The Grammar Machine

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1. Introduction

What mechanisms does the child bring to bear on the early acquisition of argument structure and grammatical relations? At least two competing hypotheses have emerged concerning this issue. The first, Semantic Bootstrapping (Grimshaw, 1981; Pinker, 1984; Grimshaw and Pinker, 1990) reduces early syntactic knowledge to the lexical semantics of particular verbs, learned from situations. Within that system, the predicate-argument structure of verbs, as determined by their lexical semantics, projects into the syntactic structure in accordance with universal linking principles which associate particular arguments, as specified in the lexical entry, with particular syntactic positions. In contrast, the second approach, Syntactic Bootstrapping (Gleitman 1991, 1995 and subsequent work) relies heavily on the early knowledge of the syntax of argument structure to help the child acquire the meaning of specific verbs associated with that structure. Gleitman (op. cit.) explicitly challenged the ability, presupposed by Semantic Bootstrapping, to learn the meaning of verbs from situations, and argues that it is the syntactic structure (specifically, the subcategorization environment) which suggests to the child what the meaning of the verb may be in isolation.[1] Both approaches, note, agree that there is a relationship between the interpretation of arguments and their syntactic position. They differ, however, as regarding whether it is the syntactic position which determines the interpretation of arguments and the interpretation of the verb which is the lexical head of the VP, or rather, it is the lexical head, the verb, which determines the nature of the arguments and their syntactic placement.

Consider now these two views from the perspective of syntactic theory. Semantic Bootstrapping finds its roots in a well-established syntactic tradition, reducing argument structure to lexico-semantic information associated with single lexical items. The assumption that the syntax associated with argument structure is thus determined is shared by many approaches to argument structure developed in the '80 and early '90.[2] These approaches, differ as they may on other matters, share the assumption that the appropriate lexical representation of the verb contains information on the syntactic projection of its arguments, making the latter deterministically dependent on the former. A syntactic theory of argument projection which is compatible with Syntactic Bootstrapping, on the other hand, could be, potentially, quite different. Specifically, if we assume that the child does have in her possession the knowledge allowing her to assign interpretation to arguments independently of lexical entries, as Gleitman (op. cit.) assumes, it raises the distinct possibility that for adults as well, argument structure is computed syntactically, and independently of lexical information, thereby stripping the verbal lexical entry of its crucial role in the determination of the projection of arguments for adults as well as for children. Instead, the

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[1] As is clear from later writings within both approaches, both sides acknowledge that some measure of learning from situations as well as some structural contribution are essential to the acquisition of lexical items. These approaches continue to differ, however, in the relative weight that they assign to these components, and crucially, in their assumptions as concerning the relationship between the acquisition of lexical items and the acquisition of structure. See discussion later in this section. It should be noted that Gleitman (op. cit.) does not assume that argument structure, for adults, is independent of lexical entries. Rather, she suggests that Syntactic Bootstrapping is the means by which information concerning argument structure associated with specific verbs (and hence the precise meaning of those verbs) is acquired.

[2] See, among others, Williams, (1981); di Sciullo and Williams (1987); Baker's (1985, 1988) UTAH; Conceptual Structure, as developed by Jackendoff (1990) and subsequent work; the linking approach developed in Levin and Rappaport-Hovav (1995 and previous work) among others.

interpretation of arguments would proceed along 'constructionist' lines: the syntactic configuration of the arguments would determine their interpretation, and the verb, rather than being the determinant of structural properties, would serve as the modifier of the resulting event structure.[3]

Now if this is the correct approach to the adult projection of arguments, an interesting prediction emerges, concerning acquisition. If the projection of arguments is not related to lexical knowledge of any sort, we expect it to be available in the absence of lexical knowledge. Specifically, we expect the child, potentially, to go through a developmental stage in which the syntax of argument structure is known, but knowledge of the properties of specific vocabulary items may be missing or fuzzy. If such a stage indeed exists, it would cast serious doubt not only on Semantic Bootstrapping, but also on any linguistic model which projects, for adults, argument structure on the basis of information in the lexical entry. Instead, it would support Syntactic Bootstrapping, alongside a model of argument structure in which the link between the syntactic position of arguments and their interpretation is independent of the properties of any one particular vocabulary item. Within such a model, the traditional lexicon must be eliminated and replaced, rather, by a vocabulary list of some sort, in which some morpho-phonological and semantic information may be associated with vocabulary items, but little or no syntactic information.

Systems assigning interpretation to arguments entirely independently or partially independently of information in lexical entries have been developed by a number of grammarians in the past few years, largely under the influence of the seminal work of Hale and Keyser (1993). Kratzer (1994, 1996) as well as Harley (1995) and Marantz (1997), among others, assume that external arguments are assigned structurally, through the mediation of a functional head (VoiceP, for Kratzer, ***v***, for Harely and Marantz). Both external and internal direct arguments are assigned structurally in proposals made by van Hout (1992, 1996), Borer (1994, 1998), and Ritter and Rosen (1998) among others. Specifically, in Borer (1994, 1998) I argue that arguments are assigned interpretation in functional specifiers of nodes associated with event structure. Event structure, within that system, is not determined by properties of the vocabulary, but rather, by the optional merger of specific functional heads with particular semantic values. Substantive vocabulary items, in turn, function as modifiers of the emerging event structure.

The optional merger of nodes which give rise to varying event structures, together with the modifying nature of substantive vocabulary items, gives rise to the emergence, for any particular vocabulary item, of multiple event structures and multiple argumental interpretation. In fact, it predicts massive 'ambiguity' for any one verb. In view of this prediction, consider the following paradigm, from Clark and Clark (1979):

(1) a. The factory horns sirened throughout the raid
    b. The factory horns sirened midday and everyone broke for lunch
    c. The police car sirened the Porsche to a stop
    d. The police car sirened up to the accident site
    e. The police car sirened the daylight out of me

We note that if the syntax of the arguments and the event structures in (1a-e) are to be attributed to the properties of some verbal lexical entry *siren*, we would have to assume that there are five distinct entries for *siren*, the one in (1a) associated with an *atelic agentive* reading, and meaning *to emit a siren noise*, the one in (1b) associated with a *telic agentive* (and *theme*??) meaning *to signal through emitting a siren noise* the one in (1c) associated with a *telic agent-patient* and meaning *to force by emitting a siren noise*, the one in (1d) associated with *telic-agentive*, and subcategorizing a particle, meaning *to hurry while emitting a siren noise*, and finally, in (1e), *siren* would be associated with a *stative* and an *experiencer*, and would mean *to frighten by*

[3] See Goldberg (1995), Fillmore and Kay (1997) for discussion of Construction Grammar which inspires this approach. See Marantz, (1997) and Borer (2000, forthcoming) for some discussion of the role of "constructions", in this specific sense, in Universal Grammar.

way of emitting a siren noise. Of course, the common denominator here is the emission of a siren noise, which, indeed, appears to be the meaning of *to siren*, but it is entirely clear that in each of (1a-e), the event denoted is modified by the emission of a sound, rather than determined by that emission. Thus at least in (1a-e), we must assume that the syntax of the event (and the syntax of the event's arguments) does not emerge from five different lexical entries for *siren*. Rather, it is the syntax which determines the interpretation of the event and its arguments, as well as the specific nuance contributed to that interpretation by the vocabulary item *siren* which modifies that event.

If it is correct to assume that argument structure is syntactically, rather than lexically determined, and if it is further correct to assume that the building blocks of argument interpretation are nodes associated with event structure, rather than thematic structure, we derive the result that the relationship between structure and argumental interpretation must be fixed, but nevertheless, different verbs need not occur with the same arguments. Thus, for instance, if *destructible* is embedded within a stative event structure, and is not itself associated with the assignment of any semantic roles, we may think of its subject, e.g., in *the piano is destructible*, as *subject-of-state*. On the other hand, in *I destroyed the piano*, the same stem, *destroy/destruct* is embedded within a telic event structure, and the *piano* is *subject-of-result*, or *subject-of-change*, plausibly occupying a distinct syntactic position from that occupied by *subject-of-state*. In contrast, in UTAH-driven approaches, *destroy/destruct* is lexically associated with a *theme* which must always project in an identical syntactic position, a restriction that has proven difficult to reconcile with the differing syntactic properties of e.g. the subject of [$_{A}$*destructible*] and the object of [$_{V}$*destroy*].

That the interpretation of arguments is, indeed, dependent on event structure, and that it is independent of properties of verbs is argued in detail in van Hout (1992, 1996) and in Borer (1994, 1998). Both researchers focus on the well-known correlation between the syntax of the unergative-unaccusative distinction and its event interpretation (see Dowty 1990), alongside the fact that most intransitive verbs occur in both contexts, exhibiting variable behavior. Van Hout (1992, 1996) further discusses transitivity alternations associated with single verbs (e.g., *move-move; drop-drop*), arguing that here, too, it is the syntax of the argument structure which determines the event structure, rather than lexical information associated with distinct (related) lexical entries for, e.g., *move*.trans and *move*.intrans .[4]

Acknowledging the challenge to the projection of arguments from lexical entries posed, specifically, by the correlation between structure and interpretation for intransitive variable behavior verbs, Levin and Rappaport-Hovav (1992) note:

> Verbs which show variable behavior [between unaccusative and unergative] are always associated with more than one meaning; each meaning turns out to be correlated with the predicted syntactic properties… the question … is whether the change of meaning … is to be attributed to [the verb's] appearance in a particular construction… or to the existence of some lexical rule which gives rise to multiple semantic classifications of verbs, which then license the appearance of these verbs in more than one construction.[5]

Wishing to preserve the projection of arguments from lexical entries, Levin and Rappaport-Hovav (1992, 1995) opt for the second solution, assuming that variable behavior verbs, occurring in more than one syntactic environment with distinct interpretation in each configuration, do so due

[4] Although van Hout (1996) does assume that verbs may be lexically marked as to whether or not they are telic.

[5] And see also Levin and Rappaport-Hovav (1995), where it is stated that "[T]he question is whether multiple meaning are handled via principles or rules specific to the lexicon, or whether they can be shown to reduce to properties of syntactic configurations", (p. 208)

to the existence of some lexical rule which gives rise to multiple semantic classifications of verbs (and see also Reinhart, 1996, 2000).[6]

Returning to Semantic vs. Syntactic Bootstrapping, note that the question posed by Levin and Rappaport-Hovav, is the same question posed here concerning the type of acquisition device used by the child and its relation to the adult grammar. From the perspective of an acquisition theory which assumes Semantic Bootstrapping, there must exist a lexical rule which gives rise to multiple semantic classification of variable-behavior verbs, which then licenses the appearance of these verbs in distinct syntactic contexts. In a theory that views the lexical entry as the sole source of information on the syntactic projection of argument structure, no other possibilities exist, as no other source is available, for child or for adult, for the syntax of arguments. On the other hand, if Syntactic Bootstrapping is on the right track, it is indeed possible, in Levin and Rappoport-Hovav's terms, that "the change in meaning …[is] to be attributed to [the verb's] appearance in a particular construction," making the existence of lexical rules of the sort discussed by Levin and Rappaport-Hovav (op. cit.) or Reinhart (op. cit.) unnecessary. Instead, it would be the syntax of the arguments that would determines their interpretation (as part of the event interpretation), and that interpretation would shift when the syntactic position of the arguments is different, regardless of the specific verb used. In turn, if it is correct to assume that it is the syntax of event structure, rather than lexical entries, which determine the interpretation of arguments for adults, then Syntactic Bootstrapping does not just become a plausible hypothesis, but the only hypothesis compatible with the adult grammar. Quite simply, the child could not project argument structure from a vocabulary item, regardless of her knowledge of that item, as such an item does not contain information concerning the syntax and the interpretation of arguments. Such information is available exclusively through the syntactic structure.

2. Syntactic event structure in a nutshell

For the remainder of this paper, I will assume without further justification the structures in (2), following Borer (forthcoming), where they are justified in great detail (and see also Borer, 1994, 1998). Importantly, however, the logic of the argument to be put forth in this paper is independent of the particular syntactic structures used here. To the extent that it can be established that the projection of arguments is independent of the properties of substantive vocabulary items, clearly some syntactic structure must exist such that it represents the unique linking between structural positions and argument interpretation. The specific properties of that structure could then be the subject matter of a separate debate.[7]

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[6] Levin and Rappaport-Hovav (1992) propose that variable-behavior intransitives involve a lexically-marked telicity alternation. Levin and Rappaport-Hovav (1995) depart from that assumption, proposing instead that the distinction should be characterized as involving an external vs. an internal causer (and see Reinhart, 2000 for a detailed criticism of this latter assumption). The main point we wish to make, however, is independent of any particular lexical account for variable behavior intransitives. Rather, it concerns the lexicon-syntax-interpretation interface. Specifically, we ask whether in the presence of two syntactic structures, each associated with a distinct interpretation, one should reduce the distinct interpretation to the distinct syntactic structures, or rather, assume that the distinct interpretation is to be traced back to two (related) lexical entries, which, in turn, project distinct structures. Whether the interpretational difference involves telicity or any other appropriate semantic classification is clearly orthogonal to our main interest here. Levin and Rappaport-Hovav (1992, 1995) as well as Reinhart (1996, 2000) opt for the lexical solution, regarding the lexical entry as the ultimate source of information on syntactic projection. Here, as well as in Borer (1994, 1998, forthcoming), the opposite view is taken, advocating the determination of the interpretation by the structure, independently of lexical properties. While the specific syntactic distinctions used here relate to event, we note that other executions compatible with syntactic, rather than lexical, projection of arguments are possible and have, indeed, been proposed. For the detailed justification of the event structure approach, see Borer (forthcoming).

