



Brief Communication

A critique of Mark D. Allen's "The preservation of verb subcategory knowledge in a spoken language comprehension deficit"

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Abstract

Allen [Allen, M. (2005). The preservation of verb subcategory knowledge in a spoken language comprehension deficit. *Brain and Language*, 95, 255–264.] reports a single patient, WBN, who, during spoken language comprehension, is still able to access some of the syntactic properties of verbs despite being unable to access some of their semantic properties. Allen claims that these findings challenge linguistic theories which assume that much of the syntactic behavior of verbs can be predicted from their meanings. I argue, however, that this conclusion is not supported by the data for two reasons: first, Allen focuses on aspects of verb syntax that are *not* claimed to be influenced by verb semantics; and second, he ignores aspects of verb syntax that *are* claimed to be influenced by verb semantics.
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1. Introduction

How much of a verb's syntactic behavior can be predicted from its meaning? In the literature on the syntax–semantics interface, this is, to quote Jackendoff (2002, p. 138), "the big question". The answer he gives—namely, "a lot . . . but far from all"—is based on a large body of research conducted by numerous linguists affiliated with a variety of specialized theories (for a review see Levin & Rappaport Hovav, 2005). In a recent paper, however, Allen (2005) uses neuropsychological data and reasoning to argue against all semantic accounts of the syntactic properties of verbs. He describes a brain-damaged patient, WBN, whose pattern of performance across several experiments putatively demonstrates that "one particular aspect of lexically encoded syntax—verb subcategory—is retrieved independently of verb meaning during language comprehension" (p. 256). According to Allen, "WBN presents a strong challenge . . . to meaning-dependent theories

of subcategory retrieval in general" (p. 257). In this critique, I argue that Allen's conclusion is not supported by his data. More specifically, I show that his findings do not really threaten the hypothesis that a substantial amount of the syntactic behavior of verbs—including much of what is usually treated as argument structure—is semantically constrained, because his experiments were not appropriately designed to assess the validity of that hypothesis.

2. Summary of Allen's study

Allen states that "a verb's subcategorization frame is simply a specification of the syntactic form(s) that must be used in order to express its arguments as surface complements (e.g., *buy* [NP] [*from* [NP]])" (p. 256). He then observes that "according to some theories (Jackendoff, 1990; Levin & Rappaport Hovav, 1991; Radford, 1988), verb subcategory specifications need not be stipulated independently in the lexicon (for the most part), so long as verb meaning is construed within a framework of richly elaborated lexical-conceptual structures" (p. 256). Allen's paren-

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thetical qualification “for the most part” is important because, as is commonly acknowledged, at least some of the syntactic properties of verbs cannot be predicted from semantics: “Jackendoff (1990), for example, notes ‘recalcitrant’ cases of idiosyncratic phrasal and prepositional subcategory options that appear to require stipulation in the lexicon (as in the examples *believe in NP*, *convince NP of*, *depend/rely/count on NP*)” (p. 256). After making this point, Allen refers to what he apparently interprets as an alternative view: “Nevertheless, some language acquisition theorists, such as Pinker (1989) and Gropen et al. (1991a), suggest that when facts about language representation and acquisition are understood in the context of a sufficiently elaborated theory of semantic representation, syntactic complement options will be ‘completely predictable from their semantic representations, for all verbs, speakers, ages, and languages’ (Gropen, Pinker, Hollander, & Goldberg, 1991a, p. 179)” (p. 256). Allen latches onto this claim and indicates how its empirical consequences for language comprehension could be tested using the methods of cognitive neuropsychology: “If verb subcategory information is computed directly from a verb’s semantics . . . , then it should not be possible to observe intact knowledge of verb subcategory options when verb meaning information is severely compromised or absent in patients with acquired language impairments. If, on the other hand, verb subcategory information can be accessed independently of semantic information, then it might be possible to observe intact knowledge of subcategory information when verb meaning is inaccessible” (pp. 256–257). After setting up this background, Allen presents his case study of patient WBN and argues that it fits the latter scenario just described, thereby challenging semantically based theories of verb subcategorization.

