### Abstract

It is a universal property of argument structure that verbs cannot take more than three arguments – one external and two internal (Hale K, Keyser SJ, On argument structure and the lexical expression of syntactic relations. In: Hale K, Keyser J (eds) The view from Building 20: essays in linguistics in honor of Sylvain Bromberger. MIT, Cambridge, 2002, henceforth H&K); any additional (pseudo)arguments are introduced via (possibly recursive) syntactic or discursive procedures, not lexical. This is the Two (internal) Argument Restriction (TAR), which is part of the basic architecture of natural language. It is argued that a modified version of the theory presented in H&K can account for this restriction. In this proposal, the TAR crucially depends on the lack of recursion in the lexicon (in building argument structures), thereby restricting the possibility of using this formal mechanism to the domain of sentential syntax (building of sentences). Argument structures are thus built in a cyclic and directional way, and without recursion.

### Keywords

Argument structure - Lexicon - Recursion - Selection - Cyclicity - Argument - Adjunct - Ditransitivity - Lexical syntax
Deriving the Two-Argument Restriction Without Recursion

Eva Juarros-Daussà

Abstract  It is a universal property of argument structure that verbs cannot take more than three arguments—one external and two internal (Hale K, Keyser SJ, On argument structure and the lexical expression of syntactic relations. In: Hale K, Keyser J (eds) The view from Building 20: essays in linguistics in honor of Sylvain Bromberger. MIT, Cambridge, 2002, henceforth H&K); any additional (pseudo)arguments are introduced via (possibly recursive) syntactic or discursive procedures, not lexical. This is the Two (internal) Argument Restriction (TAR), which is part of the basic architecture of natural language. It is argued that a modified version of the theory presented in H&K can account for this restriction. In this proposal, the TAR crucially depends on the lack of recursion in the lexicon (in building argument structures), thereby restricting the possibility of using this formal mechanism to the domain of sentential syntax (building of sentences). Argument structures are thus built in a cyclic and directional way, and without recursion.

Keywords  Argument structure • Lexicon • Recursion • Selection • Cyclicity • Argument • Adjunct • Ditransitivity • Lexical syntax

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E. Juarros-Daussà
Department of Romance Languages and Literatures, University at Buffalo, Buffalo, NY, USA
e-mail: ejuarros@buffalo.edu

1 Properties of Argument Structure

Most linguistic frameworks accept that each verb in natural language is associated with a set of arguments, which are not systematically predictable from the verb’s meaning, and which form its argument structure. While argument structures can also include adverbial or other semantic information associated with the predicate, arguments are commonly taken to be those elements that are realized syntactically as the projected sentence’s subject, direct and indirect objects. Other participants or anchor elements appear in the sentence as adjuncts, typically completing and further specifying the meaning of the predication. The distinction between arguments and adjuncts has thus been long recognized in linguistic theory (e.g., Dowty 1979, 1991, 2001; Chomsky 1986), even when no set of necessary and sufficient criteria has yet been proposed as the basis for the ontological distinction between these two kinds of elements (cf. Koenig et al. 2003; Baumer 2005), and the precise differences in the way they are introduced in the sentence’s structure remains a subject of debate (e.g., Borer 2005; Babby 2009; Randall 2009).

At the processing level, most frameworks also accept as a working hypothesis the distinction, supported by psycholinguistic evidence, between some participants that are implicitly introduced by the verb as soon as it is recognized (lexically encoded arguments), and those participants that, even when they might be part of general world knowledge associated with the verb and frequently appear in the same context as the verb, are not necessarily activated each time the verb is encountered, and are thus adjuncts (Boland 2005).

Throughout this paper, thus, argument structure is taken to be the level of linguistic representation which includes a predicate and all of its lexically encoded arguments. In this context, this paper explains the basic fact (apud Hale and Keyser 2002) of argument structure that verbs cannot take more than three lexical arguments –more precisely, one that will become the sentential subject, or external argument, and a maximum of two additional arguments that will be realized as the sentential objects, or internal arguments. This maximal argument structure corresponds to that of the English verb give (1).

(1) [The LinguistList] gave [nice prizes] [to the winners of the challenge]

Proof of the restriction is that introducing a conceivable additional participant without the help of a lexical preposition (such as for in (3) below) which contributes its own argument-taking abilities, results in ungrammaticality (2):

(2) * [The LinguistList] gave [nice prizes] [to the winners] [the students]
(3) [The LinguistList] gave [nice prizes] [to the winners] [for the students]

In previous work (Juarros-Daussà 2010), I showed that this limitation in fact concerns the number of internal arguments associated to a predicate, and thus formulated the above empirical observation as the Two-Argument Restriction (TAR):
“A single predicate can have at most two internal arguments.”¹ I claimed that the TAR is an unrestricted universal (in the sense of Croft 1990), and I argued that the commonest valence-increasing operations, which result in applicative and causative constructions, while they present a challenge, however do not to violate the TAR.² I further showed that, since there is no known processing or discursive reason not to lexically associate more than three (strictly, two) participants to a predicate, the TAR is syntactic in nature, and it is one of a family of architectural constraints that determine and limit possible attainable languages (in this case possible argument structures).