[7] The structures in (2) are partial syntactic representations, focusing on the syntactic placement of arguments. Facets of the syntactic structure which are not directly relevant, such as verb movement or the status of the VP are largely ignored here for the sake of simplicity. As for functional structure, in addition to the event structure marked by the

(2) a. *Transitive, Telic*:
$[_{ASPP}$ DP_1 $[_{TP}$ ~~DP_1~~ $[_{ASPQ}$ DP_2 $[_{VP}V]]]]$ (in two hours/*for two hours)
NOM ACC

b. *Transitive, Atelic*:
$[_{aspP}$ DP_1 $[_{TP}$ ~~DP_1~~ $[_{FP}$ DP_2 $[_{VP}V]]]]$ (*in two hours/for two hours)
NOM PRT

c. *Intransitive, Telic*:
$[_{TP}$ DP_1 $[_{ASPQ}$ ~~DP_1~~ $[_{VP}V]]]]$ (in two hours/*for two hours)
NOM

d. *Intransitive, Atelic*:
$[_{ASPP}$ DP_1 $[_{TP}$ ~~DP_1~~ $[_{VP}V]]]]$ (*in two hours/for two hours)
NOM

In (2), ASP_P is a process node and ASP_Q is a quantity node, a telicity-inducing node.[8] A DP in [Spec,ASP_P] is interpreted as the *originator* of the process headed by ASP_P. The DP in [Spec,ASP_Q], is interpreted as the *subject of a result state*, or put differently, the DP which defines the endpoint of the event. Following Verkuyl (1972, 1989), Tenny (1987, 1994), Krifka (1991) among others, I will assume that a quantity DP, in turn interpreted as *subject-of-result*, is necessary to give rise to telicity.[9] Finally, I assume that ASP_Q (may) check *accusative* Case for the DP in its specifier (the *subject-of-result*), as in (2a). Based on the aspectual properties of partitive Case in Finnish as described by Vainikka and Mailing (1993) and Kiparsky (1998), I assume that partitive Case (PRT) marks the absence of telicity, and that it is the Case assigned to the direct argument in atelic configurations, as in (2b). In English and Hebrew, objective case marking does not differentiate morphologically between *accusative* and *partitive*, but such a distinction is marked in Finnish, as well as in some Slavic languages, where the relation between atelicity and partitive Case, on the one hand, and telicity and accusative Case on the other hand, is overt and morphologically transparent.

Considering, specifically, an English verb such as *move*, it may be embedded in all structures in (3), with the following result:

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aspectual nodes ASP_P and ASP_Q, only TP is marked. I take no position on the necessity of additional functional structure between V^{max} and CP.

In Borer (2000) I argue that lexical category labels such as V, N, A are determined by the functional structure dominating substantive vocabulary items. Slightly simplifying, a TP or an ASP_P would render an (underived) vocabulary item dominated by it a verb, while a DP would render an (underived) vocabulary item dominated by it a noun etc. In other work I also suggest that arguments which are not interpreted in functional specifiers must project as PPs. As these claims are not crucial to the acquisition discussion in the rest of this paper, they are largely ignored, as is the relations between the numeration and the subsequent emerging phrase structure.

Following much literature (see Verkuyl, 1989; Parsons, 1990, among others), I assume that there is no distinction between *achievements* and *accomplishments*, and, hence, specifically, that the structure does not reflect such a distinction, and that the main dividing line, within non-stative events, is between events which are either telic (*accomplishments* and *achievements*) or atelic (*processes*, at times known as *activities*). See Borer (forthcoming) for some discussion, as well as the demonstration that so-called *achievements* are not a unified class. Stative events are not treated in this article.

[8] ASP_Q corresponds to ASP_E, in Borer (1994, 1998).

[9] This is again simplifying somewhat. See Borer (forthcoming) for cases in which telicity emerges without a DP altogether, or with a non-quantity DP. For a discussion of telicity with non-quantity DP see also Mittwoch (1991). I am setting aside here issues concerning the role of the internal argument as *measuring out the event* as proposed by Tenny (1987, 1994) (see also Krifka's, 1991, *measure theme*). For a review of some problems, see, especially, Schein (1999).

(3) a. *Transitive, Telic*:
$[_{ASPP}$ *Kim*$_1$ $[_{TP}$ ~~*Kim*~~$_1$ $[_{ASPQ}$ *the piano*$_2$ $[_{VP}$ *move*]]]] (in two hours)
NOM ACC
originator *subject-of-result*

b. *Transitive, Atelic*:
$[_{ASPP}$ *Kim*$_1$ $[_{TP}$ ~~*Kim*~~$_1$ $[_{FP}$ *the piano*$_2$ $[_{VP}$ *move*]]]] (for two hours)
NOM PRT
originator *default participant*†

c. *Intransitive, Telic*:
$[_{TP}$ *Kim*$_1$ $[_{ASPQ}$ ~~*Kim*~~$_1$ $[_{VP}$ *move*]]]] (in two hours)
NOM
subject-of-result

d. *Intransitive, Atelic*:
$[_{ASPP}$ *Kim*$_1$ $[_{TP}$ ~~*Kim*~~$_1$ $[_{VP}$ *move*]]]] (for two hours)
NOM
originator

†*default participant*= a pragmatically appropriate participant. See Borer (1994, forthcoming, for discussion).

Crucially, the structures in (3) all exist independently of the verb inserted in them, and each has a fixed event structure regardless of that verb. Recall now that the verb in this system acts, essentially, as a modifier. Combined with the arguments in (3a-d) being arguments of the event, rather than the verb, the resulting interpretation is best captured by the following (neo-Davidsonian) representations:[10]

(4) a. *Transitive, Telic*:
?e (process, e) & originator (*Kim*, e) & subject-of-result (*the piano*, e) & (*move*, e))

b. *Transitives, Atelic*:
?e (process, e) & originator (*Kim*, e) & participant (*the piano*, e) & (*move*, e)

c. *Intransitive, Telic (unaccusative)*:
?e (non-stative, e) & subject-of-result (*the piano*, e) & (*move*, e)

d. *Intransitive, Atelic (unergative)*
?e (process, e) & originator (*the piano*, e) & (*move*, e)

Given the modifier status of vocabulary items in this system, cases of mismatch between the syntax of an event and the specific verb inserted into it (e.g., **Kim arrived for two hours*) are to be ruled out using the very same system that would rule out inappropriate modification, e.g., **John ran gradually*, **Kim deliberately understood the solution*, **Pat feared the storm energetically* etc. (and see Borer, 2000, for discussion).

We note now that the transitive derivations available for English (3a-b) are not available for adult Hebrew. With a few exceptions, Hebrew marks intransitive/transitive pairs morphologically. For *zaz*, 'move.intrans', the transitive form would be *heziz*, 'move.trans'. For that reason, an utterance such as (5a), the equivalent of either (3a) or (3b) in English, is ungrammatical. But as

[10] It has been noted (see especially Hale and Keyser, 1993) that the *originator* in (3a-b) is not necessarily understood as undergoing movement (and is an *external causer*), while the *originator* in (3b) must undergo movement (and is an *internal causer*). Our claim, however, is that such distinctions are not, in actuality, relevant to the computational system, although they may reflect our knowledge of the world. That (3a-b) have different properties from (3d) follows, in this system, exclusively from their syntactic differences and their subsequent distinct mapping onto the distinct semantic events.

predicted, (5b), the correct transitive form, *heziz*, is ambiguous between a telic and an atelic reading.

(5) a. *Ran *zaz* 'et ha-ricpa
Ran moved-intrans OM the-floor
b. Ran *heziz* 'et ha-ricpa (be-mešek ša9atayim/tok ša9atayim)
Ran move-trans OM the-floor (for two hours/in two hours)

Likewise, *zaz*, 'move.intrans' is ambiguous between an unaccusative/telic and unergative/atelic. That this is indeed the case can be illustrated by using the unaccusative/unergative tests suggested in Borer and Grodzinsky (1986), where it is shown that the possessor dative in Hebrew must possess a DP within the classical complementation domain, and hence when occurring in intransitive contexts, is only compatible with unaccusatives (and passives), while a reflexive dative in Hebrew may only be coindexed with a true 'external argument', and hence when occurring in intransitive contexts is only compatible with unergatives. In Borer (1998) it is further shown that these tests correlate with event structure. Thus in (6b), in the presence of a *reflexive dative*, atelicity is obligatory, and the modification with the telic modifier *in two hours* is ungrammatical. Similar logic predicts the *possessor dative* in (6c) to induce telicity, and hence the ungrammaticality which results in the presence of an atelic modifier such as *for two hours*:[11]

(6) a. ha-ricpa *zaza* (be-mešek ša9atayim/tok ša9atayim)
the-floor moved (for two hours/in two hours
b. ha-ricpa *zaza* la (be-mešek ša9atayim/*tok ša9atayim)
the floor moved to-it (for two hours/*in two hours)
c. ha-ricpa *zaza* le-rani (*be-mešek ša9atayim/tox ša9atayim)
the floor moved to-Rani (*for two hours/in two hours)

We note, then, that *zaz* and *heziz*, intransitive and transitive 'move', respectively, are each associated with two syntactic event structures, but not with four, as is the case for English *move*. Rather, *zaz* may only modify intransitive structures, while *heziz* modifies transitive ones. I return below, in section 3.2, to the characterization of the *zaz-heziz* alternation in the grammar of Hebrew, and to the manner in which this additional restriction is to be characterized. Focusing for the time being on the ways in which verbs leave the syntactic projection of arguments undetermined, as in English, or underdetermined, as in Hebrew, we note that if the system sketched here for the adult syntactic representation of argument structure is correct, it has clear consequences for language acquisition. First, it makes the acquisition of syntactic structures based on verb meaning impossible. In this system, a vocabulary item is categorially and syntactically undetermined (or underdetermined), and specifically, it makes no reference to the syntactic projection of arguments. The full interpretation of the arguments is computed on the basis of the syntactic structure of the entire predicate. While is it headed by a substantive vocabulary item, in turn verbalized by the functional structure, the meaning of that vocabulary item is syntactically uninformative. Rather, in such a system, the acquisition of syntactic structures must proceed independently of the acquisition of vocabulary. In reference to our concrete examples, even if the child has acquired the meaning of English *move* or Hebrew *zaz*, 'move.intrans', in isolation, it would provide her with no information on whether or not to project a single argument in the specifier of ASP_Q (i.e., 'internally'), as in (3c) and (6c), or in the specifier of ASP_P (i.e. 'externally'), as in (3d) or (6b). For English, it would

[11] Importantly, the respective morpho-phonological form of *zaz*, 'move.intrans' and *heziz*, 'move.trans' do not suffice to determine the number of arguments associated with either. The morpho-phonological template associated with *zaz* (binyan I) is often associated with transitive verbs, at times extremely close to the meaning of transitive *heziz* (e.g., *daxap*, 'push'; *sarap* 'burn.trans') while the morpho-phonological form of *heziz* is often associated with intransitive verbs, including inchoative ones (e.g., *higlid* 'form-scab'; *hibri'* 'get-healthy', etc.). See tables in (14)-(15) and related discussion.

further leave the learner with no information on whether to project *move* in nominal structure or in verbal structure, and in the latter case, whether to project it within a dyadic or monadic event structure.

But if the child has knowledge of the projection of arguments independently of the properties of the verbs associated with the resulting structure, an interesting prediction emerges. We predict that it should be possible, in principle, for the child to pass through a stage where the syntactic event structure is fully in place, but vocabulary knowledge is impaired. If such a stage turns out to exist, it would lend strong independent support not only to Syntactic Bootstrapping, but also to the independence of argument structure from vocabulary and to a syntactic approach to the projection of arguments.

The remainder of this paper is devoted to showing that there is, indeed, such a stage in language acquisition. I will argue that children acquiring Hebrew pass through a stage in which their performance has precisely these characteristics: they appear to have full knowledge of the syntax of argument structure, complete with nominal and verbal syntactic functional structure in place, as attested by word order, case markers, and tense and agreement inflection. Nevertheless, that knowledge could not possibly be coming from the actual verbs used, as these are often used in incorrect syntactic contexts, or are altogether non-existent in the adult vocabulary. At that stage, I will suggest, children often make decisions on vocabulary insertion based on morpho-phonological factors alone, being oblivious to the way in which the correct selection of a morphological template is conditioned, for adult Hebrew, by syntactic factors. Far from projecting the syntax as based on syntactic properties of vocabulary items, their knowledge of vocabulary items is deficient precisely in that respect. Instead, they often embed a morpho-phonologically correct, but morpho-syntactically flawed form in a nearly perfect syntactic structure, complete with tense and agreement markings, providing evidence that their ability to do so is entirely independent from their vocabulary knowledge.[12]

Specifically, I will propose the following developmental sequence:

(7) Naming>the morpho-phonology stage >the morpho-syntax stage >adults

3. The morpho-phonology stage.

3.1. Valence neutralization

Berman (1982, 1993, and 1994), observes that there is a stage in the early acquisition of Hebrew, in which errors such as those in (8) are quite common:

[12] We note, before proceeding, that by necessity, any data on flawed vocabulary knowledge on the part of the child is limited both by comprehension, and by the lack of access to direct introspective data. For instance, if a child utters a totally inappropriate verb, existing or non-existing, in the context of some arguments (e.g., *mommy poured (at) the table*), comprehension fails altogether, and any reasoning concerning the knowledge of argument structure is hampered by the lack of our ability to grasp whether the placement of arguments does or does not correspond systematically to the interpretation the child might have had in mind. Likewise, if the child says *mommy touched the ball*, we assume, plausibly, knowledge of both verb and argument structure, although, of course, it is possible that the child has mis-lexicalized *touch* as meaning 'throw-at', 'kick', 'move', etc. It therefore emerges that most 'errors' that can actually be studied are those which exhibit at least partial vocabulary knowledge, on the part of the child, and are hence transparent to our investigation, rather than cases of radical misuse of vocabulary, which may not be studied, with a few exceptions, on the basis of spontaneous production data.

