

Some New Perspectives on Lexical and Functional Categories: Revisiting Brown's 'Fourteen Grammatical Morphemes'

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Opening Remarks

I'd like to start off by sharing something my 14-year-old son said to his sister just this morning while I was preparing this talk. He said: '*Why hasn't she *weared her watch?*' I corrected him: 'you mean *worn*'. 'Yes, I know' he said: 'I just couldn't find the word'. I responded: 'too many wh-sounds got in the way, perhaps?'

What's funny about this little exchange is that my son's linguistic intuition is quite right. Irregular verbs such as 'worn' (for past-participle of 'wear') in fact have to be 'found' and 'retrieved' directly via brute memory. (For whatever reason, memory failed him at this instant and all he had recourse to was the ol' sure escape: the [stem + {ed}] rule by default). Also, the idea of other processes such as phonology (e.g., too many 'wh-sounds') getting in the way sits well within current psycho-linguistic modeling.

What's particularly nice is that linguists are now in the unique position of being able to understand just how such mistakes take place in the brain.

I have three points on my mind here:

- (1) To talk about this [stem+affix] processing,
- (2) To review the morpho-syntactic literature of the past 40 years, forming as our point of reference the classic Brown list of 'Fourteen morphemes and their order of acquisition',
- (3) To question old assumptions as based on this list.

Finally, I conclude with some data.

Within the last fifteen years or so, a very short period of time, linguistics and linguistic theory has achieved more to put the 'language question' on a 'biological-basis' footing than in any other time. Naturally, this shift has come out of technological advances, many of which initially had no language based implications. Recent Brain Imaging (BI) Studies made using fMRI, and ERPs have shown for the first time, in real time, the activation and mapping that proceeds in the brain during specific language tasks, e.g., word retrieval and production, regular vs. irregular grammatical formations, semantic anomalies, differences between verbs and nouns, etc. Advances in any science are always welcome. However, something gained (on one hand) usually translates into something lost (on the other hand). It could be said that a tension has emerged due to this gain-loss exchange, whereby traditional theory might need to be reevaluated as evidenced by new theories proposed about the brain/language processing. This tension is perhaps most evident with regards to syntactic theory. In particular, the question that now emerges is (i) how to reconcile what has been

long accepted in theory with (ii) differing facts about that theory as evidenced in brain processing. For instance, the production of an affix morpheme (e.g., [add {ed}] for past tense) has long been held as a ‘rule’, independent of any frequency-based association. This may now have to be reconsidered in light of some studies which show that *high frequency* {ed} process differently from *low frequency* {ed}. Another example might be regarding morphology itself. Studies now indicate that one shouldn’t just group morphology together as one type of processing system which is rule-based throughout. BI studies now show, for example, that derivational morphology may in fact be frequency-driven and processed accordingly as opposed to inflectional morphology which is rule-based—notwithstanding the aforementioned quarky high frequency-driven {ed} which is indeed considered inflectional. You get the picture: tensions and overlaps in theory abound.

The separation question.

The question as to how children come to separate [stem+affix] is just one of the many pieces of the learnability puzzle. Accounts to the problem vary, but most fall somewhere on the spectrum of either a ‘bottom-up’ account (which utilizes frequency and pattern association), to a ‘top down’ account (which makes use of rules). Any account will have to explain how the child comes to process *walk-s* as [stem+affix], but *dance* as [stem-only] (both being of a CVCC phonological ‘stream’ as found in the input). One commonsense approach might be to say that young children actually work backwards in realizing that there is a decomposed stem *walk*, but not a stem **dan*.

(A kind of statistical learning)

If so, we might expect a young child to first produce such affix related items as *un-decomposed wholes*, only to delete them at a later stage of development when separation takes place. (*Note*: the matter is not whether or not a child produces an affix, but whether or not the child is being productive with the given affix (i.e., they add or delete affixes in natural speech)).

(We might want to suggest that separation, the pulling apart of concatenate stem+affix is the result of differing modular brain processes).

There is some evidence for early un-decomposition to the extent that some children seem to follow a ‘U-shape’ learning curve for affix morphology. For instance, with plural nouns, there are data showing that some children pass from saying things like *two socks*, to saying things like *two sock*, returning later to *two socks* (similar to what we find with over-regularizations *went*→*goed*→*went*.) There is some evidence that nouns and verbs behave differently here. In any case, however, most children never pass through this u-shape learning, are rather conservative, and pass through an initial stage where they only delete the required affix (for both nouns and verbs).

(Phonological examples include the progression of pretty>bidi>pretty, taken from the Leopold study. See Appendix of this paper).

Other points

- There is a ‘brain-basis’ (biological basis) for language. This wasn’t always the case. Earlier linguists were mostly concerned with language as a ‘classificatory’ system.
- Child’s grammar is a real grammar onto itself. This wasn’t always the case. Earlier attempts to deal with language development squarely put the child’s grammar on the same footing with adult grammar, accounting for surface errors in an unsystematic way.

· Taking these two stands together, we now are in a position to account for the child's autonomous grammar, (i) as a real grammar onto itself, and (ii) in ways that reflect the child's maturational development of the brain.