In Sections 3 and 4 of his paper, Allen reports that although WBN can recognize the phonological forms of spoken nouns and verbs, he has great difficulty mapping those forms onto the corresponding semantic structures. Then, in Section 5, Allen describes three experiments that addressed the central theoretical question of the study, namely “whether information about a verb’s subcategory requirements can be retrieved and exploited during sentence comprehension, even when information about verb meaning is inaccessible” (p. 259). First, WBN was presented with spoken sentences in which each of three nouns (*baby*, *dog*, and *tree*) functioned as the subject of 52 verbs, and the combination was either plausible (e.g., *Can a baby crawl?*) or implausible (e.g., *Can a baby gossip?*).¹ He was severely impaired on this task. Second, WBN was required to detect semantic/pragmatic violations that were syntactically realized as verb–object combinations and that involved three different types of anomaly: physical constraints (e.g., *The man will peel*

*the orangel*phone*), animacy (e.g., *The man will punish the criminal*stapler*), and pragmatic expectancies (e.g., *The man will cook the stew*stapler*). Again, WBN was severely impaired on this task. Finally, WBN was required to detect syntactic violations that revolved around prepositions and that took three different forms: preposition addition (e.g., *consume ___/to the dinner*), preposition deletion (e.g., *agree with/*___ the owner*), and preposition substitution (e.g., *rely on/*for the teacher*). Remarkably, he performed flawlessly on this task.

Allen argues that this dissociation between accessing the semantic and syntactic properties of verbs has significant implications. In particular, he claims that it “speaks against linguistic theories in which verb subcategory knowledge is not itself represented in the lexicon, but rather is derived entirely from semantic/conceptual representations (Fisher, Gleitman, & Gleitman, 1991; Gropen et al., 1991a; Levin & Rappaport Hovav, 1991; Pinker, 1989; Radford, 1988)” (p. 261). In other words, according to Allen, “WBN provides evidence that, as a linguistic constraint, the representation of a verb’s subcategory is not dependent on the representation of its lexical-conceptual properties” (p. 263).

3. Critique of Allen’s study

The dissociation manifested by WBN is, without a doubt, quite striking. However, as I demonstrate below, it does not undermine theories which assume a close connection between verb meaning and syntactic structure.

3.1. Allen focuses on aspects of verb syntax that are not claimed to be influenced by verb semantics

The only experiment that Allen explicitly designed to probe WBN’s access to the syntactic properties of verbs concentrated on the following two types of information involving prepositions: (1) whether or not a verb subcategorizes for a preposition, and (2) what the preposition should be if a verb does in fact demand one. To my knowledge, however, few if any researchers in the linguistics community have seriously tried to argue that these syntactic properties of verbs can be completely predicted from their meanings. Some pairs of verbs are semantically quite similar but nevertheless differ as to whether or not they subcategorize for a preposition (e.g., *Susan provided Amy with/*___ a cupcake* vs. *Susan presented Amy *with/___ a cupcake*; Jackendoff, 2002, p. 141). In addition, although the idiosyncratic prepositions that certain verbs specify (e.g., *believe in NP*, *depend on NP*, *stare at NP*, etc.) may be historically based on semantic considerations (Kuteva & Sinha, 1994; Lindstromberg, 1998; Radden, 1985), modern speakers are presumably not very sensitive to such factors. This is precisely why these syntactic restrictions are commonly treated as instances of so-called “strict” subcategorization. Allen points out that even Jackendoff (1990),

¹ Allen does not, however, discuss the precise nature of the semantic incompatibilities. Also, unlike for the other two experiments, he does not list the stimuli in the Appendix.

who argues in many publications for a close (but not perfect) relationship between the syntactic and semantic properties of verbs, accepts that which preposition a verb demands must be stipulated in the lexicon as an arbitrary syntactic property that cannot be derived from semantics (see also Jackendoff, 2002, pp. 141, 177). But then Allen quotes Gropen et al. (1991a, p. 179) as ostensibly endorsing a much bolder position, namely that once a sufficiently elaborated theory of semantic representation is in place, syntactic complement options will be “completely predictable from their semantic representations...”. Crucially, though, the original passage from Gropen et al. is as follows: “In its strongest form the semantic structure theory predicts that verbs’ *syntactic argument structures* are completely predictable from their semantic representations...” (my emphasis). I suspect that anyone who carefully inspects the various publications by Gropen, Pinker, and colleagues from the late 1980s and early 1990s (Gropen, Pinker, Hollander, Goldberg, & Wilson, 1989, 1991a; Gropen, Pinker, Hollander, & Goldberg, 1991b; Pinker, 1989, 1994; see also Pinker, *in press*) will agree that the expression “syntactic argument structures” in the quotation above most likely refers to constructional alternations like the dative, causative, passive, and locative, and is *not* intended to encompass the idiosyncratic prepositions that verbs strictly subcategorize. Moreover, I am not aware of any passages in the other references that Allen cites together with Gropen et al. (1991a) that implicitly assume or explicitly defend a semantic account of strictly subcategorized prepositions like the *in* of *believe in NP*; on the contrary, Radford (1988, pp. 344–345) argues quite clearly that such prepositions must be stipulated. Overall, it appears that no one seriously maintains the view that the idiosyncratic prepositional complements of certain verbs can be derived directly from the meanings of those verbs. Such a view is a straw man, and this in turn defuses Allen’s argument that WBN’s dissociation presents a “strong challenge ... to meaning-dependent theories of subcategory retrieval in general” (p. 257). More precisely, because the meaning-based theories that Allen attacks do not assume that the idiosyncratic prepositional requirements of verbs are semantically determined, they are entirely consistent with Allen’s discovery that WBN has preserved access to

