Comment

On the emergence of grammatical language as a means of bypassing the limitations of working memory capacity

Comment on “Interaction between lexical and grammatical language systems in the brain” by Alfredo Ardila

Frederick L. Coolidge

Psychology Department, University of Colorado–Colorado Springs, Colorado Springs, CO, USA

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Ardila [1] has produced a provocative and interesting description of two different language dimensions, lexical/semantic and grammatical, and he speculated as to their different timings in evolutionary record. I shall take issue with the latter. Ardila relied primarily on Bickerton’s [2] arguments on the nature of a protolanguage. I do not disagree with Bickerton’s contention that a protolanguage probably existed in the earliest Homo, Homo habilis, about 2.3 million years ago. However, recent anthropological evidence suggests that Homo habilis co-existed with Homo erectus approximately 1.8 million years ago to about 1.5 million years ago. Therefore, a consensus is forming that modern Homo sapiens sapiens did not have Homo habilis as a common ancestor. It is now suspected that Australopithecus afarensis was the common ancestor for both Homo habilis and Homo erectus, and furthermore, that Homo habilis was probably an evolutionary dead end. Indeed, although Homo habilis’ brain volume increased to about 50% greater than that of Australopithecus afarensis, Homo habilis’ body proportions remained much like those of Australopithecus afarensis, i.e., their bodies were still designed for arboreal life. It appears that Homo habilis never made the full transition to terrestrial life as had Homo erectus. The latter assumption has profound implications for the evolution of language because arboreal life places a practical limit of group size because there is a point at which additional group members living in a tree would not be a protection against predators but would likely serve as a predator attraction at some point in group membership. However, as Homo erectus had made the full transition to life on the ground, this restriction on the upper limit on group membership would have lifted, as more group members on the ground would undoubtedly have been advantageous against predators. Anthropologist Robin Dunbar [3] has speculated this number might have approached 150 group members. Dunbar’s additional argument is that a group life such as this would have naturally selected for a more ‘social’ brain. Thus, Ardila’s protolanguage speculations would have been more appropriate and relevant for Homo erectus than Homo habilis.

More importantly, large group membership has at least two other inherent demands: awareness of social hierarchies/alliances and cheater detection. As social hierarchies are nearly ubiquitous in non-human primates, it can be speculated that they would have been also present in Homo erectus. Knowing and recognizing socially dominant individuals, their allies, and their enemies would have been critically important in surviving and flourishing in a large
group. Furthermore, being able to detect cheaters, either sexual or those who do not pull their own weight in terms of resources, would have also been a critical skill in surviving and adapting in a large group. Both of these activities, monitoring a social hierarchy and cheater detection, would have placed much greater cognitive and lexical/semantic language demands on *Homo erectus* than *Homo habilis*.

Ardila then hedges with regards to the evolution of the syntactic/grammatical aspect of language. He uses Steels’ [5] arguments that cultural evolution is a much more powerful process on the evolution of language than genetic evolution, which is not only vague but even perhaps specious. Genetics and biology place very powerful limitations upon culture, and the ‘vice versa’ notion is much less compelling. So what then would have been the impetus for the emergence of a grammatical language, if we agree with Ardila that its emergence represents a crucial leap in human evolution (and I do agree with him on that salient point)?

I believe that Ardila’s third language stage (grammatical language) does not have to be a sudden (genetic mutation) or solely cultural phenomenon as he has typified it. I believe that Ardila himself flirts with a possible solution: While citing the work of Haverkort [4], Ardila noted that patients with Broca’s aphasia may select less simple syntactic structures because they impose less of a burden upon working memory capacity. Imagine the working memory demands that the knowledge of social hierarchies and cheater detection placed upon early *Homo erectus*. If we grant that *Homo erectus* may have had a rather elaborate lexical/semantic language store, then one possible way to bypass the limits of working memory capacity would have been to have an imposed order in the word lexicon such that individuals could expect, for example, that actions followed agents of those actions. Thus, the inchoate emergence of grammatical language could have developed both from cultural demands and a background of genetic mutations that helped language become more and more efficient over time, all the while these grammatical structures would have been selected for because of their ability to reduce demands on verbal memory limitations and working memory limitations.

References