Overview

- [1] In this brief paper, we unpack Roger Brown's classic list of 'fourteen grammatical morphemes and their order of acquisition'. We review the nature of this classic 'Functional/Lexical' dichotomy in light of the observed delayed onset of AGR(ement) morphology. The paper's main goal is to question how we go about accounting for apparent affix-related morphology found in an otherwise 'agreementless' stage of child grammar. Finally, we question the mental processes involved in [stem+affix] realization and synthesize our findings within recent advances made in Brain Imaging Studies (BIS).
- [2] [Data: We won't talk in percentages. We rather ask what might be happening in a particular instance. Data taken from (early) Braine and (recent) Galasso show a possible reinterpretation of what Brown suggested to be early instances of morphology found in his stage-2 data. (We will refer to Brown's early multi-word stage-2 (MLU ≤ 2.5) as our lexical stage-1).]

Introduction

- [3] We begin by accepting as our point of departure the view that the brain partitions language into two fundamentally different processes, roughly correlating to Broca's area (for more abstract rule-based/AGR computational tasks) vs. Wernicke's area (for memory-based tasks) (Grodzinsky 2000). This partition is seen as a natural overlap onto what had been the traditional cut between Functional vs. Lexical Categorization (respectively). (See 'Words & Rules Theory' (Pinker 1999)—The theory can be taken as a contemporary interpretation of the classic 'Skinner-Chomsky' debate (Chomsky 1959)).
- [4] The Functional/Lexical dichotomy can be easily captured by what I call the 'Sally Experiment':
- a. Sally wear-*s* strange sock-*s* (not (final) positional deletion, cf. b)
 - b. Mrs. Sally is a nice girl who walk-*s* to dance class once a day.
- /s/ /s/ /s/ /s/ /s/ /s/ /s/ /s/

In L2 contexts (ESL), the italic functional /s/ may optionally delete, but not the underlined lexical /s/. The experiment shows the processing distinctions between what is idiomatic/rote-learned (lexical) and what is a rule computation (functional).

Question: How is it that the child comes to 'know' that *walk-s* is a [stem+affix] product, but that *dance* is a [stem-only] product—both being a CVC{/s/} structure?

- [5] This 'functional/lexical cut' has been extensively written about in the child language literature, where theories have been posited claiming that young children initially go through a lexical stage-1 during which they omit functional inflection, only later entering into a functional stage-2

(I cite some work here (Brown (1958), Brown, Fraser & Bellugi (1964), and more recently Radford (1990), Wexler (1994), Galasso (2003)).

It seems children start with the simple operation of 'merge stems' (forming an XP), and only later do they gradually come to the more abstract operation 'move affixes'. Broca's area seems to be exclusively implicated with *move* operations (not *merge*) (Grodzinsky,

Friederici, (2006), Galasso (2007)). AGR(eement)-based affix-morphology is a *move* operation.

(Merge $X \rightarrow Y$ ($V, N = VP$) Move $WX \rightarrow YZ$ (Agreement) (two items on left))

- [6] A lexical stage-1 is characterized by the absence of functional material such as Determiners (*the/this/that*), Auxiliaries (*do, be, have*) and Modals (*can/could, shall/should, etc*). In addition, AGR-based/movement inflection such as Tense, Case, Number is absent.
- [7] Problem: If a [-AGR] ‘affix-less’ lexical stage-1 model is correct, as assumed, we then have to explain how an apparent overlap exists whereby early MLU onsets of affix functional morphology manifest at the otherwise hypothesized lexical stage-1 (as shown in Brown’s list below). (What we mean by ‘overlap’ is that it appears functional affixes come on-line at an otherwise assumed lexical stage of development. Stage-1: MLU 2.5/or below).
- [8] Solution: While such an overlap may be transparent enough, as Brown’s list shows, it may be that dichotomies are never as strict as we wish them to be—viz., when what appears to be a ‘functional’ representation actually gets processed via ‘lexical’ means (and potentially *vice versa*). Again, this is best illustrated by looking at Brown’s first items on his list. There is good evidence in the child language literature to suggest that some of these early onsets of what appear to be functional affix-morphology can be called into question, opening-up claims that there needs to be a refinement over how to define seemingly affix-bound INFL(ectio)nal morphology early-on in an otherwise non-inflectional, lexical stage of child development.
- [9] In other words, we wish to make a distinction between seemingly (i) ‘Lexical’ Meaning INFL—resulting from mere frequency of input or via semantic marking—and (ii) true rule-based ‘Syntactic’ Meaning INFL. As we shall show below, when the child named ‘Eve’ (of the Brown study) says e.g., ‘*two chair*’, ‘*one blocks*’ or ‘*where mommy going?*’ we can’t equate Eve as having an adult target grammar for [‘number’ on noun] or [‘progressive’ on verb]. We can only claim for adult grammar when we have evidence of the appropriate AGR-relation (e.g., ‘**two** chair-**s**’, ‘**one** block- \emptyset ’, ‘where **is** mummy going?’). There fact that affixes {s}, {ing} emerge is not evidence in of itself for an AGR-based functional INFL. (§§27, 34).
- [10] Hypothesis: After close examination of the first items acquired on the Brown list, we suggest that a better way of describing the classic lexical/functional dichotomy is to redefine the underlying affix processing distinction as either belonging to an AGR(eement)-based computation (i.e., Functional INFL), or a NON-AGR-based relation (Lexical INFL).

