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Light-verb Learning is Light Verb-learning*

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Abstract

This paper addresses the issue of learning verbs, in particular, learning light verbs. We develop a model for verb learning within a dynamic view on the lexicon in which verbs are characterized with their event type and their lexical-syntactic structure. We argue that light verbs (LVs) are easy to acquire, that a child learning her lexicon makes use of the dynamic properties of the lexicon, and that LVs are core verbs in learning the linking system between lexicon and syntax. These hypotheses are supported by Dutch data from four children in longitudinal studies. From early on, children produce a great variety of LV constructions, including overgeneralized ones. We conclude that verbal lexical knowledge is best represented in a dynamic lexicon and that child language data thus present another source of data for testing lexical theories.

1. Goals of this paper

A well known fact about child language, never systematically studied, is that children use light verb constructions a lot. The question of why they do so has, at least to our knowledge, never been posed. This paper addresses the issue of light verb learning and present a theory regarding why light verbs are such popular verbs for children.

Children learning the verbs of their language must learn their lexical-semantic and lexical-syntactic properties so that they can use them appropriately in sentences. One theoretical issue is: What is the exact nature and representation of the lexical-semantic and lexical-syntactic properties that verbs are listed with in the lexicon? Another issue concerns the links between lexical properties and syntactic projections. Theories on the lexicon and projection deal with these issues, mostly on the basis of adult data. Independent of these theoretical questions is the issue of acquiring the verbal lexicon. How do children come to know the lexical-semantic and lexical-syntactic properties of the new verbs they are learning? How do children

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Our ideas on light verb learning have benefited a lot from discussions with Melissa Bowerman, Joseph Emonds, Martin Everaert, Jan de Jong, Susan Powers, Henk van Riemsdijk, Tom Roeper and Jürgen Weissenborn. For their questions and comments, we thank the audiences of the Dutch-German Colloquium on Language Acquisition (University of Groningen, September 1994), the TIN dag (Utrecht University, January 1995) and the participants of the Acquisition Group Meetings at UMass. Thanks to Susan Powers and Jacqueline Vermeul for their help with the data.

come to know the projection links between the lexicon and the syntax? Integrating these theoretical and acquisition issues one can ask: Can child language data show anything about how the lexicon and projection onto syntax are organized, and if so, what?

We will take Hale & Keyser's (1992, 1993) (henceforth, H&K) theory on the lexicon and projection onto syntax as background for formulating and testing hypotheses on verb learning. First, we briefly outline the basics of their lexical framework, extending it with our proposal for the lexical representation and lexical-syntactic function of light verbs. Then we lay out our hypotheses on what is involved in acquiring verbs under an H&K view, develop a model for verb learning and formulate some predictions. A longitudinal study of light verb constructions produced by four Dutch children provide evidence for our hypotheses on development. We will conclude moreover, that child language data present another source of data for testing theories on the lexicon and projection. In particular, they seem to provide some evidence for the plausibility of a theory like H&K's.

2. Hale & Keyser's view on the lexicon and projection onto syntax

Assuming that syntax is projected from the lexicon (cf. Chomsky 1981), Hale & Keyser (1993) claim that the proper representation of lexical predicate argument structure is itself a **syntax**. As a matter of strictly lexical representation, each lexical head projects its category to a phrasal level and determines within that projection structural relations holding between the head and its arguments (its complement and its specifier, if present). H&K refer to these projections as **lexical relational structures** (LRS's).¹ LRS's are represented as conventional tree diagrams, with conventional labels for the lexical categories V, N, P and A and their phrasal projections.

H&K have been led to their syntactic view of lexical-syntactic properties through investigation of denominal verbs like *shelve* and *saddle*, and deadjectival verbs like *clear* and *flatten*. Assuming that these verbs are in fact derived from nouns and adjectives, the process involved in their derivation is most probably lexical. But, H&K assume furthermore that this process is also syntactic in nature. Their arguments for this latter, rather unconventional assumption come from the range of denominal and deadjectival verbs that actually exist in a language: not just any noun can surface as a verb, nor can just any adjective. H&K argue that established principles of syntax also function to constrain denominal and deadjectival verb derivations and thereby restrict the potential set of denominal and deadjectival verbs in any language. The syntactic principles they consider relevant to this respect are **incorporation**, the head movement variant of Move alpha, and the **ECP** in the form of the Head Movement Constraint.

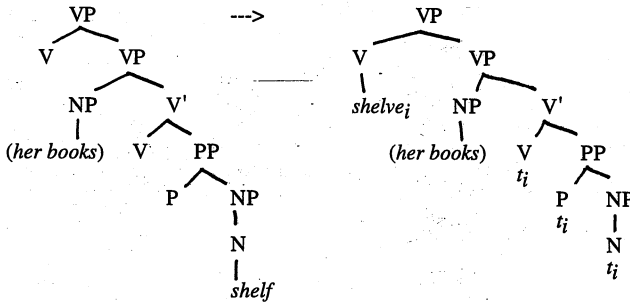
As an illustration, consider in (2) H&K's **lexical derivation** of the verb *shelve* from the noun *shelf* for a sentence like (1a), with a meaning similar to (1b).

- (1) a. She shelved her books.
b. She put her books on the shelf.

¹See Lebeaux (1988) for a similar proposal.

(2) LRS for /shelve/

lexical incorporation



The LRS for *shelve* contains two abstract V positions, a matrix V and an embedded V position. The matrix V takes a VP complement; the embedded V takes a PP complement and a specifier, i.e., the position for the direct object *her books*. H&K note that their lexical VP structure is inspired by the syntactic VP structure for verbs like *put* and ditransitives proposed by Larson (1988). After incorporation of the prepositional complement N via P and the lower V into the matrix V, *shelve* surfaces lexically as a verb. Thus, the initial LRS's of verbs like *put* and *shelve* have essentially the same relational structure; the difference is that the morphological "constant" for *put* is a verb, whereas for *shelve* it is a noun.

In H&K's view then, the notion **argument structure**, by which verbs are lexically characterized, is a **syntactic** entity, to be identified with syntactic structures projected by lexical heads. The two domains of lexicon and syntax thereby become less rigidly distinct. The projection of an LRS onto syntax involves an extension of the lexical projection of the LRS with functional categories.

H&K furthermore assume that LRS's are the lexical-syntactic correlates of **semantic** entities, to wit different **event types**. Each type of LRS is related to a different event type. Thus, a verb's lexical-semantic and lexical-syntactic representation includes its event type, and directly associated with it, an LRS. Given that there is only a limited number of event types, H&K assume there is only a limited number of LRS types. They distinguish the following four event types: Causation, Change of Location, Change of State and Creation.² These event types are associated with the following LRS's.

²The actual names for these different event types are ours. H&K talk about "notional" types for each of the syntactic categories in the complement position of an LRS: the notional type of V in (3) is "dynamic event," that of P in (4) is "interrelation," that of A in (5) is "state" and that of N in (6) is "creation" (H&K 1993:70-74).

- | | | | |
|-----|--------------------|------|--|
| (3) | Causative event | LRS: | <pre> VP / \ V VP </pre> |
| (4) | Change of Location | LRS: | <pre> VP / \ NP V' / \ V PP </pre> |
| (5) | Change of State | LRS: | <pre> VP / \ NP V' / \ V AP </pre> |
| (6) | Creation event | LRS: | <pre> VP / \ V NP </pre> |

A causative event is represented by a verb taking a VP complement which represents another, embedded event. *Shelve* in (2) represents a causative event; the embedded event of which is a change of location, which results in a final state to be identified as a predication relation between an entity and a location, i.e., the (syntactic) direct object (*the books*) is the (semantic) "subject" of a locative PP (*on the shelf*).

Lexical incorporation takes place in any of these LRS's, to derive actual verbs, each with lexical-semantic and lexical-syntactic specification, i.e., their event type and LRS with complement and specifier positions (in old terminology, with a specific subcategorization frame). In this way, all verbs of a language are lexically derived within one of the LRS-types.

One important aspect of H&K's view is that the lexicon is an "algebra:" both the lexical-semantic and the lexical-syntactic specifications in an entry are structured entities, one event type and associated LRS may be embedded in another; there is lexical derivation within one entry. In this respect, the H&K view differs from a traditional view of the lexicon which takes it as a list of entries with stative specifications. And it is much more similar to other **dynamic** views, such as Jackendoff (1990) and Grimshaw (1990).

