Tutorial

The Sequential Unfolding of First Phase Syntax: Tutorial and Applications to Development

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Purpose: This tutorial is an introduction to first phase syntax (FPS; Ramchand, 2008). FPS provides a new, cross-linguistically motivated perspective on clause internal structure. A new sequence of syntactic development is proposed based on FPS with 4 levels of complexity: (0) verb particles and adjectives in the 1-word stage, (1) semantic relations of entity + location/attribution, (2) intransitive structures encoding change of location/state, and (3) transitive sentences with an internal argument that changes state/location and an external, causer argument. A novel prediction of this framework is that a Level 2 structure emerges earlier than a Level 3 structure.

Method: Archival longitudinal data of 15 children (8 boys) were selected to test the proposed developmental sequence. The 15 children's data were drawn from the DeKalb corpora (Rispoli, Hadley, & Holt, 2008, 2009) and Champaign

corpora (Hadley, Rispoli, Holt, Fitzgerald, & Bahnsen, 2014), selected because their mean lengths of utterance did not exceed 2.54 at age 2;6 (years;months). One-hour language samples taken every 3 months from 1;9 to 2;6 were searched for Level 1–3 structures. The diversity of the internal argument was tracked across levels.

Results: Average argument diversity shifted across levels over the period of 1;9–2;6. At 2;0, argument diversity was highest for Level 1; at 2;3, diversity was highest for Level 2; and at 2;6, it was highest for Level 3. Paired-samples *t* test revealed that, at 2;3, argument diversity in Level 2 was significantly higher than that in Level 3.

Conclusion: This developmental application of FPS provides a theoretical framework for a developmentally ordered sequence of syntactic goals and treatment targets for children struggling with the acquisition of syntax.

How does language allow us to communicate about events in the world? What structure does syntax provide that enables us to relate the initiation of a process to its eventual outcome? Understanding this syntactic structure and how it develops in children would be of great value to those concerned with facilitating the language development of children so that they can become effective and efficient communicators. This tutorial and application is addressed to clinical researchers and language interventionists whose concern is early syntactic development, especially the transition from the one-word stage to syntax. It concerns the structure of predication, event structure, argument structure, and intraclausal complexity. As such, it does not deal with grammatical aspect or tense,

which has scope over this intraclausal complexity, nor is this tutorial concerned with multiclausal syntax.

A theory of how syntax is structured as a platform for communicating about events has long been in the making. Its origins can be traced to natural language philosophers such as Vendler (1957) and Dowty (1977), who developed a taxonomy of predicate types, distinguishing between state, activity, achievement, and accomplishment predicates. Those insights gradually found a place in minimalist approaches to syntax (Chomsky, 1995). With minimalism came a reformulation of the more traditional notions of verb phrase, argument structure, aspect, and the syntactic structure of predication itself (Hale & Keyser, 2002; Ramchand, 1997). What has emerged is a reconfiguration of the relationship between the lexicon and syntax called *first phase syntax* (FPS; Ramchand, 2008). In this tutorial, we will see how FPS answers our opening question of how syntax enables us to communicate about events from their inception to their outcomes. I will trace in broad, illustrative strokes the sequential unfolding of clause structure in development based on this framework. I will also draw connections to phenomena that have relevance to assessing

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grammatical development in toddlers acquiring English and other languages. I will also provide empirical support of the hypothesized sequence from the longitudinal data of 15 English-speaking children who exhibited slow, typical development.

In the earliest proposals of generative syntax, lexical items were inserted into the terminal nodes of syntactic trees (Harley & Noyer, 1999). In FPS, verbs are constructed syntactically (Ramchand, 2008). If the predicate is one of a temporally dynamic process (as opposed to a state), it may be constructed out of as many as three predicate heads, each expanding into its own phrase. These heads are called *initiation* (init), *process* (proc), and *result* (res). They syntactically embody the semantic operators of (cause (become (state))), whereby something is caused by an external initiator to undergo a process through which that undergoer enters a new state. An English sentence illustration of a process and result would be *The piece slid in*. The FPS hierarchical structure for this sentence is given in Figure 1. In the notation for Figure 1 and the figures that follow, bold type signifies the surface position of a word or morpheme. Light type in angle brackets <> represents sites occupied during the derivation prior to arriving in the surface position. Note that the result phrase is the complement of the process head and that the elements of the result phrase have actually risen out of a prepositional phrase that is the complement of the result head. The preposition *in* is often referred to as a “verb particle,” that is, a prepositional head that is a required component of a verb. The reader may recognize that *slide in* is a garden variety intransitive unaccusative (Perlmutter, 1978) with a verb particle. Indeed, intransitive unaccusatives are process predicates, and the verb particle syntactically fills the head of the result phrase. It should be born in mind that, in FPS, unaccusatives are structurally simpler than transitive structures that might incorporate them.

The transitive version of the verb “slide” is found in Figure 2, *The workman slid the piece in*. The initiation and process heads are merged into one morpheme “slid.” Note that the result phrase appears to contain the direct object of the verb. However, FPS makes it plain that the direct object is also, and actually, the specifier of the result phrase. The subject of the entire sentence, “the workman,”

is the specifier of the initiation phrase. That is, this causer argument has been added to the FPS construction by having an initiation phrase over the process phrase. In essence, transitive sentences that contain [initiation [process [result]]] structure have two arguments: the specifier of the result phrase, or undergoer, and the specifier of the initiation phrase, or causer. The undergoer is referred to as the *internal* argument and, the causer, the *external* argument. It is important to understand that the result phrase in Figure 2 is essentially a simple state predicate, as in Figure 3. This structure has no verb. It is inherently stative and has an argument and a predicate joined in a basic predicative relationship. These single argument “monadic” state predicates (Bowers, 1993; Hale & Keyser, 2002) become result phrases by virtue of being the complement of a process head.