The Literature

- [11] The literature over quite a span makes available to us such [-AGR] defining formulas:
- (i) **Autoclitic** (by 1st generation developmental linguists (Skinner, Brown))
 - (ii) **Lexical Inflection** (by 2nd generation developmental linguists (Radford))
 - (iii) **Undecomposed** (by neuro-linguists (Pinker, Clahsen)).
- [12] For example, Radford (1990) suggests that ‘Lexical’ inflections (as opposed to ‘Functional’ inflections) should be defined as scheme affix morphologies without recourse to the more abstract AGR relation. Functional inflection is triggered only by the appropriate features of the counterpart functional class. For example, ‘ing’ verb constructions without the necessary

AUX(iliary) ‘Be’ might be one instance of a lexical inflection whereby the ‘ing’ may simply mark the semantics [verbal [present action]] (e.g., *Daddy working*).

[13] Extending this, we informally define AGR has a morpho-syntactic mechanism which involves the ‘holding’ and ‘spreading’ of a syntactic feature across its relevant phrase (XP), from a lexical-to-functional constituent. (It is suggested in the literature that Broca activation is triggered by a *syntactic working memory over-load* due to this ‘holding’ and ‘spreading’ associated with ‘move’ across XP). Whenever one or more features match between two or more constituents, such as between ‘subject-verb agreement’, we define that as [+AGR]. AGR may also refer to functional words which enter into an AGR relation on their own basis. By this definition, for example, the possessive pronominal determiner *your* would be [+AGR] since it enters into an AGR relation with a noun. (See §50b).

[14] In fact, recent studies show that the once heralded classical distinction between lexical and functional categories may actually splinter-off along more finely grained computational processes, so that what we find is a two-prong splinter for each category:

<u>Lexical</u>	<u>Functional</u>
(i) AGR-based, (ii) Non-AGR-based	(i) AGR-based, (ii) Non-AGR-based.

(While target English may not show an AGR-based lexical category *per se*, due to its morphological typology—e.g., agglutinative languages may show such features—English does however show the functional splinter). It could be argued that Derivational morphology falls under ‘Functional Non-AGR’, and Inflectional morphology falls under ‘Functionalized AGR’¹. (Derived [[teach]er] (teacher) incorporates {er}, ‘merging’ the affix into the stem).

Theory

[15] Such a functional splinter could manifest as a singular affix form, though showing two different underlying processes: AGR and non-AGR based. In this context, language might be seen as ‘degenerative’ whereby competing factors may work simultaneously in producing a language result which falls within a *rule-based-to-memory-based* processing spectrum. (I refer to ‘degeneracy’ as linguistic instances in which seemingly similar surface outputs (i.e., affixes) are the result of differing internal processing). Degeneracy can explain how the functional affix comes to get processed lexically in certain environments. (See fn.3).

(Competing factors: A color blind person obeys traffic lights via position and not via color. On the surface, it may appear a color-blind and color-seeing person obey due to similar internal processes: not so! Also, see ‘u-shape learning’ found in the appendix. While the same child pronunciation of ‘pretty’ /prIti/ surfaces in both sides of the u-curve, the child’s underlying processes are different—viz., non-segmental/memory vs. segment/rule-based. Early correct word order may be shaped by non-linguistic factors, though on the surface it appears the word order parameter is set).

¹ BI studies have shown that the derivation affix {er} in the bi-morpheme word ‘teacher’ may not be decomposed of a [stem+affix] as compared to, say, tense which decomposes ‘teach-es’ into [stem+{es}]. In brain studies, the word ‘teacher’ has been found to carry a signature identical to the word ‘brother’, a single morpheme item. In addition, whereas L2 students of English often delete rule-based inflectional affixes, they never delete derivational affixes, suggesting that item [stem-affix] remains undecomposed and processed as a single idiomatic chunk. To a certain extent, agglutinative language types may follow this procedure. (See Baker 2001) for language typologies which use such incorporation of grammar.

- [16] We conclude that what is behind the degeneracy of processing is a rather prosaic distinction having to do with ‘Frequency-affective’ items on the one hand, and ‘Movement-affective’ items on the other hand, correlating to our [-AGR] vs. [+AGR] distinction (respectively). This redefined distinction forces a reclassification of what might constitute as functional *per se*, while allowing us to correctly interpret longitudinal case studies of child acquisition (such as the one focused on in this paper) which show a slow, maturational development of ‘movement-affective’ processes.

(Out of the German plurals (e, er, en, s), {s} seems to be the default rule-based plural despite the fact that it is the least frequent in the input. Phonology patterning seems to play a role for all German plural affixes except for {s} (Marcus et al. (1995)).

- [17] This ‘affix splinter’ would, for example, allow the nominal/plural {s}, the progressive {ing}, as well as past participles {en}, {ed} to split into either AGR-based or Non-AGR-based modes of processing. If this is so, we should find some evidence early-on in child language data demonstrating that what appears to be a functional representational affix is actually a bi-product of ‘rote-learned’ memory processing.

- [18] At the moment, there is still relatively few child case studies—of child data recorded ‘early enough’—to show a maturational development of AGR-related movement analogies².