Summarizing the H&K view of the lexicon, an individual lexical entry of a certain verbal meaning contains a certain LRS expressing the full system of lexical-syntactic relations inherent in the meaning. Phrased alternatively, all verbs are to some extent "phrasal idioms,"³ that is, syntactic structures that must be learned as the conventional "names" for various dynamic events. More empirical support put forward by H&K to support this view includes the fact that in many languages, a large set of the verbal lexical items are **overtly** phrasal. In others, the verbal lexicon contains many entries whose morphological make-up is **overtly** the result of incorporation. And, last but not least, other languages, including Dutch and

³Similar views can be found in Marantz (1995).

English, have an inventory of **light verb constructions** that represent the class of overtly phrasal lexical entries.

3. Light verbs in an H&K framework

Loosely speaking, "light" verbs are main verbs with less semantic content than "non-light" main verbs. Light verbs (henceforth LVs) have been studied in a number of languages, among which are English by Cattell (1984), Kearns (1989) and Jackendoff (1990), Japanese by Grimshaw & Mester (1988) and Dubinsky (1990) and Dutch by Hollebrandse (1993) and Everaert & Hollebrandse (in press). A typical example of an LV in Dutch and English is *geven* 'give' in *een kus geven* 'give a kiss.'

Syntactically, an LV functions in a similar way as its "heavy" counterpart does; e.g. LV *geven* 'give' takes two complements (i.e., a ditransitive subcategorization frame), just like "heavy" *geven*.⁴ Semantically though, an LV is a "bleached" variant of the "heavy" verb. The meaning of LV *geven* 'give' is only remotely related to "heavy" *geven* 'give.' The event one can refer to with *een kus geven* 'give a kiss' is not an event of giving; rather, it is a kissing event. For many (but not all) LV constructions in Dutch and English, there exists a corresponding lexical verb; e.g. the counterpart for *een kus geven* 'give a kiss' is *kussen* 'kiss.' LV constructions differ from idiomatic constructions in that their meaning is to a large extent compositional.

In an H&K framework, LVs can be analyzed in a straightforward way. With Hale (p.c.), we will assume that when no lexical incorporation takes place in an LRS, the abstract verb needs to be "spelled out;" a **light verb** functions as such a **spell-out verb**. We characterize an LV as an aspectual verb with no more lexical-semantic content than denoting a certain event type (Causation, Change of State or Location, Creation) and no more lexical-syntactic specification than a certain LRS type. In an LV construction, the abstract verb in the LRS thus surfaces lexically, as an LV, to form a complex predicate with some predicate (an NP, an AP, a PP); we will refer to such a complex predicate as a **light verb construction**.

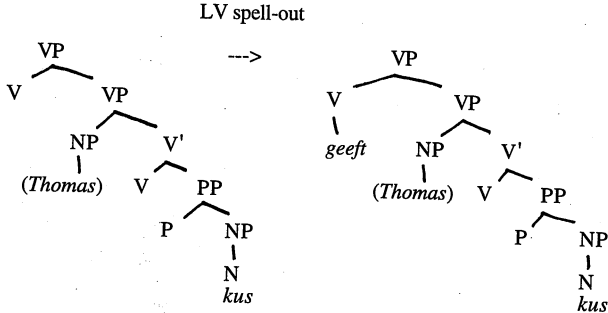
Comparing LV constructions with their variants with a lexical verb, we assume with H&K that the lexical verb has been derived through lexical incorporation. To distinguish "light" verbs that are inserted as spell-outs from verbs that originate out of lexical incorporation, we call the latter "**full**" verbs. For example, *kussen* 'kiss' is the full verb variant of LV construction *een kus geven* 'give a kiss.'

As an illustration, consider the LV construction in (7a) and its lexical derivation in (8).⁵ The lexical derivation of full verb *kussen* 'kiss' in (7b) proceeds exactly parallel to *shelve* illustrated in (2).

⁴For differences in syntactic behavior between LVs and their "full" variants in Dutch, see Hollebrandse (1993).

⁵In LRS's word order, in particular verb placement, is abstracted away from.

- (7) a. Hein geeft Thomas een kus. b. Hein kust Thomas.
 'H. gives Th. a kiss.' 'H. kisses Th.'
- (8) LRS for /kus/:



So, both the LV construction *een kus geven* 'give a kiss' and the full verb *kussen* 'kiss' are derived from one and the same lexical specification for the verbal meaning kissing, listed as a causative event with an associated LRS, (8). Viewing LV constructions and full verbs as each other's lexical variants, the tight semantic relation between the two follows automatically.

Geven 'give' in (7a) does not mean literally 'give' something to somebody. Rather, *een kus geven* 'give a kiss' is a complex predicate in which the verb only "fills up" the verb position. Still, LV *geven* 'give' refers to a causative event, the same event type that "heavy" *geven* 'give' refers to. We will assume that the only part of the lexical semantics that light and "heavy" *geven* 'give' have in common is indeed their event type and the configuration of the associated LRS (and thus, in old terms, their subcategorization frame).⁶ In their further semantic content, the two *geven*'s are not related.⁷ As for the semantics of an LV construction, the LV only determines the event type; the semantic content of the complex predicate, i.e., what kind of event it denotes, is determined by the predicate in the LV construction,

The term LV is usually reserved for LV constructions that have a somewhat idiomatic flavor. Given that idiomacy and semantic lightness are both gradual notions, which constructions can wear the name LV construction is a definitional matter rather than an empirical one. We will be using the term "light" in LV and LV construction here in a somewhat broader sense than what is "traditional" and include all non-literal uses of a "lightish" verb under the label LV. The semantics of an LV construction is compositionally constructed out of the event type of the LV plus the event denotation of the LV complement; it is not determined by the LV by itself. Thus, we call *maken* 'make' an LV both in *een opmerking maken* 'make a

⁶Hollebrandse's (1993) calls this hypothesis the Subcategorization Principle.

⁷Hollebrandse (1993) notes that the subcategorization frames of the two *geven*'s are not always the same. "Heavy" *geven* and LV *geven* in *een kus geven* 'give a kiss' are ditransitive; LV *geven* in LV constructions like *een gil geven* 'give a scream' or *een feest geven* 'give a party' is transitive. We relate the difference between ditransitive and the transitive LV *geven* to different event types: *een kus geven* is a causative event and thus associated with a "ditransitive" LRS; *een gil geven* on the other hand is a creation event and thus associated with a "transitive" LRS. See later in this section for a discussion of the issue that one particular LV may spell out several different LRS's.

remark' and *open maken* 'make open,' even though the former has a slightly more idiomatic sense than the latter. Our criterion is that both complex predicates have compositional semantics and neither refers to an event of literally making or creating something (as for example in *een stoel maken* 'make a chair').⁸

Notice that our usage of the term "light" does not just mean unspecific. The full verb *put* for example, is definitely lighter in meaning than other verbs of "putting" such as *smash, throw, slide*, etc., *put* being unspecific about the manner of "putting." Still, a putting event as in (1b) above is a literal event of putting something somewhere, here the books onto the shelf. Therefore, we will not consider *put the books on the shelf* as an LV construction. Of course, in other constructions, *put* may well be an LV, e.g. *put forward*.

Having defined what an LV is and what an LV construction in a H&K framework, consider for each of the LRS types some examples of Dutch LVs. (9). When there is one, the full verb variant of the LV construction is listed along with it.