(8) a. *ra'iti*.I 'et ha-ciyurim le-'aba
saw.1sg OM the-paintings to-daddy .
'I showed the paintings to Daddy'
cf. adult *her'eti*.V
showed

b. 'ani roca še-'aba *yokal*.I 'oti 9akšab
I want that-daddy eat.fut.3.sg OM.me now
'I want Daddy to feed me now'
cf. adult *ya'akil*.V
feed.fut.3.sg

c. 'ima *zuzi*.I li 'et ha-kise
mommy move.intrans.imperative to-me OM the-chair
'Mommy, move the chair for me'
cf. adult *tazizi*.V
move.trans.imperative

In (8), the child is using the wrong morpho-phonological template, *binyan*, in each case. The *binyan* the child is using is marked immediately following the form used (ranging from I-VII), e.g., *ra'iti*.I is the root *R'H* used in *binyan* I. The gloss in (8) indicates what the adult interpretation of the form used by the child is (e.g. *ra'iti* means 'saw.1sg' for the target language). The translation gives the (presumed) meaning of the utterance, for the child ('feed'). Correct adult forms, for the meaning *intended* by the child are given under each form, together with the adult *binyan* membership (e.g., *her'eti*.V, 'showed.1sg', inflected in *binyan* V)

We note, now, that in (8a-c) the child is syntactically correct, placing the arguments appropriately for the (presumed) meaning intended. Further, in (8a-c) the child uses the correct *root* to express the meaning she has in mind. However, the morpho-phonological form of the verb, the *binyan*, is wrong when matched against the syntax. E.g., the syntax of the adult form *zaz*.I 'move.intrans' bars transitive sentences, and the form associated with the root *ZZ* in transitive context must be *heziz*.V.

The cases in (8) appear to cluster, in that all erroneous forms are of *binyan* I, and all avoided correct forms are of *binyan* V. Further, all cases in (8) are cases of valence increase (intransitive form used transitively, dyadic form used triadically). However, as already shown by Berman (op. cit.), and as is clear from the study of the CHILDES files of Na'ama, this by no means characterizes the early performance. In (9), dyadic *mesader*.III, 'arrange', *madbiq*.V 'stick.trans' and *moci*.V 'take-out.trans' are used monadically. In the latter case, the child uses *binyan* V instead of *binyan* I, in direct opposition to the pattern in (8). Similarly, transitive forms are used intransitively in (10):

(9) a. ze lo *mesader*.III Na'ama, 2;2
this no arrange
'It doesn't fit/become arranged'
cf. adult *mistader*.VII
get-arranged.intrans

b. ze lo *madbiq*.V Na'ama, 2;2
this no stick.trans
'it doesn't stick'
cf. adult *nidbaq*.II
stick.intrans

c. ken hu *moci*.V lebad Na'ama, 2;3
yes he take-out alone
'It comes out by itself, too'
cf. adult *yoce*.I
come-out

(10) a. tir'i 'ek kol ha-xalab *šapak*.I
look how all the-milk spilled.trans
'Look how all the milk spilled'
cf. adult *nišpak*.II
spilled.intrans
b. lama ha-delet lo *potaxat*.I?
why the-door no open.trans
'Why doesn't the door open'
cf. adult *niptaxat*.II
open.intrans Berman (1982)

Some additional cases, taken from Na'ama's CHILDS files, together with cases cited in Berman (op. cit.) illustrate that errors occur, in fact, in all possible morpho-phonological directions, regardless of valence or *binyan*. Following Berman (op. cit.) I will refer to the (erroneous) use of one morphological form in more than one valence context as (Valence) Neutralization:

(11) *Valence Neutralization*:

a. *Intransitive forms used transitively (valence increase)*:

	Adult form		*Neutralized child form*	*Adult meaning of neutralized form*
i.	*hik'ib*.V	'hurt.cause'	*ka'ab*.I	'hurt.intrans'
ii.	*hiš'ir*.V	'leave.trans'	*niš'ar*.II	'stay'
iii.	*liklek*.III	'soil'	*hitlaklek*.VII	'become-soiled'

b. *Transitive forms used intransitively (valence decrease)*:

	Adult form		*Neutralized child form*	*Adult meaning of neutralized form*
i.	*nizraq*.II	'thrown.pass'	*zaraq*.I	'throw.active'
ii	*mitxabeq*.VII	'hug.recip.'	*mexabeq*.III	'hug.transitive'

These data already suggest that children are capable of projecting argument structure correctly, although their knowledge of the specific vocabulary item with which that structure is paired is flawed. If, indeed, the syntactic projection of arguments is independent of information associated with specific vocabulary items, the behavior illustrated above can be readily explained. This has already been observed by Berman (1982, 1993), who proposes, correctly in my view, that some syntactic knowledge must precede full lexicalization. What, however, does that syntactic knowledge consist of? In the next subsection, I will make a specific claim as concerning the nature of that early knowledge. In section 4 I will turn to some questions which the model of early knowledge must address before being complete. In section 5 I outline the next developmental stage, labeled in (7) above as the morpho-syntax stage, and turn to speculations as concerning the passage from the morpho-syntax stage to adult knowledge.

3.2. The Hebrew binyan system and the early knowledge of it

Before proceeding to a description of the early grammar, a brief review of the Hebrew *binyan* system is in order. In Hebrew, a Semitic language, verbs are formed based on a consonantal root, mostly consisting of three consonants, but at times consisting of two or four. These roots, loosely associated with a meaning, are not in and of themselves associated with either syntactic category or argument structure. To illustrate, a root such as *KTB*, loosely associated with the meaning of writing, can occur in all forms in (12), associated with distinct categories and with different argument structures, when they are verbal:[13]

[13] As is traditional within Semitic linguistics, forms are given in past.3.sg.masc. The list in (12) does not contain nominals derived from verbs. As the text discussion focuses on syntactic properties of *binyanim*, the choice of phonological representation is intended to highlight the relevant syntactic properties. While vocalic representation

(12) a. *kataḇ* 'wrote' (verb.I, dyadic)
b. *niḵtaḇ* 'was-written' (verb.II, monadic)
c. *hiḵtiḇ* 'dictated' (verb.V, triadic)
d. *huḵtaḇ* 'was-dictated' (verb.VI, dyadic)
e. *hitkateḇ* 'corresponded' (verb.VII, symmetrical)
f. *miḵtaḇ* 'letter' (noun)
g. *maḵteḇa* 'desk' (noun)
h. *katḇan* 'typist' (noun)
i. *ktoḇet* 'address' (noun)
j. *ktuba* 'marriage contract' (noun)
k. *kataḇ* 'hand-writing' (noun)
l. *kataḇ* 'correspondent' (noun)

Roots are, in turn, embedded within different templates, consisting of vocalic melodies as well as affixes. Centering on verbal templates, the *binyanim,* Hebrew has seven, each associated with specific morpho-phonological properties, and linked to its morphologically specific set of participial forms, derived nominals, agentive nominals, etc. as illustrated for *binyan* III and *binyan* V in (13):

(13) *The Morpho-phonological paradigm, binyanim III and V*:

	Binyan III	*Binyan V*
verb.pst.3.sg	*biteax* 'insure'	*hiḇtiax* 'promise'
infinitive	*le-ḇateax*	*le-haḇtiax*
derived nominal	*bituax*	*haḇtaxa*
agentive nominal	*meḇateax*	*maḇtiax*
passive participle/adjective	*meḇutax*	*muḇtax*

The reader will also no doubt note that while the diachronic association between the meaning of 'insure' and 'promise' is rather obvious, it nevertheless is sufficiently different in current, synchronic use, to warrant distinct root listing. And indeed, different roots occurring in differing *binyanim* may have quite diverse meanings.

Further, even with respect to roots which have a consistent meaning across different *binyanim,* while some of the *binyanim* are canonically associated with particular argument structure configurations and particular interpretations (see table 14), the link is pretty loose, and the bulk of Hebrew verbal vocabulary does not actually conform to these canonical generalizations, as tables (15a,b) illustrate. These canonical generalizations do hold, however, for productive word formation operations, guided, in Modern Hebrew, by syntactic and morpho-phonological regularities:[14]

[Table (14) here]

15a. *Intransitive, atelic motion verbs – binyan membership*:

Motion Verb	*Interpretation*	*Binyan*

follows Modern Hebrew pronunciation, representation of roots is designed to highlight use of identical root across forms. For instance, spirantized /k/ and /x/, pronounced identically in Modern Hebrew, are nevertheless represented as /ḵ/ and /x/ respectively, in order to highlight the fact that /ḵ/ is the same consonant, in a root, as /k/, but distinct from /x/.

[14] See, especially, Bolotsky (1978) and subsequent work for discussion. One comment is noteworthy from the morpho-phonological perspective: binyanim III and VII are (potentially) morpho-phonologically quadro-consonantal, making them the only possible choice for morphological innovations based on quadro-consonantal roots, regardless of their morpho-syntactic properties.

ZaZ	moved	I
hiStoBeB	wandered around	VII
NaDaD	wandered	I
RaC	ran	I
hitRoCeC	ran around	VII
QaPaC	jumped	I
QiPeC	jumped repeatedly	III
DiLeG	skipped	III
HaLaK	walked	I
hitHaLeK	walked around	VII
neXPaZ	hurried	II
MiHeR	rushed	III
hitQaDeM	progressed	VII
hiMŠiK	continued	V
GaLaŠ	slid	I
hitGaLeC	slid	VII
hiSMiL	veered left	V

15b. *Inchoative-causative alternations – binyan correspondences:*

Alternation	*Inchoative*		*Causative*	
1. II-I	*nisrap*.II	'burn.intrans'	*sarap*.I	'burn.trans'
	niptax.II	'open.intrans'	*patax*.I	'open.trans'
2. I-V	*taba9*.I	'drown.intrans'	*hitbia9*.V	'drown.trans'
	camax.I	'grow.intrans'	*hicmi'ax*.V	'grow.trans'
3. VII-III	*hitpareq*.VII	'fall-apart'	*pereq*.III	'take apart'
	hitgalgel.VII	'roll.intrans'	*gilgel*.III	'roll-trans'
4. II-V	*nišxat*.II	'become-ruined'	*hišxit*.V	'ruin'
	nirtab.II	'wet.intrans'	*hirtib*.V	'wet.trans''
5. V-V	*he'edim*.V	'redden.intrans'	*he'edim*.V	'redden.trans'
	hibri'.V	'heal.intrans'	*hibri'*.V	'heal.trans'
6. I-III	*gadal*.I	'grow.intrans'	*gidel*.III	'grow.intrans'
7. VII-V	*hit'adem*.VII	'redden.intrans'	*he'edim*.V	'redden.trans'

The pairing between a particular argument structure and a morpho-phonological token is almost always unique, which is to say, a particular form in a particular *binyan* is either transitive or intransitive, but is almost never both. This is in sharp contrast with, e.g., English, where verbs such as *move, drop, shake,* etc. may be either transitive or intransitive (and see row 7 in table (15b) for an exception to this generalization in Hebrew). Nevertheless, the particular *binyan* associated with transitive or intransitive interpretation is not predictable from the argument structure alone. Thus any *binyan* may be intransitive. This degree of unpredictability in matching a particular *binyan* with argument structure configuration is such that for adult speakers of Hebrew, we must assume access to a mental reservoir which contains listed pairings of roots and *binyanim*, associated with particular argument structure (i.e., *ZZ.I* is only appropriate in intransitive contexts, *DXP.I* is appropriate in a transitive context, etc.). While the productive word-formation component of the adult grammar is overwhelmingly regular, pairing specific *binyanim* with predictable argument structure configurations, subject only to some morpho-phonological restrictions, this productive generative system is peripheral, by and large, to the existence of a list, for the adults, of the particular morpho-phonological binyan associated with a particular argument structure

configuration in the context of a specific root, and which is not fully predictable from a regular rule system.

A full model of vocabulary insertion is outside the scope of this paper. For concreteness, however, suppose we follow Anderson (1992) (and see also Halle and Marantz, 1993) in assuming that functional structure is associated with (inflectional) features, and that substantive vocabulary items associated with such functional structure become marked with these inflectional features. In turn, such inflectional features trigger the application of particular phonological operations, resulting in the insertion of phonological material, following the syntactic derivation. For concreteness sake, we may assume that the phonological component consists of a search for that phonological representation which matches in features the abstract properties of a particular syntactic node, reflecting its syntactic derivational history. I will diverge, specifically, from both Anderson (1992) and Halle and Marantz (1993) in assuming that at least some phonological material must be associated with vocabulary items throughout the derivation, and specifically, I will assume that the consonantal root is present in the structure throughout the derivation, functioning as a modifier of the structure (see sections 1-2 for discussion). Consider, as an illustration, the structures in (2) in conjunction with the consonantal roots *ZZ*, 'move' and *SRP*, 'burn':

(16) a. *Transitive, Telic:*
$[_{ASPP}\ DP_1\ ZZ\ [_{TP}\ \overset{NOM}{\cancel{DP_1}}\ \cancel{ZZ}\ [_{ASPQ}\ DP_2\ \cancel{ZZ}\ [_{VP}\ \cancel{ZZ}\ ]]]]$
ZZ,+ASP$_Q$, +ACC, +pst, +ASP$_P$ ✍ */heziz/*

b. *Transitive, Atelic*:
$[_{ASPP}\ DP_1\ ZZ\ [_{TP}\ \overset{NOM}{\cancel{DP_1}}\ \cancel{ZZ}\ [_{FP}\ \overset{PRT}{DP_2}\ \cancel{ZZ}\ [_{VP}\ \cancel{ZZ}\ ]]]]$
ZZ, +PRT, +pst, +ASP$_P$ ✍ */heziz/*

c. *Intransitive, Telic*:
$[_{TP}\ \overset{NOM}{DP_1}\ ZZ\ [_{ASPQ}\ \cancel{DP_1}\ \cancel{ZZ}\ [_{VP}\ \cancel{ZZ}\ ]]]]$
ZZ, +pst, +ASP$_Q$ ✍ */zaz/*

d. *Intransitive, Atelic*:
$[_{ASPP}\ \overset{NOM}{DP_1}\ ZZ\ [_{TP}\ \cancel{DP_1}\ \cancel{ZZ}\ [_{VP}\ \cancel{ZZ}\ ]]]]$
ZZ, +pst, +ASP$_P$ ✍ */zaz/*

