name agreement and number of syllables. Using a delayed naming paradigm similar to Laganaro et al. (2008), participants overtly named all of the pictures on two separate occasions whilst event-related potentials (ERPs) were recorded. Items were presented for naming in blocks of 16 items. A few minutes prior to each naming block, items from the facilitated set were presented to participants for phonological facilitation in one session (participants heard the spoken word form and repeated it aloud) and semantic facilitation in the other session (participants answered a semantic attribute question about the item).

Analyses

Only correctly named trials were analysed. Epochs were analysed in 40ms segments from 0-600ms relative to picture onset (criterion for significance, $p < .01$). Analysis of the control group's data revealed high naming accuracy for all items and no significant differences in ERP mean amplitude between facilitated and unfacilitated items for semantic or phonological facilitation.

Analysis of the aphasic subject's data revealed increased naming accuracy for both semantically and phonologically facilitated items (80% and 78% respectively) relative to baseline assessment (66%). Significant differences in ERP mean amplitude were also observed between facilitated and unfacilitated items relative to the control group, with differences evident from 120-280ms for semantic facilitation and from 240-360ms for phonological facilitation.

Conclusions

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The results indicate that semantic and phonological facilitation effects in picture naming may be associated with distinct electrophysiological profiles in aphasia, with semantic facilitation inducing earlier changes to neural activity than phonological facilitation. These results may be consistent with changes to early semantic encoding processes following semantic facilitation, and changes to later phonological encoding processes following phonological facilitation.

References

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