(9) Examples of Dutch LV constructions for each type of LRS, some with their full verb counterpart:

a. Causative event, V^{VP} LRS:

<i>een kus geven</i> 'give a kiss'	<i>kussen</i> 'kiss'
<i>een zoen krijgen</i> 'get a kiss'	<i>gezoend worden</i> 'be kissed'
<i>open maken</i> 'make open'	<i>openen</i> 'open'
<i>in bad doen</i> 'give a bath'	<i>baden</i> 'bath'
<i>in arrest nemen</i> 'take in arrest'	<i>arresteren</i> 'arrest'
<i>in verleiding brengen</i> 'bring under seduction'	<i>verleiden</i> 'seduce'

b. Change of location event, V^{PP} LRS:

<i>in bad gaan</i> 'take a bath'	<i>baden</i> 'bath'
<i>op bezoek komen</i> 'come on visit'	<i>bezoeken</i> 'visit'
<i>in de ban raken</i> 'get under the spell'	—

c. Change of state event, V^{AP} LRS:

<i>open gaan</i> 'go open'	<i>(zich) openen</i> 'open'
<i>schoon worden</i> 'become clean'	—
<i>ziek raken</i> 'get ill'	—

d. Creation event, V^{NP} LRS:

<i>een plasje doen</i> 'take a pee'	<i>plassen</i> 'pee'
<i>een tekening maken</i> 'make a drawing'	<i>tekenen</i> 'draw'
<i>een douche nemen</i> 'take a shower'	<i>douchen</i> 'shower'
<i>een gil geven</i> 'give a scream'	<i>gillen</i> 'scream'
<i>een gesprek hebben</i> 'have a conversation'	<i>spreken</i> 'speak'

Even with a small set of LV constructions as the one in (9), one can already see some advantages of having a lexicon that is a lexical algebra, and moreover, of viewing LVs as aspectual verbs. Consider the fact that a certain LV complement can combine with different LVs. According to which LV is selected, different event

⁸See also Everaert (1992).

types will get expressed. For example in (9), causative *open maken* 'open make' and change of state *open gaan* 'open go'; *maken* 'make' is the spell-out for the causative event of opening; *gaan* 'go' is the spell-out for the change of state of opening. The meaning alternation, i.e., causative-inchoative, in this LV construction pair is similar to a verb like *breken* 'break' in the causative-inchoative alternation. Another example is the pair *in bad doen* (do in bath) 'give a bath' – *in bad gaan* (go in bath) 'take a bath,' which can even be extended with *in bad zitten* (sit in bath) 'have a bath.'

Pairs like this point towards the compositional and algebraic properties of LV constructions. Another hint comes from "deictic" pairs such as *op bezoek gaan* 'go on a visit' – *op bezoek komen* 'come on a visit' and *een kus geven* 'give a kiss' – *een kus krijgen* 'get a kiss,' and oppositional pairs such as *in roulatie brengen* 'bring into roulation' – *uit roulatie nemen* 'take out of roulation' and *in gebruik nemen* 'take into usage' – *uit gebruik nemen* 'take out of usage.'

There are several issues that need discussion. We will go over some of the relevant ones. First, not every LV construction can be associated with a full verb, cf. (9). For certain verbal meanings only an LV construction exists, for some both variants exist, and for others there is only a full verb variant. For example, *schoon worden* 'get clean' and *in de ban raken* 'get under the spell' in (9) express their verbal meaning only in an LV variant; most verbal meanings in (9) can be expressed in both variants. *Eten* 'eat' and *hulien* 'cry,' on the other hand, only occur as full verbs.

For those LV constructions that have a full verb counterpart, both members of the pairs in (9) more or less mean the same thing, i.e., they denote the same event. This does not hold generally for any semantically related noun-verb pair: there are also seemingly LV-full V pairs in which both variants refer to similar but not the same verbal meanings. For example, in a pair like *een feest geven* 'give a party' – *feesten* 'party,' the noun *feest* '(a) party' and the verb *feesten* '(to) party' are semantically related. Still, the two variants of this pair do not refer to the same event: one refers to an event of organizing a party, the other to an event of being at a party and having a good time. We do not consider a pair like this an LV-full V pair, derived via lexical incorporation. Rather, we want to restrict the H&K-style LV-full V pairs to those with very closely related meanings that form each other's paraphrases and refer to the same event.⁹

We think the existence of subsets such as these merely reflects the way a certain language, i.e., Dutch, happens to lexicalize a particular lexical meaning. H&K's theory of the lexicon does not make any claims about actual lexical derivations. So, this kind of variation is possible and therefore expected to occur. There is no deep reason behind these lexical gaps and accidents in Dutch. Moreover, this potential variation is a source for cross-linguistic variation. Remember at this point that there are languages whose verbal lexical items are always overtly phrasal, i.e., which do not have full verbs at all. H&K assume that lexical incorporation happens not to apply in these languages; the abstract LRS verbs always need a spell-out form.

⁹Assuming with H&K that all full verbs must be related to one of the LRS's, full verb *feesten* 'party' would be derived from a creation type LRS which "means" something like *een feest hebben* 'have a party' or *een feest maken* 'make a party'

A second issue that needs discussion is the fact that each type of event type / LRS is not instantiated by just one spell-out verb in Dutch, but rather by a small set of LVs. By illustrating different event types with the LV constructions in (9), we have aimed at listing for each type an exhaustive set of different LVs. A causative event can go with *geven* 'give,' *krijgen* 'get,' *maken* 'make,' *doen* 'do,' *nemen* 'take' and *brengen* 'bring'; a change of location with *gaan* 'go,' *komen* 'come' and *raken* 'get'; a change of state with *gaan* 'go,' *worden* 'become' and *raken* 'get'; a creation with *doen* 'do,' *maken* 'make,' *nemen* 'take,' *geven* 'give,' *krijgen* 'get' and *hebben* 'have.'

Moreover, note the fact that a particular LV can spell out more than one event type. *Geven* 'give,' *maken* 'make' and *nemen* 'take' sometimes spell out a causative event and at other times a creation event. *Doen* 'do' can spell out a causative and a creation event; *gaan* 'go' and *raken* 'get' a change of location and change of state. *Krijgen* 'get' spells out only causative events; *worden* 'become' only changes of state.

Observing that on the one hand the relation between event type and LV is not one-to-one, but rather, one-to-a-few in Dutch, and on the other hand the relation between LV and event type is not one-to-one, but for most LVs, one-to-two, we must conclude that it is not predictable which spell-out verb must be selected for the LV variant of a certain verbal meaning on the basis of its event type only. The predictive "power" of event type properties for the selection of a certain LV is limited. Alongside with event type, other factors play a role in the selection of the spell-out verb.

One factor is the subcategorization frame of LVs which is, by hypothesis, a direct reflection of their LRS and event type. Assuming that LVs and their "heavy" variants share their subcategorization frame (as we did above), an LV having a certain subcategorization frame can only spell out the LRS that represents such a frame. The relation between a certain LV and a certain LRS and associated event type is thus a reflex of the LRS and event type the verbs refers to in its "heavy" meaning. For example, "heavy" *gaan* 'go' and *komen* 'come' take a PP complement, and cannot not take an NP complement; thus, light *gaan* 'go' and *komen* 'come' spell out a change of location event because that is the type associated with an LRS with a PP complement. *Maken* 'make' and *hebben* 'have' take an NP complement, and cannot take a PP complement; thus, light *maken* 'make' and *hebben* 'have' can spell out a creation event type because it is associated with an LRS with an NP complement.

The subcategorization properties of heavy verbs do not completely carry over to light ones, though. For some verbs, the heavy variant can occur in more frames than the light one. For example, heavy *geven* can occur either in a prepositional dative construction, $_NP$ PP, or in a double object construction, $_NP$ NP; light *geven* strongly prefers the double object construction, or takes a single NP complement (*een gil geven*) with no "dative" argument at all (**iemand een gil geven*). This latter example also shows that for some verbs, the light variant can occur in more frames than the heavy variant. For example, light *gaan* can also occur in an $_AP$ frame and spell out a change of state. Light *maken* can also occur in an $_NP$ AP frame and spell out a causative event. Such "extra" frames show that the subcategorization properties of LVs are only to a certain extent derivative of those of their heavy counterparts. The "extra" frames and associated event types suggest that these verbs are just aspectual spell-out verbs, i.e., fill-in's for abstract V positions in an LRS.