(17) a. *Transitive, Telic:*
$[_{ASPP}\ DP_1\ SRP\ [_{TP}\ \overset{NOM}{\cancel{DP_1}}\ \cancel{SRP}\ [_{ASPQ}\ \overset{ACC}{DP_2}\ \cancel{SRP}\ [_{VP}\ \cancel{SRP}\ ]]]]$
SRP,+ASP$_Q$, +PRT, +pst, +ASP$_P$ ✍ /*sarap*/

b. *Transitive, Atelic*:
$[_{ASPP}\ DP_1\ SRP\ [_{TP}\ \overset{NOM}{\cancel{DP_1}}\ \cancel{SRP}\ [_{FP}\ \overset{PRT}{DP_2}\ \cancel{SRP}\ [_{VP}\ \cancel{SRP}\ ]]]]$
SRP, +PRT, +pst, +ASP$_P$ ✍ /*sarap*/

c. *Intransitive, Telic*:
$[_{TP}\ \overset{NOM}{DP_1}\ SRP\ [_{ASPQ}\ \cancel{DP_1}\ \cancel{SRP}\ [_{VP}\ \cancel{SRP}\ ]]]]$
SRP, +pst, +ASP$_Q$ ✍ /*nisrap*/

d. *Intransitive, Atelic*:
$[_{ASPP}\ \overset{NOM}{DP_1}\ SRP\ [_{TP}\ \cancel{DP_1}\ \cancel{SRP}\ [_{VP}\ \cancel{SRP}\ ]]]]$
SRP, +pst, +ASP$_P$ ✍ /*nisrap*/

A scrutiny of the output forms in (16) and (17) reveals immediately the inflectional features which the phonology does and does not choose to spell out. Tense (as well as agreement) are clearly distinctive. While the presence of any one particular aspectual node does not seem to result in a phonological distinctiveness, the availability of an objective case does. Thus transitive forms, regardless of whether telic or atelic, are phonological homophones, as are intransitive forms, regardless of their telicity. In turn, while the presence of objective case is always phonologically marked, that phonological marking need not be consistent across roots, realized as binyan V for *ZZ*, but as binyan I for *SRP* and binyan III for *GLGL* 'roll'. We may thus conclude that the relevant input to the phonological search consists of the representations in (18), containing the root itself, together with the phonologically relevant feature +OM (OM=object marking), and whatever idiosyncratic morphological pattern is associated with the output for particular roots:

(18) a. *ZZ,*+OM, +pst ✍ *V(heziz)*
SRP,+OM, +pst ✍ *I(sarap)*
GLGL, +OM, +pst ✍ *III (gilgel)* ('roll', trans., telic, atelic)
etc.

b. *ZZ,* +pst, (+ASP) ✍ *I(zaz)*
SRP, +pst, (+ASP) ✍ *II(nisrap)*
GLGL, +pst, (+ASP) ✍ *VII (hitgalgel)*('roll', intrans., telic, atelic)
etc.[15]

Let us highlight what is regular in (16)-(18) and what is idiosyncratic. Regular is the fact that almost without exception, the presence of the inflectional feature +OM in Hebrew ***is*** distinctively marked, although there is no one-to-one correspondence between +OM and a specific binyan. Nevertheless, the binyan system does have some unexceptional inflectional properties. Most strikingly, binyanim II, IV, VI, and VII never take direct objects, which is to say, they never occur in the presence of a +OM feature. There are simply no vocabulary items in Hebrew which are an exception to this generalization. The +OM feature, thus, may only be realized as binyanim I, III, or V. Yet, this is a fact that the child clearly does not know. Note specifically (11aii,aiii), where the child uses binyanim II and VII transitively[16]. Further, binyan III is never used reciprocally in the adult language, yet the child uses it reciprocally as illustrated by (9a) and (11bii). It seems safe to assume, then, that the child is oblivious to the information contained in column 2 of table (14): she does not know of regularities associated with particular binyanim, nor does she seem aware of any measure of relationship between the syntactic structure and the selection for the appropriate binyan. Finally, although the phonological distinctiveness of the +OM feature is almost without exception in the adult language, the child seems oblivious to that fact, as well. In sum, the child seems oblivious to the effect of syntactic feature marking on her choice of binyan, be it regular, from the perspective of the target use, or idiosyncratic.

Yet, strikingly, all forms produced by the child are morpho-phonologically correct, in that they all represent morpho-phonologically-possible words and belong to well-formed *binyanim.* All attest to morpho-phonological knowledge of what are possible words in the adult grammar, but to the absence of knowledge, on the part of the child, of the fact that the appropriate morpho-phonological output must be checked against the history of the syntactic derivation. This is not only true of the neutralized verbs in (8)-(11), attested in the adult language, and used by the child with the wrong valence. Novel forms which are not attested in the adult language, occur in the

[15] Quite possibly, the +ASP specification in the phonologization conventions in (18b) is redundant, making the occurrence of the morphological forms in (19b) quite simply the unmarked verbal instantiation of the roots in question. Wishing to leave this possibility open, subject to further investigation, the feature is placed in parenthesis.

[16] Passive binyanim IV, VI, uncommon in adult speech, are not attested in pre-school children altogether, clearly for independent reasons.

early speech as well, as illustrated by (19), and here, too, all occurring forms are morpho-phonologically possible, although not attested, words:

(19) a. hu *kines*.III la-tanur Na'ama 2;2
he … to-the-oven
'He entered the oven'
cf. adult *niknas*.II (root *KNS*)
entered

b. ani *mevina*.V le-Dafna. Na'ama 2;2
I to-Dafna
'I explain to Dafna' (lit. 'I understand to Dafna')
cf. adult *hisbir*.V (root *SBR*)
explain
cf. adult *hevin*.V (root *YBN*)
understand

c. 'ani roca *le-naheg*.III ba-fiesta Na'ama 2;3
I want to-… in-the-Fiesta
'I want to drive the Fiesta'
cf. adult *li-nhog*.I (root *NHG*)
to-drive

d. kaka'ani roca *le-ša'er*.III Na'ama 2;4
so I want to- …
'I want to stay like this (?)'
cf. adult *le-hiša'er*.II (root *Š'R*)
to-stay

As in (8)-(11), all forms in (19) use an existing root, interpretationally appropriately, in an existing, but wrong, binyan. For the adults, another binyan is used to convey that meaning with that root, or, as the case is for (19b), another root altogether is used (rather on a par with the *eat/feed* situation in English). All forms are morpho-phonologically correct, in that they belong to an existing binyan, but strongly suggest that the child could not possibly be projecting argument structure from an acquired token. As an illustration, the child has never been exposed to *kines*.III, as in (19a), although it is likely that she has been exposed to the adult *niknas*.II, 'enter', sharing the same root. She has been successful in acquiring, from the input, the basic meaning of the root *KNS*, as pertaining to entry, but has failed to store in memory the particular morpho-phonological binyan with which it is associated in the adult language. She is now proceeding to embed this root within a binyan which is morpho-phonologically correct, but which is not the one associated with the correct adult binyan. To the extent that she is now projecting argument structure to go along with this creatively produced form, what could be its origin? It could not possibly be coming from the newly invented form, as that form has just been coined and does not have an argument structure in and of itself. It could not be emerging from the binyan used, as binyan III, used here, does not have a fixed argument structure associated with it and is compatible with both +OM and –OM. Finally, it could not be emerging from the meaning of the root, as roots, as such, are not associated with argument structure (or event with category). Thus all the roots in (19) occurs in more than one binyan, with divergent meanings and argument structures. We are therefore driven to the conclusion that the argument structure associated with these newly invented forms must be available independently of the knowledge of vocabulary items, reflecting a computational knowledge on the structure of events that cannot be reduced to the acquisition of tokens. We note the particularly interesting case of (19b), where the child is using an existing root in an existing binyan, but with an argument structure never attested, for adults, with this root. Yet, the child is displaying, in the process, a conceptual understanding of the meaning of the root, together with complete disregard for whatever grammatical context in which she may have heard the existing

form previously. This behavior thus casts serious doubt on the idea that lexical items are acquired, from situations, together with their argument structure projection possibilities.

To summarize, the child appears to have acquired some extremely important aspects of the morpho-phonology of Hebrew: she is successful in extracting roots from existing words, storing them with the relevant meaning and embedding them in morpho-phonologically correct templates, as the novel forms in (19) illustrate. She is further successful in projecting syntactic event structure to go along with her morpho-phonologically correct forms. She is, however, unsuccessful on two fronts: first, she has yet to learn that the particular binyan associated with a particular root is not just subject to morpho-phonological constraints, but also to morpho-syntactic ones, and that the appropriate binyan must be searched in accordance with the syntactically determined +OM feature. And second, paying no attention to the syntactic conditioning of the binyan system, she has also failed to acquired whatever measure of morpho-syntactic regularities are associated with it.[17]

3.3. On root extraction and morphological early knowledge

A couple of comments are in order on the abilities which are assumed here, on the part of the child. I assumed that the child has attained the morpho-phonological aspects of the binyan system by the morpho-phonological stage. That ability consists of two crucial elements: the child knows all existing morpho-phonologically possible templates (relevantly, binyanim I,II,III,V,VII, excluding passives), and further, has acquired the ability to extract the root from input words and store it independently of the morpho-phonological environment in which it was acquired.

Evidence of full knowledge of all morpho-phonologically possible binyanim has been independently argued for by Berman (1982) and by Levy (1988). Table (20), from Levy (1988), shows the distribution of roots across binyanim in two children, Ruti and Arnon. All forms are *singletons*, or *underived*, in the sense of Levy:[18]

[17] We note in this context that the child is not ignoring the inflectional system in its entirety, inflecting forms for both tense and agreement correctly. The avoidance here, then, is associated with the choice between different binyanim, conditioned as it is by the +OM feature together with idiosyncratic, root-specific knowledge. The source of the delay here may be either the idiosyncratic, root-specific knowledge required, or, alternatively, a specific difficulty with marking event structure. The choice between these options cannot be made without a fuller investigation of the development of argument structure inflectional marking in other grammars, but see conclusion for some relevant considerations.

[18] Where by *singletons* (Levy's *underived*) we mean roots which occurs in a single binyan, and were by *non-singletons* we mean roots which occur in more than one binyan. By *type*, we mean a given root in a specific binyan, that is, the root *zz* in binyan I is a distinct *type* (*zaz*, 'move.intrans') from the same root zz in binyan V (*heziz*, 'move.trans'), but both count as one *root*.. Thus for *singletons*, the number of roots and the number of *types* is the same. For *non-singletons*, the number of types exceeds the number of roots.

Levy's classification is based on her contention that for children, a given root only occurs in a single binyan (and see also Berman, 1982), which is to say, children only have *singletons*. For adults, of course, a particular root may occur in more than one binyan. As it turns out, the conclusion that children at the relevant age only have *singletons* is in error. I return to this issue at length in section 4, where I evaluate the claim that morphological biases or deficiencies account for the early neutralization facts.

(20) *Distribution of verb tokens and roots (singletons) across different binyanim, Ruti and Arnon (2;0-2;4) (%/#)*

	Arnon		*Ruti*	
Binyan	*Tokens (total 400)*	*Roots (total 81)*	*Tokens (total 1757)*	*Roots (total 100)*
I	57.5%/230	53%/43	60.4%/1062	40%/40
II	5%/20	5%/4	3.6%/65	7%/7
III	13.75%/55	18.5%/15	16%/283	25%/25
V	20%/80	18.5%/15	16%/286	22%/22
VII	3.75%15	5%/4	3.4%/61	6%/6

Table (21) gives an extremely similar distribution for Na'ama (*singleton* and *non-singleton* roots):

(21) *Distribution of verb tokens and types across different binyanim, Na'ama (singletons and non-singletons)(1;7.8-2;6.4)(%/#, root total: 146)*

Binyan	*Tokens (total 1199)*	*Types (total 174)*
I	62.9%/754*	43.1%/75
II	2.2%/26	7.5%/13
III	13.8%/165	21.2%/37
V	18.8%/225**	18.4%/32
VII	2.3%/28	9.2%/16

*including 170 occurrences of *raca*, 'want'.
**including 73 occurrences of *he<u>b</u>i*, 'give, bring'

Finally, table (22) gives the distribution of verb tokens and types in adults:[19]

(22) *Distribution of verb tokens and types across different binyanim, Adults (singletons and non-singletons) (%/#, root total: 217):*

Binyan	*Tokens (total 519)*	*Types (total 254)*
I	56.1%/291	43.1%/75
II	9.2%/48	13%/33
III	11.6%/60	14.2%/36
IV	0.4%/2	0.8%/2
V	15.8%/82	19.3%/49
IV	0.6%/3	1.2%/3
VII	6.1%/32	9.8%/25
VII' (nitpa9el)	0.2%/1	0.4%/1

With the possible exception of binyan II, the distribution of both tokens and types for children across different binyanim is virtually identical to that of adults, and even for binyan II, note, Na'ama has 13 distinct types. The children under consideration, then, have an accurate knowledge

[19] It would have been best, of course, to conduct an analysis on the adult input to Na'ama. Such a direct analysis is unfortunately impossible, as the adult tier in the CHILDES files is rarely included. Adult data here is from a sample text containing a total of 519 verbs (tokens), taken from the Hebrew newspaper *ša<u>b</u>ua israeli* 'An Israeli Week', July 19, 1999. It represents three differently authored articles, and so does not actually characterize the language of any one particular individual. As this is a written, rather than a spoken sample, it probably represents a higher linguistic register. In view of that, the almost identical distribution among binyanim to that of the children is particularly striking. Distribution of verbs in the passive binyanim, IV and VI, is included for completeness, as is the one occurrence in the stylistically elevated variant of VII, marked here as VII', *nitpa9el.* Participial forms (requiring an auxiliary in past and future tenses), including adjectival passives, are not included in Na'ama's sample and in the adult sample.

of the different morpho-phonological templates available in Hebrew. We note that there are virtually no cases of 'invented' binyanim in the early speech, that is, morpho-phonological forms used by the child that cannot be traced back to an existing binyan, possibly with some phonological errors especially in cases which are phonologically irregular.

