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ARGUMENT STRUCTURE AND LEARNABILITY: IS A SOLUTION IN SIGHT?

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1. Introduction

Verbs that are similar in meaning are often similar in their syntax as well; that is, they share the set of syntactic frames they can appear in. But these regularities are not fully predictable—for any particular pattern, there are often "good candidate" verbs that behave exceptionally. A classic example is *donate*, which resists appearing in the double object construction despite its semantic and syntactic similarity to verbs that do allow it:

(1) a. John gave/ sent / bequeathed/ donated all his books to the charity.
b. John gave/ sent/ bequeathed/ *donated the charity all his books.

These exceptions create an intriguing learning problem for young children. In the course of language acquisition, learners clearly become sensitive to the syntactic frame patterns shared by sets of verbs, and they overgeneralize, producing combinations of verb and frame that adults find peculiar, for example:[1]

(2) **Dative Alternation** (cf. give Mary a book/ give a book to Mary; bake a cake for John/ bake John a cake)
a. C 3;1 ***I said her no.*** (Age shown in years; months)
b. C 3;4 ***Button me the rest.*** (Wants remaining snaps on pyjamas fastened.)

(3) **Locative Alternation** (cf. spray paint on the wall/ spray the wall with paint)
a. E 5;0 ***Can I fill some salt into the bear?*** (=bear-shaped salt shaker.)
b. E 4;5 ***I'm gonna cover a screen over me.***

(4) **Causative Alternation** (cf. the stick broke/ John broke the stick)
a. E 3;10 ***You staggered me.*** (After M pulls on E's arm when E stumbles.)
b. C 4;8 ***I saw a witch and she disappeared them.*** (Pretending some blankets have disappeared.)
c. C 12;3 ***Salt clings it together.*** (As C mixes playdough.)

When children make such errors, they receive little or no corrective feedback from adults (for discussion of this so-called "no negative evidence" problem, see Bowerman 1988 and Pinker 1989). Why then do they eventually stop?

This question has preoccupied researchers for more than a decade, and by now a number of solutions has been proposed. Several of these have been critiqued in previous works (Bowerman 1988, Pinker 1989) and I will not repeat these arguments here. Instead I want to explore the two lines of solution that at present seem to me to be the most promising. These are (1) Pinker's (1989) 'thematic core' approach, and (2) a cluster of usage-based mechanisms such as competition among forms, activation, strengthening, graded productivity, and category induction. I will examine certain key predictions of these approaches with the help of longitudinal spontaneous speech records from my two daughters, C and E, whose

argument structure overgeneralizations, such as those shown in (2)-(4), have formed the basis for much of the discussion in the literature. I will focus on novel causatives ((4) above), since the Causative is the argument structure alternation that gave rise to the largest number of errors over the longest period of time in C's and E's speech.

2. Pinker's (1989) 'thematic core' approach

2.1. The theory. According to Pinker (1984, 1989), errors like those in (2)-(4) reflect lexical rules that learners have formulated for converting verbs of one kind into verbs of another kind. To explain how children distinguish between verbs that do and don't undergo a particular argument structure alternation, Pinker depends critically on the observation that the sets of verbs that participate in a given alternation are not random—they share semantic and sometimes morphophonological properties as well.

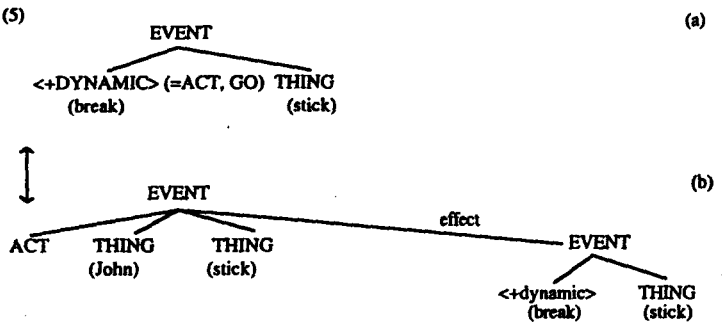
In an early crack at the problem, Pinker (1984) proposed that the learner's rule that converts, say, the prepositional object construction *give* NP_1 *to* NP_2 into the double object construction *give* NP_2 NP_1, or the intransitive NP_1 *break* into the transitive causative NP_2 *break* NP_1, is initially insensitive to the semantic and morphophonological properties of candidate verbs, so the rule is applied too broadly. Over time, however, the rule is annotated for various criteria the verb must satisfy and errors die out. For example, the rule for the Dative Alternation is annotated to restrict the double-object construction to verbs whose Goal argument specifies a "prospective possessor" of the Theme argument. The rule for the Causative Alternation is annotated to limit derived causatives to events of "direct" and "stereotypical" causation.

