6. Phonological processing of sign language

Phonology describes the level of analysis at which the smallest, meaningless, contrastive units of language combine to form larger, meaningful units. In spoken languages these are auditory/articulatory elements. Substitution of a single element creates a new lexical item, e.g., in English /pin/ – /bin/. The same level of analysis has been applied to signed languages, where phonology is visual, with handshapes, movements and locations combining to form signs (Stokoe, 1960 [2005]; Brentari, 1998; Sandler and Lillo-Martin, 2006). As with words, the substitution of just one element can create a new sign. For example, the British Sign Language (BSL) sign NAME is located at the forehead while AF˜TERNOON differs only in that it is located at the chin.
In this talk we will address whether the application of the term 'phonology' to signed languages has neurological as well as linguistic and psycholinguistic validity. We address whether similar neural processing is involved in phonological analysis of both signed and spoken languages.
In our first set of experiments we employed event-related potentials (ERPs) to characterize the time-course of neural activation during phonological similarity judgments in response to pairs of written words (do they rhyme?) and pairs of American Sign Language (ASL) signs (do they share the same location and movement?). As predicted from previous studies, hearing participants demonstrated an enhanced negativity to the non-rhyming pairs in contrast to the rhyming pairs (N350). This was largest over posterior regions of the right hemisphere. Of particular interest here, deaf adults making phonological similarity judgments in response to ASL signs showed the same modulation of the N350; furthermore this was similar in timing and distribution to that seen in hearing participants performing the rhyme task.
Although ERPs are informative regarding the time-course of neural activation, they are less informative regarding the location of activation. Therefore, in the second set of experiments we used fMRI to further address this issue. We report that a left lateralised fronto-parietal network is engaged during phonological similarity judgements made in both English (rhyme) and BSL (location).
In summary, our data support the notion that phonological processing in signed and spoken languages recruits similar neural processes and should be regarded to some extent as supramodal: that is, involving representations that in some way 'transcend' the sensory modalities. These data are consistent with prior demonstrations concerning semantic and syntactic processing, that modality has relatively little influence on the neural systems that support language (Neville et al., 1998; Petitto et al., 2000; Braun et al., 2001; Emmorey et al., 2002; MacSweeney et al., 2002; Corina et al., 2003; MacSweeney et al., 2006). Demonstrating this in the context of phonological processing is even more striking since awareness of phonology is more directly linked to sensory input, which differs for sign and speech, than either semantic or syntactic processing.

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