Particle “shift” in English is explained as the merging of the head of the result phrase “in” with head of the prepositional phrase (PP) “in,” coupled with the failure of the specifier of the PP “the piece” to move into the specifier position of the result phrase. This gives rise to the word order *The workman slid in the piece* (see Figure 2; Ramchand & Svenonius, 2002).

PPs are not the only type of complement a result head may take in English. Adjective phrase complements are common in English, and some adjectives “shift” in the same way verb particles “shift”; for example, *The workman slid the door open* and *The workman slid open the door* are both grammatical.

The two arguments of the [initiation [process [result]]] structure add substantially to the Aktionsart of that predicate–argument structure (Ramchand, 1997; Vendler, 1957). The single argument of the result is the argument that gains a property. The property is viewed as changing, and the argument is viewed as undergoing this change, because a monadic state predicate has been structurally embedded beneath a process predicate. The argument of an initiation predicate is an external causer, an identifiable initiator of a process-leading-to-result sequence. Multiple-argument state predicates (e.g., *want*, *see*) do not denote temporally dynamic events and thus do not follow the upward progression of result phrase to process phrase to initiation phrase. The arguments of state predicates are neither undergoers nor causers. Ramchand (1997) preferred the term *predicate modifier* for such arguments but later (in 2008) opted for the term *rhematic material*. Figure 5 shows the derivation of *I want juice*. Notice that *juice* is not in the specifier position of a result phrase, as for example, the direct object is in Figure 2. Rather, it is just the complement of a state verb.

This explains why state predicates are highly variable in the alignment of argument to subject and object positions, as seen in reverse linkage pairs of verbs in English such as *I own the dog* and *The dog belongs to me*, and *I enjoy notoriety* and *Notoriety delights me*. Another interesting illustration of the difference between arguments in a process + result combination versus the arguments of a state predicate can be seen when comparing “have a cold” versus “down with a cold” (1–3).

Figure 1. First phase syntax derivation of *the piece slid in*.

Figure 2. First phase syntax derivation of *the workman slid the piece in*.

- (1) I have a cold. (State)
- (2) I am down with a cold. (State)
- (3) I am coming down with a cold. (Process)

In all three examples, *a cold* literally has the same real-world relationship to *I*: It is a property or condition of the subject *I*. The structure of *I have a cold* is like that of *I want juice*, as seen in Figure 5. Syntactically, the state verb *have* in Sentence 1 takes two arguments, and the noun phrase *a cold* is the complement of *have*, but clearly, *a cold* is not undergoing a change of property. Now let us consider Sentence 2. The structure of *I am down with a cold* is essentially verbless, although its meaning is very similar to that of Sentence 1. Copula is only inserted as a consequence of merging this stative structure with a higher projection of tense. However, we can take this stative structure and subordinate it to a process verb as a result phrase, giving us (3) *come down with a cold*. The internal argument of this process + result pair is *I*, and the result phrase is *down with a cold*.

Whereas the alternation between transitive and intransitive seen in verbs such as *slide* may be more familiar, the concept of result phrase in all likelihood is novel to the reader. To reiterate, result phrases are headed by particles, prepositions, and adjectives. The phrases expanded from these heads become the complements of process heads (see Figures 1, 2, and 4). A result phrase is not to be confused with a predicate modifier (see Figure 5). One can see

the inherently predicative nature of result phrases in the following copular sentences (4–6). The point that particles, prepositions, and adjectival predicates are inherently predicative will be taken up again in the section on development.

- (4) The toys are out.
- (5) The toys are in the box.
- (6) The toys are clean.

FPS is simultaneously a formalism and explanation of how syntax enables us to communicate about events. The three-headed structure of initiation, process, and result can be embodied in derivational morphology, as in the following English pattern of alternation (7–9; Hale & Keyser, 2002):

- (7) The sky is red. [state]
- (8) The sky reddened. [process [result]]
- (9) The sunset reddened the sky. [initiation [process [result]]]

English has ubiquitous zero derivation, and so the same alternation pattern can be seen without derivational morphology (10–12).

- (10) The sink is empty. [state]
- (11) The sink emptied. [process [result]]
- (12) Mom emptied the sink. [initiation [process [result]]]

FPS treats these alternations as syntactically generated, and the derivational morphology is a reflex of this syntactic derivation. With this syntactic, generative mechanism, we as English speakers are given enormous flexibility in the way we match lexical roots to the description of events. Thus, we can speak of abstractions with the same syntax that we use to speak of the location and relocation of objects (13–15).

- (13a) The plans were solid after the meeting.
- (13b) The plans solidified after the meeting.
- (13c) The committee solidified the plans after the meeting.
- (14a) The balls were off the table.
- (14b) The balls rolled off the table.

Figure 3. A simple state predicate.

Figure 4. First phase syntax derivation of *the workman slid in the piece*.

- (14c) The boy rolled the balls off the table.
 (15a) The gate was down.
 (15b) The gate fell down.
 (15c) The bulldozer knocked the gate down.

Cross-Linguistic Comparisons

Hale and Keyser (2002) argued that the generative syntactic structures by which verbs are constructed are recognizable in totally unrelated languages as distantly separated as Navajo and English. Ramchand (2008) successfully compares Scotts Gaelic and Bengali. These authors readily concede that the mechanism shows lexical variation across languages. Some languages will use derivational morphology or dummy and light verbs to flesh out the architecture of FPS, whereas other languages will merge abstract operators into lexical items. However, their position is that there is enough of the pattern visible in every language to view the three-headed [initiation [process [result]]] structure as a deep universal in clause structure. In this section, I will compare three of the world's most frequently spoken languages: English, Spanish, and Mandarin. These languages are acquired natively by children numbering in the billions.

Spanish

Let us use Sentences 16a–16c to demonstrate the deep similarities between Spanish and English. The sentences, translations of *the plate was broken in two*, *the plate broke*

in two, and *the girl broke the plate in two*, show the progression from state, to [process [result]], to [initiation [process [result]]].

- (16a) El plato estaba quebrado en dos.
 The plate was broken in two.
 (16b) El plato se quebró en dos.
 The plate broke in two.
 (16c) La chica quebró el plato en dos.
 The girl broke the plate in two.