Consider now the ability attributed here to the child to extract the root out of a morpho-phonological template, and embed it within a different one. While this appears as a very abstract operation, requiring considerable computational sophistication, it is also very clear that the ability to do so must be assumed to be available at an extremely early age. The reason here has to do with properties of the tense system, rather than the binyan system. Just like the binyan system, tense morphology is expressed through a combination of vocalic melodies and affixation. These vary from binyan to binyan, as the table in (23) shows (only 3.sg.m. phonologically regular forms are given; binyanim IV, VI, absent in early language, are omitted. Root is *PKD*, roughly 'count' or 'command'):

(23)

	I	*II*	*III*	*V*	*VI*
past	*P**a**Q**a**D*	***ni**PQ**a**D*	*P**i**Q**e**D*	***hi**PQ**i**D*	***hit**P**a**Q**e**D*
present	*P**o**Q**e**D*	***ni**PQ**a**D*	***me**P**a**Q**e**D*	***ma**PQ**i**D*	***mit**P**a**Q**e**D*
future	***ya**PQ**i**D*	***yi**P**a**Q**e**D*	***ye**P**a**Q**e**D*	***ya**PQ**i**D*	***yit**P**a**Q**e**D*

As is evident from the table in (23), the appropriate use of tense inflection already requires the ability to extract the root and to embed it, in different tenses, in distinct vocalic-affixal melodies, which have distinct tense value (e.g., past, present, etc.), together with the explicit knowledge that different vocalic-affixal melodies may be associated with the same tense value in different binyanim. Thus the vocalic-affixal melody for past for binyan I is ***a-a***, while the vocalic-affixal melody for past for binyan V is ***hi-i,*** etc.. Interestingly, binyan I, the one the children and adult use most (see above), is the one which displays the widest vocalic variation across tenses (***a-a; o-e; ya-i***). And yet, as is well-established, Hebrew learners master tense morphology extremely early. Na'ama, at age 1;9, uses during one session 19 tokens, with the following tense marking, in which vowels and affixes used are correct in at least 17 forms:

(24)

	Binyan I	*Binyan V*	*Unclear*
Past	3 (1 root)		
Present	4 (3 roots)		
Future	2 (2 roots)		
Imperative	2 (2 roots)	1	
Truncated infinitives	5 (4 roots)	1	
Truncated, unclear			1 (*bet*)
Inflection error	1 (*sigor*)		

At age 2;2, at which Na'ama begins to use neutralized forms, she uses, in one session, 11 verbs in more than one tense, with vocalic melody fully correct, ranging over 3 distinct binyanim (I, III, V). The ability, however acquired, to extract the root from vocalic/affixal templates and to embed it correctly within another, sensitive both to tense considerations and binyan considerations, is beyond dispute, then, and is in place prior to the stage in which children exhibit the errors illustrated in (8)-(11), the first clear instance of which occurs in the Na'ama corpus at age 2;2.[20]

[20] Berman (1993, 1994) suggests that at the earlier stage, that corresponding here to the morpho-phonological stage, children have acquired specific tokens as unanalyzed amalgams. It is not clear, however, how that can be, or how the facts could possibly support such a claim, given the productive use of verbs in different tenses. The ability to extract the root must be assumed, given the competence children show at the relevant age in producing tense morphology. Further,

3.4 Constructing argument structure in the morpho-phonological stage:

Granting that the child did master the principles which govern the morpho-phonology of the binyan system, including the ability to extract the root and to embed it in a morpho-phonologically well-formed binyan, the errors exhibited by the child could not be attributed to morpho-phonological shortcomings. However, having attained the morpho-phonology of the binyan system without having acquired the knowledge that the form must be matched, specifically, against the presence of the +OM feature, presents the child with an interesting dilemma. Suppose for a moment that she already knows that pairs such as *yaca.I/hoci.V* 'come-out/take-out', *hidbiq.V/nidbaq.II* 'glue/become-glued' etc. have the same root and hence the same basic conceptual meaning. She also knows, already, that these are all morpho-phonologically well-formed. In the absence of the knowledge that the full grammaticality of her choice is dependent on the presence vs. absence of the +OM feature, what could possibly be the difference between them, from her perspective? The answer, it appears, is none. To the extent that the child has become aware of the existence of particular morpho-phonological pairs derived from the same root, such pairs could only be construed as synonyms, two equally felicitous outputs of the morpho-phonological system with the same interpretation. In the absence of any sensitivity to the +OM marking, there is no way for the child to know, in a given syntactic environment, which of them to use, and as a result, she is guessing. This, I claim, accounts for the cases of neutralization with attested forms, illustrated by (8)-(11). It turn, memory of attested morpho-phonological forms, whether attested in derivational pairs or not, occasionally fails altogether. In those cases, the child resorts to a productive use of the morpho-phonological system. Having acquired the root with its basic meaning, she embeds it in some possible morpho-phonological binyan, which quite plausibly will deviate from that actually attested in the language. The novel forms in (19) are the result.

Consider what such a system might look like, so that it involves knowledge of the root, storage of some already attested root-binyan pairs, but no knowledge of their syntactic conditioning. In that system argument structure could not come from the knowledge of vocabulary. Even if children have learned many verbs as isolated tokens, with root and vocalic template together, this knowledge does not interact with the way in which they project argument structure. In fact, as is clear from (8)-(11), they proceed to ignore the syntactic environment which determines the selection of the proper token, and instead project whatever argument structure suits the propositional content they have in mind, inserting into it a morpho-phonological form with an interpretationally appropriate root, but not necessarily the correct binyan from the perspective of the morpho-syntax.

Consider now this behavior from the perspective of a syntactic model in which the interpretation of argument structure is independent of verbs. Suppose the child knows the syntactic structures which are associated with arguments. Specifically, the child is using the following innate linking correlations to help her into the projection of a preliminary argument structure:

(25) a. *originator* ? [Spec,ASP_P]
b. *subject-of-result* ? [Spec,ASP_Q]
c. ASP_P dominates ASP_Q

From the perspective of production, what the linking regulations in (25) tell the child (and the adult) is that whenever she wishes to express the existence of an *originator* of an event, she must embed it within the structure in (25a), and that whenever she wishes to express the existence of a *subject-of-result* of an event, she must embed it within the structure in (25b). From the perspective

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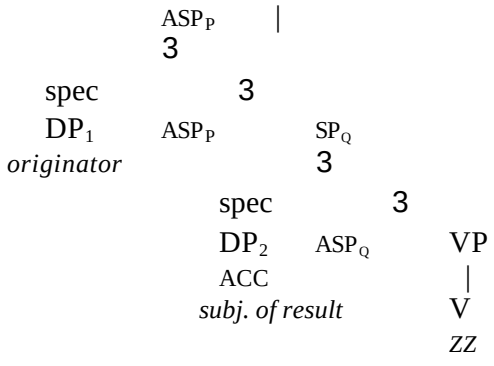
the fact that the children err on binyanim but not on roots also indicates an ability to separate the root from the morpho-phonological template. None of these is expected if the children treat specific tokens as unanalyzed amalgams.

of comprehension, the child will likewise understand a DP occurring in the structures in (25a-b) as *originator* and *subject-of-result*, respectively, regardless of the particular verb used.[21]

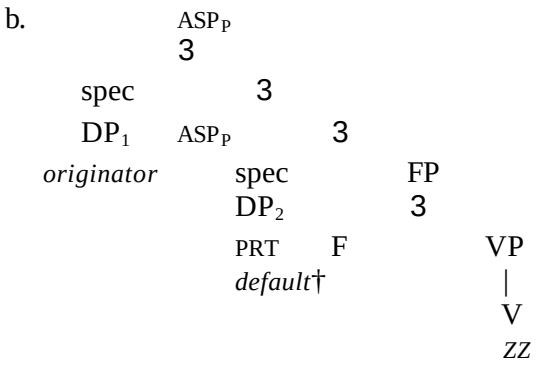
As an illustration, consider again the root *ZZ*, associated with the meaning of movement. Making use of the linking principles in (25), the child will be able to construct the structures in (26), with the accompanying interpretation:

(26) a.



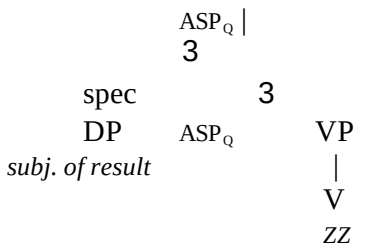
?e (process, e) & originator (DP_1 e) & subject-of-result (DP_2, e) & (*ZZ*, e)
(DP_1 *originated* a *ZZ process event* which *resulted* in DP_2 being in a *ZZ state*). ((2a)(4a))

b.



?e (process, e) & originator (DP_1, e) & participant (DP_2, e) & (*ZZ*, e)
(DP_1 *originated* a *ZZ process event.* DP_2 was a (relevant, non-*originator*) *participant*)
((2b)(4b))

c.



?e (non-stative, e) & subject-of-result (DP, e) & (*ZZ*, e)
(DP participated in a *non-stative event resulting* in it being in a *ZZ state*) ((2c)(4c))

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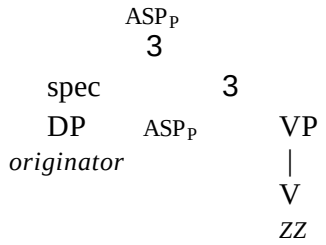
[21] Of course, comprehension is dependent here on syntactic and semantic transparency. Thus in the presence of two DPs and a non-stative event, the first must be an *originator*. The second, however, may either be a *subject-of-result* or just a default participant. Likewise, for intransitives, a single DP may either be *originator* or *subject-of-result*. A successful parse, then, is dependent on the degree to which the type of event involved is obvious from the communication act. The child, however, is not alone here in attempting to process a structurally ambiguous input on the basis of pragmatic clues, nor is event structure the only area in which structural ambiguities cannot be resolved without context. A similar problem is faced by adults here, as well as in many other well-discussed cases of structural ambiguity.

d.



?e (process, e) & originator (DP, e) & (ZZ, e)
(DP *originated* a ZZ *process event*) ((2d)(4d))

The child now needs to phonologize, so to speak, the root, given that a string of consonants, even if related to some meaning, is not a phonological option. If at all retrievable, the child will assign to the root in (26a-d) a morpho-phonological token already attested with that particular root. As most roots appear to occur in the (adult) input only in one binyan (see section 4 for discussion), the child will be largely correct. However, when the child is confronted with roots attested in more than one binyan, or when the child has forgotten the attested binyan, she will randomize, phonologizing the root in any of the binyanim attested with the root, or alternatively, embedding it within an unattested one.

Consider an attested example, a particular root, say *YC'*, pertaining, in essence, to exit, and which is quite commonly attested in adult speech both as binyan V (transitive, meaning 'bring-out', 'take-out') and as binyan I (intransitive, used both telically, i.e., 'come-out', and atelically, i.e., 'go-out', e.g., for a walk). We expect the child to phonologize the root *YC'* in more than one way, and in a manner quite oblivious to the argument structure configurations and the interpretations associated with the structures in (26). In short, we expect her to randomize, mapping either binyan-root pair into any of the structures in (26), although *yaca*.I is only appropriate for (26c-d), while *hoci*.V is only appropriate for (26a-b).

The data bears out these predictions, as (27)-(28) illustrate:

(27) a. 'ima, ta9azri li, ze lo *yoce.I* lo (26c)[22] Na'ama 2;2.
mommy, help to-me, it no *come-out* to-it
'Mommy, help me, it is not coming out'

b. 9axšav 'ani roca *la-cet.I* 9im imale (26d) Na'ama 2;3
now I want *to-go-out* with mommy
'Now I want to go out with Mommy'

(28) a. ken hu *moci.V* lebad (neutralized form) (26c) Na'ama, 2;3
yes he alone
lit: *take-out;* intended meaning: *come-out*
'it comes out by itself, too'

b. *hoci.V* 'oto me-ha-bor (26a) Na'ama, 2;3
took-out it from-the-hole
'(he) got it out of the hole'

Negation aside, the subject-verb, event interpretation of (27a) and (28a) is virtually synonymous, and the same root is used, Still, Na'ama uses two different binyanim here to express the same event. Further, when using the neutralized (adult-incorrect) form in (28a), she has already used both *yaca.I* ('come-out') and *hoci.V* ('take-out') correctly, in the very same session. And in a particularly striking example or random use, consider the following sequence, in which *hoci.V* form is used twice, once transitively and correctly, and immediately following it, intransitively, and incorrectly:

[22] As an aside, we note that the child has not yet acquired the correct use of the reflexive dative, ungrammatical for adults in the context in (27a).

(29) NAA: *toci'i.V* 'et ze
take-out.sg.2.f. OM it
NAA: ken hu *moci.V* [=*yoce.I*]† lebad
yes he (*comes-out*) by-itself
'it comes out by itself, too'
†adult tier missing; comment in square brackets from original CHILDES transcript

More than anything else, the case in (29) looks like a recency effect. The child has just used the root *YC'* in binyan V, and this use is quite straightforwardly repeated. And yet, such recency effects are not attested for tensed verbs: the child is never tempted to repeat the past tense, with a future interpretation, just because it has been recently used, nor does the child use the wrong root. That recency does, in fact, have an effect here is thus direct evidence for the fact that the root-binyan pairs do not register, with the child, as having differing values appropriate in some, but not other, syntactic environments. To conclude, neutralization errors stem from the fact that the child has extracted the root and stored it with its basic meaning, and possibly with already attested morpho-phonological forms. The child has further acquired the morpho-phonological aspects of the binyan system, pretty much in full. However, in the absence of the ability to select the correct binyan based on syntactic factors, types which for the adult are only distinguishable as based on syntactic factors are treated as synonyms by the child, and the choice between them becomes random.

4. Morphological deficits? Morphological preferences?

As shown in tables (20)-(21) above, it cannot be assumed that the early performance is driven by a morpho-phonological deficit which leads the child to avoid some binyanim and replace them by others. Children have no morpho-phonological problems with any binyanim as such (passive binyanim excluded), nor is their distribution of roots across different binyanim different substantially from that of adults, as table (22) illustrates. Even roots in binyan II, occurring in the early speech only about half as often as in adult speech, take part in neutralization in both directions. Thus binyan II, avoided in (10a-b) is the very same one neutralized towards in (11aii).