CHILDES (Brown corpus)

Such an early stage would reveal, among other things, a stage-1 of Non-AGR across the board. The data presented in this paper show such a (non-Inflectional) Non-AGR stage-1.

A brief history on the classic Lexical vs. Functional distinction

- [19] Let us take as our historical starting point the classic Brown, Braine studies in forming an analysis of the lexical/functional distinction. Moving beyond the basic word-level classification of Lexical vs. Functional (lexical making-up the substantive *Noun, Verb, and Adjective*, functional making-up the more formal *Determiner, Auxiliary*), perhaps the most important tangible result coming out of these early studies was Brown’s list of fourteen grammatical morphemes and their order of acquisition. The (partial) list is broken down into two parts, with the first part composing of early acquired morphemes which are potentially lexicalized (Brown’s stage-2, MLU 2.25):

Lexicalized [stem-only]

1. present progressive {ing}
- 2-3, prepositions *in, on*
4. plural {s}
5. past irregulars *went, came*

Functionalized [stem+affix]

6. possessive {‘s}
9. past regular {ed}
10. 3pers/sing/present {s}

(I have always been somewhat suspicious of this first part of the list. We know prep and irregulars pattern as lexical. So too might early {s} and {ing}).

- [20] The question here is whether or not all of Brown’s fourteen morphemes (along with their order of acquisition) should be cast together as inherently signaling the onset of AGR-based morphological representation in children’s early speech. Most traditional analyses do suggest that these onsets do signal some kind of an agreement mechanism in grammar

² This fact has prompted Wexler into claiming an early stage-1 as an ‘Optional Functional’ stage where there is [+AGR] albeit optionally produced. We counter this by showing a true lexical Non-AGR stage-1, with the optional stage being relabeled as our functional stage-2 (Radford & Galasso 1998).

whereby rules enter into the computation.

[21] We counter this by suggesting that functional affix-morphemes 6, 9, 10 have a potentially distinct processing signature, say, from that of affix-morphemes 1, 4. While all tend to be equally bunched together as constituents of functional grammar, we believe only morphemes 6, 9, 10, as attested in most child corpora, are unambiguous and signal rule-based AGR.

[22] Let's review some of Brown's data found in list one, starting with plural, and see if there might be evidence of lexicalization. (We define 'lexicalization' here as a formation when an otherwise decomposed [stem-affix] processing—as in [verb+ing]—allows the affix {ing} to go undecomposed by incorporating the affix into the stem, having the whole construct be realized as a single [stem-only] structure [verbing]).

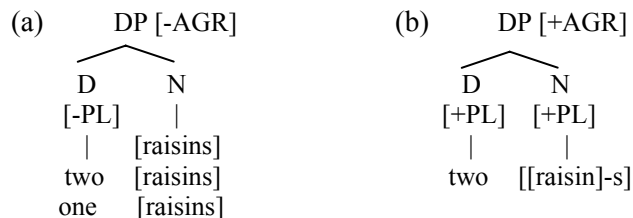
Lexicalization of Affix [stem-only]

[23] **Plural {s}** The plural {s}—while typically referred to as a functional marker in forming the grammatical rule [Noun+{s}= plural]—may be ambiguous and not necessarily involve AGR-based computation. The plural marker {s} may splinter along the lines of being a semantic/referential marker for number—*what Skinner referred to as autoclitic 'mands' and 'tacts'*—with little if any recourse to any agreement relation.

Such '[-AGR] number' constructs show in the literature—e.g., *two car, two chair, two stick*, and *Microphone is all gone* (Braine 1976, Brown 1958) where there is no apparent agreement between the plural determiner (*two*) and the nouns (*car, chair, stick*). In the latter example, Brown notes that Eve's use of the determiner '*all*' is without the AGR number distinction, given that for the adult grammar, '*all*' goes after plural count nouns (e.g., *The microphones 'are' all gone*).

[24] Conversely, stage-1 data show seemingly two-word combos where plural {s} nouns lack AGR relation with Determiner (e.g., '*one' blocks/peas/raisins* (Brown et al. p.83)).

[25] While a true AGR-based computation would require the 'number' feature to spread across the phrase, a Non-AGR number feature may register directly onto the stem—e.g., [DP [D *two/one* [N *raisins*]] (Braine, cf. a).



(c) [DP [-AGR {Ø}]] [D one/two] [N raisins]]

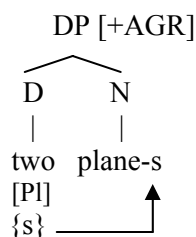
(d) [DP [+AGR {s}]] [D two] [N raisin-s]]

(It could be claimed that early determiner system in child English is marked [-AGR]).

[26] The plural {s} as shown in the word *raisins* (Braine 1976) above appears in an overall stage where plural determiners (*more, two*) don't typically agree with the noun—e.g., *more boy, two plane*. This makes any plural {s} which does surface at this stage potentially ambiguous

in nature. The fact that we do get a few examples of the inflectional morpheme {s} showing-up on some nouns such as *raisins/peas/blocks/pockets* suggest that these few nouns might be processed in a declarative manner as idiomatic stems: viz., they are processed as [stem-only] [*raisins*] and not as [stem-affix] [[*raisin*]-s]. It is this same type of declarative processes that enables one to memorize irregular verbs (*went, came*) as [stem-only] constructs, with past tense grammar already ‘incorporated’ and ‘lexicalized’ into the verb stem. Irregulars are also found in the lexicalized portion of Brown’s list.