Spanish is quite similar to English in that verb participles are adjectives and can be used as adjectival state predicates. In Example 16a, *quebrado* and the English participle “broken” work almost identically. Just as in English, these participles are morphologically related to forms of a verb *quebrar/break* in Sentences 16b and 16c, which are intransitive [process [result]] and transitive [initiation [process [result]]] structures, respectively. Spanish is most notable in its special marking of the [process [result]] structure, whose derivation is given in Figure 6. Spanish marks the head of the process phrase with the reflexive *se* (Montrul, 1999). Because the process head has its own dedicated marker, intransitives appear to be more morphologically complex than transitives (compare *quebrar* transitive vs. *quebrarse* intransitive). However, FPS does not base complexity on morphological complexity. Rather, complexity is based on the augmentation of a process head by the addition of the result phrase below it and the initiation phrase above it. In

Figure 5. Derivation of *I want juice*.

Figure 6. First phase syntax derivation of the Spanish *se* unaccusative.

other words, in order to introduce a cause argument, *la chica* in Sentence 16c, the transitive sentence must be more complex than the intransitive sentence, despite morphological derivation pointing to the contrary. It is the addition of the causer argument that makes the transitive sentence more complex.

Mandarin

One might think that Mandarin is far afield of Germanic or Romance languages, and yet as we shall see, Mandarin shows remarkable similarities to English and Spanish. Let us consider the translations of Sentences 17a–17c *the plate was broken, the plate broke, and the girl broke the plate*. Bear in mind that Mandarin has no distinction between finite and nonfinite verb forms and therefore no verb-related tense and agreement marking. The translations in Sentences 17a–17c reflect this lack of tense.

- (17a) Panzi shuai cheng liangban.
Plate broken in two.
- (17b) Panzi shuai cheng-le liangban.
Plate break in two.
- (17c) Nüsen ba panzi shuai cheng liangban.
Girl break plate in two.

The sentence *panzi shuai cheng liangban* is stative. Therefore, *shuai cheng* “break become” is on a par with *broken* (break + en) in English or *quebrado* (quebra + do) in Spanish. To incorporate this [state] into a [process [result]] structure, *shuai cheng* must become a verb. In Mandarin, the verb suffix *-le*, as in *shuai cheng-le*, is a reflex of this conversion. Thus, the verb affix *-le* is associated with a change from [state] to [process [result]]. The placement of *-le* after *shuai cheng* signals *shuai cheng* has become a resultative verb compound (RVC; Huang, Li, & Li, 2009; Li & Thompson, 1989). RVCs are a highly productive FPS mechanism in Mandarin, whereby the heads *proc* and *res* can be filled by different morphemes.

Adding the initiation phrase entails adding the causer argument. Mandarin has a dedicated mechanism for doing so, as can be seen in Sentence 17c. The structure is called the “*ba* phrase” (e.g., *ba panzi*). There has been much discussion of the syntactic nature of the *ba* phrase (Huang et al., 2009). However, one influential analysis by Sybesma (1999) places *ba* in the head of a phrase of an abstract “Cause” predicate. Sybesma’s analysis translates well into Ramchand’s initiation phrase, with *ba* filling the *init* head. The tree structure of Sentence 17c is displayed in Figure 7.

Mandarin makes an interesting comparison to Spanish. Spanish fills the *proc* head with a nonverb *se*, whereas Mandarin fills the *init* head with the nonverb *ba*. Both Spanish and Mandarin use nonverb dummy elements to mark heads in FPS structure.

This brief comparison of English, Spanish, and Mandarin underscores the power of FPS. Despite surface differences, there are deep commonalities of structure shared by these three languages. Each language converts simple state predicates into result phrases. The result phrases are the complements of process verbs. The process

verb dominating the result phrase shares a single argument with the result phrase. A new, external causer argument is added with augmentation by the initiation phrase, creating a transitive change of state verb. We can see in all three languages a highly productive generative syntactic engine that allows us to communicate about events in the following way: Causers initiate processes that lead to results. Each one of the stages or segments of this chain of causality finds its own syntactic expression within a single clause.

Development

In this section, I will present an outline of the development of the FPS structural sequence [initiation [process [result]]]. It should be noted in passing that this may not be the sole FPS-defined sequence occurring as the child transitions from the one-word stage to clausal syntax. Other possible sequences will be outlined in the Discussion portion of this tutorial. I focus on this sequence because, as I argue, it begins with and incorporates the simplest form of predication, the monadic state (see Figure 3). I will use examples from children developing language slowly, because their rate of development allows us to see a series of developmental changes stretched over time, as compared to children developing more rapidly, whose more rapid pace of development compresses events into a shorter time frame. The sequence begins at the end of the one-word stage, shifts into semantic relations that are prevalent in the transition to syntax, and continues through the third year of life, by which time most children are capable of producing sentences with a high level of intra-clausal complexity. Most significant in my view is that the sequence follows the structure of the triphrasal clause from the bottom up. It begins with the verb particles and adjectives that can fill the head of result phrases. During the transition out of the one-word stage, the particles and adjectives are the heads of monadic state predicates. These simple one-place predications, for example, *baby out* and *stove hot*, form the basis of the result phrase, which figures importantly in the next phase of this sequence. Creating a structure in which a process verb takes such a state predication as a complement constitutes a milestone in syntactic development. The structures children are capable of formulating and producing expand to the combination of [process [result]] and end with the complete structure of [initiation [process [result]]]. The sequence is dissected into levels. At each level, there are constraints on what kind of FPS structure a child is capable of formulating and producing. In the sequence examined in this tutorial, each developmental level is defined by the extent of the [initiation [process [result]]] that children can formulate and produce. This includes the heads of each phrase and both internal and external causer arguments.

Level 0

Level 0 is the one-word stage. In the one-word stage, children are unable to join a predicate to its arguments.

Figure 7. First phase syntax derivation of the Mandarin *ba* phrase.

