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Construction grammar and its implications for child language research

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Proponents of generative grammar sometimes refer to their particular theoretical framework as 'the' theory of syntax (Chomsky, 1965; Grodzinsky, 1986; Smith & Tsimpli, 1995; Rice, 1997), implying that a consensus has been reached within linguistic theory. For child language researchers who do not find this framework useful, and/or are not willing to accept the epistemological baggage that it carries (i.e. radical claims about the innateness and autonomy of grammar), this is an unfortunate situation. The old alliance between linguistics and child language, forged with great optimism in the nineteen sixties, has turned into a partisan affair, practised almost exclusively by cognoscenti of MIT linguistics. In response, many developmental psycholinguists have abandoned linguistic theory altogether, basing their explanations on more general principles of representation and learning taken from developmental psychology and cognitive science. Although these fields also have a lot to offer, they do not provide the detail or the rigour that we once derived from a fruitful relationship with linguistics.

Michael Tomasello has proposed that we revive the old alliance within a broader framework, offering construction grammar (Fillmore, Kay & O'Connor, 1988; Goldberg, 1995) as a promising alternative for linguistically-guided child language research. He provides a lucid and faithful rendition of construction grammar (CG) and its implications for language

development, noting that CG is compatible with an interactionist/emergentist epistemology that is more acceptable to many of us in this field than its nativist counterpart. However, Tomasello's persuasive and mildly worded account of CG understates some of its most radical implications. Because CG eliminates the traditional boundary between grammar and the lexicon, it denies both the autonomy of grammar and the need for (innate) mechanisms devoted exclusively to its learning and maintenance. As Judith Goodman and I have noted elsewhere (Bates & Goodman, 1997), all elements of linguistic form in CG are represented within a heterogeneous lexicon that contains bound morphemes, free-standing content and function words, and complex phrase structures without terminal elements (e.g. the passive). Within this framework, the same mechanisms that children use to acquire words are also used to acquire grammar. This is a direct challenge to traditional claims about grammatical autonomy, and to the extent that lexical learning reflects more general principles of learning and conceptual development (a position acknowledged by many nativists, e.g. Pinker, 1991), it is also a direct challenge to linguistic nativism.

But how can this be? Haven't we been told that words are learnable but grammatical principles are not? That grammatical and lexical deficits dissociate in adults and children with various forms of neurological impairment? That different parts of the brain light up for grammatical *versus* lexical processing in normals? These conclusions have been widely circulated, and have gained some credence in our field (as one can infer from the perplexed questions raised by child language researchers on various electronic bulletin boards). If they were true (in a strong and interesting form), they would constitute solid evidence against the central claim of CG, and obviate its utility in the field of child language. The same pessimism would have to extend to cognitive grammar (e.g. Langacker, 1995), head-driven phrase structure grammar (Pollard & Sag, 1994), and any other theory in which lexical and grammatical principles have merged. But if these claims are not true (or they are premature), then we should all feel free to follow Tomasello's advice.

With regard to the learnability issue, I would simply underscore that claims about the unlearnability of grammar are still pure conjecture at this point. There are no formal proofs that incorporate anything resembling realistic assumptions about the learning device (Bates & Elman, 1997; Seidenberg, 1997). With regard to the second two points, extensive reviews of the evidence for and against a neural dissociation between grammar and the lexicon (e.g. Bates & Goodman, 1997; Elman, Bates, Johnson, Karmiloff-Smith, Parisi & Plunkett, 1996) lead to the conclusion that there is (so far) no compelling evidence for a separate 'grammar organ'.

First, consider the claim that non-fluent Broca's aphasics suffer from a selective loss of grammar, with sparing of lexical semantics. This is the

empirical basis for the further claim that grammar is located in a specific part of the brain, in and around the left anterior regions referred to as Broca's area. However, evidence has accumulated that casts great doubt on a 'grammar box' interpretation of these results. For example, studies show that so-called agrammatic Broca's aphasics can still make very subtle judgments of grammaticality, and cross-linguistic studies show that these patients retain exquisite details of their native grammar, manifested in many aspects of comprehension, production and real-time language processing (Menn & Obler, 1990; Bates, 1991). In short, the grammatical deficit associated with Broca's aphasia seems to involve some aspect of performance, rather than a loss of grammatical knowledge (Milberg, Blumstein, Katz, Gershberg & Brown, 1995).

Second, the grammatical problems displayed by Broca's aphasics are in no way unique to this group. The same kind of deficit (i.e. an omission pattern) has been reported for Down Syndrome and Specific Language Impairment (SLI), while other kinds of expressive agrammatism (e.g. grammatical substitution and/or simplification) have been observed in Wernicke's aphasia, anomic aphasia, Alzheimer's disease, Williams Syndrome, and the oral language of the congenitally deaf. Furthermore, patients who display deficits in expressive and/or receptive grammar, invariably display non-grammatical deficits as well, including lexical and/or phonological impairments of various kinds. Indeed, word-finding deficits (a symptom called ANOMIA) have been observed in every form of acquired aphasia that has ever been studied (Goodglass, 1993).

