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Commentary on Evans and Levinson, the myth of language universals Language diversity, cognitive universality

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ABSTRACT

Evans and Levinson's (2009) article claims that the assumption of Chomskyan generative linguistics that knowledge of natural language draws on a small inventory of principles with fixed parametric variation (i.e., Universal Grammar) is empirically untenable. We agree that the authors point out *prima facie* limitations of that approach, and we leave it to others to assess how well their criticisms survive closer scrutiny. Here we argue that Evans and Levinson (2009) overstate the dependence of current psycholinguistic research on the Chomskyan idea of Universal Grammar. To show this point, we review cross-linguistic research in sentence processing that shows the influence of two cognitive factors – ambiguity and memory demands – on the form of complex sentences within different languages and of the relative ease of understanding different types of sentences within those languages. The complex sentences we focus on contain relative clauses, a construction that has been extensively studied by typologists working in the tradition that seeks conditional statistical generalizations about similarities between languages. We argue that Evans and Levinson do not present a proposal counter to classical claims in generative linguistics that is comprehensive and testable in this domain.

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1. Introduction

One domain in which Evans and Levinson (2009) challenge the universality of basic linguistic constructs (e.g., grammatical constituents and grammatical categories such as subject and object) is that of differences between languages that rely heavily on word order to organize the mapping from sentence order to meaning (as English does) and those that do not (e.g., Latin, Japanese or Walpiri to varying degrees). However, these notions have proved very useful in the formulation of implicational universals in Greenberg's groundbreaking work. Indeed, they are used to advantage in the Noun Phrase Accessibility Hierarchy of Keenan and Comrie (1977), one of the most robust and well-attested implicational universals that has been proposed. This hierarchy posits that subject » direct object » indirect object » oblique » genitive. Evidence supporting the hierarchy comes from the cross-linguistic validity of the implication that if a language allows relativization on one position in the hierarchy, it allows relativization on every point to its left. Thus, there are languages that only allow relativization of subjects but no language that allows relativization only of indirect objects or obliques (Keenan and Comrie, 1979). Further, there is a well-established theoretical and empirical basis for giving the Keenan and Comrie hierarchy a

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probabilistic interpretation rather than a categorical one (Keenan, 1975; Gordon and Hendrick, 2005), thus reducing the force of many of the questions raised by Evans and Levinson about the universality of grammatical relations like subject and direct object. More centrally to our present argument, one does not need to make a commitment to the interpretation (or even the existence) of grammatical functions in order to use the hierarchy as a vital heuristic in the development of theories of sentence processing that apply to a range of languages.

2. Ambiguity and memory in the processing of relative clauses

Theories of language processing must characterize how the human mind tackles computational demands of ambiguity and memory that arise in using language for communication. A well-worn example of local ambiguity in interpreting sentences occurs for reduced relative clauses (RCs) in English as shown in 1 where “examined” is momentarily ambiguous between a main verb and participle interpretation.

1 The defendant (that was) examined by the lawyer sought new counsel.

Such structures can cause garden-path difficulties when a main verb is assigned to the ambiguous word but a participle interpretation is demanded by the remainder of the sentence. Many non-structural factors (e.g., thematic role, frequency of verb forms, discourse context) affect the severity of this type of garden-pathing, and the extent to which structural and non-structural information are processed by the same mechanisms is a central question in language research on the processing of locally ambiguous sentences (Clifton et al., 2003; Trueswell et al., 1994). However, reduced RCs of this sort have provided a very robust arena in which to study how cognitive processing of language tackles the basic (one might say universal) challenge of the local ambiguity of linguistic forms.

In contrast, object-extracted RCs in English (e.g., 2) show relatively little ambiguity (cf. Gennari and MacDonald, 2008) but they impose a cost on immediate memory (Gibson, 1998; Gordon et al., 2002). This cost occurs because the two NPs (the defendant and the lawyer) must be held in memory before they can be integrated with a verb. This effect is demonstrated experimentally by contrasting an object-extracted RC (e.g., 2) with a subject-extracted RC (e.g., 3) which contains exactly the same words but in a different order. A wide range of behavioral and neural evidence has demonstrated this object–subject difference in ease of processing.

2 The defendant that the lawyer examined sought new counsel.

3 The defendant that examined the lawyer sought new counsel.

The object–subject difference in English mirrors the Keenan–Comrie Accessibility Hierarchy and for this reason provides an opportunity to closely examine the value of a linguistic construct developed to account for cross-linguistic patterns in psycholinguistic research.

3. Word order and morphemic complexity: English, Chinese and Korean

As described above, the object–subject difference in processing RCs could be attributed to two characteristics of English that Evans and Levinson identify as overly influential in linguistic theory—heavy dependence on word order to convey sentence structure and relatively non-elaborate morphemic structure. In addition, RCs in English are post-modifiers, occurring after the head NP that they modify. This means that in English the RC interrupts the main sentence in which it is embedded, and this interruption could increase the memory demands created during the comprehension of English sentences containing RCs. Finally, English does not freely allow pronouns to be dropped. Examination of other languages that differ from English on these dimensions provides a way of investigating whether the processing principles found to influence the object–subject difference in English operate more generally during language comprehension. With respect to the processing of sentences with RCs, Korean and Chinese provide critical contrasts with English and with each other. For both languages it appears that the ease of comprehending sentences with RCs varies with the demands for processing ambiguous information and for storing linguistic information in immediate memory as has been found for English.