Still, apparently, there are some left-overs: to a certain extent selection of an LV seems to be an arbitrary choice. Consider the following three examples of creation events with a V^{NP} LRS (i.e., an _{NP} frame). Each verbal meaning selects one specific LV and cannot combine with another one: *een gil geven* / **maken* / **doen* 'give / *make / *do a scream'; *een beweging maken* / **doen* / **geven* 'a movement make / *do / *give'; *een plasje doen* / **maken* / **geven* 'do / *make / *give a pee.' Since we do not see any event type or subcategorization differences, nor any other semantic differences between the three verbal meanings that could account for the different choices of LVs, we take examples like these to reflect idiosyncratic selection of LV. To a certain extent then, it must simply be learned which particular LV must be selected for a certain verbal meaning (i.e., for a certain LV complement), even though the choice can be reduced to a small set.

The Dutch lexicon would have looked neatly organized, especially to a verb-learning child, if the mapping between LV spell-out on the one hand and event type and LRS on the other was a bi-directional relation: every LV associated with just one event type and LRS; every event type and LRS associated with just one LV. The Dutch facts are different: an LV is associated with one or two event types; a certain event type can spelled out by a small set of different LVs. Although, the Dutch picture is not quite as clean as a one-to-one bi-directional relation, we think that the choices for which LV spells out a certain verbal meaning are drastically reduced having a lexical theory based on event types and an analysis of LVs as basically denoting an event type and LRS which is similar to the event types and LRS's (i.e., subcategorization frame properties) as their heavy variants denote. Stretching the predictive power of lexical theory to a maximal extent as to which LV must be selected as spell-out verb, the task of learning the LV constructions of one's lexicon is brought down to a minimal amount of learning.

A final issue concerns cross-linguistic variation. Languages vary with respect to how many and which LVs instantiate a particular event type and with respect to the selection of a particular LV with a certain LV complement.¹⁰ Even in closely related languages, such as Dutch, German and English, there is unpredictable variation in LV selection for certain verbal meanings. For example, each of these three languages has an LV variant for 'pee,' but the selection of the spell-out LV is a different one in each: Dutch *plasje doen* 'do a pee,' German *pipi machen* 'make a pee' and English *take a pee*. Comparison of large sets of lexical facts suggests that the set of LVs spelling out a particular event type is language specific, and moreover, that the selection of an LV for a certain verbal meaning is item specific. H&K's theory of the lexicon is a universal theory about the predictable part of the lexicon. Given that their theory is not a theory of lexicalization, the kind of variation across and within languages as discussed above is actually expected in their view.

To conclude our discussion of Dutch-LV constructions, having done the Dutch exercises on the relation between LV and event type (listing particular LRS's along with LVs, particular LV's along with LRS's and LV constructions along with their full verb counterparts), we have in fact discussed the borders of (un)predictability of a H&K-style lexicon. We have thus pulled apart what is in the lexical algebra and what is not, what part of lexical information is systematic and

¹⁰Henk van Riemsdijk (p.c.) has pointed this and accompanying examples out to us, presenting them as a potential counterargument for an H&K-style analysis of LVs.

what is arbitrary, what part of lexical knowledge comes from the general organization of lexicon and projection and what must be listed. We can now ask how do lexical entries look? How do particular verbs differ in their lexical specifications? What needs to be listed and, crucially, learned for each verbal meaning?

Assuming that all verbs are phrasal at a lexical level, what needs to be lexically specified for each verbal entry is its event type and LRS.¹¹ For LVs this suffices: LVs being semantically light and functioning as spell-out verbs, are simply listed with their LRS or set of LRS's. For other verbal entries on the other hand, those that are "nominal" or "adjectival" in nature, more information needs to be listed. Thus, for each verbal meaning, alongside with event type and LRS, it must be listed whether this meaning can be expressed as a full verb, i.e., whether lexical incorporation applies, as a LV construction, or as both. So, a lexical entry must specify what is the full V, if there is one, and which verb is the LV spell-out, if there is an LV construction variant.

Summarizing so far, any lexical algebra can, of course, only deal with the systematic parts and regularities in a lexicon; that is its function being a theory of the lexicon. Taking a H&K view on the lexicon and in particular on LVs, we can pull apart the compositionality of LV constructions on the one hand and their idiomacy on the other and draw the division of labor to its extremes. The LRS algebra assumes a biggest task as possible, in predicting which kinds of full verbs can exist and that LV constructions may exist (in which an abstract LRS verb is spelled out by an LV) and explaining the systematic relations between LVs and full verbs.

What is left, is unsystematic and unpredictable. Whether a certain verbal meaning is realized as a full verb, as an LV construction or as both is a language-particular and moreover item-particular matter. It simply reflects how Dutch, for example, happens to lexicalize certain meanings. Moreover, it must be seen as a lexical peculiarity of Dutch that each LRS is associated with a small set of LVs. Finally, the actual selection of an LV for a certain verbal meaning out of this small set is to some extent an idiosyncratic matter. All these issues then must be subsumed under the general arbitrariness of the lexicon, the lexicon after all being a storage place for irregularities and idiosyncracies.

Before we develop our proposal for the acquisition of light verbs in the next section, we need to point out that our analysis for LVs, proposed within a lexical program that links lexical-semantic, i.e., event type, and lexical-syntactic specification, i.e., LRS, as developed in H&K (1993), represents a first step towards a theory that needs to be more fully developed in the future. We want to hint at some of the issues.

In H&K's proposal, not all possible event types are represented: atelic processes and states are lacking. LV constructions (with full verb counterparts) representing these kind of events exist as well, e.g. *in bad zitten* 'sit in bath' (*baden* 'bath'); *onder de douche staan* 'stand under the shower' (*douchen* 'shower'); *in bezit hebben* 'have in possession' (*bezitten* 'possess'). Such facts suggest that the picture with relations between event type and LRS must be further developed.

¹¹Given that LRS's correspond to different event types, it may be sufficient to list the event type; a lexical redundancy rule could automatically give the corresponding LRS. See below, however, for some critical notes about these correspondences.

As to our analysis of LV constructions presented above, our criterion for LV-full V association based on "closely related semantics" is not water-tight, given slight meaning differences between LV construction and full V, even across the variants of some of the pairs in (9). For most pairs, each variant focuses on a different part of the event; in particular, in many cases there is a telic-atelic distinction between the LV construction and associated full verb. For example, *een kus geven* 'give a kiss' is necessarily a telic event, whereas *kussen* 'kiss' may be an atelic event (cf. Hollebrandse 1993). In general, although LV construction and full verb refer to the same event, comparing the two variants of a verbal meaning across many pairs, they do not refer to the same event type. This suggests that lexical incorporation actually affects the meaning, more specifically, that it triggers event type shifting (cf. van Hout 1996, in press). Such meaning differences have not been incorporated in our analysis of LV constructions and related full verbs so far.

In this paper, we will not develop any further the H&K system of linking, nor our analysis of LVs. Having suggested what our line of thinking is in these matters, we leave it for future work.

4. Light-verb learning is light verb-learning

What kind of information do children need to learn for each verb when they are learning their verbal lexicon?

Assuming that an H&K-type lexicon and projection system is part of universal grammar, the child comes equipped with knowledge of the correspondences between the small set of different event types and the equally small set of different LRS's (for a similar assumption, see van Hout, Randall & Weissenborn 1993; Randall, van Hout, Weissenborn & Baayen 1994). Further, she will know which lexical incorporations are proper movements and thus potential full verbs. What needs to be learned then are the specific lexical-semantic (i.e., event type) and lexical-syntactic (i.e., LRS type) properties for each verbal meaning. Lexical theory restricts the set of possible full verbs; the child needs positive evidence, i.e., hearing a full verb variant for every single verbal meaning that actually has one, in order to acquire the correct set of full verbs. Other irregularities and idiosyncracies of the kind discussed in the previous section need to be stored as well. Our assumptions on verb learning in an H&K framework are formulated in (10).

- (10) Children learning the verbs of their language need to learn:
- a. for each verbal meaning, its event type and LRS, whether there exists a full verb for it or not, and whether there exists an LV construction for it or not, and if so, with which particular LV.
 - b. for each of the LRS's, which LV is or which LVs are its spell-out forms (or, alternatively, for each LV, its event type and LRS).

What are the hypotheses and associated predictions for verb learning? Our first hypothesis is that LVs are "easier" than full verbs, therefore "easier" to acquire and therefore popular verbs for children.

(11) Basic Hypothesis:

LVs are easy to acquire.