Following that work, in this article I propose an explanation of how (an extension of) the framework of lexical syntax put forth by Hale and Keyser (2002) is especially suited to derive the TAR at the theoretical level. Crucially, in my proposal, deriving the TAR involves negating the existence of a recursive function in the domain of argument structure. The paper is structured as follows: first I show how H&K’s theory as it is encounters the problem of generating a recursive structure in order to account for the maximal argument structure (the one in give above). I claim that, since recursion threatens the restrictive power of the theory, it should be avoided. I argue that an account within H&K’s framework that avoids recursion can be achieved once we accept a restriction in the combination of lexical categories, the Uniqueness of Selection Hypothesis (USH). I then show that such view of argument structure derivation, together with a cyclical, directional view of lexical Merge very much alike the one advocated in Chomsky (2001) and Collins (2001), and captured in the proposed Cyclicity of Selection Hypothesis (CSH), can both capture the maximal argument structure (that of a predicate with two internal arguments), and explain its maximality.

¹The TAR has been implicitly accepted in many frameworks. Rarely, one finds explicit clam of the restriction. On such rare examples is Levin and Rappaport Hovav (2005: 233); discussing template augmentation in ditransitives, these authors note “Such verbs cannot undergo event composition, which adds another subevent, since they already have a maximally articulated event structure.” However, I have not found the restriction the matized anywhere.

²Still unexplained is the counterexample presented by what Juarros-Daussà (2010) called bet-verbs, which seem to systematically accept a forth argument, as in

(i) [I] bet [you] [fifty dollars]

While verbs like bet, taking two phrasal internal arguments and one sentential internal argument, are rare, they potentially present a legitimate counterexample. Even more worrisome for the universalist claim of the generalization is the fact that certain verbs like promise or guarantee can also enter into what seems a four-argument construction, as in (ii) (Lyn Frazier, p.c.):
2 Deriving the TAR: Rationale of Eliminating Recursion in Argument Structure

Ideally, the TAR, as an empirical generalization, would follow from independent principles of grammar. To that purpose, it is useful to recall that, in essence, what we are deriving here is the fact that argument structures are finite in a way that sentential structures are not: they have a limit on the number of linguistically encoded participants, where at the level of sentences there is not such restriction. Now, it is well known that in many grammars recursion is the formal mechanism used to attain this kind of infinitude at the sentential domain. Therefore, one obvious way to explain the lack of infinitude in argument structures is to simply claim that recursive mechanisms are not available in this grammatical domain. This apparently simple move only makes sense within a theory that otherwise assumes the same principles to apply for the levels of argument (lexical) structure and sentential structure – otherwise, the finitude of argument structures would be a fact incommensurable with the infinitude of sentences (they would just form two different grammatical systems, and their properties following from the same mechanisms would be no more than a coincidence). Hale and Keyser (2002) present such a theory, and I next show that, when assuming it, the claim of there be no recursion in the building of argument structures precisely derives the facts captured by the TAR.

2.1 Hale and Keyser’s (2002) Theory of Lexical Syntax

Lexical syntax, as it is compiled from a series of formerly distributed articles in Hale and Keyser 2002 (henceforth H&K), is a theory of the grammatical level representing the relationships between the verb and its arguments, without taking into account their extended or functional projections. It assumes that a verb’s argument structure is not a mere enumeration of its arguments, but rather a structural representation that follows the same principles as sentential syntax.

Crucially, H&K claim that verbs are not syntactically simplex items, but rather they all contain heads (roots) with diverse projection and incorporation properties. For example, even an otherwise seemingly simplex (from the point of view of its internal argument structure) unergative verb like laugh is created by incorporating

\[\text{[We] promise [our clients] [our first born] [that we will deliver your order in time]}\]

In strings captured by rules in which an element contains another element of its same type. For example, \(\text{NP} \rightarrow \text{N PP} \) and \(\text{PP} \rightarrow \text{P NP}\), which results in potentially infinite NPs.
the complement of a transitive-like structure into a light-verb-like head – a structure equivalent to the analytical counterpart “do laugh”\(^4\):

\[
\begin{array}{c}
\text{h} \\
\text{DO} \\
\text{\(\check{\text{laugh}}\)}
\end{array}
\]

(4)