verb-specific prepositional requirements but impaired access to verb-specific semantic structures.

3.2. Allen ignores aspects of verb syntax that are claimed to be influenced by verb semantics

Allen mentions several studies that exemplify the meaning-dependent theories that he criticizes (e.g., Gropen et al., 1991a; Levin & Rappaport Hovav, 1991; Pinker, 1989), but he does not give any concrete examples of the kinds of analyses that have been guided by those theories, nor does he refer to any of the detailed studies that have appeared since 1991 (for a review see Levin & Rappaport Hovav, 2005). Most importantly, none of the experiments that he reports were specifically designed to evaluate WBN’s sensitivity to the types of syntactic properties of verbs that have actually been claimed to be semantically determined. These points are elaborated below.

3.2.1. Meaning-based theories of argument structure constructions

One of the major proposals of the theories under discussion is that the syntactic frames of verbs—also known as argument structure constructions—are typically associated with schematic meanings, and in order for a verb to occur in a particular frame, its meaning must be compatible with that of the frame. This notion is illustrated in Table 1, which focuses on the so-called locative alternation—a central topic of the studies by Gropen et al. (1991a, 1991b) and Pinker (1989; see also Pinker, *in press*). The locative alternation involves two constructions that both express “putting” actions, but that capture different subjective construals of, or perspectives on, those actions. The first construction is the theme-object (“content”) locative, in which the moved entity is linked with the direct object NP (a syntactic position usually reserved for “affected” entities); the second construction is the goal-object (“container”) locative, in which the endpoint of the path is linked with the direct object NP. The verbs in sentences (1) and (2) in Table 1 are very choosy about which constructions they can occur in. This choosiness cannot be explained in purely syntactic terms, however, because all of the verbs can take a direct object NP as well as a PP. Instead, Pinker (1989) maintains that the different patterns of grammaticality can be accounted for roughly as follows.

Table 1
Simplified analysis of the English locative alternation, based on Pinker (1989)

Theme-object (“content”) locative construction	Goal-object (“container”) locative construction
Syntax: Subject ₁ Verb Object ₂ <i>on/in</i> Object ₃	Syntax: Subject ₁ Verb Object ₂ <i>with</i> Object ₃
Semantics: X ₁ causes Y ₂ to go to Z ₃ in some manner	Semantics: X ₁ causes Y ₂ to change state by adding Z ₃
Examples: (1)	Examples: (2)
(a) Sam ₁ sprinkled salt ₂ on the popcorn ₃	(a) Sam ₁ sprinkled the popcorn ₂ with salt ₃
(b) Sam ₁ poured water ₂ on the plant ₃	(b) *Sam ₁ poured the plant ₂ with water ₃
(c) *Sam ₁ filled beer ₂ in the glass ₃	(c) Sam ₁ filled the glass ₂ with beer ₃

See the original source for complete details. Note: For each construction, the coindexed subscripts indicate linking patterns, following the formalism of Jackendoff (2002).