Korean uses a very rich, consistent set of morphemic markers that conveys information about the roles that NPs play in the structure of a sentence. While subject–object–verb (SOV) is the most common sentence type in Korean, word order is free and other word orders are used commonly. Further, RCs in Korean are pre-modifiers that occur before the modified head and therefore do not interrupt the main clause in the same way that post-modifying RCs do. Finally, Korean freely allows pronouns to be dropped. These characteristics mean that simple sentences in Korean frequently require that two NPs be held in memory before a verb occurs. This stacking up of NPs at the beginning of a sentence is a critical feature of the processing demands that occur for object-extracted RCs in English (e.g., 2 above). Stacking does not cause any apparent difficulty in processing most Korean sentences, including those with RCs. As might be expected, the ease of keeping track of NPs at the start of Korean sentences is due to the distinctive information attached to each NP through case marking. Case markers provide information on how the NP fits within the sentence of the sorts provided by word order and the verb in English.

Somewhat less expected is what occurs in situations where sentences in Korean stack NPs that have the same case markers, as can happen with embedded complement clauses. In such cases, studies using eye-tracking as a measure of reading comprehension show that native Koreans show difficulty in arriving at a correct interpretation of the relationship between NPs and verbs when the two NPs with the same case marking are similar (Lee et al., 2007). This is the same pattern that has been observed in English. The object–subject difference in processing RCs is greatest when the NPs to be integrated are similar (Gordon et al., 2001, 2002, 2004, 2006; Warren and Gibson, 2005). When those NPs are dissimilar (e.g., when the head is a description and the embedded NP is a pronoun) the object–subject difference in English can be eliminated completely. Thus, the demands placed on memory by the stacking of NPs in both English and Korean reflect a common principle of operation – similarity-based interference during memory retrieval – which operates both in sentence processing and during the retrieval from memory of information that was not part of a sentence (Gordon et al., 2001, 2002, 2004, 2006; Lee et al., 2007; Van Dyke and McElree, 2006).

Accordingly, psycholinguistic studies show that the same memory-retrieval mechanisms operate during the comprehension of Korean and English when sentence-processing imposes a demand that relatively undifferentiated information be held in memory before information in the sentence can be processed. This can occur for English sentences with object-extracted RCs and can occur for some RC structures and embedded complements in Korean. However, the fact that RCs in Korean are premodifiers means that RCs do not generally impose the kind of memory load found in English where postmodifying RCs interrupt the main clause of the sentence. Further, the prevalence of dropped pronouns in Korean creates a local ambiguity in whether the missing argument in an initial NP-verb sequence should be interpreted as the gap in an RC or as a dropped pronoun in a main clause. The bias toward a main-clause interpretation is greatest when the overt NP is accusative because this implies that a nominative NP, corresponding to the subject of the main clause, has been dropped. Eye-tracking research on the comprehension of Korean sentences has shown that this local ambiguity results in greater ease in the initial processing of object-extracted RCs as compared to subject-extracted RCs when the head of the RC is the subject of the main clause (Kwon et al., *in press*). This pattern reverses the typical object–subject difference in ease of processing where object-extracted RCs are found to be more difficult to understand than subject-extracted RCs. This particular pattern in the ease of processing sentences in Korean is not consistent with an extension of Keenan and Comrie's NP Accessibility Hierarchy to sentence processing results. However, this pattern is only found for a limited range of sentence types, and the scrambling structure in Korean allows this ambiguity to be avoided. In cases where RCs do not involve ambiguity in whether the missing constituent a dropped argument rather than a gap, Korean sentences with object-extracted RCs are more difficult to comprehend than those with subject-extracted RCs. As with reduced relatives in English (e.g., 1), this shows that sentence processing is influenced both by local ambiguity of linguistic forms and by memory demands. The patterns in processing difficulty that conform to the NP Accessibility Hierarchy appear to be associated with memory demands.

Psycholinguistic research on the comprehension of Chinese sentences containing RCs provides additional evidence regarding the impact of local ambiguity and memory demands on sentence processing. As in Korean, RCs in Chinese are pre-nominal modifiers, so two NPs need not be held in memory until a predicate arrives regardless of whether the RC is subject-extracted or object-extracted. This characteristic of Chinese has made it an attractive language in which to test memory-based accounts of the difficulty associated with understanding object-extracted RCs in English because the semantic differences in object- and subject-extracted RCs are preserved but their differing memory demands are eliminated. An initial self-paced reading study by Hsiao and Gibson (2003) showed that object-extracted RCs are understood more easily than subject-extracted RCs. However, as in Korean, Chinese sentences containing subject-extracted RCs are initially ambiguous between a main clause versus a subordinate clause interpretation when their head is a subject NP. This potential garden-path effect does not exist for RCs headed by objects, and experiments examining comprehension of these structures have shown the same object–subject difference that is seen in English. As is also found for English and Korean, results on the comprehension of Chinese show that difficulty in comprehending complex sentences depends on the demands that those sentences place on memory.