In defining the lexical categories that form the building blocks of argument structures, two structural relations are taken as basic: whether the lexical head (\(h\) below, the root) has a specifier (\(\text{spc}\)) or not, and whether it has a complement (\(\text{cmp}\)) or not. Based on these parameters, H&K (2003: 13, adapted) distinguish the following four lexical structural categories (\(\alpha\) is an unprojected head):

- Monadic: \([+\text{cmp}] [−\text{spc}]\)
- Basic Dyadic: \([+\text{cmp}] [+\text{spc}]\)
- Composite Dyadic: \([-\text{cmp}] [+\text{spc}]\)
- Atomic: \([-\text{cmp}] [−\text{spc}]\)

These structures contain information about the projection properties of the word. Obviously, structural information of this kind might coexist in the lexical entry with information of semantic character that also plays a role in the syntactic behavior of the word, such as aspectual type, certain features on the arguments such as definiteness or number, or features on the root itself, such as boundedness.\(^5\) It is the interaction between structural and semantic information what ultimately determines the syntactic behavior of the word.

Under this view, all words are morphologically derived from one lexical type or other: there are no verbal, nominal or otherwise, basic stems, but the category of the word depends on the structure the stems appear in (much in the spirit of Distributed Morphology). Since all possible argument structures are formed by combinatorial merging of these primitive structural categories, the goal of the theory is to determine the zero-relatedness of all predicates, i.e., to identify their argument structures in terms of the types allowed by the basic lexical categories above.

\(^4\)A vision supported by those languages that present surface transitive structures (oftentimes based on a light verb) for many of their verbs which would otherwise be crosslinguistically unergative, such as Basque and Persian (see, for example, Folli et al. 2003).

\(^5\)See the relevant work of Heidi Harley (1995, 1996), and Folli et al. (2003, 2005).
In the fashion illustrated for unergative verbs above in (4), the above configurations correspond prototypically to the following taxonomy in the verbal domain:

(a) monadic: unergative (John laughed) or (pseudo)transitive (John made a fuss)
(b) basic dyadic: transitive (I shelved books) or ditransitive (I put books on the shelf)
(c) composite dyadic: unaccusative (Many guests arrived; The screen cleared)
(d) atomic: presumably weather verbs (It rains), although they are not discussed in H&K.

Other argument structures are obtained by combination of the basic structural categories. For example, a transitive verb like *shelve*, in Ayse shelved the books, is formed by combination of a basic dyadic structure with a monadic head:

(5)

\[ m \rightarrow \text{CAUSE} \rightarrow \text{bd} \rightarrow \text{ON} \rightarrow a \rightarrow \text{shelve} \]

In this structure, a basic dyadic head *bd* (roughly glossed as the homonymous preposition *ON*) projects a structure with the properties of [+complement, +specifier]. The [+complement] requirement is satisfied by the morphological constant (the root), itself an atomic structure. Because of *bd* being phonologically empty, a (*shelve*) is automatically incorporated (conflated) onto it. The required specifier is projected, and is occupied by a lexical variable, here represented by *y*, acting as a placeholder for the object to be inserted in sentential syntax. The whole basic dyadic structure is itself the complement of a monadic element, which is responsible for the introduction of the external argument in sentential syntax (hence its gloss as *CAUSE*), thus making the resulting verb necessarily transitive (cf. *The books shelved.*). Again, the emptiness of *m* requires the incorporation of the complex [shelve + p], resulting in the transitive verb *shelve*.

In this fashion, H&K claim that the constrained nature of argument structure follows from the structural properties of the existing lexical categories. In a nutshell, we have a limited typology of argument structures because of the structural limitations of the primitive building blocks that form those argument structures. Despite of this claim, a problem arises when, in building argument structures for different kinds of verbs, H&K allow for unrestricted, recursive combination of the

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6In Hale and Keyser (1993), what they mean by the constrained nature of argument structure is the limited absolute number of theta roles.
lexical categories. For example, in their argument structure for give, as in I gave the bottle to the baby, a basic dyadic category contains another basic dyadic category, a classical example of recursion (H&K 2003: 163; some re-labeling applied):

(6)

In H&K, nothing prevents recursion of the lexical categories in this fashion; in fact, it seems that H&K’s model actually predicts that, in order to build the argument structures of verbs with two internal arguments (such as give above), recursive merging of the basic lexical categories is actually required. The result is that their system produces a potentially infinite number of argument structure types. Moreover, driven to its ultimate consequences, this situation has the potential to create argument structures with an unlimited number of arguments, each one introduced by recursive combination of the basic lexical categories. Such structures would obviously be violating the TAR—something that does not occur in natural language.