They may indicate the referents of these arguments through gestures, such as pointing. Because of this constraint, interpreting a toddler one-word utterance is usually dependent on context. It is well established that verb particles (*up, down, on, off, in, out*, etc.) of English can be found in these one-word utterances (W. Miller & Ervin, 1964). From the FPS perspective, the verb particles used in this “verb-like” manner are predicates in their own right. The concreteness of the spatial relation predicates *up, down, off*, and so forth makes them ideal for the child’s communication attempts in the one-word stage. In context, a single verb particle such as *out* can readily be interpreted as a request for help in removing an object from a container.

Nouns outnumber verbs substantially in child utterances during the one-word stage (Gentner, 1978). Because of their infrequency, it is difficult to use verbs as landmarks of progress during the one-word stage. However, verb particles are also predicates and closely tied to discrete spatial relationships that are variants of the general figure/ground dichotomy. They arise initially from a very small class of complementary antonyms: *in* versus *out*, *up* versus *down*, and *on* versus *off*. For these reasons, I hypothesize that the verb particles in one-word utterances signal that the toddler is nearing the end of the one-word stage.

Level 1

This level is defined by the child’s ability to formulate and produce a specifier argument with a state predicate. There are no verbs per se in the syntax of these predication, because, as previously stated, verbs are syntactic composites. Toddlers do not compose verbs syntactically during this transition to syntax. Utterances such as *stove hot* can be viewed as instances of missing copula. Indeed, Mandarin (Sentence 17a) does not have a copula, a purely syntactic device, for such predication.

Because the verb particle is a predicate, the child is now able to produce utterances such as *baby out* and *hair off*. The pioneers of language acquisition classified such two-word combinations as a type of semantic relation, “entity location” (Brown, 1973) or “locative state” (Bloom,

Lightbown, & Hood, 1975). The form of these utterances looks identical to result phrases based on verb particles, for example, *Do you want me to take the baby out?* Their sentence final position makes them prime candidates for early acquisition, possibly through a backward chunking mechanism (Freudenthal, Pine, & Gobet, 2006). However, from an FPS perspective, these are monadic (single-argument) predicates with a hierarchical structure, as displayed in Figure 8 (Bowers, 1993; Hale & Keyser, 2002). Their structure is practically identical to the structure of adjectival predicates, as displayed in Figure 9. Therefore, we should expect that children producing “entity location” can also produce “entity attribute.”

A child at Level 1 ability still cannot formulate and produce structures that embed the monadic state predicates within a process phrase. That is, children at Level 1 cannot produce [process [result]] structures. Children constrained to Level 1 production cannot produce *baby get out*. It naturally follows that, if a child cannot formulate [process [result]] structures, he or she cannot produce [initiation [process [result]]] structures, such as *mommy take the baby out*. It is very important to note that, at Level 1, children could produce *sit down* and *fall down* or even *put in*. These verb + particle combinations lack the internal argument, which would surface as the subject of *sit down* or *fall down* or the object of *put in*.

Figure 8. First phase syntax representation of entity location.

Figure 9. First phase syntax representation of entity attribute.

It is also important to bear in mind that Level 1, or any of the levels discussed in this tutorial, has no bearing on the production of state verbs such as *want*. As explained in the Introduction, state verbs take rhematic material as their complements, and not result phrases. The constraints of Level 1 and all other levels concern only stage predicates that take the internal argument of undergoer and the external argument of causer. Furthermore, the levels are most directly concerned with structures that can potentially contain a result phrase or be the antecedent of a result phrase. These points are crucial and cannot be overlooked. What I am claiming is that, at Level 1, children cannot take the specifier arguments of states and make them the internal arguments of [process [result]] structures. I am also claiming that the verb particle and adjectival predicates in Level 1 cannot be merged with process heads.

Level 2

Level 2 structures are the first complex event structures that children produce. Level 2 structures embed states beneath process heads, thus deriving [process [result]] structures. The internal argument must be overt and explicit. Examples are *pig get out* and *baby fall down*, which are intransitive. Determining whether a child production constitutes a Level 2 production can be challenging from transcript data, because certain high-frequency, early acquired, intransitive verbs are pluripotent. For this reason, Level 2 structures are further subdivided on the basis of the verb.

Level 2A. *Pig get out* and *baby fall down* are paradigmatic examples of Level 2A structure. One diagnostic for Level 2A is the scope of progressive aspect in the adult grammar, when applied to the structure. Progressive *-ing* has scope over the process, but not the result portions of the complex predication. Thus, *pig getting out* implies that the pig is not yet quite out, and *baby falling down* implies that the baby has not yet quite hit the ground.

Level 2B. There is a subclass of intransitive posture verbs in English for which progressive aspect has an ambiguous scope in adult grammar. For example, *I'm sitting down* can mean either that "I am reaching a seated position" or that "I am already in and holding a seated position." For this reason, posture verbs + verb particle *sit*

down and *stand up* are considered a different class from Level 2A.

Level 2C. Some verb + particle or verb + locative combinations can have either process or state readings. Consider the verb *go*. It can easily be construed as a state when a child is putting pieces into a puzzle and says *piece go in here*, paraphrased as "piece belongs in here." On the other hand, suppose a child is moving a cow toy into a barn and says *cow go in here*. This latter instance seems more likely to be a process predication, which could be paraphrased as "cow going in here." For this reason, the verbs *go* and *fit* accompanied by a verb particle or locative PP are considered a different class than 2A and 2B.

Level 3. Level 3 is the final level of complexity in this developmental application of FPS. This level is defined by the syntactic position of the internal argument. In familiar, traditional terms, the internal argument is the direct object of the verb. In FPS, the internal argument is the specifier of the result phrase. Thus, truncated structures such as *take pig out* and *put mustard back* constitute Level 3 structures. Related to them are complete sentences such as *I put the car away*, *I kicked tower down*, and *I'm taking the dish out* that contain the full extent of the complex event structure covered in FPS. Namely, they include the external causer argument, which is more traditionally seen as the subject of these transitive verbs. However, it must be stressed that such subjects are optional in determining whether a structure is Level 3. The sole criterion is the position of the internal argument.