- [27] One way to think about all of this is to ask what amount of ‘holding’ must take place of the ‘feature’ across the phrase in realizing number. One suggestion might be that all plural markers which directly register on noun stems are not abstract, being rather referential and ostensive in nature. But then how do we identify true AGR-based plurals? Well, we can say that AGR is established when and only when we have evidence that whatever feature involved (in this case the ‘number’ feature) *holds* and *spreads* across the phrase from Determiner to Noun—e.g.,



In this case, it is the emergence of a number sensitive determiner that tells us that an AGR relation has been built between D and N, with {s} signaling AGR. In other words, when both emerge simultaneously, we can except as the null hypothesis that AGR has been established. This was not the case in the early $MLU \leq 2.5$ stage.

- [28] However, what we can claim about this early emergence of the determiner system is that determiners are correctly used in the grammar (i.e., determiners introduce a noun—e.g., ‘@*Two the book*’ is unattested). While the syntactic organization may indeed be correct—although the linear ordering may be only phonologically based—the determiner itself would be viewed as void of any AGR-material: (viz., a DP phonological shell).

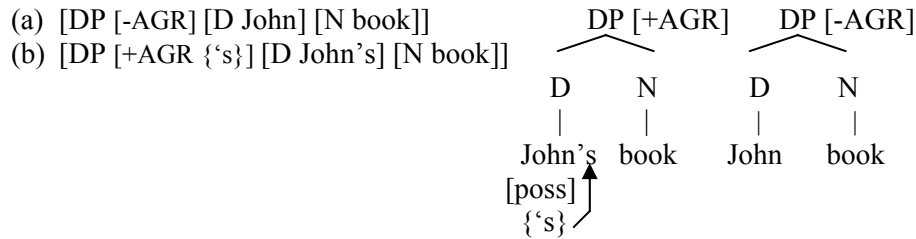
- [29] Regarding the DP, there is a dual way of telling whether or not AGR has been established:

Firstly, in examples where there is the determiner (*two*) but not the plural {s}, what we can say is that no AGR has been established and the determiner *two* is empty of its AGR properties. In other words, the determiner gets generated as an empty phonological shell.

Secondly, if the plural {s} does indeed surface with a non-matching determiner (e.g., *one raisins*), or surfaces at a stage where there is no further evidence of the emergence of functional categories, what we can then suggest is that the {s} has lexicalized and has become part of the stem. (The /s/ gets realized much in the same manner as the /s/ in the word *dance* /dæns/ as cited in our Sally Exp. It becomes part of the stem).

- [30] An interesting side note here is that foreign language students often report having little difficulty with processing plural {s} on semantically rich nouns (e.g., *book* vs. *book-s*, *car* vs. *car-s*, etc) but complain of difficulty (and often produce {s} deletion) with more abstract nouns (e.g., *motivation-s*, *impression-s*, etc.).

- [31] This same treatment of AGR ‘feature spreading’ extends to possessive {‘s} formations:



(Possessive utterances like ‘Mummy car’ are fully attested in Brown’s stage-1 data).

(Simple Merge can be applied for ‘John book’ N→N, NP)

Verbs with {ing}

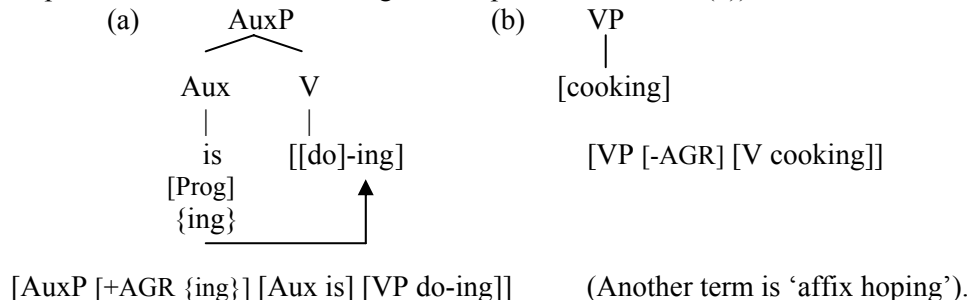
[32] Let’s begin by saying that ‘ing’ verb forms have only one allomorph, are highly regular and constitute a very high frequency in the input—(they model after irregular verbs as well as the special case of the high frequency regular verb e.g., [walk] → [walked], where the {ed} affix in such high freq. items don’t prime for the stem (as opposed to the low frequency item ‘stalk-ed’ which does prime the stem [‘stalk’] (Alegre, Gordon).

(Current studies show that ‘ing’-nouns get processed lexically: children don’t seem to delete the (ing)-affix for ing-noun structures, as opposed to ing-verbs. Early children ‘ing’-verbs may likewise model lexically like ‘ing’-nouns (when without AGR)).