For reasons discussed in Pinker (1989) and Bowerman (1988) (the existence of verbs that satisfy the proposed criteria but still do not undergo the alternation; the seeming arbitrariness of the relationship between the rule and its associated semantic criteria; the puzzle of why a child would bother to further annotate an already adequately functioning rule), Pinker (1989) later rejected this hypothesis in favor of a more radical one: that lexical rules do not simply rearrange the arguments of a verb syntactically, but instead fundamentally change the verb's *semantic* structure. The new meaning automatically gives rise to a new syntactic structure via the application of simple and quite general linking rules (i.e., rules for linking arguments to syntactic positions), which Pinker proposes are innate.

To explain how children end up with rules that are properly constrained, Pinker makes a crucial distinction between *broad-range* and *narrow-range* lexical rules. The *broad-range rule* for a particular alternation captures what all the verbs that undergo the alternation have in common. It relates two "thematic cores"—conflations of semantic elements that define a kind of possible verb meaning. For example, for the Causative Alternation, the (bidirectional) broad-range rule looks

like this (Pinker 1989:223) (lexical content is added for readability):

(5)



The thematic core in (5a) can be paraphrased as "Y acts/ goes", e.g., *The stick broke.* The situation is stipulated to be a <+dynamic> event to capture the generalization that no verbs with BE or HAVE in their semantic representations causativize (Pinker 1989:223); causativization is thus ruled out for verbs of "existing and being in a place" like *be, exist, stay, wait,* and *have*. The thematic core in (5b) can be paraphrased as "X acts on Y, thereby causing Y to act/ go"; e.g., "John acted on the stick, causing it to break", or *John broke the stick.* In this construction the first argument of ACT links to subject position and the second argument to direct object position. This thematic core is responsible for the reading of "direct" or "unmediated" causation associated with lexical causatives: "direct" is the default interpretation of ACT, postulates Pinker.

But the broad-range rule by itself is not enough: it provides the NECESSARY conditions for a verb to alternate (the verb must be representable in terms of both thematic cores), but many verbs that satisfy its requirements still do not alternate. To account for this, Pinker invokes *narrow-range rules*: these are semantically more specific versions of a given broad range rule, and they pick out—from among all the verbs that satisfy the broad-range rule—semantically coherent subclasses of verbs that in fact actually do undergo the alternation. The narrow-range rules thus provide the SUFFICIENT conditions for a verb to alternate. For the Causative, there are two classes of verbs with an associated narrow-range rule:

a. Verbs of externally-caused change of physical state (*melt, open, break...)*
b. Verbs of motion taking place in a particular manner (*slide, skid, float, roll..*)

Classes that lack a narrow-range rule and so do not causativize include:
c. Verbs of motion in a lexically specified direction (*go, come, rise, fall, enter, exit, leave, arrive...*)
d. Verbs of coming into or going out of existence (*die, appear, disappear...)*
e. Most verbs of emission of lights, sounds, substances, and smells (*glow, glisten, sparkle, blaze, shriek, buzz, bubble, leak, ooze, bleed, smell...)*

f. Verbs of internally-caused state change (*grow, bloom, blossom...*)
g. Verbs of volitionally or internally caused actions (e.g. *jump, walk, talk, climb, eat, drink, sing*) (seeming exceptions like *gallop a horse* belong to a different alternation, according to Levin & Rappaport Hovav 1995)
h. Verbs of psychological activity (*remember, watch, guess, ache...*)
i. Most verbs of emotional expression (*smile, cry, laugh, frown, blink...*)

Many of these verbs—particularly those in classes e-i—probably do not causativize because they specify internally-caused events, so they resist the "directness" interpretation required by the broad-range rule (Levin & Rappaport Hovav 1995, Pinker 1989:133). But whether a verb specifies an internally-caused event is often not obvious *a priori*, and in ambiguous cases—e.g. especially classes e and f—different languages may take different stances on this (Pinker 1989:302).

For any particular alternation, the subclasses of verbs with an associated narrow-range rule are to some extent arbitrary. How then do learners identify them? Pinker hypothesizes that children *build these subclasses from the ground up*. That is, from the beginning, they generalize the privilege of alternating *only to verbs that are closely similar in meaning to*—i.e., are members of the same subclasses as—verbs they have already heard alternating (see Pinker 1989:273-80 for discussion of the mechanisms that ensure this.) Narrow- and broad-range rules develop in tandem, the former through a bottom-up process of generalizing to the boundaries of each narrow-range class, and the latter through a top-down process of abstraction over narrow-range verb sets displaying the same alternation. There is, then, no period in which the broad-range rule operates without being constrained by the narrow-range rules—the child's rules are correct from the start.