Level 3 structures need not be longer than Level 2 structures. *Take pig out* and *pig get out* are of the same length in morphemes. What differentiates these two structures is the position of the internal argument. Unique to the FPS framework is that *pig get out* is actually less complex than *take pig out*. It is important to bear in mind that the developmental precedence of a Level 2 structure over a Level 3 structure is not based on morphemic length. In summary, when the child can spontaneously produce [initiation [process [result]]] structure with the internal argument as the specifier of a result phrase, the child has truly arrived at another important milestone in syntactic development.

Summary

Before I leave this description of developmental levels, I reiterate my claim. The triphrase structure of a clause [initiation [process [result]]] unfolds in English from the "bottom up" or, if you will, "right to left," beginning with the single-argument states that will soon form the basis for the result phrase. Levels of capacity unfold sequentially, such that each level contains the structures of the previous levels. Each new level adds a layer of structure onto the previous level. Throughout these levels, there is one common element: a monadic state predicate. In Level 0, this predicate is produced in isolation, with its argument implied. In Level 1, its sole argument is expressed. In Levels 2 and 3, this simple form of predication is embedded and incorporated into the successively more complex intraclausal

structures of [process [result]] and [initiation [process [result]]].

Case Studies

In this section, I present evidence that FPS takes shape in the sequence I have hypothesized. I will do so by reviewing the longitudinal records of 15 children developing at a slower-than-average rate. These cases were drawn from the DeKalb (Rispoli et al., 2008, 2009) and Champaign (Hadley et al., 2014) cohorts. The reader is directed to these publications for further details concerning sample collection, transcription procedures, and transcript reliability. The children (eight boys) were observed trimonthly for 1 hr, beginning at the age of 1;9 (years;months). They were selected because their mean length of utterance (MLU) did not exceed 2.54 at age 2 years, 6 months (30 months). Their MLUs place them below J. F. Miller and Chapman's (1981) estimated population average MLU of 2.54. The MLUs and number of different words (NDW), based on the first 0.5 hr of each sample, are given in Table 1. The children are arranged by their NDW at age 2;6, with the child having the lowest NDW at the top and the highest NDW at the bottom.

The analytic approach is based on the position that the strength of syntactic structures in a child's production system can be measured by the lexical diversity in examples of that structure produced (Hadley et al., 2014; Hadley, McKenna, & Rispoli, 2018; Rispoli et al., 2009). In much the same manner as Hadley et al. (2018) focused on subject diversity for sentences, this analysis focuses on internal argument diversity, because the internal argument is held in common across all three levels. Internal argument diversity

was calculated for the structures at Levels 1–3 in each of the language samples. Internal argument is defined as the single argument of a Level 1 structure (e.g., *baby out*), the subject of an intransitive of a Level 2 structure (e.g., *pig get out*), and the direct object of a Level 3 structure ((*I*) *knock it down*). Note that the subject of these transitive sentences is optional. Argument diversity was operationalized in much the same way as subject diversity was operationalized in Hadley et al. (2018); that is, each different noun or pronoun is considered a different type. Modification of the noun, for example, by a demonstrative pronoun, possessive determiner, or adjective (e.g., *this book*, *his book*, *red book*), does not constitute a new type. In the case of pronouns, case errors (e.g., *me* for *I*) do not constitute a new type.

Table 2 provides us with the means and standard deviations of argument diversity across all three levels of FPS complexity at ages 1;9, 2;0, 2;3, and 2;6. These data are also presented graphically in Figure 10. At age 1;9, very little productivity was observed at any level of structure. In fact, there was no productivity observed at Level 3, whatsoever. This is not surprising as only six children had MLUs greater than 1.25 at age 1;9.

There was a radical shift in this profile by age 2;0. Argument diversity in Level 1 rose to an average of 2.53 pronouns/nouns per child. In contrast, Levels 2 and 3 rose only a small amount, remaining well under one pronoun/noun per child. In fact, Level 1 argument diversity reached its peak at age 2;0. Level 1 argument diversity continuously declined at ages 2;3 and 2;6.

There was a further shift in profile between ages 2;0 and 2;3. At age 2;3, the highest argument diversity was found not in Level 1 but in Level 2 structures. The children produced an average of 2.47 different pronouns/nouns as subjects of [process [result]] structures. This represents an average increase from age 2;0 of almost two different words per child. Level 3 also increased, but the increase in Level 3 argument diversity was considerably less than the increase for Level 2 subjects. The average diversity of direct objects in Level 3 structures at age 2;3 was 1.4 ($SD = 1.59$).

However, the precedence of intransitive subject diversity over transitive direct object diversity disappeared by the next sampling point at age 2;6. At age 2;6, Level 3 internal argument diversity was 3.4 different words ($SD = 2.50$), greater than either Level 2 or Level 1 diversity. This application of FPS makes a novel prediction, namely, that

Table 1. Number of different words (NDW) and mean length of utterance (MLU) at ages 1;9–2;6.

Child ^a	Age							
	1;9		2;0		2;3		2;6	
	NDW	MLU	NDW	MLU	NDW	MLU	NDW	MLU
M06	19	1.08	16	1.15	68	1.81	49	1.84
O1G	46	1.37	26	1.48	80	2.01	63	1.59
F16	24	1.28	24	1.20	73	1.73	80	1.96
59B	45	1.29	86	1.84	88	2.68	94	2.45
45G	31	1.19	78	1.54	82	1.60	97	1.82
13B	12	1.18	54	1.86	58	1.46	99	1.99
09G	39	1.41	100	1.70	126	2.35	105	2.02
61B	51	1.31	80	1.96	96	1.77	115	2.25
03G	37	1.27	78	1.68	94	1.92	118	2.41
M01	17	1.26	48	1.25	88	1.63	123	2.23
51G	23	1.06	71	1.46	102	1.81	129	2.14
M16	34	1.24	67	2.23	97	2.02	132	2.46
55G	25	1.24	69	1.42	108	2.63	137	2.48
47B	14	1.13	41	1.75	96	1.96	139	2.18
33B	59	1.61	93	1.98	108	2.39	175	2.52

^aChildren from the DeKalb cohort are identified as M = male and F = female; children from the Champaign cohort are identified as B = male and G = female.