### 2.2 Maximal Verbs

Many verbs have\(^7\) the maximal argument structure of a verb with two internal arguments: obligatory ditransitives like give, send, etc., optional ditransitives like write, kick, pass, etc. (write a book and write a sentence on the blackboard; kick a ball and kick me a ball), prepositional verbs like put, splash, pour, etc.; and within the latter, many denominal verbs that have received special attention in the literature: butter, nail, spit, etc. (Jackendoff 1990; Randall 2010; Juarros-Daussà 2003). In this article I will take the verb spit as an example, following my previous work (2003, 2010), as a representative of this kind of verbs\(^8\) that are formed by the

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\(^7\)Or, should we say, “frequently or even regularly have” (Jespersen 1927: 278, *apud* Mukherjee 2005).

\(^8\)Levin (1993: 218) calls them verbs of “bodily process” of the “breathe” group, and includes the following: bleed, breathe, cough, cry, dribble, drool, puke, spit, sweat, vomit and weep. Although semantically unified (they are all verbs of excretion, related to emitting a substance from the body), the group in Levin (1993) is not unified as for syntactic behavior. Hence, for example, the verbs in (i) form good sentences, but the ones in (ii) do not:
maximal argument structure found in natural language. Crucially, the analysis of the argument structure of these verbs presented here does not need recursion, but only one single level of selection among lexical categories. Due to the fact that the argument structure of this type of verbs is taken as the most complex one that we find in natural language (a predicate with two internal arguments), and given that we can account for it avoiding recursion, a general principle banning recursion in the lexicon altogether is deduced, as it makes sense in the theoretical framework of H&K (the Uniqueness of Selection Hypothesis, or USH). The rationale is that if the USH allows for the structurally most complex case to be accounted for, simpler cases might be straightforwardly explainable within the limits allowed by the USH. The implications of this move for syntactic theory are also considered; mainly, it is claimed that a derivational conception of syntactic processes is not only favored, but necessary for the idea to work.

The verb *spit* presents the following argumental possibilities:

(7) a. When llamas get upset, they spit [VP V\text{unergative}]
   b. The volcano started spitting ash and lava [VP V\text{transitive} NP]
   c. The baby spat porridge on the table [VP V\text{resultative} NP PP]

The latter example is one of the verb with two internal arguments. The challenge is to present an analysis of this possibility that makes use of no recursion in the sense discussed above.

The first task is to determine the zero-relatedness of *spit*-verbs in terms of the lexical categories above. I claim that the properties of these verbs are compatible with them being related to a composite dyadic ($cd$) category. We will see that, for this, we have to revise the structure of $cd$ lexical categories, which are the hardest to interpret in H&K’s system. In Juarros-Daussà (2003). I presented a revision of this structure, in order to make it more compatible with the tenets of their own theory. I here present a summary.

According to H&K (2003: 16), a synthetic unaccusative verb like *clear* in the inchoative sentence *The sky suddenly cleared*, has the complex lexical projection structure of a composite dyadic element ($cd$):

\[(8) \quad \text{the sky} \rightarrow z \quad \text{m} \quad \text{m} \quad \text{cd} \quad \text{\sqrt{clear}} \quad \text{m} \quad \text{BECOME}\]

In this structure, a head $cd$ (the root $\sqrt{clear}$) projects a composite dyadic structure, by definition a [--complement, +specifier] category. In order to do so,
it appears as the complement of a monadic element, \( m \) (roughly glossed as the light verb \textit{BECOME}), hence satisfying \( m \)'s lexical requirements. H&K then say that \( m \) acts as a host that projects the specifier required by \( cd \), hence providing structural space for a variable (\( z \)) that acts as a place holder for syntax to contribute the derived subject argument (\textit{the sky}). Conflation of phonologically empty heads onto phonologically full ones produces the target inchoative unaccusative verb once the default morphosyntactic realizations of the lexical categories for English are instantiated (mainly, \( m = \text{Verb}, cd = \text{Adjective} \)).\(^{10}\)

The whole basic dyadic structure can optionally be constructed as the complement of a monadic element \( m_2 \), which would be responsible for the introduction of an external argument in syntax, thus forcing the internal argument to become the verb’s object. This is the structure corresponding to the transitive sentence \textit{The wind cleared the sky}. Again, the phonetically null character of \( m \) requires the incorporation of the complex [\textit{BECOME} + \sqrt{\text{clear}}] onto [\textit{CAUSE}].

\begin{figure}
\centering
\includegraphics[width=0.5\textwidth]{fig9}
\caption{}
\end{figure}

Since composite dyadic verbs are predicted to participate from this kind of diathesis alternation, were we to defend now such an analysis for \textit{spit}-verbs based on a composite dyadic structure, we will have to offer an explanation for the lack of alternation in these verbs:

\begin{enumerate}
\item a. The volcano was still spitting ash and lava
\item b. *Ash and lava were still spitting
\end{enumerate}

I will do so in the next section, relating the absence of inchoative form to the Source role of the subject, following a suggestion first presented in Hale and Keyser (1993), and refined in their (1998) paper. But first let us just see in detail how a derivation of \textit{spit}-verbs as composite dyadic element works out under the assumptions presented above.

