COGNITIVE AND GENETIC CORRELATES OF A SINGLE MACRO-PARAMETER OF CROSSLINGUISTIC VARIATION

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Evidence exists for a correlation, and perhaps also causation, between specific linguistic and societal features, in particular those relating to *exoteric* (open) vs. *esoteric* (close-knit) society types, characterizable in terms of population size, mobility, communication across distances, etc. Broadly speaking, languages associated with exoteric societies, or *Type A languages*, have been reported to exhibit less complex phonologies and morphologies, but more complex and more layered syntaxes, with more specialized and obligatory grammaticalized distinctions, while languages associated with esoteric societies, or *Type B languages*, exhibit a complementary clustering of features, including simpler and less layered syntaxes, but more complex phonologies and morphologies, with more irregularity, and more formulaic/memorized language chunks (e.g. Wray & Grace, 2007). We conducted an exhaustive quantitative analysis drawing upon *WALS*, *D-Place*, *Ethnologue* and *Glottolog*. Our preliminary results find partial support for the above correlations. In general,

albeit with some exceptions, Type A languages tend towards more complex morphosyntax and greater expressive power in certain domains, although also towards more complex phonological inventories, while Type B languages tend towards more complex morphology.

Next, we hypothesize that this crosslinguistic variation entails differential involvement of declarative versus procedural memories. Procedural memory subserves the acquisition of compositional, automated, rule-governed (grammatical) aspects of language, while declarative memory typically subserves vocabulary learning and irregular phenomena across domains, including memorized, opaque, formulaic language (e.g. idioms and proverbs) (Ullman, 2004; 2015; Heyselaar et al., 2017; Elyoseph et al., 2020, for impairments). While both memory systems are essential for language (with partly overlapping/redundant functions), and while both language types certainly rely on both memories, our hypothesis is that predominantly Type A languages rely more on procedural memory, while predominantly Type B languages, in comparison, rely more on declarative memory. For testing this, we are conducting standard cognitive experiments measuring the relative strengths of the two memory types with speakers of Type A vs. Type B languages. Also, because these two types of memories depend on brain regions whose emergence is genetically guided during development, another way of testing our hypothesis is by seeking correlations between the Type A/Type B linguistic distinction, and the frequency in the population of the candidate gene alleles supporting different memory types. Various genes have been found to play a role in declarative memory, e.g., *BDNF* and *APOE* (Ullman, 2015; Henke, 2010; Squire & Wixted, 2011; Eichenbaum, 2012), as opposed to procedural memory, e.g. *FOXP2*, *PPP1R1B* and *DRD2* (Packard, 2008; Doyon et al., 2009; Ashby et al., 2010; Eichenbaum, 2012). Since cognitive biases can be linked to (epi)genetic modifications, any differential reliance with respect to the two types of memories is expected to be detectable in differences in the allele frequencies of specific genes. At present, we have found differences between speakers of Type A and Type B languages with regards to genes involved in synapse organization subserving relevant brain functions.

This approach provides a tangible way to engage the neurobiological and genetic underpinnings of language variation, identifying specific and testable implications for the role of both cultural and genetic factors in language evolution, where they are seen as engaged in a feedback loop, with each reinforcing the other. As a bonus, our proposal sheds novel light on the long-standing linguist's puzzle (and controversy), where researchers often report trade-offs in complexity among different linguistic domains (e.g. Sampson, Gil & Trudgill, 2009).

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