Table 2. Average argument diversity at ages 1;9–2;6 across three levels of structure.

Level	M/ <i>SD</i>	Age			
		1;9	2;0	2;3	2;6
1	<i>M</i>	0.27	2.53	2.33	1.93
	<i>SD</i>	0.46	2.70	2.09	1.62
2	<i>M</i>	0.13	0.60	2.47	2.93
	<i>SD</i>	0.35	0.99	2.00	1.22
3	<i>M</i>	0.00	0.47	1.40	3.40
	<i>SD</i>	0.00	0.92	1.59	2.50

Figure 10. Argument diversity across first phase syntax levels and age. lvl = level.

Level 2 structures emerge before Level 3 structures. There are multiple aspects of these data that support this hypothesis. The data showed a rapid increase in Level 2 argument diversity between ages 2;0 and 2;3, which was not matched by a similar rapid increase in Level 3 argument diversity. A paired-samples *t* test comparing Level 2 subject diversity with Level 3 object diversity revealed a significant difference between the two, $t(14) = 2.978$, $p = .01$. This indicates that internal argument diversity was indeed greater for the subjects of intransitive [process [result]] structures than for the objects of [initiation [process [result]]] structures at the age of 2;3.

A rapid increase in Level 3 argument structure took place between ages 2;3 and 2;6. Level 3 average argument diversity rose from 1.4 words at age 2;3 to 3.4 words at age 2;6, an increase of two whole words. Nevertheless, the difference between Level 3 and Level 2 was not significant, however, $t(14) = -0.74$, $p = .47$. Although there was no statistical difference in argument diversity between these two levels, there was evidence that Level 3 argument diversity was related to other more general aspects of language development. At age 2;6, Level 3 productivity was significantly related to the children's NDW, $r(13) = .549$, $p < .05$, and marginally related to MLU, $r(13) = .491$, $p = .06$.

Discussion

The data reviewed in this small sample of 15 children developing at a slower-than-average rate indicate that there is a sequence of syntactic development that has not previously been isolated and discussed. The data analyzed here begin with a point in syntactic development when two-word utterances, generally referred to as "entity location" and "entity attribute" semantic relations predominate (Brown, 1973). They represent the most complex FPS structure children can formulate and produce. In these children, who

developed at a somewhat slower-than-average rate, that point was apparent at age 2;0.

To the author's knowledge, the next step in the sequence has never been posited before. This next step is the subordination of the "entity location/attribute" structures as complements of process verb heads, enabling the child to produce sentences such as *piece go in here*, *I sit down chair*, and *pig get out*. These Level 2 structures became, for a brief time, the vehicle for the children's most advanced couplings of internal argument and complex [process [result]] predications. We saw this step taking place at age 2;3, when the subjects of Level 2 structures had greater diversity than the direct objects contained in Level 3 structures.

The final step in the sequence is the addition of an initiation phrase on top of this structure, enabling the child to formulate and produce a new type of structure: [initiation [process [result]]]. Crucially, the internal argument has become the direct object of transitive frame, which is the specifier of the result phrase in FPS. Once again, in this operationalization, the presence of an external causer argument was optional. In these data, this next step was taken by the more advanced children of this slower-than-average group at age 2;6.

In summary, this developmental application of FPS tracks the transformation of a simple predicate–argument relationship. This relationship first appeared in "entity location" and "entity attribute" semantic relations. This predicate–argument relationship was next subordinated as the complement to process verbs in the form of result phrases. However, at the surface level, we see that argument as the subject of the intransitive process verb. It is not until the third and final step, when the potential for a new external causer argument becomes available, that we see the internal argument become a direct object of a complex event structure. What is most remarkable about this sequence is that the structure of FPS appears to emerge corresponding to the "bottom up" or "right to left" direction in Figure 2.

The question naturally arises as to what mechanisms are responsible for this sequence. Is this a sequence driven by maturation (Wexler, 1998), or is this sequence the by-product of learning? There is an extant learning model for which this sequence is unexpected and counter to prediction. Mosaic (Freudenthal et al., 2006) is an early child language hypothesis about input–output relationships. Input is created by working backward from the end of an input string and then chunking. This perspective can adequately explain "entity location" *baby out*–type utterances. From this perspective, an input string such as *Do you wanna take the baby out?* is processed by working from the end of the utterance and then chunking the next to last words together with the final word, deriving *baby out*.

However, the next step predicted from this algorithm would be a continuation of the same process, moving serially in the leftward direction, deriving *take (the) baby out*. Children do indeed produce such utterances, but I disagree as to the mechanism of formulation and production. Most importantly, Mosaic does not anticipate the timing

of Level 2 structures. It does not anticipate the precedence of Level 2 structures over Level 3 structures that was observed in these data at age 2;3. Because, in Level 2 structures, the internal argument surfaces as the subject of an intransitive verb, Mosaic would not expect them immediately after the precedence of “entity location” and “entity attribute” semantic relations. To put it another way, Mosaic simply does not recognize the deep similarity in structure between *baby down* and *baby sit down* and therefore would not predict that *baby sit down* should follow directly after *baby down* in developmental time.

Even if Mosaic cannot account for this sequence, it is too premature to conclude that no learning mechanism contributes to this sequence. Because these structural levels share representations, there is the distinct possibility that learning at an earlier level in the sequence facilitates learning of the next level in the sequence (see Rispoli, 2016, for a discussion of abstract grammatical facilitation). This possibility has clinical implications and will be discussed in the Clinical Implications section.