[33] Thus, similar to irregular verbs (*went, bring*), ‘ing’-verbs don’t signature a priming effect. Early stage-1 onsets of the present progressive {ing} can thus be attributed to frequency effects found in the input and may not be a product of an AGR formation [Be+Verb+{ing}]. Note that a true AGR-based {ing} would be triggered as part of the auxiliary rule. Note, the AUX ‘Be’ typically doesn’t emerge until late in MLU 3.5, a classified functional stage of development—e.g., *What daddy doing? Mommy cooking*, etc. (Brown, Radford).

(Irregulars prime faster reaction times since they are drawn directly from the lexicon as wholes. Concatenated products [stem+affix] show slower reaction times (since there is a computation), and where the affix primes for the stem. Irregulars show no such stem priming).

[34] This suggests that early MLU [verb+ing] is idiomatic and rote-learned, as made apparent by frequency of ‘ing-verbs’ found in the input. The same children at this lexical stage seem to incorrectly analyze ‘ing-verbs’ as roots and therefore often fail to produce the counterparts *Daddy do, Mommy cook*, etc. (In fact, ‘ing-verbs’ occur much more frequently in the input as compared to bare verb stems. ‘ing’-nouns process more like (b)).



Past Participle {ed} {en}

- [35] Similar to our findings regarding ‘ing’ verbs, likewise early onsets of the past participles {ed}, and {en} can be attributed to frequency affects found in the input and may not be a product of a rule formation, such as the perfect rule [Have+Verb+{ed}/{en}]. Again, note that a true AGR-based {ed/en} would form as part of the auxiliary rule. The auxiliary ‘Have’ is typically missing at the earliest lexical stage of these formations—e.g., *Daddy all gone?*

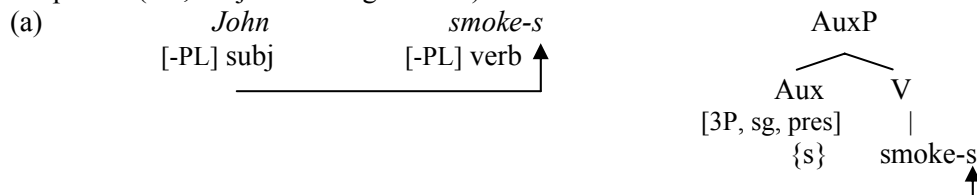
Functionalization

- [36] The upshot to all of this is that we believe it is only with the onset of morphemes 6-10 of the Brown list that we can provide evidence for procedural, rule-based functionalization. One way to think about the differences here is to examine the role of frequency within the respective paradigm. For instance, ‘ing-verbs’ (*walking*) and ‘bare stems’ (*walk*) enter into the child’s morphological paradigm as potentially competing forces since both forms approach equilibrium in sharing a common semantic field, as determined by the input. (Children commonly misread the two forms as involving the same semantics as well as the same morpho-syntax. This makes both forms linguistically ambiguous). In fact, ‘ing-verbs’ hold a higher frequency count over bare verb stems). The same equilibrium does not seem to hold however for the noun+possessive {‘s} [stem+affix] and the bare proper-noun stem [stem-only]—where the frequency and distribution of e.g. [[*John’s*] *book*] and [[*John*] *book*] would not share a common semantic field, nor rest in competition with one another. Based on this, the attested possessive {‘s} exclusively found at a latter stage of development is indeed the result of a true rule-formation.

- [37] Using the same criterion, present and past tense inflectional morphology {s} and {ed} respectively do not enter into a frequency based competition and are thus purely of a rule-based formation³.

- [38] **Verbal {s}** The verbal 3Per/sing/present {s} on the other hand is both morpho-phonetic (the sound /s/) and morpho-syntactic (crossing word boundaries) due to this holding and spreading across the phrase. Hence, the verbal {s} is a quintessential AGR-based affix.

- [39] Consider this AGR-based processing showing agreement between two constituents across the phrase (i.e., subject-verb agreement):



The AGR mechanism results in the affix {s} being spread over the phrase. Broca’s area is activated in such spreading. It is believed that this extra processing load of AGR ‘holding’ and ‘spreading’ triggers Broca’s activation (Grodzinsky).

³ Though see the Alegre and Gordon study showing possible {ed} as declaratively processed, based on frequency. For instance, they claim that a frequency paradigm can be created whereby two otherwise phonetically similar verbs *walked* and *stalked* get processed differently as dependent upon frequency differences, with the former *walked* holding a much higher frequency count and thus potentially formed idiomatically as a [stem-only] lexical item—viz., [*walked*] as compared to [[*stalk*] *ed*].

**Data. The lack of Functional Agreement at stage-1 of child language acquisition:
A Non-AGR stage**

[42] Two- and three-year-old children generally go through a stage during which they sporadically omit possessive 's, so alternating between saying (e.g.) *Daddy's car* and *Daddy car*. At roughly the same age, children also go through a stage (referred to by Wexler 1994 as the 'optional infinitives' stage) during which they sporadically omit the third person singular present tense +s inflection on verbs, so alternating between e.g. *Daddy wants one* and *Daddy want one*. The question addressed here is whether children's sporadic omission of possessive 's is related to their sporadic omission of third person singular present tense s—and if so, how. Furthermore, by extension, we suggest the proposed relation is implicated in the maturational progression between 'under-specification' in the child's grammar, leading to optional AGR projection (at stage-2), and the 'un-specification' leading to exclusive omission of AGR (at stage-1).