But why then do children make errors like (2)-(4)? For two reasons, proposes Pinker (1989:292ff, 350): **1. One-shot innovations.** Speakers of all ages sometimes use broad-range rules creatively on-line to produce forms that are not licensed by any of the narrow-range rules associated with them. This may occur in children more often than in adults for a variety of reasons; e.g. children may innovate to extend their communicative resources when they don't yet know the more appropriate verb an adult would use, or cannot access it at the moment. One-shot innovations are not actually licensed by the speaker's grammar, so they do not require any specific unlearning. (See also Braine & Brooks 1995 for a similar proposal.) **2. Incorrect verb meanings.** Some errors are due to the child's assigning an incorrect meaning to a verb, either temporarily or stably over time, in a way that causes it to be paired with an incorrect argument structure. When the child fine-tunes the verb's semantic representation, errors will automatically cease.

2.2 Evaluating the 'thematic core' theory

Pinker's theory is admirably explicit, closely argued, and undergirded with a well-developed theory of lexicosemantic structure. But is it true that learners' lexical rules are appropriately constrained from the very beginning, so that no after-the-fact pruning and correction—the process that has been so hard to explain in light of the "no negative evidence" problem—is needed?

The success of the theory depends on the accuracy of many interacting assumptions. Several of these are controversial. For example, the theory requires children to have innate access to linking rules, but explicit tests of this hypothesis

have found no evidence for such knowledge in very young children; the data suggest instead that knowledge of linking is acquired over time on the basis of linguistic experience (Bowerman 1990, Brinkmann 1993, in press). The theory also requires children to be sensitive to syntactically relevant semantic subclasses of verbs from the start, since they must never generalize beyond these, but explicit tests of this hypothesis have also proved negative (Braine & Brooks 1995; Pye & Loeb 1995; see also Ingham 1992). These negative results do not disconfirm the theory, but they do tend to undermine it.

In this paper I want to question another aspect of the theory: can children's errors like those in (2)-(4) really be "explained away"—as the theory requires—either as one-shot innovations licensed by the broad-range rule or as a consequence of incorrect verb meanings? Or do they instead indicate—just as researchers had originally assumed—that the child's grammar is overly general, sanctioning constructions beyond those that the adult grammar allows? Let us examine how well Pinker's hypotheses can account for the novel causatives produced by our two language learners, C and E.

Novel causatives followed a very similar course in the children's speech: they appeared around age two, flourished—especially for C—between about three and five, and then continued at a lower level until about age twelve, after which they ceased (total number of recorded errors: C: 225 tokens, 79 types; E 92 tokens, 54 types). The children made many errors with verbs from all the noncausativizable classes listed above, and they also erroneously causativized verbs and adjectives used to express "externally-caused changes of physical state", a class for which there is a narrow-range rule. Their errors are summarized in the Appendix.

The very quantity, variety, and persistence over time of these novel causatives seems rather at odds with Pinker's theory—is this profusion of errors really compatible with the view that the learners' grammars were perfectly adult-like? The presence of multiple errors in the "externally-caused change of physical state" class is also troubling: this class is supposed to causativize, so how can the child figure out that intransitive verbs like *overflow* do not? (cf. *You're gonna overflow the spoon with medicine*, C 6;7). (See also Braine & Brooks 1995 for a more general discussion of negative exceptions to Pinker's causativizable subclasses.) Most of the errors listed in this category involve adjectives, which are not in themselves state-change predicates; they are stative, i.e. <-dynamic>, and so do not qualify directly for the broad-range rule. But of course many adjectives do have a corresponding causative verb (*The milk is warm; Mary warmed the milk*). If they do, they also have an intransitive state-change counterpart (*The milk warmed slowly*), and it may be this that serves as the base for the transitive, at least in adult grammars. In any event, Pinker gives no account of how children determine which adjectives can be used to express a caused state-change and which cannot.

Although Pinker hints that incorrect word meanings could explain at least some of children's novel causatives (1989:325), he makes no concrete suggestions about this (most of his evidence for this process revolves around the Locative Alternation). It is indeed not clear what could be wrong with the meaning of most of the words shown in the Appendix that would make them susceptible to causativization. Especially resistant to this interpretation are errors with frequent verbs like *come*, *go*, *disappear*, and *stay*, which occurred over a long period of

time. This puts the major burden of explanation for novel causatives on Pinker's "one-shot innovation" hypothesis—the idea that the errors result from the creative on-line use of the broad-range rule, perhaps especially under communicative pressure when the child doesn't know or can't remember a better verb. But the persistence of many of the errors also argues against this explanation: e.g. C causativized *stay* (e.g., ***stay the door open***) at least 43 times between the ages of 2;4 and 10;4, long after she knew—and usually used—the more appropriate verbs *keep* and *leave*; and she causativized *go* at least 28 times between the ages of 2;8 and 7;11, long after she knew verbs like *take* and *send*. Sometimes the erroneous causativization of a verb did not set in until well after the correct form had already been established in the child's speech; even so, the novel form was in a few cases powerful enough to temporarily almost supplant the correct form (Bowerman 1974).

