One path or two: Could differential grammatical class processing reflect human language evolution?

by

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Abstract

The fundamentally transient nature of human speech and sign means that there is no direct fossil record to document the emergence of language. As a result, theories of language evolution have traditionally relied on educated guesswork informed by child language acquisition studies and comparisons with other species' vocal communication systems. More recently, however, more refined language evolution models have been proposed from three general perspectives: the proto-speech model which assumes that spoken language first emerged as a communicative system in humans; the proto-sign model which broadly assumes that language first emerged in the form of manual gesture; and the mixed or co-evolution model which posits both sound and gesture components. Although there is a vast pool of literature examining the neural bases of modern human language which has, in turn, been interpreted from a language evolution perspective, many of these studies have used methodologies which could have potentially confounded results. The current thesis was therefore firstly designed to address such concerns by establishing a corpus of experimental stimulus words in which both cognitive and acoustic properties were quantified and therefore controllable. Having thus established this corpus, electroencephalography (EEG) was recorded from 30 human participants as they undertook (i) a passive listening task involving animal vocalisations and (ii) a grammatical decision/learning task (nouns versus verbs) using real and nonsense human speech stimuli. Results suggested that within the adult human brain, changes in both the lower (8 – 10 Hz) and upper (10 – 12 Hz) alpha EEG range reflect functional differences in the processing of complex communicative sound strings, with spoken noun and verb stimuli showing clearly distinct patterns of information processing flow. Of note, the left frontal eye field appears to process verb but not noun stimuli *on-the-fly*. Furthermore, differences in grammatical class processing (nouns versus verbs) appear to occur early (<100 ms post-stimulus onset) with the physical trigger for this differential processing potentially occurring in the sub-audible range of the speech sound wave. When interpreted within an evolutionary context, results appear to support the Co-evolution Model of language evolution, whereby human language emerged from both gestural and vocal processes.

Certification

I certify that:

* the substance of this thesis has not already been submitted for any degree and is not currently being submitted for any other degree or qualification; and,

* any help received in preparing this thesis and all sources used have been acknowledged in this thesis.

Bernadine Cocks

8/4/15

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