The following arguments support this hypothesis. First, LVs are easy verbs because they have very light, unspecific meanings, i.e., they require very little lexical specification and impose few selectional restrictions. It is relatively easy to determine which event type a certain LV instantiates; it is precisely the event type that can be extracted as the constant factor across the set of different LV constructions a particular LV occurs in.¹² As for full verbs on the other hand, their basic event type is much harder to determine, since full verbs undergo event type shifting. Moreover, LVs occur in just one or two syntactic frames overall, whereas most full verbs can occur in a whole range of frames. Determining exactly what is the complete set of syntactic frames for every full verb is a rather complex task.¹³

The fact that LVs as well do not occur in just one syntactic frame is not a challenge to this argument, since each syntactic frame points straightforwardly to a different LRS and thus to a different event type from which it can simply be concluded that a certain LV is a spell-out verb for two different LRS types. The mapping relation between LV construction via LRS to event type is direct and uncomplicated for each pair of syntactic frame-event type.

The underlying reason why LVs are easy to learn is because they link straightforwardly to syntax. The LRS of an LV maps directly onto D-structure. The lexical representations of LVs do not include abstract Vs, nor do they involve lexical incorporation; rather, LV constructions directly spell out their lexical-syntactic relations. The projection links between the lexicon and syntax are visible and transparent, lexical and syntactic structure being isomorphic. In other words, the event type/LRS of an LV can be read off immediately from the syntactic frame it appears in. The mapping between event type/LRS of a full verb and its syntactic frame(s) gives a more distorted, and therefore more complex relation. Hence, learning the LRS of an LV is easier than learning the one of a full verb. Taking a perspective from the other side and assuming that isomorphic links from lexical to syntactic structures are easier than non-isomorphic links, LVs are easier to project than full verbs.

Next, there may be an economy argument: If no movement (or fewer movement steps) is more economical, LV constructions, involving no head movement, are more economical than full verbs, that do involve head movement. Of course, this argument is only valid on a process interpretation of the notion of economy and moreover, only if economy principles hold in the lexical domain as well. One may doubt this, however, given that full verbs exist alongside with LV constructions. If LV constructions are possible lexical-syntactic constructions, why would there exist any full verbs at all? Even worse, it would pose a severe learnability problem: Once a child has learned an LV construction for a certain meaning which satisfies all lexical-syntactic requirements, why would she

¹²Martin Everaert (p.c.) puts forward that precisely this would make LVs hard to learn, because the child has to abstract away over all kinds of semantic details and compare them in a lot of different situations. We think however, that we do not need to doubt the child's capacities for doing abstractions and comparisons of this kind. Moreover, if our bootstrapping hypothesis, to be discussed below, holds any water, the child is actually on the look out for such "abstract" and multi-functional verbs.

¹³Especially so since event type-shifting and frame alternations are intricately related in so-called argument alternations (cf. van Hout in press, in prep.)

subsequently unlearn it and/or start using a full verb variant alongside? Interpreted in this form, economy principles cannot apply to the lexicon, the lexicon by its very nature being an uneconomic storage place. There is much more to say about this issue. However we will leave it at this for the time being.

The learnability problem could be solved since, although both an LV construction and a full verb refer to the same verbal meaning, they differ slightly in meaning focus, thus making some economic sense of the lexicon again. The child, who hears both variants in her input and who assumedly follows some general principle of Contrast (cf. Clark 1987), will conclude that there must be some difference between the two.

By itself the hypothesis that LVs are easy to acquire does not make any predictions about the temporal course of verb learning. Combining it with other, independent acquisition hypotheses, we can derive such predictions. Consider the line of reasoning taken by Weissenborn (1994), formulated as the Syntactic Precedence Principle: The child prefers to satisfy licensing conditions at a syntactic level, rather than at LF (see also Penner & Weissenborn 1994). Alternatively, in a similar spirit but different implementation, consider a concept of economy proposed by Van Kampen & Evers (1994) and Van Kampen and Evers (1995): Spelling out traces lexically is less costly; not spelling them out requires more LF processing. Assuming one of these views, we would predict that the child prefers an LV construction above a full verb and, even stronger, produces an LV variant earlier than its full variant.

Having presented our arguments for the hypothesis that LVs are easy to acquire, (11), let us now formulate some predictions that follow from it, (12):

(12) Predictions following from the basic hypothesis:

1. LVs are early and popular verbs.
2. No frame errors occur with LVs.
Frame errors occur with full verbs only.
3. LV constructions are preferred above their full verb counterparts.

Focusing on other properties of LV constructions, one could argue against our basic hypothesis, claiming that LVs are actually "difficult" verbs. A devil's advocate¹⁴ could stress the idiomatic character of LV constructions rather than their compositional nature. He could stress meaning differences between LV constructions and full verb counterparts, suggesting that the link between the two is not as tight as we propose. He could focus on the fact that the proper LV in a certain LV construction needs to be chosen idiosyncratically. He could highlight lexical "accidents." Such an alternative view on LVs would create a paradox. Note that under this alternative view, predictions 1 and 3 in (12) would be reversed. In this way then, the acquisition of LV constructions presents a research domain in which child language data may resolve the paradox.

What does the child's lexicon look like? Under a Continuity Hypothesis (cf. Pinker 1984; Whitman, Lee & Lust 1990; Weissenborn 1993), the child's lexicon is a lexical algebra, just like the adult's. If so, the child can make use of its dynamic and algebraic properties, (13).

¹⁴Martin Everaert played the devil's advocate in this part.

(13) Continuity Hypothesis:

From the start, a child learning her lexicon makes use of its dynamic and algebraic properties.

What are the child's learning strategies under the Continuity Hypothesis? Learning the verbs of a lexicon is a continuous process of learning more and more items of the set of verbal meanings listed in the adult lexicon. In an algebraically and dynamically organized lexicon, there are in principle two sources for growth of the lexicon. One is **conservative** learning through induction over the actual input, generalizing over both a new verb's syntax (the frame(s) it occurs in) and its semantics (the kind of event it denotes, the different event types it can refer to, the kinds of arguments it takes). Besides this, for learning the unpredictable and arbitrary parts of the lexicon, a certain amount of item-by-item learning is independently needed.

The other source for growth is **creative** learning through abduction, either by combining LVs with new predicates and predicates with new LVs or by lexically incorporating nouns or adjectives in basic LRS's. The latter way of learning new verbs is a potential source for **overgeneralizations** (cf. Bowerman 1974; Pinker 1989). Given the tension between the regularity and predictability of the lexicon being a lexical algebra on the one hand and its arbitrariness and unpredictability on the other, overgeneralizations are expected as long as all arbitrary and unpredictable details have not yet been learned. If the child is indeed equipped with a lexical algebra from the start, she (just like adults, for that matter) is bound to make overgeneralizations with LV constructions in the course of learning her lexicon.

Overgeneralizations with LVs can be divided into two kinds: Those that arise from partial learning and those that are completely creative. Two possible types of the former are the following: Suppose a child has started to learn a certain verbal meaning, knows its event type and LRS, but not yet the idiosyncratic selection of its LV. She may produce an LV construction with a "wrong" spell-out verb. She will not choose just any spell-out verb, but one that she may already have associated with that particular event type. Alternatively, a child having started to learn a certain verbal meaning and knowing its event type and LRS, may not yet know the corresponding full verb variant or that this particular meaning does not "exist" as an LV construction variant. This child will use this particular verbal meaning in an LV construction, creatively using the LV spell-out mechanism as a means to get by.

Creative overgeneralizations include the following. The child may combine a PP, AP or NP with already learned LVs. Suppose she applies her complex predicate formation algebra to construct completely new verbal meanings or to select a new event type for a verbal meaning she already knows. New, non-existing (but interpretable) LV constructions will arise. For another creative type, suppose the child knows the LRS of a certain verbal meaning. She may creatively apply lexical incorporation, within the limits of restrictions on head movement, of course, and thus create a new full verb, i.e., a potential, yet non-existing a verb whose absence in the adult lexicon is a lexical "accident."

Having discussed the consequences of the Continuity Hypothesis that states that children make use of the dynamic and algebraic properties of the lexicon from the start, (13), we summarize by formulating some predictions in (14).