A second critical problem for the "one-shot innovation" hypothesis is that many errors fall outside the scope of the broad-range rule that is supposed to govern them. Recall that Pinker's basic strategy for solving the learnability problem associated with argument structure alternations is to insure that the child never generalizes too broadly to begin with, and so has nothing to repair later. In pursuit of this goal, Pinker formulated the broad-range rule for the Causative Alternation ((5) above) as restrictively as the facts of adult English will allow. First, **the caused event must be <+dynamic>** (i.e., the verb must have ACT or GO in its semantic representation); second, **the causing event must involve an ACT** whereby an agent impinges on a patient; third, this act must bring about the caused event **"directly"**. C and E repeatedly violated all three constraints: they often causativized <-dynamic> verbs (examples 6a-e below and 4c above); they causativized when the causing situation cannot be conceptualized as an "act" by any stretch of the imagination, not even the metaphorical impingement of an actor on a patient (examples 6b,c,f); and they causativized when the causation was clearly indirect; i.e., when a physically or psychologically active animate causee mediated between the agent's act and the resulting event (examples 6g-k).

(6) Violations of the broad-range rule for causativization
a. C 5;5 ***I meant to be it like this.*** (=have it be. Showing with her hand how she had intended an unsuccessful styrofoam Christmas tree to turn out.)
b. C 4;5 (C making a drawings to bind as a book; upset with a poor picture.) ***This one is yukky! Be it for a picture.*** (=let/have it be [only] a picture) (M: *Hmm?*) C: ***Be it for a picture, I don't need a book.***
c. E 7;11 ***I was used to turning it [TV] on a channel and being it on a channel.*** (=keeping it, letting it continue to be...)
d. C 2;11 ***Maybe they had a cold and the cold stayed them awake.*** (=kept.)
e. E 6;7 ***Now I'm going to have you a lesson.*** (=give.)
f. C 3;1 ***Is this to climb her up?*** (=enable her to climb up. C looking at picture of a hippo at the bottom of a ramp leading into a truck, pointing to the ramp.)
g. E 3;3 ***Will you climb me up there and hold me?*** (Wants help climbing a pole.)
h. C 10;5 (C doing a trick; explains that the magician must first make everyone feel a marble hidden under a scarf:) ***First you have it, and you feel it to everybody.*** (=make/ have everybody feel it.)
i. C 4;3 ***Andrea, I want to watch you this book!*** (Trying to get a friend to look at a book she is holding.)

j. C 3;3 (C has drawn a puzzle.) M: *Do you think Daddy can guess that one?* C: *I'm gonna guess it to him!* (=have him guess it. Runs off to find F.)
k. E 3;2 *Everybody makes me cry.* (F: *I didn't make you cry.*) *Yes, you did, you just cried me.*

Causatives like (6g-k) were relatively infrequent—most errors with verbs of volitional or semivolitional action, like *climb*, *walk*, *swim*, *eat*, and *cry*, involved dolls and other toys that could not really carry out the action independently. Noting this, Pinker (1989:302ff) argues that this shows that children ARE sensitive to the "directness" constraint: if they were not, they should produce many more of these errors than they do, given the pervasive role of forcing, urging, threatening, and persuading in parent-child interactions. But Pinker's argument is only valid if children do in fact talk frequently about such events. If they seldom do, even using periphrastic causatives (e.g. *She made me laugh*), then the relatively low numbers of novel lexical causatives like *She laughed me* would reflect only the low number of opportunities to make such errors, and would tell us nothing about children's sensitivity to "directness" in lexical causatives.

To explore this issue, I compared the number of novel lexical causatives in C's and E's corpora to the number of opportunities to produce them (calculated as the sum of novel lexical causatives plus the sum of periphrastic causatives with *make*, *get*, or occasionally *let* where *let* seemed to mean *make*) for **noncausativizable verbs** of three different types: 1) volitional and semivolitional actions (e.g. *climb, crawl, jump*; *laugh, giggle, cry*), taking into account ONLY utterances referring to events with a **truly animate, active causee** (i.e. not a doll or other inanimate, 2) verbs of motion in a lexically specified direction (e.g. *go, come, fall, rise*), and 3) verbs of coming into/ going out of existence (e.g. *disappear, vanish, die*). If Pinker's argument is correct, the proportion of lexical causatives to all causatives should be significantly lower for verbs in the first class than for verbs in the second and third classes, since the first seriously violates Pinker's "directness" constraint, while the second and third do not. The results are shown in (7):

(7) Proportion of novel lexical causatives out of all causatives (novel lexical plus periphrastic) belonging to that class in the data base

C:	1. Volitional and semivolitional actions:	70%	14/20
	2. Motion in a lexically specified direction:	74%	45/61
	3. Coming into/going out of existence:	58%	14/24
E:	1. Volitional and semivolitional actions:	55%	6/11
	2. Motion in a lexically specified direction:	76%	26/34
	3. Coming into/going out of existence:	63%	5/8

The children talked infrequently about the causation of volitional and semivolitional actions. But when they did, they used novel lexical causatives no less often (C) or only slightly less often (E) than when they talked about events that do not violate "directness". Consistent with this, Pye & Loeb (1995) found that children in an elicited production study were just as willing to causativize volitional action verbs as change of state verbs and verbs of motion in a lexically specified direction. Contrary to Pinker, then, children's rule for causativization does not seem to be restricted to events involving "direct" causation.