Predictions

This developmental application of FPS makes additional predictions for the development of English and development cross-linguistically. Before I conclude this tutorial, I would like to enumerate them.

Further Predictions for English

This developmental application of syntactic theory is limited in scope to the origins of result phrases and the structures that contain them. Recall that state verbs (e.g., *want*, *see*) are unaffected by the constraints of developmental Levels 1–3. This is because the thematic roles and argument structure associated with such state verbs are radically different from roles and structure associated with initiation, process, and result heads (compare Figures 2 and 5). I can therefore offer a prediction with regard to the comparison of state verbs versus [initiation [process [result]]] structures. As the child moves through Levels 1 and 2 in particular, argument structure for state verbs will seem more advanced. That is, because the arguments of *want*, *see*, *have*, and so forth are neither internal nor external arguments, producing them is easier. Their production is not constrained by the ability levels described in this tutorial. Transitive state verbs will have more complete accompanying arguments than any structure containing a result phrase. I call this phenomenon in development *state advantage*. This is a novel and unique prediction based on this developmental application of FPS that should be relatively easy to confirm or disconfirm.

Predictions for Spanish

Level 2 structures in Spanish are marked by the *se* reflexive, which is a nonverb morpheme that fills the head of the process phrase (see Figure 6). Therefore, at the same ages that children in English first produce *baby fall down*, *pig get out*, and so forth, Spanish-speaking children should

begin to produce *se* reflexives with intransitive verbs. Indeed, there is some evidence that this is the case for Mexican Spanish. Jackson-Maldonado, Maldonado, and Thal (1998) reported the use of *se* in short naturalistic language samples for children of two age groups, ages 2;4 and 3;0. They asked whether these uses were of *se* reflexive or of *se* “middle.” Note that the “middle” includes intransitive verbs that, when combined with *se*, form [process [result]] structures. They reported that 87% of *se* was “middle” and that 77% were middles formed with intransitive verbs as their base (e.g., *se acostó* “he lay down,” *se cayó* “it fell down,” *se mojó* “it got wet”). The explanation offered was that this form of *se* was more “cognitively salient.” Unfortunately, the authors did not provide language-independent evidence of cognitive salience to give empirical support to this explanation. However, the vast predominance of [process [result]] uses of *se* is an expectation of the FPS-based sequence of levels outlined in this tutorial, especially at the age of 2;4. In addition, the sequence of levels proposed here makes an additional prediction: The children aged 2;4 should exhibit greater internal argument diversity with intransitive *se* than in [initiation [cause [result]]] transitive sentences.

Predictions for Mandarin

Recall that the RVC is the primary structure through which Mandarin subordinates simple monadic states into the result phrase of a [process [result]] structure. The emergence and development of the RVC should therefore begin when a Level 2 structure emerges in English-speaking children. Hsu (2017) reports analyses of archival corpora data that indicate this prediction is basically correct. Hsu also investigates an interesting Mandarin-specific consequence of the more universal pattern. Because the two heads of the RVC form a compound at the surface in Mandarin, the verb suffix *-le* cannot intervene between the two heads (see Sentence 17b). However, there are two infixes that can intervene: *bu*, “negative potential,” and *de*, “positive potential.” Despite the low frequency of these infixes in input, 3-year-olds have a strong command of their morphology and meaning, indicating that 3-year-olds have analyzed the multimorphemic structure of the RVC. Hsu’s research also demonstrates productivity of the RVC in experimental, nonce word learning tasks by age 4;0. Clearly, the acquisition of the RVC is early and central to the development of Mandarin FPS.

We have also seen that the head of initiation phrase can be optionally filled by *ba* in Mandarin (see Figure 7). Therefore, it is predicted that, at the same age English-speaking children reach Level 3, the *ba* phrase will emerge in child Mandarin. Although Mandarin is a relatively understudied language (Hsu, 2017), there are already publications indicating that this prediction is correct. Deng, Mai, and Yip (2017) reported that, in the Tong case-study longitudinal corpus, *ba* first emerged at age 2;2. The vast majority of *ba* uses were with three predicate types: resultative verb complements, directional verb complements, and locative noun phrase/PP complements. The former

two categories correspond to Hsu's (2017) RVC, and the locative noun phrase/PP complement type corresponds to a locative phrase filling the result phrase. In short, their description confirms that *ba* signals *initiation* encompassing [process [result]]. The age of 2;2 seems somewhat young given the data provided in this tutorial, but bear in mind that the children analyzed here were slower-than-average typically developing children, and Tong may have developed more rapidly. Finally, it is a prediction of this application of FPS that the RVC structures should emerge before the *ba* phrase emerges, which seems likely in Tong's case.

Other Languages

It is unfortunate that I cannot devote more space to issues of cross-linguistic investigation. All human languages have something to say about whether the proposed sequence of levels is universal. The binyan system of Hebrew (Berman, 1982) and the so-called *aspectual* prefixes of Slavic languages (Weist, 1983) are just two phenomena that come to mind as potentially fertile areas of cross-linguistic investigation.

Broader Issues and Future Directions

A major goal of this tutorial was to illustrate in rather broad strokes an important developmental sequence of increasing clausal complexity that had not previously been discussed. The sequence begins with two-word combinations formerly identified as "entity location" and "entity attribute" and ends with fully encoded formulations of [initiation [process [result]]]. By highlighting this sequence, I do not mean to imply that it is the sole developmental sequence involved in the development of FPS. The syntactic primitive [process] exists independently of [result]. In classic semantic relation terms (Bloom et al., 1975; Brown, 1973), "agent action" (e.g., *Bambi go*), "action object" (e.g., *eat juice*), and even "agent object" (e.g., *Eve lunch* = Eve is eating lunch) might all be identified with the emergence of the process phrase.