(14) Predictions following from the Continuity Hypothesis:

1. LV constructions with a "wrong" LV occur, due to the idiosyncrasy of the "correct" spell-out verb.
2. New LV constructions occur, due to a delay in learning the full verb or due to creatively forming new verbal meanings.
3. New full verbs occur, due to creative application of lexical incorporation.

Crucially, the predictions listed in (14) can only be made in views of the lexicon in which event type is part of lexical specification and in which LV constructions can be analyzed as compositional predicates. In other words, if the adult lexicon is not a lexical algebra, or if LVs are not compositional predicates, overgeneralizations of this type are not expected. Child language data may thus clarify this issue.

A theory that predicts overgeneralizations must be extended with a theory on retreat (cf. Bowerman 1988; Pinker 1989; Randall 1992 on retreat from overgeneralizations in the domain of argument structure). The difficulties posed by learning a (partly) arbitrary lexicon as well as the need to retreat from overgeneralizations require yet another learning strategy, alongside with inductive and abductive learning, so that the child can finally reach a stage in which her lexicon represents the adult one. She must thereto apply some kind of evaluation measure to LV constructions and full verbs of her own creation.¹⁵

Finally, we present our hypothesis on bootstrapping: We think LVs are core verbs for learning the linking system between lexicon and syntax.

(15) Bootstrapping Hypothesis:

LVs are core verbs in learning the linking system between the lexicon and the syntax.

We assume that the small set of possible event types is given by a "conceptual-semantic UG" (cf. van Hout, Randall & Weissenborn 1993; Randall, van Hout, Weissenborn & Baayen 1994).¹⁶ Given that LVs lack semantic content and analyzing them basically as aspectual verbs, LVs merely spell out an event type. Assuming moreover with H&K that event types are tightly associated with lexical-syntactic structures and syntactic structures, LV constructions show transparent links between lexical-semantic and lexical-syntactic specification on the one hand and syntactic projections on the other; the underlying LRS can be directly read off of their syntactic frame. Focusing then on the isomorphism between lexical specification and syntactic projection, LV constructions function as the "bootstraps"

¹⁵ Assuming that the child pays attention to the input, she can simply evaluate her "own," abductively learned words against those she conservatively learns from the input. After continuous evaluation over a period of time, the verb lexicon will end up as a stable model in which the adult LV constructions and full verbs have acquired enough "credit" to survive and the overgeneralized forms having too little "credit" have become non-existing. In this way, the kinds of overgeneralizations discussed before can and will disappear.

¹⁶ We introduce the notion "conceptual-semantic UG" as an intuitive concept here; in essence, it is similar to Jackendoff's concept of Conceptual Semantics (1990).

into the linking system between syntax and semantics (cf. Pinker 1989, 1994 and others; Gleitman 1990 and others).

The syntax of different LV constructions provides a set of frame schemata. Their semantics basically constitutes a set of event types. Using the transparent syntax and semantics of LV constructions, the child can approach the bootstrapping problem from both sides, integrating syntactic and semantic bootstrapping and learning how the universal projection links between event type and syntactic frame work out in her language. Being equipped with an H&K type lexicon, the child "knows" that there may exist LV constructions in her language that form the "gateways" to projection rules. So, probably, the child is even "on the look-out" for LV constructions. Employing LV constructions for learning the linking and projection rules between lexicon and syntax, she can apply them subsequently for learning full verbs.¹⁷

As far as we can see, our light-verb-learning view on bootstrapping does not lead to any obvious predictions that can be tested in longitudinal data. Probably, it can be tested in experimental designs. We will leave this for further research.

To summarize this section, we have discussed what needs to be learned for every item of the verbal lexicon in an H&K lexical theory. Furthermore, we have presented three hypotheses and accompanying predictions on LV learning and verb learning in general. We tested some of these predictions for Dutch; the results are presented in the next section.

5. LV Findings in Dutch

The data are taken from four Dutch children, available on Childes (MacWhinney & Snow 1990); (16) lists the corpus, age range and MLU for each of the children.

(16) Longitudinal data from four Dutch children:

NAME	CORPUS	AGE RANGE	MLU
Niek	Wijnen	2;7.0 to 3;10.17	2.28 ¹⁸
Hein	Utrecht	2;4.11 to 3;1.24	2.31 ¹⁹
Thomas	Utrecht	2;3.22 to 2;11.22	2.33
Laura	van Kampen	1;9.18 to 2;2.18	1.42

Our methodology was the following. In order to find all LV occurrences for each child, we searched with lists of all (inflected) forms of typical Dutch LVs, including: *geven* 'give,' *krijgen* 'get,' *brengen* 'bring,' *zetten* 'put,' *nemen* 'take,' *komen* 'come,' *gaan* 'go,' *worden* 'become,' *raken* 'get,' *doen* 'do' and *maken* 'make.' We marked the LV constructions in these search results, defining an LV as a verb in some non-literal use and part of a compositionally formed complex predicate. For each child, we listed the types and tokens of LV constructions. To

¹⁷If our bootstrapping hypothesis is correct, i.e. if the child "needs" LV constructions (or, alternatively, verbs with a transparent morphological make-up) to be able to bootstrap into the linking system, we predict that there cannot exist languages without LVs (or, alternatively, without transparent verbal morphology). Such languages would be unlearnable.

¹⁸Niek is a "slow starter" in language; he has an MLU of 1.72 at the age of 2.7, cf. Wijnen (1988).

¹⁹Hein and Thomas are both disfluent children, cf. Elbers & Wijnen (1990).

these lists, if possible, the adult full verbs were added, thereby creating for each child a set of potential full verbs. These potential full verb lists were then used as search lists in order to investigate each child's usage of associated full verbs. Notice that Laura's data are different from the other three children, being very early data from the relatively few files available; they contain only few (types of) LV constructions.

Children use LV constructions from early on, (17).²⁰

(17) First LV constructions:

a. Niek	foto maakt .	2;8.00
b. Hein	gaan die bad . photo made	2;4.16 ²¹
c. Thomas	Thomas #poepje doen . go that bath	2;3.22
d. Laura	ik ga onder douche . Th. poop-DIM do I go under shower	1;11.21

Early occurrence suggests that LVs and LV constructions are easy to learn. If children cannot learn idiomatic meanings until a very late age, (i.e., after 4;5, as claimed by Penner & Roeper 1994; see also Roeper in press), these data suggest that LV constructions are not represented in the lexicon as big idioms chunks. Early LV constructions thereby confirm a compositional analysis of LVs, rather than an idiomatic analysis.

Each child uses several different LVs; their LVs form a subset of the adult set of LVs that was searched for. Many different types of LV constructions are produced, for some even many tokens. This suggests that LVs are common verbs for the child. Each child produces a great variety of LV constructions. Constructions with the LVs *gaan* 'go,' *doen* 'do' and *maken* 'make' are especially popular; these verbs are combined with several different LV complements. The examples in (18) illustrate (part of) this variety; these sets of LV constructions are not exhaustive. Notice that the examples in (18) present types of LV constructions, not actual tokens.

(18) Certain LVs occur with different LV complements:

a. Niek

foto / wakker / kapot / tekening / open / grapjes **maken**
make photo / awake / broken / drawing / open / jokes
overleg / boodschappen / plasje / in bad / pijn / poepie **doen**
do consult / shoppings / pee / in bath / pain / poop
kapot / mis / open / los / dicht / aan **gaan**
go broken / wrong / open / loose / closed / on
antwoord / hand **geven**
give answer / hand

²⁰Henk van Riemsdijk (p.c.) points out that *gaan* 'go' in (18b) and (18d) is an aspectual auxiliary, rather than an LV. Although *gaan* 'go' is a borderline LV case, we consider these expressions as LV constructions because they are paraphrases of full verb variants, *gaan baden* 'go bath' and *gaan douchen* 'go shower.'