The theme-object locative, which is instantiated by the sentences in (1), has the syntactic frame “Subject₁ Verb Object₂ *on/in* Object₃”, and this frame is associated with the schematic meaning “X₁ causes Y₂ to go to Z₃ in some manner.” In contrast, the goal-object locative, which is instantiated by the sentences in (2), has the syntactic frame “Subject₁ Verb Object₂ *with* Object₃”, which is associated with the schematic meaning “X₁ causes Y₂ to change state by adding Z₃”. (In addition, each construction has a polysemous network of more specialized “narrow range” meanings that are essentially generalizations over verb classes. These meanings are integral to the theory; however, they are beyond the scope of the current summary.) As shown in (1a) and (2a), *sprinkle* can occur in both constructions because it specifies not only a particular manner of motion (an aggregate of tiny objects moves downward in a loose pattern) but also a particular change of state (a surface gets covered with tiny objects in a fairly even spatial distribution). However, as shown in (1b,c) and (2b,c), *pour* and *fill* are in complementary distribution for the following reasons. On the one hand, *pour* can only take the first construction because although it encodes a particular manner of motion (a liquid moves downward in a cohesive stream), it does not necessarily imply a change of state (e.g., if I pour some water into a glass that has a gaping hole in the bottom, the water will go right through without affecting it in any significant way). Conversely, *fill* can only take the second construction because it encodes a change of state (a container becomes full) but is mute about the specific manner in which this happens (there are obviously myriad ways of filling containers).

This approach to investigating the syntax–semantics interface draws heavily on the Grammatically Relevant Semantic Subsystem Hypothesis (Pinker, 1989), which states that a distinction exists between two levels of verb meaning: (1) a level of semantic features that are *not* relevant to grammar but instead enable verbs to express an open-ended range of actions, events, and states of affairs; and (2) a level of semantic features that *are* relevant to grammar insofar as they allow verbs to occur in some constructions but not others. For example, the semantic nuances that differentiate the meanings of *pour*, *drip*, *dribble*, and *spill* are grammatically irrelevant, since they do not trigger different syntactic behaviors; however, the fact that all four verbs share the more abstract meaning “X₁ causes Y₂ to go to Z₃ in some manner” is grammatically relevant, since this is precisely what allows them to occur in the theme-object locative construction (e.g., *Sam poured/dripped/dribbled/spilled water on the flowers*). Although the exact nature of grammatically relevant facets of meaning continues to be controversial, the basic idea that such facets exist has inspired a great deal of research on the syntax–semantics interface, especially regarding verbs (again, for a review see Levin & Rappaport Hovav, 2005; for other recent work see, e.g., Fried & Boas, 2005; Iwata, 2005; Kuno & Takami, 2005; Ostman & Fried, 2005; Van Valin, 2005).

It is important to note that none of the meaning-based theories of argument structure constructions completely rules out by fiat the possibility that some of the syntactic frames in which verbs can occur are “stipulated in the lexicon” in the sense of being stored as associations in long-term memory. Indeed, it would not be terribly surprising if such associations were established for the most frequently used frames of certain verbs. But whether or not this happens is ultimately an empirical issue, and what really matters in the current context is that the explanatory power of meaning-based theories comes from their demonstration that such stipulations are usually not necessary because a given verb’s spectrum of potential syntactic frames can often be predicted on semantic grounds. This allows meaning-based theories to account for the truly impressive distributional breadth of many verbs. For example, as shown in Table 2, even though *kick* is traditionally considered to be a prototypical transitive verb, it is used in at least nine distinct active-voice constructions (Goldberg, 1995, p. 11; see also Rappaport Hovav & Levin, 1998). These constructions describe very different kinds of schematic events, but the meaning of *kick* can be reconciled with all of them. To take just one case for purposes of illustration, consider the *X’s way* construction, which consists of a particular syntactic structure—roughly “Subject Verb *X’s way* Oblique”—that is paired with a particular semantic structure—roughly “X makes progress along path Y by V-ing.” In the sentence *Bill kicked his way through the crowd*, the general concept of “agentive motion of the subject referent along a path” comes from the *X’s way* construction itself, and the more specific notion of “forceful leg action” comes from *kick*. It would be otiose to claim that *kick* always carries around the optional syntactic frame of the *X’s way* construction, because the verb’s ability to occur in that construction can be computed online by consulting only semantic factors (see Jackendoff, 2002, p. 176). More generally, the notion that the syntactic frames of verbs tend to interact strongly with meaning has been receiving increasing psycholinguistic support (e.g., Bencini & Goldberg, 2000; Hare, McRae, & Elman, 2003; Kako, 2006a, 2006b; Kaschak & Glenberg, 2000).