Nevertheless, the child may be experiencing a variety of morphological difficulties of a more complex sort. Berman (1982, 1994) makes two claims as concerning the early behavior. First, she suggests that the child rarely have roots attested in more than one binyan. Neutralization, then, could be simply the result of the child acquiring a single binyan for any particular root, and sticking to that binyan for all occurrences of that root. The difficulty, then, is not in recognizing morpho-phonologically distinct forms, but in mapping between them. Children are, indeed, predicted to have no problems with *singletons*, but to have problems with *non-singletons*.

Yet another claim concerning morphological difficulties is made by Berman (1993, 1994). Berman suggests that the child neutralizes overwhelmingly towards binyan I, precisely because the child does not know, yet, how to match particular binyanim with particular syntactic contexts. As binyan I is a catch-all template without any canonical morpho-syntactic properties, the child gravitates towards it, thereby avoiding using binyanim with restrictions which she does not yet fully comprehend.

Obviously, both claims can only be substantiated if it turns out that children have non-singletons significantly less than adults, and that their attested preference for binyan I, likewise, exceeds that of adults. We have already shown that the early distribution of roots across the binyanim does not, in fact, differ significantly between children and adults. Importantly, while table (20), from Levy (1988) only contains singletons (underived forms, in Levy's terms), which is to say, roots that occur in a single binyan, table (21), from Na'ama, includes both singletons and non-singletons, where by non-singletons we mean cases of roots attested in the corpus in more than one binyan. Yet, the distribution of forms when both singletons and non-singletons are included remains the same, which is to say, there is no significant increase in the occurrence of any one

particular binyan as a result of the inclusion of non-singletons. This is not only true for Na'ama, but also for adults. Thus when the distribution across different binyanim for adults or for Na'ama is compared to the distribution across different binyanim for Ruti and Arnon, we find that the occurrence of root-binyan pairings in different binyanim is by and large the same, with binyan II, showing a marked increase for adults, being the only possible exception. Prima facie, then, it appears that the inclusion of non-singleton root-binyan forms does not alter the proportion of forms attested in each binyan. Note further that even if children do tend to favor one binyan for each root occurrence, this is a tendency, rather than an exception less situation. We already saw that Na'ama uses roots in more than one binyan, including *YC'* (I,V, 'come-out/take-out'), *'KL* (I,V, 'eat/feed') and others.

A closer scrutiny of non-singletons in Na'ama's speech (including erroneous forms, both neutralized and novel), as compared to non-singletons in an adult corpus further reveals that there is no difference here between the adults and children, disproving the claim that children (tend to) have singletons, as well as the claim that they favor binyan I.

A count of non-singletons pairs (i.e., types which share a root but are inflected in a different binyan, such as *zaz-heziz*) in the speech of Na'ama reveals that non-singleton pairs occur in 27 out of the 147 roots that she uses. That is, 18.3% of the roots Na'ama uses occur in more than one binyan. Table (30) gives the distribution, by binyan, of non-singleton types, including neutralized forms and novel forms. In total, there were 55 non-singleton types in Na'ama's speech, to a total of 31.6% of singleton and non-singleton types attested (where a non-singleton type is a $root_1$-$binyan_i$ form with a corresponding, attested $root_1$-$binyan_j$ form):

(30) *Distribution of non-singleton types by Binyan, Na'ama (#/% of non-singleton types. Total non-singleton roots: 18.3%):*

Binyan	*I*	*II*	*III*	*V*	*VII*
Distribution	15/27.3%	7/12.7%	9/16.4%	16/29.1%	8/14.5%

Table (31) gives the distribution of erroneous types only (singletons and non-singletons), including neutralized forms and non-existing innovations. In total, there were 18 erroneous types, a 10.3% of total types, or 30% of all 'creative' forms, that is, correct non-singletons, neutralized, and non-existent (a total of 60, or 34.5% of total types). The table in (31) should be read as follows: 6 of the erroneous forms used by Na'ama, or 33.3% of total erroneous forms, were in binyan I. 1, or 5.6% were in binyan II, etc.

(31) *Distribution of erroneous types by Binyan, Na'ama (#/% erroneous types):*

Binyan	*I*	*II*	*III*	*V*	*VII*
Na'ama	6/33.3%	1/5.6%	5/27.8%	4/27.8%	1/5.6%

Consider now the distribution of non-singletons in the speech of adults. In the adult sample, of a total of 217 roots, 32 where non-singletons, which is to say, occurred in more than binyan, or 14.7% of total roots, ironically, less than the number of non-singleton roots in Na'ama's sample. Table (32) gives the distribution, by binyan, of non-singleton types for adults. In total, there were 65 non-singleton types, or 25.6% of total types (254):

(32) *Distribution of non-singleton types by Binyan, Adults (#/% of non-singleton types (total non-singleton roots: 14.7%):*

Binyan	*I*	*II*	*III*	*IV*	*V*	*VI*	*VII*	*VII'*
Distribution	22/33.8%	20/30.8%	5/7.7%	1/1.5%	11/16.9%	1/1.5%	4/6.2%	1/1.5%

As is evident from the comparison of the adult corpus to the performance of Na'ama, there is, in the early speech, no preference towards singletons which distinguishes it from adult performance. The percentage of non-singleton roots, as well as the total of non-singleton types are in fact higher

in the child's speech than in the adult corpus. Further, preference for binyan I is attested neither for non-singletons nor for neutralized or novel forms. Binyan I makes one member of a non-singleton root group 27.3% of the times for Na'ama (table 30), to 33.8% in the adult speech (table 32), and its occurrence in neutralized and non-existent forms is virtually the same as its occurrence as a ;member of a non-singleton root group or in non-singletons for adults, at 33.3% (table 31) The distribution across binyanim, for Na'ama, is largely the same, for the entire corpus, for non-singleton types alone, and for erroneous types, showing, if anything, a slight decrease in use of binyan I in non-singleton and erroneous types, as compared with the entire corpus. The only marked difference from the adult behavior involves binyan II, which for the adults makes up 30% of non-singleton types, but only 12% of non-singleton types for Na'ama. For adults, the distribution of binyan II in non-singleton types far exceeds its distribution in the adult corpus in general (at 13%, see table 22), but not so much so for Na'ama, supporting directly the claim that Na'ama's choice of binyan is governed by whatever factors determine the statistical frequency of that binyan in the corpus at large, and not on her knowledge of the syntactic restrictions that may restrict the occurrence of that binyan in the context of a specific root. We conclude then that contra Berman (op. cit.), the pattern of errors in the early grammar cannot be attributed either to a preference for singletons, or to a principled favoring of binyan I by children. Rather, as we claimed in the previous section, morpho-phonological knowledge at the relevant stage of development seems virtually identical to that of adults, and the reason for the early errors must be sought elsewhere, in a deficient morpho-syntactic component, that is, the early inability to relate particular morpho-phonological forms to the syntactic event structure in which they are inserted.[23]

It might be worthwhile to consider at this point what would need to be assumed, for the early grammar, by approaches which project argument structure directly from traditional lexical entries. Considering, specifically, the multiple occurrences of the root *YC'*, pertaining to exit, illustrated in (27)-(28) one would have to assume, on the part of the child, at least the following lexical entries:

(33) a. *YC'.V* 1 *theme* come-out
?
direct internal illustrated in Na'ama's speech by (28a).

b. *YC'.V* 2 *causer, theme* take-out
? ?
external direct internal illustrated in Na'ama's speech by (28b).

c. *YC'.I* 1 *theme* come-out
?
direct internal illustrated in Na'ama's speech by (27a)

d. *YC'.I* 2 *agent* go-out
?
external illustrated in Na'ama's speech by (27b)

As telicity is not morphologically marked by the binyan system, *YC'*.I in Hebrew could be used in both telic and atelic intransitive context, making it a so-called 'variable behavior verb' (see section 1 for discussion). We noted already the theoretical problems which are presented by variable behavior verbs for models which project argument structure from information stored in lexical entries. This issue, however, is theoretically problematic quite independently of the issue under discussion here, as the child attempting to acquire variable behavior verbs need not make here any

[23] Higher numbers for usage of binyan I are reported in Berman (1994), where binyan I is reportedly used in 67% of neutralized cases (although for individual children it is at times as low as 35%). Berman only counts neutralization, and although other unconventional cases are considered, their distribution across binyanim is not given. It is also not clear whether the 67% result is of tokens or of types. Note that if the former is the case, it continues to reflect, quite closely, the ratio of binyan I tokens in both adult and early speech.

assumptions that would lead her to deviate considerably from the properties of the target grammar. We note, considerably more significantly, however, that the entries in (33) includes homophones with distinct transitivity value ((33a) and (33b)), as well as synonyms with distinctive morpho-phonological representations ((33a) and (33c)), all derived with the same root, a situation never attested in adult Hebrew. Further puzzling is the emergence of the lexical entry in (33a), non-existent in the adult grammar. How could it have come to exist in the early grammar? Clearly, not through positive evidence. Nor is the singleton route helpful here. Not only have we shown that this generalization does not hold, in general, for the early grammar, it most certainly does not hold for this particular root and for this particular child, as the data in (27)-(28) directly shows: Na'ama plainly has both *YC'*.I and *YC'*.V. The only possibility, then, is that *YC'*.V with its intransitive interpretation in (33a) has come to exist through a wrongly formulated rule of word-formation, essentially as in (34a) or alternatively, (34b). Rule (34a) would derive an intransitive form in binyan V from an intransitive form in binyan I, with an identical meaning and argument structure. Rule (34b) would derive an intransitive form in binyan V from a transitive form in binyan V. Neither rule represents a sub-regularity occurring in the adult grammar:

(34) a. root.I (*theme*) ? root.V (*theme*) (e.g., *yaca*.intrans ? *hoci*.intrans)
come-out.intrans come-out.intrans

b. root.V (*causer, theme*) ? root.V (*theme*)(e.g., *hoci*.trans ? *hoci*.intrans)
take-out.trans come-out.intrans

(34b) would further require the child to assume the equivalent of ? -affixation (or conversion) for valence decrease, otherwise not attested in the Hebrew binyan system. A second rule of ? -affixation, this time for valence increase, would have to be postulated to account for the derivations in (8a-b). This rule, in essence as in (35a), would allow a transitive binyan I to be derived from an intransitive binyan I. (35b), on the other hand, would ? -derive valence decrease, as in (10a). The child must now be hypothesized to have two rules of ? -affixation with a diametrically-opposed effect, none of which is attested in the input:[24]

(35) a. root.I (*theme*) ? root.I (*causer, theme*) (e.g., *zaz*.intrans ? *zaz*.trans)
move.intrans move.trans

b. root.I (*causer, theme*) ? root.I (*theme*) (e.g., *šapak*.trans ? *šapak*.intrans)
spill.trans spill.intrans

While (35) would require the child to assume ? -affixation with diametrically opposed effects, (34a) would require of the child to assume vacuous morphological affixation, mapping binyan I to binyan V without any modification in argument structure, again a situation otherwise not attested in the Hebrew binyan system. To make matters worse, with respect to the mapping operations in (34a-b) and (35a-b), none present in the adult grammar, once assumed to exist in the early grammar, one must address the question of why the child abandons them, especially in the absence of negative evidence which would be required to exclude them.

And finally, the child must also be assumed to have the operation in (36), deriving transitive *YC'*.V 'take-out' from intransitive *YC'*.I, to give rise to the two correct forms, both already present in the early language, as attested by (28b):

(36) root.I (*theme*)? root.V (*causer, theme*) (e.g., *yaca*.intrans ? *hoci*.trans)
come-out.intrans take-out.trans

[24] Interestingly, in the one case in which ? -derivation valence change might be involved, as in (15b.5), the relevant verbs in binyan V are always derived from adjectives, and never from verbs in any other binyan. Further, see Borer (1991) for an argument that each of the members of the inchoative-causative pair is independently derived from the source adjective, and that the forms are not directly derivationally related through ? -affixation or otherwise.

In short, assuming projection from a lexical entry requires the child to postulate four distinct mapping operations, of which only one is attested systematically in the adult language. Alongside the common correlation between binyan I and binyan V which involves overt affixation together with valence increase, the child must also assume affixation with no valence effect, as well as two rules of ? -affixation with valence increase and valence decrease respectively, three mapping operations not available in the adult system.

We conclude by noting that in principle, Semantic Boot Strapping is inherently conservative in its assumptions about the relations between the acquisition of verbs and the projection of arguments. Assuming that the argument structure canonically projects from the lexical entry once the verb and its lexical semantics have been appropriately acquired, Semantic Boot Strapping predicts that errors, on the part of the language learner, are restricted either to cases of wrongly acquired lexical semantics, as associated with a particular phonological representation, or alternatively, to over-generation, i.e., the rule-governed use of possible, but non-existing extensions (e.g., a transitive, non-attested, use of an intransitive verb, on a par with the existing *move-move, drop-drop* alternation). The neutralization and novel-use errors here involve correct lexical semantics (of the root), together with the absence, in the target language, of any rule-governed characteristics, excluding the possibility that they are the result of over-generation. Still, a mismatch occurs between the verb used and the argument structure. This is, in principle, a type of error which Semantic Boot Strapping predicts **not** to occur, and yet it does, strongly arguing against the association of argument structure with the lexico-semantic properties of vocabulary items. [25]

5. Fixing imperfections: the morpho-syntax stage.

As has been established already by Bowerman (1982) and Clark (1982), English learning children pass through a stage in which they produce forms such as those in (37)-(38):

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[25] Before turning to the next developmental stage, it is worthwhile to consider briefly the possibility that the child is suffering from a very specific type of computational overload problem. To illustrate, suppose the child has acquired both *yaca.I*, as an intransitive, and *hoci.V* as a transitive. However, when faced with retrieving the particular morpho-phonological form associated with each of these entries, she suffers a computational load and resorts to guessing.