\footnote{For the reasons explaining why clear projects a composite dyadic structure instead of a basic dyadic one, please read Hale and Keyser (1993, 2002).}

\footnote{This structure will be revised below.}
Following the model of (8), the root *spit*, itself a composite dyadic element, merges with a monadic element in order to project a specifier for its argument:

(11)  
\[ \begin{array}{c}
\text{porridge} \\
\xrightarrow{\text{cd}} \text{spit} \\
\end{array} \]

Let us next direct our attention to the PP argument in *The baby spat porridge on the table* (7c above). Arguably (Randall 2010, Juarros-Daussà 2003), when it appears, the PP is part of a secondary resultative predicate, with a head (roughly glossed as CAUSE, apud Stowell 1983, Bowers 1991, cf. Kratzer 2005) that takes the Theme argument (*porridge*) as its subject and the PP (*on the table*) as its complement. I here propose that a basic dyadic structure containing both the Theme argument and the resultative PP be inserted in specifier position of a composite dyadic structure, where the Theme (overt or not) would otherwise be usually inserted:

(12)  
\[ \begin{array}{c}
\text{porridge} \\
\xrightarrow{\text{CAUSE}} \text{on the table} \\
\end{array} \]

While in (12) all relevant predication relations are met, there is still one problem: the relation between the surface verb and noun *spit* (resulting from the default morphosyntactic realization of lexical categories in English) is not captured. Although H&K present de-adjectival verbs (*clear, narrow, thin, redden*, and the like) as the clearest example of unaccusative (composite dyadic) verbs, this does not mean that unaccusatives are limited to this class (cf. Levin and Rappaport Hovav 1995). *Spit*-verbs are de-nominal verbs, and still they are composite dyadic. To capture this claim, I propose that in the structure in (12), it is actually the *cd* element in (12) which is phonetically empty, the morphological constant (the root *spit*) being an atomic head, whose default morphosyntactic realization is a N, instead of a monadic head, whose default morphosyntactic realization is a V. The complex

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11Note that Kratzer (2005) outlines an alternative analysis of resultatives as uniformly raising constructions, in the context of arguments being introduced by functional categories (see also Borer 2005).
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thereby becomes (by default assignation of morphological categories) a lexical noun (with the rest of arguments unmodified)\textsuperscript{12}:

(13) The spit of porridge on the table

```
\begin{Tree}
  [.
    [a
      [bd DP porridge] [a
        [bd CAUS] [\sqrt{spit} PP on the table]]
    ]
  ]
\end{Tree}
```

The whole complex can itself be embedded under a \textit{monadic} head, to form either the activity nominal or the verb \textit{spit}:

(14) (The baby) spat porridge on the table/ (The) spitting of porridge on the table

```
\begin{Tree}
  [.
    [m DO a
      [bd DP porridge] [a
        [bd CAUSE] [\sqrt{spit} PP on the table]]
    ]
  ]
\end{Tree}
```

The following is the structure showing the default assignations of morphosyntactic categories in English\textsuperscript{13}:

(15) (The baby) spat porridge on the table

```
\begin{Tree}
  [.
    [V
      [V N]
        [P DP porridge] [P
          [P CAUSE] [\sqrt{spit} PP on the table]]
    ]
  ]
\end{Tree}
```

\textsuperscript{12}The now phonetically null element \textit{cd} can be identified as the abstract clitic position argued by Keyser and Roeper (1992). This is the position in which a particle can be inserted, to form the verb \textit{spit out}.

\textsuperscript{13}I am following H&K’s system strictly here, with regards to default morphosyntactic labeling of structures. Obviously, there is another possibility, that of lexical structures to be completely category-free, and receiving their morphosyntactic label by merging with the corresponding functional category, D for Nouns, T for Verbs, and so on (Marantz 2000; Alexiadou 2001; McGinnis 2001; Pylkkänen 2002; Juarros-Daussà 2003; Borer 2005).
The structures in (13)–(15) present a problem, however. As they stand, the atomic head appears to have the composite dyadic category as its complement. Recall that this fact was not problematic when a monadic head was merged in this position, since the monadic head and the composite dyadic head were in a relationship of mutual satisfaction, in which cd satisfied the [+ complement] requirement of m, and m provided cd with a specifier. If an atomic category appears in this position, the problem arises because the atomic category is [−complement], [−specifier], and (13) and (14) thus seem incompatible with the lexical requirements of a, since cd cannot be in complement position of an atomic category.