[43] OCCURRENCE IN OBLIGATORY CONTEXTS

AGE	3sgPres s	Poss 's
2;3-3;1	0/69	0/118
3;2-3;6	72/168	14/60

[44] (a) That *Mommy car* (2;6). No *Daddy plane* (2;8). Where *Daddy car?* (3;0).
(b) *Daddy's turn* (3;2). It's the *man's paper* (3;4). It's *big boy Nicolas's*.

[45] (a) Baby *have bottle* (2;8). No *Daddy have Babar* (2;9). The car *go*. (2;11).
(b) Yes, this *works*. This car *works*. It *hurts*. The leg *hurts*. (3;4).

[46] The data suggest a parallel between the acquisition of third person singular +s and possessive 's, and raise the obvious question of why there should be such a parallel. Both possessive 's and third person singular s are reflexes of the same functional AGR relation—the former being of a nominal AGR, the latter being of a verbal AGR. (The notation 'IP' refers to Inflectional Phrase).

[47] (a) [_{IP} Mommy-'s [+agr {'s}] driv-*ing*] (= Mommy is driving)
(b) [_{IP} Mommy [+agr {s}] drive-*s*] (= Mommy drives)

[48] In much the same way, we might suggest that possessive structures like *Mommy's car* contain an IP [+AGR] projection, whereas non-inflectional s-less possessives like *Mommy car* contain an IP [-AGR] projection which is non-specified with respect to agreement:

[49] (a) [_{IP} Mommy-'s [+agr {'s}] car] (= Mommy's car (possessive))
(b) [_{IP} Mommy [-agr {∅}] car]

Consider English as having the following Case system:

[50] An overt (pro)nominal is:
(a) nominative if in an AGR relation with a verb
(b) possessive if in an AGR relation with a noun
(c) objective otherwise (by default) (e.g., 'me' subjects).

[51] If we assume that two and three-year old children go through a stage during which AGR is optionally underspecified with respect to the features they encode, we can provide a straightforward account of why two-and three-year olds alternate between forms like *I'm playing* and *Me playing*. The two types of clause would have the respective (partial) structures (44a/b) below:

[52] (a) [_{IP} I'm [+agr { 'm }] playing]

(b) [_{IP} Me [-agr \emptyset] playing]

[53] Since IP is fully specified for AGR in (44a), the overt auxiliary 'm is used, and the subject is nominative by (42a). But since IP is underspecified with respect to AGR in (44b), it remains null and has a default objective subject by (42c). If possessive nominals contain an IP that may either be fully specified or underspecified for AGR, we would expect to find a similar alternation between nominal structures like (46a) below with genitive possessors and those like (46b) with objective possessors:

[54] (a) [_{IP} My [+agr \emptyset] dolly]

(b) [_{IP} Me [_I -agr \emptyset] dolly]

[55] In (54a), IP is fully specified for AGR with its possessor-specifier and so the possessor has (genitive) possessive case by (50b); but in (54b), IP is underspecified for agreement, and so its possessor-specifier has objective case by (50c). In both structures, IP is null because 's is used only where the specifier is proper noun, third person).

Other Agreement Data:

[56] Frequency of occurrence of first person singular possessors

AGE	OBJECTIVE ME	POSSESSIVE MY/MINE
2;6-2;8	53/55	2/55
2;9	11/25	14/25
2;10	4/14	10/14
2;11	5/24	19/24
3;0	4/54	50/54
3;1-3;6	6/231	225/231

Examples of first person/sing possessive structures produced by the child are given below:

[57] (a) That *me* car. Have *me* shoe. Where *me* car? I want *me* car. (2;6-2;8).

(b) I want *me* duck. That *me* chair. Where *me* Q-car? No *me*, daddy (= It isn't mine, Daddy). *Me* pasta. *Mine* pasta. *My* pasta. In *my* key.

(c) It is *my* TV. Where is *my* book? Where is *my* baseball? Don't touch *my* bike

[58] Frequency of *I/me* subjects in copular sentences

AGE	NOMINATIVE I	OBJECTIVE ME
2;6-2;8	10/14	4/14
2;9	15/19	4/19
2;10-3;0	51/55	4/55
3;1-3;6	105/111	4/111

- [59] (a) [_{IP} I'm [_I +agr {'m}] sick]
 (b) [_{IP} Me [_I -agr {ø}] wet]

[60] **Frequency of second person possessors**

AGE	YOU	YOUR
3;2-3;4	14/16	2/16
3;5	7/34	27/34
3;6	2/29	27/29

- [61] (a) No *you* train. (=It's not your train). No it's *you* train, no (idem).
 (b) That's *your* car. Close *your* eyes. No it's *you* house. Where's *your* friend? (3;4)

- [62] (a) [_{IP} your [+agr {ø}] car]
 (b) [_{IP} you [-agr ø] car]

Third person singular subjects produced at 3;6 are illustrated below:

- [63] (a) Him is alright. Him is my friend.
 Him is a big woof-woof. Him is hiding. What's him doing?
 Where's him going? Where's him?
 (c) He's happy. He's bad. He is a bad boy. He's in there.
 (d) He happy. He a elephant.