3.2.2. Neuropsychological issues

According to the data presented by Allen, it is likely that during spoken language processing WBN has impaired access to what Pinker (1989) and others regard as the grammatically irrelevant semantic features of verbs. These aspects of verb meaning are central to the subset of Allen’s verb–object combinations that involve semantic violations of physical constraints (e.g., *The man will peel the orange! *phone*). It may also be the case, however, that WBN has impaired access to at least one element of linguistic meaning that is well-established as being relevant to many morphosyntactic phenomena in languages worldwide, namely animacy. This is the pivotal factor for the semantic violations in another subset of Allen’s verb–object combinations (e.g., *The man will punish the criminal! *sweat*). However,

Table 2
Examples of active-voice argument structure possibilities for the verb *kick*

Construction	Syntax	Semantics	Example
1. Transitive	Subject Verb Object	X acts on Y	Bill kicked the ball
2. Caused motion	Subject Verb Object Oblique	X causes Y to move along path Z	Bill kicked the ball into the lake
3. Conative	Subject Verb Oblique _{at}	X attempts to contact Y	Bill kicked at the ball
4. Ditransitive	Subject Verb Object Object	X causes Y to receive Z	Bill kicked Bob the ball
5. Resultative	Subject Verb Object Complement	X causes Y to become Z	Bill kicked Bob black and blue
6. Possessor ascension	Subject Verb Object Oblique _{on/in}	X contacts Y on/in body part Z	Bill kicked Bob in the knee
7. Contact _{against}	Subject Verb Object Oblique _{against}	X causes Y to contact Z	Bill kicked his foot against the chair
8. X's way	Subject Verb X's way Oblique	X makes progress along path Y by performing action	Bill kicked his way through the crowd
9. Habitual	Subject Verb	X performs action habitually	Horses kick

Allen does not discuss the multifarious ways in which animacy influences grammar (e.g., word order, case marking, agreement, transitivity, etc.; for a brief summary see Whaley, 1997, pp. 172–179). Moreover, the fact that WBN is impaired at detecting animacy violations in verb–object combinations is entirely consistent with meaning-based theories of the syntactic properties of verbs, since those theories simply state that when certain verbs (e.g., *punish*) are used transitively, the entity encoded by the direct object must be animate. It is hard to see how WBN's impaired sensitivity to such constraints poses a challenge to the theories that posit them, and Allen does not address this issue. Most importantly, Allen did not systematically assess WBN's understanding of the syntactic and semantic components of the sorts of argument structure constructions that are actually the main focus of the meaning-based theories that he criticizes—i.e., constructions such as the ones mentioned above (see Tables 1 and 2).² For this reason, I submit that Allen's conclusion that “WBN presents a strong challenge . . . to meaning-dependent theories of subcategory retrieval in general” (p. 257) is unwarranted.

Allen suggests that data from other brain-damaged patients may threaten theories which assume that verb syntax is closely related to verb semantics (Berndt, Basili, & Caramazza, 1987; Breedin & Martin, 1996; Caramazza & Miceli, 1991; Martin & Blossom-Stach, 1986). However, those studies are beyond the purview of the current critique and would need to be considered separately. It is noteworthy, though, that Allen does not mention any of my own studies in this domain, despite the fact that they may be the only ones that have been deliberately designed to test certain neuropsychological hypotheses derived

from meaning-based theories of argument structure constructions (Kemmerer, 2000a, 2003; Kemmerer & Wright, 2002; for additional studies supporting the constructionist approach to the syntax-semantics interface, see Kemmerer, Chandrasekaran, & Tranel, 2007, and Kemmerer, Weber-Fox, Price, Zdansczyk, & Way, 2007). For example, in a study that focused specifically on the locative alternation (see Table 1), I reported three patients who exhibited a double dissociation between grammatically relevant and irrelevant semantic features of verbs (Kemmerer, 2000a). Two of the patients performed well on a word-picture matching test that evaluated sensitivity to the fine-grained, grammatically irrelevant semantic features that distinguish between verbs like *pour*, *drip*, *dribble*, and *spill*; however, they were impaired on a grammaticality judgment test requiring detection of unnatural sentences like **Sam poured the plant with water*. Their errors could not be attributed to a deficit involving either purely syntactic processing or metalinguistic judgment ability because both patients passed another test that assessed the integrity of those capacities. The results are therefore consistent with the possibility that the patients' disorders involved the grammatically relevant semantic features of verbs (or perhaps the schematic meanings of the pertinent locative constructions). Importantly, a third patient exhibited the opposite dissociation, with moderately defective understanding of the grammatically irrelevant semantic features of verbs but intact understanding of the grammatically relevant ones. Based on Allen's data, it seems likely that WBN would also be deficient at discriminating between verbs like *pour*, *drip*, *dribble*, and *spill*;³ however, it is difficult to predict how