I propose that this problem however disappears when (13) and (14) are considered derivationally, rather than representationally, in the following fashion. Let us assume that a lexical element can only select and be merged with another lexical element (or, in some cases, lexical variable) whose requirements [+complement, specifier] have been satisfied (checked off, in minimalist terms, a process attained via Merge). In other words, a lexical category has to first be saturated (in Speas 1990’s terms), or complete, before it becomes the target of merge. We can express this idea with the hypothesis in (16):

(16) **Cyclicity of Selection Hypothesis (CSH)**

A lexical category x must be complete before another lexical category y can be merged with x.

The view of Merge represented in (16) has two crucial characteristics: on the one hand, it is cyclical: a category y can only be the target of Merge if it is completed, since once targeted and merged, it cannot further target any other category. On the other hand, Merge is directional, since a category x merges with a category y to check x’s features. Both properties are consistent with recent syntactic work (Chomsky 2001; Collins 2001). Moreover, the idea of a derivational approach in which (syntactic) requirements are established in the structural description of a transformation (rule) is in line with recent work by Epstein and his colleagues (see Epstein et al. (1998), and Epstein and Seely (1999), for example). This view however contradicts H&K’s own proposal. Hale and Keyser (1998), for example, use representational terminology in their definition of the structural relations *complement* and *specifier*. However, very often they adopt a derivational language, in the step-by-step construction of their lexical structures. For now, I will just remark that the assumptions made so far about the status of the arguments that appear in *spit*-verbs, together with the adoption of (16), have allowed us to construct a lexical structure of these verbs without any degree of recursion, a result that didn’t seem possible when we followed H&K’s theory as it was stated. In this sense, and given that recursion is a natural enemy of a restrictive theory of argument structure, we can say that the adoption of (16) serves progress.

Below I closely analyze the structure of composite dyadic verbs (such as *spit*), in an attempt to show the changes that the elimination of mutual satisfaction in favor of (16) introduce, and the advantage to choose one over the other. The structure is repeated below for convenience, and their derivation follows:
(17) (The baby) spat porridge on the table

The composite dyadic head, \( cd \), as the selector, dictates the conditions of the building operation; in this case, \( cd \) demands that it be merged with a category that will project a specifier, but will not “claim” such specifier as its own; moreover, such category cannot be constructed as the complement of \( cd \). When \( cd \) merges with the complete atomic category \( a \), in order not to construct \( a \) as the complement of \( cd \), \( cd \) adjoins to the maximal \( a \), creating segments, not projections, of \( a \). Hence, the \([-\text{complement}]\) requirement of \( cd \) is met (since \( cd \) itself does not project in merging, \( a \) is not its complement). Moreover, since \( a \) is complete, its lexical requirements are not modified as a consequence of being selected and merged. When the complex \([a \ bd]\), in which \( a \) is the head and \( bd \) the selector, creates another segment, the resulting specifier can only belong to \( cd \), the only non-complete lexical category. A basic dyadic category is then merged in the specifier position.

Therefore, following (16), and despite of what might look representationally, when understood derivationally, neither \( cd \) nor \( bd \) are complements of \( a \), and \( a \)’s requirement of \([-\text{complement}]\) is met. Likewise for \( cd \).

Now, let’s briefly come back to the general composite dyadic structure that H&K propose for deadjectival unaccusatives, repeated below for convenience:

(18)

Recall that H&K’s account of this structure, consists in mutual satisfaction occurring when \( cd \) is merged with \( m \): on the one hand, the \([+\text{complement}]\) requirement of \( m \) is met by the merging of \( cd \) in the complement position of \( m \); on the other hand, \( m \) is able to project a specifier by its merging with \( cd \), hence satisfying the \([+\text{specifier}]\) requirement of \( cd \). Yet recall also that, if we are to adopt (73), \( cd \) cannot be the complement of \( m \), since \( m \) must be complete before being
selected by \( cd \). For \( m \), that means that its lexical requirements of \([+\text{complement}], [+\text{specifier}]\) be met prior to its merging with \( cd \). The structure in (18) should be modified to the one in (19), in which \( m \) has satisfied its \([+\text{complement}]\) requirement (say, by merging with an atomic category) prior to its being the target of merging with \( cd \) by adjunction\(^{14}\).