That the child actually uses entirely novel forms, as in (19), based on roots which otherwise are available as singletons, and which have an identical morpho-syntactic properties to the novel form used by the child suggests that computational overload cannot possibly be the problem here. Specifically, the root *NHG*, having to do with driving, occurs as a singleton in the adult language with the relevant meaning, and in binyan I. The child coining *NHG*.III, as in (19c), is associating with the output precisely the same argument structure which is associated, for adults, with the correct *NHG*.I. Any attempt to make sense of this behavior must allow the child to store roots with their basic meaning but without binyan specification, and to have independent access to the inventory of attested binyanim, thus allowing her to join the stored root *NHG* with its stored interpretation, with binyan III inflection. Roots, however, cannot be assumed to be stored with argument structure information, as such, as they are completely underdetermined with respect to such information. Proponents of a lexical approach to the solution of the neutralization/novel binyan problem would thus have to explain why the retrieval of the root and the syntactic projection information, for a specific singleton entry, presents no problem but the retrieval of the binyan used by the adults, the only binyan in which the child ever heard the token under consideration, is problematic.

We note that even for non-singletons, a computational overload must pre-suppose the psychological reality of the root, or forms such as $root_1$-$binyan_i$ and $root_1$-$binyan_j$ would not be part of a comparison set to begin with, and the child would not be tempted to use the same root in a different binyan, rather than a different root/binyan combination altogether. In turn, the psychological reality of the root and its knowledge by the child, together with her perception of the relatedness of non-singleton pairs, entails computational knowledge of the morpho-phonological system. That the knowledge of roots and templates results in phonologically and syntactically correct input for tense inflection, but for phonologically correct and syntactically wrong input for binyan inflection, further suggests that simple morphological complexity would not do, and that the deficit here is more specific.

(37) a. It always sweats me (4;3)
b. This is aching my legs (5;3) (Bowerman, 1982)

(38) a. I broomed her (2;7)
b. Mommy trousered me (2;3) (Clark, 1982)

Can the existence of cases such as (37)-(38) in early English be correlated with the type of neutralization errors made by the Hebrew learning child? In order to investigate this question, let us consider briefly the nature of the 'errors' in (37)-(38). As is well known, in adult English the very same stem may occur as a transitive verb and as an intransitive verb. Further, in adult English the very same (underived) stem may occur as a verb and as a noun, giving rise, in effect, to triplets such as $move_{V\text{-}i}/move_{V\text{-}t}/move_{N}$; $walk_{V\text{-}i}/walk_{V\text{-}t}/walk_{N}$; $sink_{V\text{-}i}/sink_{V\text{-}t}/sink_{N}$; $race_{V\text{-}i}/race_{V\text{-}t}/race_{N}$. In Borer (2000) I argue that this picture, in English, is a direct result of the category neutral, unspecified nature of (underived) substantive vocabulary items in English, and the fact that category as well as event structure are determined exclusively by the syntactic structure and are not reflected in any way in the phonology of (underived) stems. For the English learner, then, the marginality of $sweat_{V\text{-}t}$ and $ache_{V}$ or $broom_{V}$ and $trouser_{V}$ constitutes, in actuality, an inexplicable, idiosyncratic exception. What needs to be learned here, on the part of the child, is that a general process, allowing the embedding of (underived) stems as the heads of NP or VP (and realized as nouns or verbs respectively), and under any event structure, gives, at times, an 'unconventional' output.

Consider now the picture in adult Hebrew. The equivalent of the English category-neutral stem in Hebrew is a consonantal root, by itself phonologically unpronounceable. The pronounceability of the root, in turn, depends on vocalic-affixal information provided through the inflectional component, and specifically, through the binyan system and the tense/agreement system. Thus every phonologically well-formed word in Hebrew, but not in English, corresponds to a unique syntactic structure. To illustrate, English *move*, itself category-less and devoid of information concerning event structure, may be inserted in nominal structure, in verbal transitive structure, or in verbal intransitive structure. On the other hand, a Hebrew word such as *heziz*, containing not only the consonantal root *zz*, pertaining to motion, but also the vocalic-affixal melody ***hi-i,*** is already a conglomerate of a category-neutral root, the inflectional information provided by +OM (realized here as binyan V) and by past tense (determining here specifically the quality of the first vowel, see table (23)). Thus *heziz* entails the projection of ASP_{Q} (or FP) with the accompanying +OM feature, and of TP. In turn, as *heziz* must be dominated by ASP_{Q} (or FP) and by TP, it becomes categorized as a verb. Neutralization errors, on the part of the Hebrew learner, do not constitute a failure to learn an exception, associated with unconventional vocabulary items, then, but rather, a failure to have acquired a grammatical process, that which links the vocalic-affixal melody to aspects of the grammatical event structure (and specifically, to the presence or the absence of the +OM feature). To the extent that the Hebrew learner is acting like the English learner, she does so in assuming, erroneously, that vocalic-affixal melody of Hebrew verbs, while necessarily reflecting the presence of a TP, is not sensitive to event structure in general and to the presence vs. absence of the +OM feature in particular.

Suppose, then, that this is the case, and that learners of English as well go through a stage in which they do not recognize the ability of event structure to affect the (morpho-)phonology of words. In Hebrew, neutralization errors emerge at this stage. In English, on the other hand, little, beyond the type of over-generation illustrated by (37)-(38) would go wrong, quite simply because the task of the English learner here is greatly simplified by the fact that in English, neither category nor event structure need affect the phonology of the word. The child's initial assumption, that the phonology is insensitive to event structure, works for English, although it is not correct universally, nor is it correct for Hebrew. We note here that the ungrammaticality of (37)-(38), if indeed they are ungrammatical, is of a different class from that of neutralization cases in Hebrew. While $sweat_{V\text{-}t}$ and $ache_{V}$ or $broom_{V}$ and $trouser_{V}$ do not occur, standardly, in English, they are possible

English words in the contexts in (37)-(38). Not so neutralization cases, in Hebrew, which are neither occurring nor possible. As the earlier developmental stage just happens to correspond to the state of affairs in adult English, little further learning is required on the part of the child, beyond that which is involved in the conventionalization of the vocabulary (and see section 6 for some discussion). The Hebrew speaker, on the other hand, has an extra task, needing to acquire the information that event structure does have a morpho-phonological effects on words.

Let us turn, now, to this extra task, considering the next stage in the acquisition of Hebrew, a stage that we will refer to as the morpho-syntactic stage. At this stage, I suggest, not only does the child become fully aware of the significance of event structure in determining the morphology of the verb, but in a familiar manner, she is now applying her newly found knowledge with vengeance, giving rise to frequent over-generalizations, and to the by-now well-known U-shaped curve: 'exceptional' forms are now systematically replaced with 'regularized' ones, giving the appearance of a declined performance.

Neutralization errors are attested, among learners of Hebrew, roughly between 2;2 and 2;11, at which point they stop. What replaces neutralization errors, are errors of the type illustrated by (39)-(40):[26]

(39) a. lama 'at *madxipa*.V 'oti kaka 3;2 (earliest attested occurrence)
why you push me so
cf. adult *doxepet*.I

b. 'ani yoda9at lebad *le-haxlic*.V 'et ha-na9alayim 3;3
I know alone to-take-off OM the-shoes
cf. adult *la-xloc*.I

c. ze mamaš *masrip*.V 'oti, ha-šemeš 4;7
it really burns me the-sun
cf. adult *sorep*.I

(40) a. uf, at kim9at *hiclalt*.V 'oti 4;7
exp. you almost made-dive me
novel, derived from adult *calal*.I.intrans 'dive'

b. ba-yam 'aba *masxe*.V 'oti
in-the-sea daddy make-swim me
novel, derived from adult *saxa*.I.intrans 'swim'

The examples in (39)-(40) are of two kinds. In (39), the child replaces an existing word, occurring in the adult grammar in binyan I, with a form derived from the same root, but in binyan V. In (40), the child is coining a novel causative form in binyan V, which is related to an existing intransitive form in binyan I. The adult vocabulary does not contain a binyan V realization of these roots.

The cases in (39)-(40) involve a 'creative' use of binyan V, with novel binyan V forms derived from binyan I (40), or with the replacement of existing binyan I forms with binyan V forms (39). Replacements of binyanim other than I, as well as innovations in binyanim other than V occur as well, as illustrated by (41)-(42):

[26] Data and generalization in this section are all based on the original observations and conclusions reached in Berman (1982) and Berman and Sagi (1981). While the pervasive "creativeness" on the part of children at the relevant age is amply demonstrated in these studies, quantitative data on overgeneration is not available. A developmental study of Na'ama, as compared to her earlier stage, is not possible, as the Na'ama corpus ends at age 2;6.4. For this reason, the conclusions reached in this section remain tentative, and must be subject to quantitative verification.

(41) a. ha-qosem *9ilem*.III 'et ha-šapan 4;5
the-magician disappeared OM the-rabbit
cf. adult *he9elim*.V

b. 9axšav 'at *masmixa*.V 'oti
now you cheer-up me
cf. adult *mesamaxat*.III

(42) a. lama ze ha-kol *nipraq*.II 3;11
why it the-all fell-apart
'Why did it all fall apart?'
cf. adult *hitpareq*.VII

b. 'ani nora *mit9aleb*.VII kše-'omrim li kaka 5;2
I very offended when-say.pl to-me that
'I become very offended when someone says that to me'
cf. adult *ne9elab*.II

How is the pattern of errors exhibited by (39)-(42) different from the pattern of neutralization errors attested in younger children? Crucially, note, in all the 'errors' made in (39)-(42), the children respect the canonical morpho-syntactic properties of the different binyanim which they are using (cf. table (14)). Recall, specifically, that binyan I does not have any canonical properties, binyanim II and VII are always intransitive, both often corresponding to inchoative and middle interpretation, and binyanim III and V are dominantly transitive, often with a causative interpretation. If we assume that at this stage, the children take the syntactic environment in which a verb form is inserted very seriously, quite possibly more seriously than adults, then the pattern of errors is readily explained. Binyan I was previously favored, being the most common morpho-phonological template in the language. But now, the children are avoiding it, precisely because it has no well-defined morpho-syntactic properties. They replace it with those binyanim which best correspond to the particular syntactic structure which they wish to express: binyanim III and V for transitive configurations, binyanim II and VII for intransitives. Of that particular stage, Berman (1982) and Berman and Sagi (1981) make the specific claim that while children often confuse binyanim III and V, on the one hand, and binyanim II and VII on the other hand, mistakes involving the replacement of binyanim III/V by binyanim II/VII never occur, resulting in the generalization in (43) (glossed forms in (43) are adult forms. Forms marked with ‡ are not attested in the sample, regardless of whether or not they are adult-correct. ✍ indicates inter-changeability. ✍ * ✍ indicates absence of interchangeability):

(43)

Root.III	✍	Root.V	✍ * ✍	Root.II	✍	Root.VII
9ilem		*he9elim*		*ne9elam‡*		*hit9alem‡*
		disappear.trans		disappear.trans		
simeax		*hismiax*		*nismax‡*		*histameax‡*
make-happy						
pereq‡		*hipriq‡*		*nipraq*		*hitpareq*
take-apart						fall-apart
9ileb‡		*he9elib‡*		*ne9elab*		*mit9aleb*
		insult		be-offended		

What can account for this particular pattern of behavior? Recall that we assumed a model of vocabulary insertion, for adults, according to which the particular selection of a vocabulary item for a particular root is dependent both on the presence vs. absence of the +OM feature, and on a list matching up the realization of the +OM feature with specific binyanim for specific roots. Such list is made available at some point by the end of the syntactic derivation, after the relevant root becomes associated with the relevant inflectional features. For the adults, both are needed: while the presence vs. absence of the +OM feature delimits the search, it does not fully predict the morpho-phonological appropriate form. It is an arbitrary fact of Hebrew vocabulary that the

relation between *burn*.trans and *burn*.intrans is expressed as *sarap*.I.trans and *nisrap*.II.intrans, the relation between *drown*.trans and *drown*.intrans is expressed as *taba9*.I.intrans and *hitbia9*.V.trans, and the relation between *grow*.trans and *grow*.intrans is expressed as *gidel*.III.trans and *gadal*.I.intrans (see table 15b). While the syntactic structure would exclude some possible morpho-phonological binyanim from consideration (i.e., binyanim II and VII, which are always intransitive, would never occur as causatives; binyan I is never the causative of binyan V, etc.), the presence or the absence of the +OM feature still leaves the final morpho-phonology rather underdetermined and subject to root-specific listed information..

But suppose our child has now moved from the earlier stage, the morpho-phonological stage, to a new stage. From the morpho-phonological stage she comes equipped with the knowledge of roots and with the knowledge of the set of morpho-phonological well-formed outputs in the language. She also appeared to be equipped with some statistical guidelines, as concerning which of these morpho-phonological outputs is more common, leading her to favor binyan I, the most common in the vocabulary of the language and in her input. What she could not do at that earlier stage were two things: she was not aware of the fact that the choice of a particular morpho-phonological form is conditioned by aspects of the syntactic event structure, and she did not know that some binyanim are absolutely excluded in some syntactic event structures. Without that knowledge, all entries related to the same root were on an equal footings, and were equally appropriate in any syntactic contexts. Further, when memory of the particular binyan associated with a particular root failed, she simply guessed, embedding that root in some possible binyan, giving rise to an existing or a non-existing form.

Suppose that now she has learned that the particular morpho-phonological form to be used **is** dependent on the syntactic event structure, and specifically, on the presence vs. absence of the +OM feature. Presumably, she will still avail herself, predominantly, of remembered tokens, now to be paired with the relevant syntactic features accumulated throughout the syntactic derivation. But as before, memory will often fails her.[27] When that happens, she again must let the grammar guide her. Previously, equipped with morpho-phonological knowledge alone, she simply chose an appropriate morpho-phonological output as based on its statistical distribution in the language. Now, equipped with morpho-syntactic knowledge as well, she lets that knowledge guide her in selecting the right forms: binyanim II and VII for intransitive structures; binyanim III and V for transitive structures. Binyan I, so statistically dominant in the language otherwise, is now a liability. Having no morpho-syntactic properties, it provides the child with no guidance whatsoever, and is hence to be avoided in all productive operations.