² For instance, as originally observed by Partee (1965), the English ditransitive construction requires that the goal argument be animate, but the paraphrase with *to* does not have this constraint: Animate goal: (a) *I brought a glass of water to Pat*. (b) *I brought Pat a glass of water* (ditransitive). Inanimate goal: (a) *I brought a glass of water to the table*. (b) **I brought the table a glass of water* (ditransitive). Given that WBN appears to be impaired at detecting animacy during receptive language processing, it would be interesting, both empirically and theoretically, to know whether he is sensitive to the animacy constraint on the ditransitive construction.

³ This would be in keeping with the fact that WBN's left occipitotemporal lesion appears to have encompassed or encroached on a region that has been implicated in visual manner-of-motion aspects of verb meaning, namely the posterolateral temporal cortex (Kable, Lease-Spellmeyer, & Chatterjee, 2002; Kable, Kan, Wilson, Thompson-Schill, & Chatterjee, 2005; Kemmerer, Gonzalez Castillo, Talavage, Patterson, & Wiley, submitted for publication; Noppeney, Josephs, Kiebel, Friston, & Price, 2005; Tettamanti et al., 2005; Tranel, Kemmerer, Adolphs, Damasio, & Damasio, 2003; Tranel, Martin, Damasio, Grabowski, & Hichwa, 2005; Tranel, Manzel, Asp, & Kemmerer, submitted for publication).

he would perform on a test requiring naturalness judgments for sentences like **Sam poured the plant with water*, since the only grammatically relevant semantic property that Allen probed was animacy. Overall, my study of the locative alternation, as well my other studies of the syntax–semantics interface (cited above), provide neuropsychological support for the meaning-based theories of argument structure that Allen criticizes. Moreover, these studies fit nicely with recent research involving neurolinguistic modeling (Dominey & Hoen, 2006; Dominey, Hoen, & Inui, 2006; Hoen, Pachot-Clouard, Segebarth, & Dominey, 2006), the mirror neuron system (Kemmerer, 2006), and the ontogeny and phylogeny of language (ontogeny: Ambridge, Pine, Rowland, & Young, in press; Bowerman & Brown, 2007; Diessel, 2004; Goldberg, 2006; Kelly & Clark, 2005; Tomasello, 2003; phylogeny: Jackendoff & Pinker, 2005; Kemmerer, 2005).