(19)

\[
\text{DP} \quad m_1 \quad m_2 \\
\quad m_1 \quad a \\
\text{\( \forall \text{clear} \)} \\
\text{cd}
\]

---

**Addendum: The Source Role of the Subject, and the Lack of Inchoative**

We are now to address the last of our concerns about the lexical structure of *spit*-verbs, mainly the lack of transitivity alternation that these verbs present, unlike most of composite dyadic verbs studied by H&K. In my answer to this problem, I will use a version of the “manner indices” first introduced in Hale and Keyser (1993) and reformulated in binding theoretic terms in Hale and Keyser (1998, 2002). The authors notice the contrast between two kinds of verbs, both taking a PP complement: the ones in (20) participate in the transitivity alternation, while the ones in (21) don’t:

(20)  
\begin{align*}
\text{a. I splashed/got mud on the wall} \\
\text{b. Mud splashed/got on the wall}
\end{align*}

(21)  
\begin{align*}
\text{a. I smeared/put mud on the wall} \\
\text{b. *Mud smeared/put on the wall}
\end{align*}

Alleging that it has been frequently noticed in the literature that certain aspects of the meaning of lexical items have are relevant to their syntactic behavior, H&K propose an account of the contrast in (20)–(21) based on what they call “manner component indices”, which they indicate by \( \{i\} \). While the status of these indices is not totally clear, syntactically speaking they seem to act as binding entities. For example, in *splash* and *get* the manner component index \( \{i\} \) is “patient-manner”, meaning that it must be bound internally.\(^{15}\) Both in the transitive (20a) and in

\(^{14}\)The structure in (19) does not look completely satisfying to me. Although a right justification would take more space and time than what I have available for the purposes of this paper, a raising structure in which the lower \( m \) selects a lexical variable (instead of an empty \( a \)), which raises to the specifier position of \( cd \) and becomes the sentential complement makes more sense to me. For a related idea about resultatives as uniformly raising constructions, see Kratzer (2005).

\(^{15}\)Hale and Keyser (1998: 12) define patient-manner as follows: “an adverbial semantic “feature” which identifies the physical motion, distribution, dispersal, or attitude, f the entity denoted by the
the intransitive (20b), where the object has raised to subject position), the object binds the index from its specifier position. Since the object is an internal argument, the index \{i\} is always internally bound, and its requirement is met. Hence the grammaticality of the transitivity alternation.

On the other hand, *smear* and *put* have a manner component index \{i\} that is “agent-manner”, meaning that it must be bound externally.\(^{16}\) In (21a), \{i\} is bound by the subject, which, as external argument, satisfies \{i\}’s requirement. But if we raise the object *mud* to subject position (to form the intransitive (21b), the object binds the index from its new position. Since *mud* is an internal argument, the index \{i\} will be internally bound, against its requirements, and the intransitive will crash.

In order to explain the lack of the inchoative form of *spit*-verbs (recall 10), I propose that these verbs are like *smear* and *put*: they have an “agent-oriented” index that must be externally bound and therefore prevents the inchoative from surviving. Furthermore, it could be that the index of these verbs could well bear the specification *Source* for the subject, since the agent of the action must also be the source of the substance expelled from the body.\(^{17}\) This way we explain the *Source* role of the subject, where a simple Agent would be expected.

Now, as pointed out above in (7), *spit* does present a transitive/intransitive alternation of a different sort, namely, what looks like an unergative/transitive alternation:

\[(22)\]
\[
a. \text{When llamas become upset, they spit } \\
b. \text{The volcano spat even more ash and lava} 
\]

We can refer to this alternation that *spit* presents between a transitive and an intransitive form as the transitive/unergative alternation. Levin (1993: 33, and references given therein) refers to a very similar alternation that she calls “Unspecified Object Alternation”. According to her, in the intransitive variant a typical object of the verb can be omitted, or left implicit. She further claims that this alternation appears with activity verbs. Some clear examples are given below:

\[(23)\]
\[
a. \text{Mike ate the cake} \\
b. \text{Mike ate (→ Mike ate a meal or something one typically eats)} \\
\text{(Levin 1993: 33)} \\
c. \text{She is cooking again this weekend, and of course you are invited} 
\]

---

\(^{16}\)Hale and Keyser (1998: 13), for agent-manner: “an adverbial feature which describes the actions of entities denoted by their external arguments —to “smear X on Y” requires an “agent” which executes the gestures which, in accordance with the lexical encyclopedic entry, are necessary in performing the action so named”.

\(^{17}\)As evidenced by the following scenario: if Elliott wipes out from the floor the spit produced by one of my dogs, and in his way to the kitchen his mop drips some of the substance on the floor, we cannot however say that Elliott (and even less the mop) spat on the floor.
This is consistent with spit being related to an atomic element; the unergative counterpart occurs when the root appears as a complement of a monadic category:

(24)  

Notice that other unquestionably composite dyadic verbs do not present this possibility (in the relevant interpretation, where the subject is the Agent and not the Theme):

(25) a. *I cleared  
b. * I broke

This is further encouragement to abandon the analysis of spit as the head of a composite dyadic category, in favor of it being the head of an atomic one. In addition, the unergative/transitive alternation exhibited by spit is consistent with what we know of the syntax of verbs in English, where the addition of a goal phrase to an arguably unergative predicate like run results in the predicate showing transitive characteristics (26 a, b, from Levin and Rappaport Hovav 1995)\(^\text{18}\):