In short, just as in the morpho-phonological stage, in the morpho-syntactic stage the child could not possibly be projecting argument structure based on information associated with vocabulary items. In fact, she is often by-passing the vocabulary list altogether, by associating morphology directly with the syntactic projection of arguments, and doing so to a much larger degree than adults are. The result is an appearance of 'fixing' the adult 'mess', regularizing, incorrectly, the correlation between the selection of the binyan and the syntax of event structure. Within an approach to event structure such as the one outlined in this paper, it is thus plausible to assume that at this stage, the child often does not merely check the appropriateness of a particular vocabulary item against the syntactic structure, as we assumed for the adults, but rather, allows the structure to directly determine the particular form used. Specifically, I propose that at the morpho-syntactic stage, the child is projecting exactly the same structures as she did in the morpho-

[27] In the absence of information on frequency of errors, the frequency of such memory failure cannot be evaluated. Clearly, however, it occurs frequently enough to differentiate the early performance from the adult one. Assuming, without direct evidence, that the child continues to use standard vocabulary, by and large, we maintain that the primary pool for vocabulary must remain that which is available through memory, or the child would be predicted to avoid just about all binyan I forms.

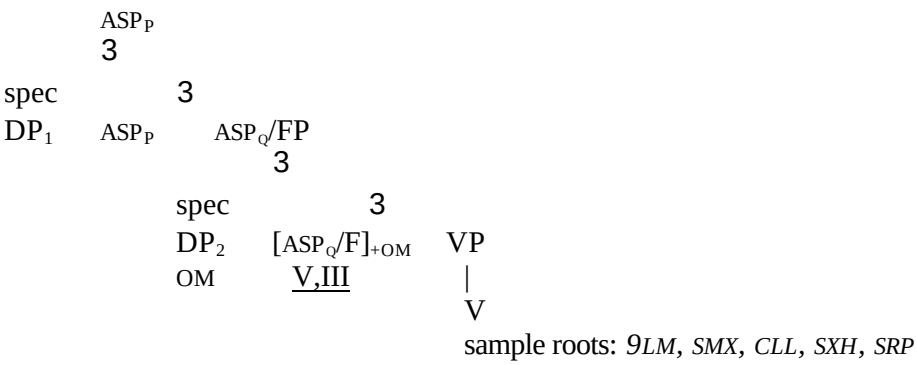
phonological stage. She continues to assume the mapping in (25), repeated here as (44), and the structures in (26). However, she now adds the morphological generalizations in (45) to guide her through productive word formation (and compare with the adult system in (18)):

(44) a. *originator* ? [Spec,ASP_P]
b. *subject-of-result* ? [Spec,ASP_Q]
c. ASP_P dominates ASP_Q

(45) a. root, +OM ? V,III
b. root, +ASP ? II, VII

The resulting trees are in (46), and the input to the morpho-phonology in (47):

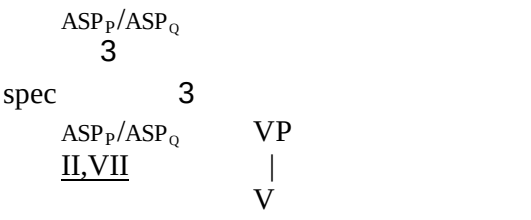
(46) a.



sample roots: *9LM, SMX, CLL, SXH, SRP*

Telic and atelic transitives, compare with (26a-b).

b.



sample roots: *PRK, 9LB*[28]

Telic and atelic intransitive, compare with (26c-d)

(47) *Mapping to phonological representation(forms in parentheses conjectured and not attested in child sample; underlined forms are correct adult forms attested in child sample):*

					Structure	*Example*
a.	*9LM*,+OM	?	III,V	*9ilem; (he9elim)*	(45a)	(40a)
	CLL,+OM	?	III,V	*(cilel); hiclil*	(45a)	(39a)
	SMX,+OM	?	III,V	*(simeax), hismiax*	(45a)	(40b)
	SXH,+OM	?	III,V	*(sixah); hisxah*	(45a)	(39b)
	SRP,+OM	?	III,V	*(sirep), hisrip*	(45a)	(38c)
b.	*PRQ*,+ asp	?	II,VII	*nipraq, hitpareq*	(45b)	(41a)
	9LB,+asp	?	II,VII	*ne9elab, hit9aleb*	(45b)	(41b)

By assumption, the child now associates directly the morpho-phonology of some binyanim with the syntactic event structure. This still leaves a certain degree of under-determination, precisely because the canonical properties of binyanim III-V, on the one hand, and binyanim II-VII, on the other hand, cannot be teased apart by using event structure criteria. Rather, both binyan III and binyan V are canonically compatible with +OM. Both binyan II and VII are incompatible with +OM. We therefore expect precisely the behavior reported in (39)-(43): a measure of

[28] Atelic intransitives are missing from the sample, a fact which we take to be accidental.

randomization when it comes to the selection between binyan II and binyan VII, or between binyan III and binyan V, but no errors across these types.

To conclude, the child has learned to focus on syntactic argument structure configurations as determining the particular selection of an appropriate morpho-phonological form. However, she clearly continues to project argument structure independently of any one particular vocabulary item. Rather, having at her disposal the syntactic structures in (26)/(46), she continues to project event structures as based exclusively on syntactic considerations, linking argumental interpretation with particular syntactic position. As before, whenever memory fails her, she will let her grammar alone select the correct morphological form of the verb for her. Unlike the previous stage, however, she now considers not only morpho-phonology, but morpho-syntax, as reflected in the particular syntactic structure associated with particular argument structure configurations.

It may be worth noting that in a sense, the morpho-syntactic stage presents even more of a problem for models which entail the projection of arguments from the information stored in lexical entries, than the morpho-phonological stage. While during the morpho-phonological stage one could at least try to make a case for a computational load, leading to randomization, such an account is patently implausible for the children at the morpho-syntactic stage. There is no confusion here, but rather, a very systematic case of overgeneralization, showing a rather sophisticated computational apparatus in place. The child who is producing *masxe* or *9ilem* is not suffering from a computational load, but rather, is matching the morphology with the syntax of the event structure in a regular way not attested in the adult grammar. If, indeed, argument structure is projected from lexical entries, what is the relevant lexical entry from which the argument structure of *masxe* or *9ilem* are projected? These forms do not exist in the adult language, and the child did not hear them or list them in any way. The child obviously knows the meaning of the root, e.g., *9LM* 'pertaining to disappearance', but equally obviously, does not have, in storage, the knowledge that there is a lexical entry *9ilem* with transitive argument structure, as she has not been exposed to this knowledge before. Nor can the child be assumed to remember that there is a transitive entry associated with this root, but fail to recall its morpho-phonology. Where that to be the case, we would not expect errors to conform to canonical argument structure possibilities in the second developmental stage, but not in the first one. Rather, the child's behavior is directly predictable, if we assume that the binyan morphology, for the child, is agreement, of sort, a reflection of syntactic structure. It is the syntax of arguments which determines the agreement, i.e., the binyan distribution, and not vice verse, and it is the assumption that agreement is 'regular' which leads to overgeneralization.

Let us finally return briefly to the English learner. Recall that to the extent that the English learner goes through a morpho-phonological stage, like the Hebrew child, such a stage is obscured by the fact that performance in the morpho-phonological stage, giving rise to words whose phonology is insensitive to syntactic information, is by and large compatible with the target language, English, where, indeed, (underived) stems rarely are phonologically marked for such information (pairs such as *eat* and *feed* being the exception rather than the rule). Suppose now that like the Hebrew learner, the English child as well proceeds to the morpho-syntactic stage, fully marking stems for their event structure environment. As it turns out, that stage is obscured as well, as English rarely marks agreement of any sort, event structure agreement being no exception here. The English speaking child will thus continue to produce forms such as those in (37)-(38) in the morpho-syntactic stage, not because she doesn't know that her stems are now marked by event structure features, but because these event structure features are phonologically unrealized in her target language. We thus conclude that the passage through these two developmental stages, in evidence in Hebrew, is obscured in English, quite simply because the phonological distinctions that make it possible to discern these two stages are never overt in English. Between ages 2;2, the onset of the morpho-phonological stage in Hebrew, and roughly 6;0, the stage at which the morpho-

syntactic stage phases out, we expect the English learner to persist with 'errors' such as those in (37)-(38), obscuring her passage through two distinct, but inert in English, developmental stages.

5. Conclusion

The main purpose of this paper was to investigate the ramifications, for acquisition, of a grammatical model in which the argument structure and event structure are not based on properties of vocabulary items, but rather, are associated with specific syntactic structures, projected independently of vocabulary. Within such an approach, vocabulary items dominated by a verb function as modifiers, rather than as determinants of event structure. Crucially, if this model is on the right track, a child acquiring language could not resort to her understanding of the meaning of a particular verb or any other information relevant to argument structure listed in individual entries to guide her into the syntactic projection of arguments. Rather, the child must be in possession of syntactic knowledge on the projection of arguments and event structure independently of her knowledge of vocabulary. In turn, such a child is expected to produce utterances in which the syntax of the event and the arguments and the actual verb embedded in it do not match. Such cases of mismatch were, indeed, found, and were shown to cluster in a way that gave evidence for the existence of two developmental stages:

A. The morpho-phonological stage, in which the child knows the syntax of events and the morpho-phonology of the binyan system, but does not show knowledge of the fact that the particular morphological form used with a particular root is not just conditioned by the morpho-phonology, but also by the syntactic event structure. At that age, errors in binyan selection tended to be random, and their statistical distribution across binyan types mirrored vocabulary distribution across binyan types in the language in general.

B. The morpho-syntactic stage, in which the child augments her knowledge of the syntax of arguments and the morpho-phonology of the binyan system with the understanding that the selection of a particular binyan is conditioned by the syntactic event structure. However, unlike adults, who use the syntax primarily to delimit the selection of the correct binyan in the context of a specific root, the child appears to consider the binyan morphology as agreement of sorts, associated directly with specific syntactic event structures. As a result, she continues to confuse binyanim which have the same event function and tends to favor, at times erroneously, binyanim with well-defined morpho-syntactic properties, over binyan I, which lacks them.

A final important question must concern the recovery from the morpho-syntactic stage leading to adult performance. At some point the Hebrew learning child as well as the English learning child does learn that the forms in (37)-(41) are not the standard adult forms, and that vocabulary insertion involves primarily a search through a finite, conventionalized, list, a search which returns unique and at times idiosyncratic items for a particular syntactic environment, and which lacks, at times idiosyncratically, possible but non-attested forms.

Viewed differently, however, the adult system and the child grammar, at the morpho-syntactic stage, are not very different. Both adult and child have a list which they match against a set of syntactic environments. The child must, in fact, be assumed to have such a system, or a phenomenal rate of errors would be expected, contrary to fact. We suggested that the child resorts to the system in (44)-(47) whenever memory fails her and she must be productive, or alternatively, whenever she has not been exposed to a specific token but has already learned the root, and must make do with a productive strategy, rather than appeal to memory. Such productive strategy avails itself of the system in (44)-(47). But adults, too, have a productive word-formation system, virtually identical in properties to that outlined in (44)-(47). Such productive word-formation knowledge, on the part of the adult, comes to the front in the adult ability to comprehend novel expressions and to produce them, in the context of innovative word formation, extremely common in current day Israeli society, in many varied social and cultural domains.

Both the child at the morpho-syntactic stage and the adult, then, have a productive word formation component. Both have a vocabulary list, from which they select items in accordance with the guidelines in (18). They differ, however, on one issue: the size and the accessibility of the vocabulary list. The adult's list is bigger, and the adult's access is easier. The child is more creative, quite simply, because she has a smaller vocabulary, and because her memory fails her more often, forcing her to resort to rule-governed behavior. Forms produced in this fashion, however, are not stored. Rather, they are produced 'on line', like syntactic structures, which are not committed to memory. When her ability to store vocabulary and to access it improves, 'improvised' forms such as those in (37)-(42), in both English and Hebrew, disappear, quite simply because they are no longer produced on line. The ability to produce them, however, stays intact, and is at the core of all future productive word formation and comprehension.

There remains an open question, concerning not just the grammar of Hebrew, but grammar in general: why are syntactic structures produced and comprehended on line, and why does syntactic knowledge **not** avail itself of a list? Put differently, why does word-formation remain a generative system which exists only at the periphery of a conventionalized vocabulary list? The answer to this general question notwithstanding, the picture of the language learner which emerges from this study, shows her to acquire the generative, computational, rule-governed aspects of linguistic knowledge independently of that conventionalized vocabulary list and well before it is fully in place. Computationally, the child is sophisticated and adult-like at a very early age. It is exactly those aspects of the linguistic behavior which are not computational in nature and which may very well interact with general cognitive development, which the child comes to acquire fully at a late stage, well past the solidification of the computational system. It is thus precisely in this respect that the child is a little automaton, computationally sound, conceptually lacking, in short, a grammar machine.

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14. *Basic Hebrew Binyanim and Their Canonical Properties:*

1. *Binyan*	*2.* *Canonical argument structure*	*3.* *Productive*	*4.* *Morpho-phonology*	*5.* *Examples*
I- *CaCaC*	None	No	Tri-consonantal roots only	šabar–'broke.trans'; napal–'fell'; caxaq--'laughed'
II- *niCCaC*	Always intransitive (-OM); a. middle; unaccusative; b. passive of binyan I	No	Tri-consonantal roots only	a. namas-melt.intrans; niptax–'open.intrans', b. nora–'shot.passive'
III- *CiC(C)eC*	Transitive	Yes	Quadro-consonantal roots possible	Pocec–'blew-up.trans'; šilem–'paid'; sereq–'combed'
IV- *CuC(C)aC*	Internal passive of binyan III (-OM)			
V- *hiCCiC*	a. transitive, causative b. intransitive, inchoative	Yes	Tri-consonantal roots only	a. hipxid–'scared'; he'edim–'redden.trans' b. hibri'–'healed.intrans'; he'edim–'redden.intrans'
VI- *huCCaC*	Internal passive of binyan V (-OM)			
VII- *hitCaC(C)eC*	Always intransitive (-OM) a. inchoative, often related to binyan III b. reflexive/reciprocal of binyan III	Yes	Quadro-consonantal roots possible	a. hitpocec–'blew-up.intrans'; hištalem-'paid off.intrans' b. histareq-'combed.reflexive'