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References

- Allen, M. D. (2005). The preservation of verb subcategory knowledge in a spoken language comprehension deficit. *Brain and Language*, *95*, 255–264.
- Ambridge, B., Pine, J. M., Rowland, C. F., & Young, C. R. (in press). The effect of verb semantic class and verb frequency (entrenchment) on children's and adults' graded judgements of argument-structure overgeneralization errors. *Cognition*.
- Bencini, G. M. L., & Goldberg, A. E. (2000). The contribution of argument constructions to sentence meaning. *Journal of Memory and Language*, *43*, 640–651.
- Berndt, R., Basili, A., & Caramazza, A. (1987). Dissociation of functions in a case of transcortical sensory aphasia. *Cognitive Neuropsychology*, *4*, 79–107.
- Bowerman, M., & Brown, P. (Eds.). (2007). *Crosslinguistic perspectives on argument structure: Implications for learnability*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Breedin, S., & Martin, R. (1996). Patterns of verb impairment in aphasia. *Cognitive Neuropsychology*, *13*, 51–91.
- Caramazza, A., & Miceli, G. (1991). Selective impairment of thematic role assignment in sentence processing. *Brain and Language*, *41*, 402–436.
- Diessel, H. (2004). *The acquisition of complex sentences*. Cambridge, UK: Cambridge University Press.
- Dominey, P. F., & Hoen, M. (2006). Structure mapping and semantic integration in a construction-based neurolinguistic model of sentence processing. *Cortex*, *42*, 476–479.
- Dominey, P. F., Hoen, M., & Inui, T. (2006). A neurolinguistic model of grammatical construction processing. *Journal of Cognitive Neuroscience*, *18*, 2088–2107.
- Fisher, C., Gleitman, H., & Gleitman, L. (1991). On the semantic content of subcategorisation frames. *Cognitive Psychology*, *23*, 331–392.
- Fried, M., & Boas, H. C. (Eds.). (2005). *Grammatical constructions: Back to the roots*. Amsterdam: John Benjamins.
- Goldberg, A. E. (1995). *Constructions: A construction grammar approach to argument structure*. Chicago: University of Chicago Press.
- Goldberg, A. E. (2006). *Constructions at work: The nature of generalization in language*. Oxford, UK: Oxford University Press.
- Gropen, J., Pinker, S., Hollander, M., Goldberg, R., & Wilson, R. (1989). The learnability and acquisition of the dative alternation in English. *Language*, *65*, 203–257.
- Gropen, J., Pinker, S., Hollander, M., & Goldberg, R. (1991a). Affectiveness and direct objects: The role of semantics in the acquisition of verb argument structure. *Cognition*, *41*, 143–195.
- Gropen, J., Pinker, S., Hollander, M., & Goldberg, R. (1991b). Syntax and semantics in the acquisition of locative verbs. *Journal of Child Language*, *18*, 115–151.
- Hare, M., McRae, K., & Elman, J. L. (2003). Sense and structure: Meaning as a determinant of verb subcategorization preferences. *Journal of Memory and Language*, *48*, 281–303.
- Hoen, M., Pachot-Clouard, M., Segebarth, C., & Dominey, P. F. (2006). When Broca experiences the Janus syndrome: An ER-fMRI study comparing sentence comprehension and cognitive sequence processing. *Cortex*, *42*, 605–623.
- Iwata, S. (2005). Locative alternation and two levels of verb meaning. *Cognitive Linguistics*, *16*, 355–407.
- Jackendoff, R. (1990). *Semantic structures*. Cambridge, MA: MIT Press.
- Jackendoff, R. (2002). *Foundations of language: Brain, meaning, evolution, grammar*. Oxford, UK: Oxford University Press.
- Jackendoff, R., & Pinker, S. (2005). The nature of the language faculty and its implications for the evolution of language (Reply to Fitch, Hauser, and Chomsky). *Cognition*, *97*, 211–225.
- Kable, J. W., Lease-Spellmeyer, J., & Chatterjee, A. (2002). Neural substrates of action event knowledge. *Journal of Cognitive Neuroscience*, *14*, 795–805.
- Kable, J. W., Kan, I. P., Wilson, A., Thompson-Schill, S. L., & Chatterjee, A. (2005). Conceptual representations of action in the lateral temporal cortex. *Journal of Cognitive Neuroscience*, *17*, 1855–1870.
- Kako, E. (2006a). Thematic role properties of subjects and objects. *Cognition*, *101*, 1–42.
- Kako, E. (2006b). The semantics of syntactic frames. *Language and Cognitive Processes*, [August issue].
- Kaschak, M. P., & Glenberg, A. M. (2000). Constructing meaning: The role of affordances and grammatical constructions in sentence comprehension. *Journal of Memory and Language*, *43*, 508–529.
- Kelly, B., & Clark, E. V. (Eds.). (2005). *The acquisition of constructions*. Stanford, CA: CSLI Publications.
- Kemmerer, D. (2000a). Grammatically relevant and grammatically irrelevant features of verb meaning can be independently impaired. *Aphasiology*, *14*, 997–1020.
- Kemmerer, D. (2003). Why can you hit someone on the arm but not break someone on the arm? A neuropsychological investigation of the English body-part possessor ascension construction. *Journal of Neurolinguistics*, *16*, 13–36.
- Kemmerer, D. (2005). Against innate grammatical categories. (Supplemental commentary on M. Arbib, “From monkey-like action recognition to human language: An evolutionary framework for neurolinguistics.”) *Behavioral and Brain Sciences*. Available from <http://www.bbsonline.org/Preprints/Arbib-05012002/Supplemental>.
- Kemmerer, D. (2006). Action verbs, argument structure constructions, and the mirror neuron system. In M. Arbib (Ed.), *Action to language via the mirror neuron system* (pp. 347–373). Cambridge, UK: Cambridge University Press.
- Kemmerer, D., Chandrasekaran, B., & Tranel, D. (2007). A case of impaired verbalization but preserved gesticulation of motion events. *Cognitive Neuropsychology*, *24*, 70–114.
- Kemmerer, D., Gonzalez Castillo, J., Talavage, T., Patterson, S., & Wiley, C. (submitted for publication). Neuroanatomical distribution of five semantic components of verbs: Evidence from fMRI.
- Kemmerer, D., Weber-Fox, C., Price, K., Zdansczyk, C., & Way, H. (2007). *Big brown dog or brown big dog?* An electrophysiological study of semantic constraints on prenominal adjective order. *Brain and Language*, *100*, 238–256.
- Kemmerer, D., & Wright, S. K. (2002). Selective impairment of knowledge underlying *un-* prefixation: Further evidence for the autonomy of grammatical semantics. *Journal of Neurolinguistics*, *15*, 403–432.