To summarize, children do not abide by the constraints of Pinker's proposed broad-range rule for the Causative Alternation. For learners, causativizing an intransitive predicate seems to require little more than that the predicate describe a situation that can be conceptualized as being "caused" (see also Bowerman 1974, 1982a, Gergely & Bever 1986). But if this is true, then accounting for why children eventually stop producing novel causatives will, after all, require—counter to Pinker's (1989) approach—explaining how they 'cut back' on a causativizing operation that is overly general.

3. Cutting back on novel causatives.

3.1. Usage-based mechanisms. Among researchers who have assumed that recovering from argument structure errors involves cutting back, attention has often focused on usage-based factors like competition among forms and the induction of schemas or categories. Three mechanisms of special interest are the following:

-Preemption by competing forms. Through processes of strengthening or blocking, *kill* will come to preempt causative *die*, *bring* will preempt causative *come*, and so on (Clark 1987, MacWhinney 1987, Pinker 1984, Pye & Loeb 1995). (Pinker 1989:290-293 also assigns preemption an important role: once forms like *kill* and *bring* have been strengthened enough, there will be no need for the child to make one-shot innovations to plug the gaps associated with their absence.) Of course, not all noncausativizable verbs have a suppletive causative counterpart—cf. *disappear*. For these verbs, it has been proposed that the child's causative might be preempted by the corresponding periphrastic causative, e.g. *make disappear*. But the extension of preemption to these cases seems somewhat dubious (Bowerman 1988): lexical and periphrastic causatives are, as constructions, systematically associated with different meanings, so a child should not readily allow one to be supplanted by the other.

- Induction of the relevant semantic subclasses of verbs. Some researchers have proposed that semantic subclasses indeed play a role in restricting children's errors, but that—contrary to Pinker (1989)—they are not the immediate outcome of *initial* generalization; rather, they are learned inductively over time (e.g. Goldberg 1993). Although Pinker embraced this idea in his 1984 book, he later discarded it as unfeasible. But the mechanism takes on renewed plausibility with rising interest in construction grammar (e.g. Goldberg 1995) and network-style theoretical approaches to morphology (Bybee 1985, 1988), and with the success of recent connectionist simulations of category induction (see Schütze 1994 and Ping & MacWhinney 1996 for studies relevant to verb syntax and morphology).

- Repeated exposure to a verb only in its appropriate syntactic frame(s). The idea here is straightforward: repeated exposure to the appropriate frame(s) for a verb strengthens the association between verb and frame to the point where the correct frame consistently wins out over the incorrect frame generated by the child's too-broad schema (Braine 1971, Braine & Brooks 1995, MacWhinney 1987). This mechanism leaves the schema itself intact, so it can still be applied productively to novel verbs.

In work in progress, William Croft (University of Manchester) and I have drawn on these and other ingredients to construct and begin testing a possible

scenario for the acquisition of the Causative Alternation: 1) First, individual verbs are learned with (a subset of) their correct argument structures (transitive, intransitive, or both (Bowerman 1982a). 2) Next, the lexical causative is overgeneralized across a wide range of forms and semantic classes. (The child has observed a high enough type frequency of low enough token frequency forms that alternate to merit building a schema for the alternation. This schema—which varies in strength (i.e. productivity) across children (Maratsos et al. 1987)— is broader than Pinker's 1989 broad-range rule for the Causative Alternation, since it has to encompass utterances like those in (6) above.) 3) Errors abate or cease with verbs with high frequency suppletive causative forms (e.g., *kill* for *die*). (Frequency in the input strengthens entrenchment. The removal of specific forms from the schema "bleeds" (weakens) the more abstract schema for causativization.) 4) Semantic constraints are acquired, so that fewer and fewer errors occur outside semantic subclasses whose members mostly causativize. (The input has begun to more densely populate narrowly semantically specified areas of semantic space. Within those areas, lower-level subschemas become entrenched, which also "bleeds" the more abstract schema.) Somewhere around this time, less-frequent suppletive causatives become entrenched, e.g. *remind* replaces causative *remember*. 5) The last errors to fade out involve noncausativizable predicates that are in the right semantic ballpark and have no suppletive counterparts (e.g. *disappear, small*). These are the last to go because the only mechanisms working against them are a) the overall weakening of the abstract schema through "bleeding" (see 3, 4) and b) the strengthening of the association between the verb and the intransitive frame through repeated exposure.