Claims about specific deficits of grammar in congenital populations have also fallen on hard times. It is widely acknowledged that children with SLI display problems with grammatical morphology, but these always coexist with deficits in lexical and/or phonological processing (for reviews, see Bishop, 1997; Leonard, 1997). Furthermore, some investigators have observed subtle perceptual processing problems that are not unique to language, although they could have a particularly deleterious effect on weak elements of grammar (e.g. Tallal, Miller, Bedi, Byma, Jenkins, Wang, Nagarajan & Merzenich, 1996). In short, there is still no compelling and uncontroversial evidence to indicate that grammar can be selectively impaired, sparing all other aspects of language, perception and cognition.

What about the growing stock of findings from neural imaging of the normal brain, especially the claim that regions of the brain respond differently to lexical and grammatical stimuli? In fact, there is relatively little agreement across studies on any aspect of language localization. Language areas have multiplied at an astounding rate, implicating Broca's area and Wernicke's area on the right side as well as the left, new regions on the underside of the brain (basal temporal cortex), parts of the cerebellum, a number of subcortical structures, and high frontal and parietal areas that do

not result in aphasia when they are lesioned. For the most part, studies report highly distributed patterning to any linguistic stimulus. Although it is always possible to keep subtracting away until little patches are left, these patches rarely overlap when studies are compared, and none of these regions are uniquely active for language (i.e. they are all involved in other forms of processing as well). Within individual studies, one can find evidence suggesting that different kinds of stimuli (nouns vs. verbs, content words vs. function words, syntactic violations vs. semantic violations) each lead to partially non-overlapping patterns of activation. However, this is also true for differences that no one wants to build into a linguistic theory, e.g. high vs. low frequency words, long vs. short words, or different degrees of syntactic complexity within a single class.

The bottom line is that different things are different. But these variations are not sufficient to justify claims about some kind of 'mental organ' for each structural type. Just as we configure our hands differently to pick up a pin, a book or a ball, we must configure the mind/brain differently to access and produce a bound morpheme, a content word, a function word or a phrase structure. Not every difference is a difference in kind.

In summary, I believe that the world is still a safe place for radically lexicalist theories of grammar, including construction grammar. There is no compelling evidence in favour of a modular distinction in the mechanisms that mediate words and grammar. As Tomasello notes, construction grammar is a promising linguistic framework for the analysis of child language, and it is an approach that is fully compatible with the current psycholinguistic and neurolinguistic evidence.

REFERENCES

Bates, E. & Elman, J. (1996). Learning rediscovered. *Science* **274**, 1849–1850.

Bates, E. & Goodman, J. (1997). On the inseparability of grammar and the lexicon: evidence from acquisition, aphasia, and real-time processing. *Language and Cognitive Processes* **12**: 5/6, 507–86.

Bates, E., Wulfeck, B. & MacWhinney, B. (1991). Crosslinguistic research in aphasia: an overview. *Brain and Language* **41**, 123–48.

Bishop, D. V. M. (1997). *Uncommon understanding : development and disorders of comprehension in children*. Hove, UK: Psychology Press.

Elman, J., Bates, E., Johnson, M., Karmiloff-Smith, A., Parisi, D. & Plunkett, K. (1996). *Rethinking innateness : a connectionist perspective on development*. Cambridge, MA: MIT Press/Bradford Books.

Fillmore, C. J., Kay, P. & O'Connor, C. (1988). *Regularity and idiomaticity in grammatical constructions : the case of Let Alone*. Language **64**, 501–38.

Goldberg, A. E. (1995). *Constructions : a construction grammar approach to argument structure*. Chicago: University of Chicago Press.

Goodglass, H. (1993). *Understanding aphasia*. San Diego: Academic Press.

Grodzinsky, Y. (1986). Language deficits and the theory of syntax. *Brain and Language* **27**, 135–159.

Langacker, R. (1987). *Foundations of cognitive grammar*. Stanford: Stanford University Press.

Leonard, L. B. (1997). *Specific language impairment*. Cambridge, MA: MIT Press.

Menn, L. & Obler, L. K. (eds). (1990). *Agrammatic aphasia : cross-language narrative sourcebook*. Amsterdam/Philadelphia: John Benjamins.

Milberg, W., Blumstein, S. E., Katz, D., Gershberg, F. & Brown, T. (1995). Semantic facilitation in aphasia: effects of time and expectance. *Journal of Cognitive Neuroscience* **7**(1), 33–50.

Pinker, S. (1991). Rules of language. *Science* **253**, 530–5.

Pollard, C. & Sag, I., (1994). *Head-driven phrase structure grammar*. Center for the Study of Language and Information, Report # CSLI-88-132. University of Chicago.

Rice, M. (ed.). *Towards a genetics of language*. Hillsdale, NJ: Erlbaum.

Seidenberg, M. (1997). Language acquisition and use: learning and applying probabilistic constraints. *Science* **275**, 1599–1603.

Smith, N. & Tsimpli, I-M. (1995). *The mind of a savant : language learning and modularity*. Oxford: Basil Blackwell.

Tallal, P., Miller, G., Bedi, G., Byma, G., Jenkins, W. M., Wang, X., Nagarajan, S. S. & Merzenich, M. M. (1996). Language comprehension in language-learning-impaired children improved with acoustically modified speech. *Science* **271** (5245), 81–84.