- Kuno, S., & Takami, K. (2005). *Functional constraints in grammar: On the unergative-unaccusative distinction*. Amsterdam: John Benjamins.
- Kuteva, T., & Sinha, C. (1994). Spatial and non-spatial uses of prepositions: Conceptual integrity across semantic domains. In M. Schwartz (Ed.), *Kognitive Semantikforschung* (pp. 215–237). Berlin: Gunter Narr.
- Levin, B., & Rappaport Hovav, M. (1991). Wiping the slate clean: A lexical semantic exploration. *Cognition*, *41*, 123–151.
- Levin, B., & Rappaport Hovav, M. (2005). *Argument realization*. Cambridge, UK: Cambridge University Press.
- Lindstromberg, S. (1998). *English prepositions explained*. Amsterdam: John Benjamins.
- Martin, R., & Blossom-Stach, C. (1986). Evidence of syntactic deficits in a fluent aphasic. *Brain and Language*, *28*, 196–234.
- Noppeney, U., Josephs, O., Kiebel, S., Friston, K. J., & Price, C. J. (2005). Action selectivity in parietal and temporal cortex. *Cognitive Brain Research*, *25*, 641–649.
- Ostman, J., & Fried, M. (Eds.). (2005). *Construction grammars: Cognitive grounding and theoretical extensions*. Amsterdam: John Benjamins.
- Partee, B. H. (1965). *Subject and object in Modern English*. New York: Garland.
- Pinker, S. (1989). *Learnability and cognition: The acquisition of argument structure*. Cambridge, MA: MIT Press.
- Pinker, S. (1994). How could a child use verb syntax to learn verb semantics? *Lingua*, *92*, 377–410.
- Pinker, S. (in press). The stuff of thought: Language as a window onto human nature. Viking.
- Radden, G. (1985). Spatial metaphors underlying prepositions of causality. In W. Paprotté & R. Dirven (Eds.), *The ubiquity of metaphor* (pp. 177–205). Amsterdam: John Benjamins.
- Radford, A. (1988). *Transformational grammar: A first course*. Cambridge, UK: Cambridge University Press.
- Rappaport Hovav, M., & Levin, B. (1998). Building verb meanings. In M. Butt & W. Geuder (Eds.), *The projection of arguments* (pp. 97–134). Stanford, CA: CSLI Publications.
- Tettamanti, M., Buccino, G., Saccuman, M. C., Gallese, V., Danna, M., Scifo, P., et al. (2005). Listening to action-related sentences activates fronto-parietal motor circuits. *Journal of Cognitive Neuroscience*, *17*, 273–281.
- Tomasello, M. (2003). *Constructing a language: A usage-based theory of language acquisition*. Cambridge, MA: Harvard University Press.
- Tranel, D., Kemmerer, D., Adolphs, R., Damasio, H., & Damasio, A. (2003). Neural correlates of conceptual knowledge for actions. *Cognitive Neuropsychology*, *20*, 409–432.
- Tranel, D., Manzel, K., Asp, E., & Kemmerer, D. (submitted for publication). Naming static and dynamic actions: Neuropsychological evidence.
- Tranel, D., Martin, C., Damasio, H., Grabowski, T. J., & Hichwa, R. (2005). Effects of noun-verb homonymy on the neural correlates of naming concrete entities and actions. *Brain and Language*, *92*, 288–299.
- Van Valin, R. D. Jr., (2005). *Exploring the syntax–semantics interface*. Cambridge, UK: Cambridge University Press.
- Whaley, L. (1997). *An introduction to linguistic typology*. Thousand Oaks, CA: Sage.