3.2. Testing these mechanisms. Is it indeed true—as virtually everyone has assumed—that errors abate earlier for verbs with suppletive causative counterparts than for verbs without them? And do they fade out earlier for verbs that are semantically distant from the core classes of causativizable verbs than for those that are semantically closer? In preliminary work, Croft and I have tested these two predictions using the speech corpora from C and E. Surprisingly, there is relatively little support for either prediction!

Role of suppletives: Figures 1 and 2 show the frequency over time of novel lexical causatives with and without suppletive counterparts in the children's speech. If the existence of a suppletive works to suppress a child's tendency to erroneously causativize an intransitive verb, the line representing errors with verbs that have suppletives should decline more rapidly than the line representing forms that do not. This is roughly true for E (in fact, she simply made fewer errors at all on verbs with suppletives), but not at all for C: for this child, forms with and without suppletive counterparts declined largely in parallel.

Role of semantic classes: Figures 3 and 4 show the frequency over time of novel causatives in each of several different semantic classes (certain classes shown in the Appendix are collapsed here). The first three bars at each time period represent predicate classes that are semantically close to the core causativizable verbs classes. The first bar in fact represents idiosyncratically noncausativizable members of the two core class: *externally-caused state change* and *manner of motion*. The second and third bars represent verbs of *motion in a lexically specified direction* and verbs of *coming into/ going out of existence; existing, being in a place/ state*: verbs in these two classes are similar to core causativizable verbs like

break in that they all are unaccusative (Levin & Rappaport 1985). The last two bars at each time period represent verbs that are **semantically distant** from the core classes: verbs of *emission* and *internally-caused state-change*, and verbs of *volitional (agentive) action* and of *emotional expression* and *psychological events* (for this calculation, references to events with both animate causees and dolls, etc., are included). If the induction of semantic categories is important in children's retreat from causative overgeneralizations, the last two bars (semantically distant) should decline faster than the first three bars (semantically close). But the results are at best equivocal: verbs of *emission* and *internally- caused state-change* (fourth bar) do tend to fade out early, though they are never very frequent to begin with, but errors with verbs of *volitional action*, *emotional expression*, and *psychological events* (fifth bar)—the classes that violate the directness constraint most egregiously—hold their own over time against the first three classes remarkably well.

4. Implications

Our failure to find crucial evidence for the power of preemption by suppletive forms is perplexing, given the starring role this mechanism been assigned in most treatments. And if preemption by suppletives is not very potent, then preemption by periphrastic causatives (*make disappear* for *disappear)* is likely to be even less effective, given the poorer semantic match between the two forms. All would be well if our second candidate mechanism for suppressing errors were to fill up the void, but induction of semantic categories seems to offer only feeble assistance at best. The main mechanism left to turn to is the one that remains when preemption and semantic category induction are set aside: the repeated registration of noncausativizable verbs only in an intransitive syntactic frame, until the association between verb and frame becomes so strong that it consistently prevails over the tendency to causativize. In Croft's and my proposed model this mechanism played a relatively humble role, serving mostly to clean up stragglers left over after preemption and semantic category induction have done their job. But it may, after all, turn out to be the most powerful force working to eliminate errors with the Causative and perhaps other argument structure alternations.

It is important to recognize, however, that this mechanism cannot be the sole solution to argument structure errors: this is because there are several genres of overgeneralization against which it is helpless. Consider, for example, the utterances in (8):

(8) Odd combinations of verb and result complement (Bowerman 1982b)
a. C 3;8 ***I pulled it unstapled.*** (After pulling stapled booklet apart.)
b. C 4;0 ***I'm patting her wet.*** (Patting sister's arm with a wet hand.)
c. C 6;2 ***...whenever I breathe, I breathe them down.*** (Trying to set up a village of paper houses.)
d. C 3;10 ***Untie it off.*** (Wants M to take piece of yarn off her tricycle.)
e. E 2;0 ***Catch me in.*** (Wants M to scoop her up between two boxes.)
f. E 3;11 ***She jumped it off for Jennifer and Christy.*** (Adult has jumped up to pull an icicle off the eaves.)

These utterances are modeled on adult English constructions with result-complement adjectives and particles, e.g. *pat smooth, rub dry, wipe clean, chop down, pull up, throw in,* and *tie on.* But they sound distinctly peculiar to adults.