(26) a. Fred ran  
b. Fred ran Alex to the emergency room

Summary: Lexical Projection Structure of spit-Verbs

In sum, the lexical projection structure of spit-verbs argued for in this chapter is the following:

(27) (The baby) spat porridge on the table/(The) spitting of porridge on the table

\(^\text{18}\)See Juarros-Daussà (in press) for an analysis of expanded unergatives within Hale and Keyser’s framework.
The crucial feature of (27) is that, assuming the USH, it exhausts the combinatorial possibilities of the lexical categories: there is one instance of each. This makes (27) the largest argument structure allowed in natural language. Since it is a structure in which two arguments are associated to one single root, the TAR is thus derived.

2.3 Cyclic Merge and the Uniqueness of Selection Hypothesis

The conception of Merge implied by the CSH as a cyclical, directional operation, poses a restriction on the construction of lexical structures, by limiting the number of possible argument structures to those that are obtained by combining completed lexical categories. In this final part of the paper, I explore one more consequence of restricting lexical structures in this fashion: that of calculating the actual absolute maximal number of possible argument structure types allowed in natural language. The reasoning goes as follows: if argument structures are obtained by mere combination of the basic lexical categories according to Merge, and if we restrict the number of categories that can be present in a single lexical entry, we can actually calculate, in an abstract manner, the number and shape of all possible argument structure types allowed by natural language. Of course, it is expected that some of the resulting structures be eliminated by other factors (such as patterns of conflation, for example, and crosslinguistic factors), and it is possible that some others be added (for example, by adding additional factors such as the obviative/proximate indexes, as we saw before), but the important thing is that the basic number of abstract structures predicted by the theory can actually be calculated. Once this is done, the task is to match these structures with the empirical facts of each language regarding verb types, while trying to account for any divergences.

Notice that in the above reasoning one further condition has been added, mainly, that of restricting the number of basic lexical categories (in H&K’s sense) that can be present in a single lexical entry. This is necessary to restrict the combinations, but it is not an obvious condition. After all, if language allows for a single argument structure to be composed of more than one basic element, any random restriction based on the number of segments would be mere stipulation. Imagine though that the restriction is not on the number of basic elements that form an argument structure per se, but on there not being two lexical categories of the same type contained in a single argument structure. We can formulate this hypothetical restriction, which I call Uniqueness of Selection Hypothesis (USH), as follows:

(28) Uniqueness of Selection Hypothesis (USH)

An argument structure can contain two lexical categories x, y, only if $x \neq y$

\[19\] Since there are four lexical category types, and only one is allowed in each structure, the calculation in gross terms is: 1P: $n = 4$; 2P: $n(n - 1) = 12$; 3P: $n(n - 1)(n - 2) = 24$; 4P: $n(n - 1)(n - 2)(n - 3) = 4! = 24$; Total: 64. I thank Gert Hoffmann for mathematical advice.
Presumably, the intuition behind the USH in (28) has to do with the identification of lexical categories with roots. If each lexical category of H&K’s type represents a root, and some form of Late Insertion of roots into structures is assumed, if the case presents itself of two roots competing for the same insertion slot, the derivation crashes. Of the most relevance to the topic of this volume is that this principle amounts to negating the existence of a recursive function in the domain of argument structure, relegating such functions to other grammatical domains. Moreover, it predicts the set of possible argument structures restricted to a given number. While the actual number of structures is not important, the fact that we can predict a restricted typology of argument structures is a very interesting consequence of the particular extension of H&K’s theory that I am proposing.

3 Conclusion

This article assumes that, at the representational level of argument structure, there is a Two (internal) Argument Restriction (TAR) that is part of the basic architecture of natural language; any additional (pseudo)arguments are introduced via (possibly recursive) syntactic or discursive procedures, not lexical. As shown, a modified version of H&K can account for this restriction. In this proposal, the TAR crucially depends on the lack of recursion in the lexicon (in building argument structures), restricting the possibility of using this formal mechanism to the domain of sentential syntax (building of sentences). Argument structures are thus built in a cyclic and directional way, and without recursion.

References


20While if the TAR is right, no language would make use of recursive mechanisms of this type in the domain of argument structure, languages could differ on the extent to which they use recursion in other domains.
Deriving the Two-Argument Restriction Without Recursion


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AUTHOR QUERIES

AQ1. Dowty (2001), Folli et al. (2005), Randall (2010), Levin and Rappaport Hovav (1995) are not provided in the reference list. Please provide.

AQ2. The citations Koenig and Mauner (2003), Kratzer (2004) has been changed to Koenig et al. (2003), Kratzer (2005). Please check if appropriate.


AQ5. Please confirm the inserted publisher name and location for Folli et al. (2003).