²¹Notice the preposition *in* 'in' is lacking in Hein's first token of *in bad gaan* 'go in bath.'

b. Hein

stuk / puzzel / lawaai / vol / troep / ruzie / muziek maken
 make broken / puzzle / noise / full / mess / row / music
pijn / open / plasje / poep / in de was / gek / spelletje doen
 do pain / open / pee / poop / in the laundry / crazy / game
in bad / kapot / open gaan
 go in bath / broken / open
kusje / flesje geven
 give kiss / bottle

c. Thomas

poepje / open / au / boodschappen / plasje / dicht / eng doen
 do poop / open / ay / shoppings / pee / closed / scary
open / muziek / dicht / kapot / los / vast maken
 make open / music / closed / broken / loose / fixed
kusje / hand / tik / hapje / water geven
 give kiss / hand / flick / bite / water

d. Laura

bad / douche gaan
 go bath / shower
slaapies / plasje doen
 do sleep / pee

These examples not only show the variety in the children's production of LV constructions, but suggest also that children know the mechanisms of their lexical algebra combining a certain LV with more than one complement, thereby forming complex predicates.

This conclusion is also reached on the basis of the next set of data. Children vary the choice of an LV with a certain LV complement, (19). The sets of different LVs combined with each LV complement show not only that children know how to use their lexical algebra, but also how to form complex predicates with similar meanings but referring to different event types. This implies that they know that different LVs are spell-outs of different event types, and moreover, that they know which particular LV spells out which event type in an almost adult-like way. The asterisk * in front of certain LVs in (19) indicates a "creative" LV spell-out which will be discussed just below.²²

(19) Specific LV complements occur with different LVs:

a. Niek

in bad doen / zitten 'do / sit in bath'
open maken / gaan / doen 'make / go / do open'
botsing ?? 'make crash' / **een botsing *krijgen** 'get a crash'

²²"Creativity" judgements depend very much on idiosyncratic and dialectal variation. Since there is no reliable way to find out the idiolect or dialect for each LV construction type in a child's input, we give our own judgements in (19)-(22).

b. Hein

puzzel maken 'make puzzle' / **een puzzel** *doen 'do a puzzle'
spelletje doen 'do game' / **een spelletje** *maken 'make a game'
poep doen / *hebben 'do / have poop'
kusje geven 'give kiss' / **een kusje** *hebben 'have a kiss'
au doen / hebben 'do / have ay'²³

c. Thomas

in bad gaan / zitten 'go / sit in bath'
open maken / doen 'make / do open'
hapje geven 'give bite' / **een hapje** nemen 'take a bite'

d. Laura

in bad doen / gaan / zitten 'do / go / sit in bath'

The next set of data concern overgeneralizations. Children indeed overgeneralize LV constructions; they do so in two different ways. First, children are "creative" in their selection of the spell-out verb; they use another LV than the default, adult one, cf. prediction 1 in (14). (20) gives a complete list of this type of overgeneralizations (including the ones from (19)).

- (20) Overgeneralizations: LV constructions with a "creative" LV spell-out (plus a default, adult spell-out in parentheses):

a. Niek

een botsing *krijgen 'get a crash' (??maken 'make,' ??hebben 'have')
verbouwing *doen 'do rebuilding' (??hebben 'have')
dicht *brengen 'bring closed' (maken 'make,' doen 'do')

b. Hein

een spelletje *maken 'make a game' (doen 'do')
een puzzel ??doen 'do a puzzle' (maken 'make')
lawaaï *doen 'do noise' (maken 'make')
een kusje *hebben 'have a kiss' (krijgen 'get,' geven 'give')
poep *hebben 'have poop' (doen 'have')
aai *doen 'pet do' (geven 'give')

c. Thomas

dankjewel *doen 'do thank you' (zeggen 'say')
een veeg *doen 'do a wipe' (geven 'give')²⁴

These creative complex LV predicates also suggest that children learn their verbal lexicon knowing the complex predicate algebra. Their creativity in selecting an LV shows that they actually exhaust its possibilities. Notice that Dutch adults have no problem interpreting the creative LVs; they are not really errors. The LV selected by the child seems to be a "possible" LV and is therefore interpretable; it just is not the default one.

²³These expressions are typical child's talk; adult Dutch uses *pijn* 'pain' here.

²⁴The LV construction *een veeg geven* 'give a wipe,' in its compositional meaning, is very uncommon; the most natural way to express this meaning in Dutch is with a full verb, *vegen* 'wipe.'

Interpreting this in light of our analysis of LVs, this type of overgeneralizations suggests that LVs are actually spell-out verbs for particular event types.²⁵ The child does not select just any LV as the (creative) spell-out, but one that fits the event type the verbal meaning expresses. Furthermore, these errors suggest that LV selection is indeed to some extent an idiosyncratic choice and needs to be learned item-by-item. We point out that for each creative LV in (20), the same child has also used that particular LV construction with its proper LV. Given that these are the only "mistakes" we found across all of their LV constructions, we conclude that, overall, children know and select the right verb.

The second kind of overgeneralizations are creations of completely new LV constructions; i.e., combinations of an LV with a complement that do not exist in the adult lexicon, cf. prediction 2 in (14). Their verbal meanings exist, but the adult Dutch lexicon employs full verbs. (21) lists all examples of this kind (plus the corresponding adult full verb). Some of the forms in (21) are marginally found in Dutch and considered marked (see also footnote 21).

- (21) Overgeneralizations: "new" LV constructions (plus the adult full verb counterpart):

a. Thomas

dweiltje doen 'do mob' (dweilen 'mob')
naar slaap gaan 'to sleep go' ((gaan) slapen 'go) sleep')

b. Laura

sape(n) doen 'do sleep' (slapen 'sleep')

Notice that some overgeneralizations are listed both in (20) and (21). They are included in (21) because they seem to be instances of LV constructions for which Dutch does in fact have an LV construction, only with a different LV. However, for the meaning the child seems to be expressing with his particular LV choice, Dutch does not have an LV construction variant. Therefore, they are also included in (21).²⁶

What can be concluded from this second set of overgeneralizations? Adult Dutch speakers do not have any problem interpreting these LV constructions, which is not surprising if the lexicon is a lexical algebra. Furthermore, an example like Niek's **een botsing krijgen* 'get a crash' points out a lexical gap; Dutch does not have a predicate that expresses that one 'got crashed into.' This suggests that children can create new LV constructions to express different meaning aspects (i.e., different event types) of verbal meanings they already know. These overgeneralizations thus provide some proof for the "arbitrary" character of the lexicon (which was discussed in section 3).

Another conclusion is that these overgeneralizations, like the ones in (20), suggest that LV constructions must be analyzed as a composition of LV and

²⁵Given the context in which Niek's LV construction *dicht brengen* 'bring closed' occurs (the father is closing Niek's pants), it probably has to be interpreted as a causative event (cf. *dicht maken*, *doen* 'closed make, do'). Although *brengen* 'bring' is a spell-out for causative events, its choice here is actually ungrammatical since *brengen* 'bring' selects a PP complement (and *dicht* 'closed' is an AP). This is the only error of this type we found.

²⁶**Een poep hebben* 'have a poop' does not mean *poepen* 'poop'; rather, it expresses that the urge to poop, i.e. *moeten poepen* 'have to poop.'

complement. More importantly, some seem to provide evidence for a view of verbal meanings in which a full V is lexically represented in a decomposed way, possibly as an LRS. Consider, in particular, *dweiltje doen* 'do mop.' This LV construction does not exist in the child's input; it is not part of the adult lexicon, i.e., adult Dutch uses a full verb, *dweilen* 'mop.' This creation seems to reflect in a straightforward way the underlying LRS for the full verb.

Finally, we present some results obtained from comparing children's LV constructions with their full verb counterparts. Searching for full verb counterparts for each child individually, we found that only some were actually produced. That is, the LV constructions for which a full verb was actually produced form a small subset of the set of LV constructions that potentially have a full verb variant. From this, we conclude very globally that children prefer LV constructions above full verbs.

For those verbal meanings for which pairs of LV construction-full verb were actually produced, we compared the usages of the two variants and looked specifically which one was the earliest of the two. In (22) pairs are listed; an LV after a pair indicates that the LV construction variant was the first one produced; an FV indicates that the full verb variant was the first; with \pm both variants are produced in the same file. These data show that when a child produces a full verb variant at all, she/he produces the LV construction earlier than the full V counterpart for more or less half of her/his pairs; in the other half, the full verb is earlier.