Note that there can be no help here from preemption. Do children then eliminate such errors simply by repeatedly registering which complements have been heard with each verb (analogous to registering which syntactic frames a verb like *come* has been heard in)? This mechanism cannot be the right solution: eventually it would lead to the complete shutdown of productivity, but the combination of verbs with novel result complements is highly productive in English (see Goldberg 1995): cf. ***They yelled themselves hoarse*** and ***I sneezed the napkin off (the table).***

It is likely that to end up as an adult who can innovate, but who no longer produces constructions like those in (8), the child must discover subtle semantic and morphological constraints governing the combination of verb and complement. And this suggests an interesting possible relationship between the semantic/ morphological properties of predicates and their syntactic behavior. Patterns for which children can in principle unlearn errors simply by repeatedly hearing the pairing of verb and appropriate argument structure, such as the Causative Alternation, can tolerate many exceptions to the semantic and morphological categories associated with them (recall, for instance, that there are state-change and manner-of-motion predicates that do not causativize). But patterns for which this mechanism will not work, like the combination of verb and result complement, must be constrained more consistently by semantic or other properties. This is because children require such consistency in these cases, since otherwise they have no way to stop making errors without sacrificing productivity altogether.

NOTES

1. From Bowerman 1974,1982a,b and unpublished records; see also Pinker 1989.

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Appendix: Verbs and adjectives used by C and E as novel lexical causatives

1. EXTERNALLY-CAUSED STATE-CHANGE/ MANNER OF MOTION

C **(37 errors, age 2;0 - 10;3)** full (6), flat, dirty, stuck [=make clogged], unstuck [=make unclogged] (2), sharp, straight, unstraight, stable, round (5), yellow, stick [=make stuck, jammed], fasten [=make go fast] (2), bigger, smaller, smallen, largen, longen, sour, colder, separate (adj. pronunciation), face, overflow (2), slip [=make someone slip] (2)

E **(11 errors, age 2;3 - 7;8)** tight, untight, broken, full (2), round (2), bumpy, hot, smallen, largen

2. MOTION IN A LEXICALLY SPECIFIED DIRECTION

C **(45 errors, age 2;0 - 9;8)** go (28), come (7), fall (5), rise, cross (3), higher

E **(26 errors, age 1;10 - 7;8)** go (12), come (4), fall (7), cross (2), higher

3. COMING INTO OR GOING OUT OF EXISTENCE

C **(13 errors, age 2;8 - 12;4)** peek out, spell [make letters on a spelling toy spell __], die (2), disappear (6), vanish (2), lose turn

E **(6 errors, age 3;7 - 11;11)** spell [cf. above], dead, disappear (2), subside (2)

4. EXISTING, BEING IN A PLACE OR STATE

C **(59 errors, age 2;1-11;3)** be (9), have (5), stay (43), take too long, lie around

E **(8 errors, age 3;7-11;7)** be (2), stay (3), have, wait, lie around

5. EMISSION

C **(10 errors, age 3;0-6;7)** bleed, sweat (3), sing [of music box] (2), squeak, squeaky, whistle (2)

E **(9 errors, age 2;11-10;2)** bleed (2), water [eyes], sing [of musical instruments] (2), talk [of music box], glow, bubble, leak

6. INTERNALLY CAUSED STATE-CHANGE, SITUATION (cf. Levin & Rappaport 1985)

C **(5 errors, age 3;6-12;3)** bloom (2), grow [feet], cling together, soak in

E **(1 error, age 3;8)** stick [=make adhere]

7. VOLITIONAL (AGENTIVE) ACTION, EMOTIONAL EXPRESSION, AND PSYCHOLOGICAL EVENT

C **(57 errors, age 2;3-11;3)** climb, crawl, jump (8), skate, ride (3), walk, drink (2), eat (3), guess, laugh, learn, play [=make act a part], remember (4), watch, feel, touch (2), turn a somersault (3), do a trick, take a bath, take little bites, take a ride (3), take a quiet time, take a walk, get [=cause to receive] (2), lie down (3), sit (3), itch, feel better (4)

E **(32 errors, age 1;11-10;11)** ride, swim, climb, stagger, cry (3), drink, giggle, talk (4), walk, watch, take a ride, take a walk (2), lag, bow down, sit down, perform, remember, recognize, learn, itch, ache (2), sore, happy, comfy

Figure 3. Frequency (in tokens) over time of novel lexical causatives in different semantic classes in C's speech