The emerging view as seen via advances in brain imaging technology

- [64] Any linguistic theory which embraces a brain-basis of language must not only attempt to reconcile but also begin to incorporate those recent insights made in BI studies which other go against the grain of more traditional norms of theory. It's only natural that a tension has emerged between the two approaches. Recent language based BI studies using fMRI and ERP have forced us into considering new ways of thinking about old issues. The once heralded Lexical/Functional cut may perhaps be better understood within this new framework of brain computation. I see much that can be gained by this new perspective on lexical vs. functional processing. Other BI implications, as I see it, involve how linguists understand and classify language typology in general. Implications to child language development are enormous.

Conclusion

- [65] This paper represents an early attempt to discern what we are beginning to learn from brain imaging studies and to apply the findings to current linguistic theory. These new applications challenge linguists into new ways of thinking about old paradigms. While the data presented herein support traditional claims that children begin their speech development without AGR, attempts are made to highlight what might be behind such a delay. Questions as to whether or not a 'Non-AGR' stage-1 is due to brain maturation as specific to a delay of neuro-connectivity in Broca's area are still open. But it seems to me the biological null hypothesis calls for some form of maturation behind the delay. Nonetheless, in theoretical terms, the data suggest there to be an interesting symmetry between the development of subject+verb structures on the one hand and possessor+noun structures on the other. Both considered AGR-based formations. Likewise, Case as determined by AGR also shows delay.

The overall data show a stage characterised by the use of objective possessors/subjects and the omission of possessive 's and third person singular s.

References

- Alegre, M., & Gordon, P. (1999) Frequency effects and the representational status of regular inflections. *Journal of Memory and Language* **40**, 41-61.
- Baker, M. (2001) *The atoms of language: The mind's hidden rules of grammar*. NY: Basic Books.
- Braine, M.D. (1976) Children's first words combinations. *Monographs of the society for research in child development* **41**, (1, serial No. 164).
- Brown, R. (1958) *Words and things*. Free Press.
- Brown, R. & Bellugi, U. (1964) Three processes in the child's acquisition of syntax. *Harvard Educational Review* **34**, 133-51.
- Brown, R. & Fraser, C. (1964) The acquisition of syntax. In *The acquisition of language*. U. Bellugi and R. Brown (eds). 43-79.
- Brown, R., Fraser, C., Bellugi, U. (1964) Explorations in grammar evaluation. In *The acquisition of language*. U. Bellugi and R. Brown (eds) 79-92.
- Chomsky, N. (1959) Review of B.F. Skinner, *Verbal behavior*. *Language* **35**, 26-58.
- Clahsen, H. (1999) Lexical entries and rules of language. *Behavioral and Brain Sciences* **22**, 991- 1013
- Clahsen, H., Lück, M., Hahne, A. (2007) How children process over-regularizations: Evidence from event-related potentials. *J. Child Language* **34**, 601-22.
- Galasso, J. (2003) *The acquisition of functional categories*. IULC Publications, Indiana University.
- (2006) *The nature of the input: Tracing Inflection through the Dual Mechanism Model of Language Development*. Ms. Paper based on a talk given at UCLA. December 2006. (posted on-line <http://www.csun.edu/~galasso/thenatureoftheinputfullpaper.pdf>).
- Grodzinsky, Y. (2000) The neurology of syntax. *Behavioral and Brain Sciences* **23**, 1-71.
- Grodzinsky, Y., Friederici, A. (2006) Neuroimaging of syntax and syntactic processing. *Current Opinion in Neurobiology* **16**, 240-246.
- Grodzinsky, Y. & Amunts, K. (Eds) (2006) *Broca's Region*. Oxford University Press.
- Marcus, G., Brinkmann, U., Clahsen, H., Wiese, R., & Pinker, S. (1995) 'German inflection: the exception that proves the rule'. *Cognitive Psychology* **29**, 189-256.
- Marcus, G., Pinker, S., Ullman, M., Hollander, J., Rosen, T., & Xu, F. (1992) Over-regularization in language acquisition. *Monographs of the society for research in child development* **57** (4, serial no. 228).
- Pinker, S. (1999) *Words & Rules: The ingredients of language*. NY: Harper Collins.
- Radford, A. (1990) *Syntactic theory and the acquisition of English syntax*. Oxford: Blackwell.
- Radford, A & J. Galasso (1998) Children's possessive structures. *Essex Research Reports in Linguistics* **19** (posted on-line at <http://www.csun.edu/~galasso/arjg.htm>)
- Skinner, B.F. (1957) *Verbal behavior*. Appleton-Century-Crofts.
- Ullman, M., Corkin, S., Coppola, M., Hickok, G., Growdon, J., Koroshetz, W., & Pinker, S. (1997) A neural dissociation within language: evidence that the mental dictionary is part of declarative memory and that grammatical rules are processed by the procedural system. *Journal of Cognitive Neuroscience* **9**, 289-299.
- Wakefield, J. & Wilcox, J. (1995) Brain maturation and language acquisition. In *Proceedings of the 19th Annual Boston University Conference on Language Development*. D. MacLaughlin & S. McEwen (eds) 643-654. Cascadilla Press.
- Wexler, K. (1994) Optional infinitives, head movement and the economy of derivation. In *Verb movement*. D. Lightfoot, and N. Hornstein (eds) 305-350. CUP.