If we were to examine "agent action," "action object," and "agent object" utterances from an FPS perspective, one could argue that none of the arguments in these early semantic relations is purely internal undergoer or purely external causer arguments. *Bambi* in *Bambi go* is simultaneously an undergoer and, in self-initiated motion, an initiator. It is a strength of FPS that thematic roles can be combined in this way. Such role combinations may well be advantageous for understanding early syntactic development. *Juice* in *eat juice* should be considered a predicate modifier until we have overt evidence from verb particles such as *up* that *juice* (i.e., *eat juice up*) is the internal argument whose origin is a result phrase. Even the verbless "agent object" combination, such as *Eve lunch* (paraphrased as "Eve is eating lunch"), is an attempt at formulating a process phrase. The lack of a verb is evidence of the degree to which predicate modifiers shoulder the burden of expressing the real-world information associated with customary activities such as "lunch."

In essence, FPS allows for several starting points for developing intraclausal complexity. With development, the sequences stemming from each of these starting points converge into a highly articulated system all contained within a single clause. However, in this tutorial, I have chosen to focus on only one such developmental sequence. I have done so because it does not actually begin with a verb at all but rather a state predicate that takes a single argument. FPS provides a theoretical framework relating the single argument of such state predicates to complex event structures found in [process[result]] intransitive sentences and [initiation[process[result]]] transitive sentences. By choosing this particular sequence, it is hoped that the complexity of a single clause is brought to the fore.

Alternative Approaches

Much of this tutorial has been devoted to interpreting facts and phenomena from a specifically generative syntactic perspective. FPS is not without its problems (Bruening, 2010). Many of those problems stem from the ambiguity of direct objects, whether they originate from a result phrase or not (e.g., *I ate the corn*, *I ate the corn up*), and whether particles such as *up* in *I ate the corn up* are the heads of result phrases. Delving into these questions is beyond the scope of this tutorial and application. It should be noted that the developmental sequence of levels proposed here refers only to "entity location/attribute" predication types as result phrases. All evidence for Level 2 and 3 structures come from sentences that have explicit locative particles, goal locative PPs, or adjectives as heads of result phrases. Transitive sentences without these features were not considered in the proposed sequence of levels.

The reader might well ask why FPS but not a more general generative syntactic framework (Hale & Keyser, 2002) is sufficient to explain these phenomena, or indeed, the reader might question whether constructional (Goldberg, 2003) or semantic (Talmy, 1988) approaches to grammar are not sufficient to explain these phenomena. The answer lies in clinical utility. Other frameworks, generative, constructional, or semantic, have existed for many years but have failed to reveal the continuity that exists from the one-word stage to event and argument structure in syntax. The continuity contained in the levels described here provides a road map for intervention that it has never previously had.

Finally, as I have focused so heavily on [initiation [process [result]]], the reader might wonder about the relationship between this syntactic representation and the cognitive representation of events. Cognitive approaches to grammatical development often lack precision of prediction (Rice, 1983). To make such explanations truly predictive, well-defined cognitive representations must be detectable independently of language. If such representations are detected in a child, then linguistic representations

should be enabled, as a direct consequence of the non-linguistic representation. To this author's knowledge, few examples of cognitive explanations of grammatical development have ever been this precise.

Clinical Implications

If, in the future, more data confirm the presence of the hypothesized [state] → [process [result]] → [initiation [process [result]]] sequence, I believe the implications to be substantial for the practical and applied discipline of communication sciences and disorders. This theory has direct relevance to intervention that seeks to facilitate the transition from single words to syntax. FPS and the sequence outlined in this tutorial could provide direction in choosing intervention targets and aid in identifying behaviors that signal readiness for change. Both the targets and the signaling behaviors are defined by the levels of ability also described here. Moreover, therapy could be adapted to incorporate vocabulary from the child's own repertoire and modeled in the developmentally appropriate FPS structures discussed in this tutorial.

Let us begin by considering the importance of Level 0 structure, verb particles, and adjectives in the one-word stage. I have hypothesized that verb particles and adjectives are a signal of readiness to transition out of the one-word stage. A child's single-word verb particle production "out," which might be coupled with a gesture toward a baby doll, could be expanded into "the baby is out," a grammatical version of a Level 1 structure, or "the baby should/will/has/ is come(ing) out," Level 2 structures. The target is to move the child to spontaneously produce a Level 1 structure, effectively transitioning out of the one-word stage and setting the foundation for further development in the FPS of English. I hypothesize that spontaneous production at each level of FPS structure signals a readiness to move to the next highest level, and so intervention should provide models of one, or at maximum two, step(s) above the spontaneous productions of the child.

The suggestion that syntactic treatment targets be sequenced according to these levels is based on a hypothesis about the role of learning in grammatical development—that of abstract structural facilitation. Rispoli (2016) presented evidence that the abstract grammatical feature of agreement learned during the acquisition of copula *is* facilitates the acquisition of verb-3s. The acquisition of the Level 1 "entity location/state" structure may facilitate the acquisition of the Level 2 [process [result]], and in turn, the acquisition of the [process [result]] structure may facilitate the acquisition of the Level 3 [initiation [process [result]]] structure. If this hypothesis concerning structural facilitation is correct, then we could design intervention to capitalize on this form of learning.

Measuring progress should focus on diversity (Hadley et al., 2018). Because the internal argument (subject of intransitive, object of transitive) is a constant throughout the hierarchy of FPS structures, measuring the diversity of the internal argument makes sense. When sufficient diversity,

customarily three to five different types, is seen in the diversity of the internal argument, attention should also be paid to measuring the diversity of verbs used in Level 2 and 3 structures. This is especially true for Level 2. It may be advisable to make sure that a child can produce structures in Sublevels A–C. Finally, when the child can spontaneously produce Level 3 structures, progress can also be measured in the diversity of external causer arguments.

Conclusion

FPS and this developmental application of FPS is not a "theory of everything." It is a compact framework for understanding a highly delimited, but crucially central, piece of syntactic development. That piece is nothing less than the generative syntactic engine for communicating about events, spanning their initiation, process of change, and eventual outcome. If this tutorial can be used clinically to help children harness the potential of that generative syntactic engine, then this tutorial will have been a success.

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