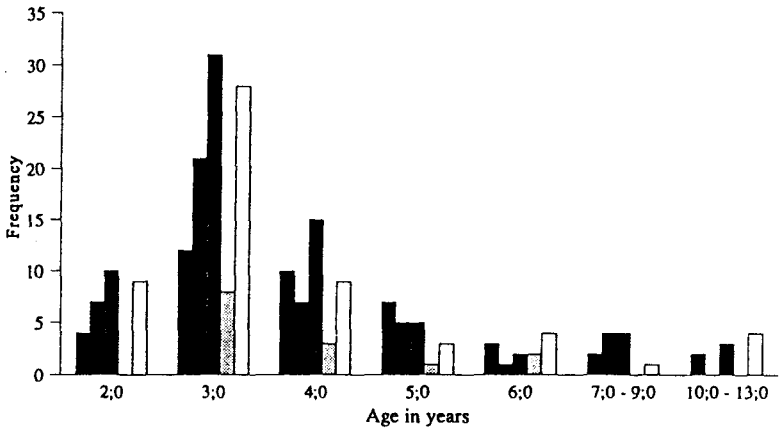
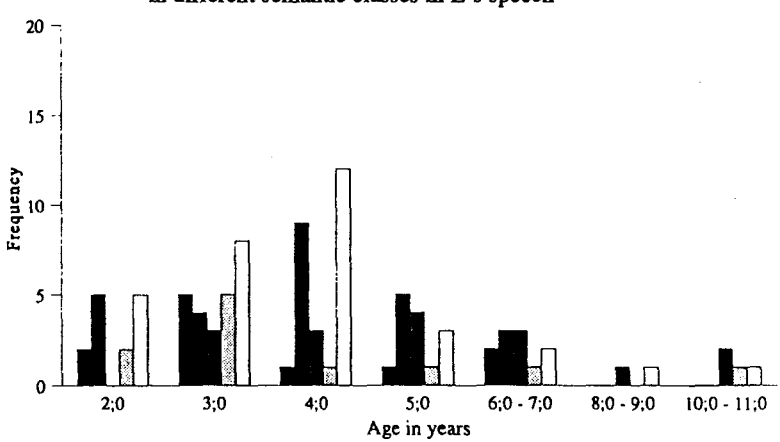


Figure 4. Frequency (in tokens) over time of novel lexical causatives in different semantic classes in E's speech



- Externally-caused state-change, manner of motion
- Motion in a lexically specified direction
- Coming into or going out of existence, existing, being in a place/state
- Emission and internally-caused state-change
- Volitional (agentive) action, emotional expression, and psychological events

Figure 1. Frequency (in tokens) over time of novel lexical causati with and without suppletive counterparts in C's speech

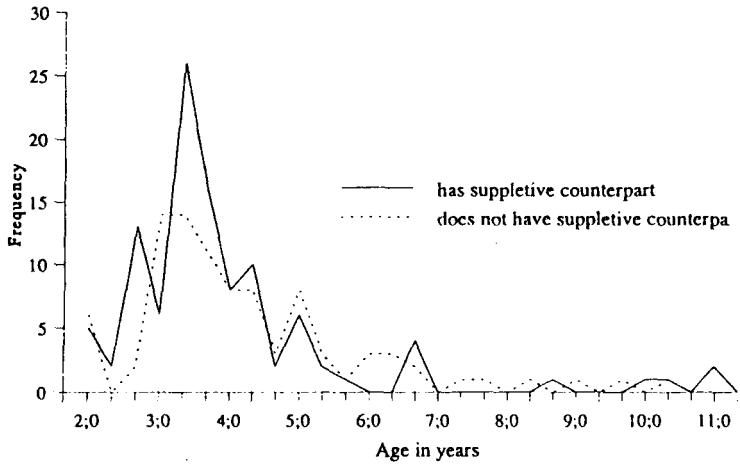
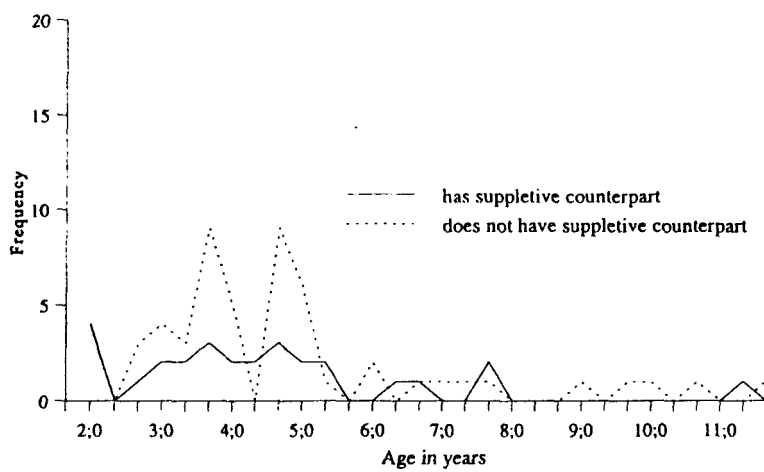


Figure 2. Frequency (in tokens) over time of novel lexical causatives with and without suppletive counterparts in E's speech



Note: Excluded from Figures 1 and 2 are causative uses of *go* where adults would use vario manner of motion or state-change verbs (e.g., *you go it in* [request for mother to *push* chair in at table]). These seem to occupy an ambiguous middle ground between havi and not having a suppletive counterpart (i.e. there *are* lexical alternatives to the child causative *go*, but they do not have a consistent one-to-one or even few-to-one relatio with it).