- (22) Pairs of LV construction - full verb variants, with an indication which one was the earliest:
- a. Niek

een tekening maken 'make a drawing' - tekenen 'draw'	FV
botsing ??maken 'make crash' - botsen 'crash'	FV
een hapje nemen 'take a bite' - happen 'bite'	FV
plasje doen 'do pee' - plassen 'pee'	LV
grote poepie doen 'do big poop' - poepen 'poop'	\pm
verbouwing *doen 'do rebuilding' - bouwen 'build'	LV
 - b. Hein

(die) puzzel maken 'make (that) puzzle' - puzzelen 'puzzle'	LV
vol maken 'make full' - vullen 'fill'	LV
hapje nemen 'take bite' - happen 'bite'	LV
(een) plas(je) doen 'do (a) pee' - plassen 'pee'	FV
poep doen 'do poop' - poepen 'poop'	FV
spelletje doen 'do game' - spelen 'play'	FV
 - c. Thomas

een hapje nemen 'take a bite' - happen 'bite'	LV
tik geven 'give flick' - tikken 'flick'	FV
(een) plasje doen 'do (a) pee' - plassen 'pee'	LV
poepje doen 'do poop' - poepen 'poop'	LV
naar slaap gaan 'to sleep go' ((gaan) slapen '(go) sleep')	FV
 - d. Laura

onder douche gaan 'under shower go' - douchen 'shower'	\pm
saape doen 'sleep do' - sapen 'sleep'	FV

Given that the list of LV-full verb pairs is so small, we cannot draw any conclusions from this comparison. Further research on full verb usage in general is needed, i.e., on the production of verbal meanings that do not have an LV counterpart at all or that are not produced as LV variant in the children's data.

This concludes our presentation of the Dutch LV findings. In the next section, we will summarize these findings in light of our hypotheses on LV learning.

6. Discussion and conclusions

As a starting point, we took Hale & Keyser's (1993) theory of the lexicon and projection onto the syntax. H&K claim that verbs are characterized with a lexical-semantic specification of their event type and a lexical-syntactic specification of their projection frame, the LRS, represented as a lexical-syntactic tree. In their view, lexical verbs are derived from lexical incorporation of nouns or adjectives. We extended their theory with a proposal for the lexical representation and lexical-syntactic function of light verbs, claiming that a lexical theory that represents the lexicon in a dynamic way and verbal meanings as characterized by their event types is crucial for an analysis of LVs as complex predicates. We proposed that LVs are aspectual verbs that spell out the abstract verb position in an LRS.

The three acquisition questions we posed were the following: Why are light verbs such popular verbs for children? What does verb learning involve, i.e., how can the child find out about the lexical-semantic and lexical-syntactic properties of verbs? Can child language data show anything about how the lexicon and projection onto syntax are organized?

We discussed what children learning the verbs of their language need to learn under an H&K view of the lexicon and formulated three hypotheses with associated sets of predictions. (i) **Basic Hypothesis:** LVs are easy to acquire (which leads to the prediction that they are such popular verbs for children). (ii) **Continuity Hypothesis:** From the start, a child learning her lexicon makes use of its dynamic and algebraic properties. (iii) **Bootstrapping Hypothesis:** LVs are core verbs in learning the linking system between the lexicon and the syntax. The results from four Dutch children show that they use LV constructions from early on producing several different light verbs. Each child produces a great variety of LV constructions, varying on the one hand the LV complements to a certain LV and on the other hand, the LVs spelling out a certain verbal meaning. Children also overgeneralize LV constructions, constructing LV constructions choosing a "new" LV and creating "new" LV constructions. Finally, comparing potential versus actual full verb counterparts to the LV constructions produced by the children, they use only few of these full verbs (which, of course, does not say anything about their full verbs in general).

From these results we can draw some conclusions with respect to the acquisition of light verbs. Children know the mechanisms of their lexical algebra and apply it to form complex predicates, combining specific LVs with specific complements. They know that LVs function as spell-outs of different event types. Moreover, they have already learned to a certain extent which particular LV spells out which event type.

What theoretical conclusions can be drawn from these acquisition data? For one thing, children's early and productive usage of LV constructions, including overgeneralizations, suggests that the lexicon is an algebra, that it is dynamic and that LV constructions compositionally form complex predicates. From their errors in selecting the "proper" LV we conclude that LVs are event type spell-outs and that LV selection is to some extent idiosyncratic, the latter conclusion confirming the conclusion drawn on the basis of cross-linguistic comparison of LV constructions. Their creative kind of overgeneralizations seems to suggest some evidence for lexical representation of verbal meanings in the syntactic way as proposed by H&K. Finally, these child data touch upon the borders of the predictable (i.e., composition of LV constructions) and arbitrary (i.e., LV selection, existence of an LV variant for a certain meaning) part of the lexicon. Their creativity suggests how to draw the two apart.

We would like to discuss what these theoretical conclusions suggest about the nature of the lexicon. More specifically, do the results exclusively point towards H&K's theory on the lexicon as the only possible theory? Or, alternatively, if we embedded our proposals on LVs and their acquisition in other kinds of lexical theories, can the same results be made to follow as well?

Defining LVs as having no more semantics than denoting a certain event type, any lexical theory that includes some basic assumption of event type specification can be assumed. In a lexical framework with lexical conceptual structures (lcs's) as basic meaning representations (Jackendoff 1983, 1990), one can strip an lcs of all of its details, the bare lcs basically representing a certain event type (causative, inchoative, process, state, etc.). An LV can be represented as a bare lcs.²⁷ Furthermore, in such a lexical theory, complex predicates can be formed compositionally and the lexicon is dynamic in the sense that a certain lcs can be embedded in another one. Alternatively, within a lexical theory like Grimshaw's (1990) who lists verbs with an argument and an event structure, LVs can also be defined as spelling out event structure types.

Although, the crucial ingredients of LVs can be framed in other lexical theories as well, we see the following advantages for an H&K framework. As for the theoretical part, the tight relation between LV constructions and related full verb variants does not need to be made explicit or worked out, since they reflect two variants of the same verbal meaning. In a representation of verbal meanings such as lcs's, in which syntactic complements are represented lexical-semantically as arguments of a functor, it is not clear how the semantic content of an argument (e.g. the noun in an LV construction with an NP complement) could ever co-determine the content of the functor (i.e., complex LV predicate), which is, however, a crucial property of LV constructions. Alternatively, in lexical theories that frame verbal meanings in argument structures with thematic roles, some special device needs to be called upon (such as thematic transfer from NP complement to LV, cf. Grimshaw & Mester 1988).

As for the acquisitional part, in both an lcs-style and argument structure lexical theory, LV constructions need to be treated in a kind of idiomatic way. If children do not know about idioms until fairly late (cf. Roeper in press, Penner & Roeper 1994), LV constructions are not expected to be early, nor wide-spread. The

²⁷Without any further analysis, Pinker (1989), working with this type of lexical frames, actually characterizes LVs as verbs defined by simple semantic structures, unadorned with idiosyncratic information.

data show, however, that they are. Second, other lexical theories could also predict overgeneralizations of the type creative LV (and, like us, resort to idiosyncratic learning). However, they would not predict overgeneralizations of the really creative and completely new type, i.e., LV constructions for which Dutch only has a full verb variant. If verbal meanings are represented in an LRS-style way, these are expected, since they point to nominal and adjectival representations for verbal meanings. This latter type of overgeneralizations also appear in the data, thereby favoring the H&K-style lexicon above the other two.

This brief discussion of how LVs could be analyzed and how their acquisition could be predicted in other lexical frameworks shows that to some extent the analysis and predictions can indeed be formulated there as well. However, given the three advantages of an H&K-style view of the lexicon, both theoretical and acquisitional, we believe that so far the H&K-style lexicon does slightly better. Of course, further research is needed in order to test our hypotheses about LV learning. Cross-linguistic research will be especially crucial. More developmental theory is needed to formulate hypotheses about the development of the verbal lexicon in general. Which verb meanings are acquired early, which later, and how does their usage develop? In other words, what does a child's profile of verbs look like and what does verbs' usage look like? So far, our theory does not address these issues.

A last (but not least) conclusion, child language data presented in this paper provide another source of data for testing theories on the lexicon and projection. In particular, lexical theories advocating an algebraic lexicon based on event types seem to be on the right track.

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