We would argue that the special characteristic of language that supports efficient retrieval of linguistic information from memory is the ability to quickly generate very fine-grained representations of utterances that are richly differentiated and highly organized. This ability greatly reduces the degree of memory interference that is observed when simply trying to remember a list of words and provides the basis for the generally high level of memory performance observed with linguistically coherent material—a high level of performance that can, however, be strained by certain types of syntactic complexity. We believe that cross-linguistic variation in the form of certain basic linguistic structures can be understood as reflecting different tradeoffs between the processing demands of ambiguity and memory. Programmatic claims to the effect that language is "... a sociocultural product constrained by cognitive constraints on learning" (Evans and Levinson, 2009:44) do not have the explicitness or detail that can be useful in research on the mechanisms of language processing.

4. Conclusion

Evans and Levinson overstate the dependence of psycholinguistic research on specific instantiations of Universal Grammar by Chomsky and his colleagues. There is no reason to believe that pressure from typological work to revise notions such as phrase or grammatical function (such as subject) would invalidate conclusions about language processing because that work has focused on how the processing of language emerges from the interaction of cognitive abilities such as memory, attention and perception. Typological generalization, like the implication universal embodied in the NP Accessibility

Hierarchy, has provided a useful guide for experimental elaboration of language processing as the direct interaction between syntactic constituency, semantic interpretation and memory processes. This will remain true even if the understanding of what it is to be a “subject” differs in the future. Evans and Levinson have not sketched a proposal that would change the orientation or practice of psycholinguistics as it is currently pursued.

References

- Clifton, C., Traxler, M.J., Mohamed, M., Williams, R.S., Morris, R.K., Rayner, K.E., 2003. The use of thematic role information in parsing: syntactic processing autonomy revisited. *Journal of Memory and Language* 49, 317–334.
- Evans, N., Levinson, S.C., 2009. The myth of language universals: language diversity and its importance for cognitive science. *Behavior and Brain Sciences* 32, 429–492.
- Gennari, S.P., MacDonald, M.C., 2008. Semantic indeterminacy in object relative clauses. *Journal of Memory and Language* 58, 161–187.
- Gibson, E., 1998. Linguistic complexity: locality of syntactic dependencies. *Cognition* 68, 1–76.
- Gordon, P.C., Hendrick, R., 2005. Relativization, ergativity, and corpus frequency. *Linguistic Inquiry* 18, 315–332.
- Gordon, P.C., Hendrick, R., Johnson, M., 2001. Memory interference during language processing. *Journal of Experimental Psychology: Learning, Memory, and Cognition* 27, 1411–1423.
- Gordon, P.C., Hendrick, R., Johnson, M., 2004. Effects of noun phrase type on sentence complexity. *Journal of Memory and Language* 51, 97–114.
- Gordon, P.C., Hendrick, R., Johnson, M., Lee, Y., 2006. Similarity-based interference during language comprehension: evidence from eye tracking during reading. *Journal of Experimental Psychology: Learning, Memory, and Cognition* 32, 1304–1321.
- Gordon, P.C., Hendrick, R., Levine, W.H., 2002. Memory-load interference in syntactic processing. *Psychological Science* 13, 425–430.
- Hsiao, F., Gibson, E., 2003. Processing relative clauses in Chinese. *Cognition* 90, 3–27.
- Keenan, E.L., 1975. Variation in universal grammar. In: Shuy, R.W., Fasold, R.W. (Eds.), *Analyzing Variation in Language*. Georgetown University Press, Washington, DC.
- Keenan, E.L., Comrie, B., 1977. Noun phrase accessibility and universal grammar. *Linguistic Inquiry* 8, 63–99.
- Keenan, E.L., Comrie, B., 1979. Data on the noun phrase accessibility hierarchy. *Language* 55, 333–351.
- Kwon, N., Lee, Y., Gordon, P.C., Kluender, R., Polinsky, M. Cognitive and linguistic factors affecting subject/object asymmetry: an eye-tracking study of pre-nominal relative clauses in Korean. *Language*, in press.
- Lee, Y., Lee, H., Gordon, P.C., 2007. Linguistic complexity and information structure in Korean: evidence from eye-tracking during reading. *Cognition* 104, 495–534.
- Trueswell, J.C., Tanenhaus, M.K., Garnsey, S.M., 1994. Semantic influences on parsing: use of thematic role information in syntactic disambiguation. *Journal of Memory and Language* 33, 285–318.
- Van Dyke, J.A., McElree, B., 2006. Retrieval interference in sentence comprehension. *Journal of Memory and Language* 55, 157–166.
- Warren, T., Gibson, E., 2005. Effects of NP type in reading cleft sentences in English. *Language and Cognitive Processes* 20, 751–767.