A CROSS-LINGUISTIC PERSPECTIVE ON THE ACQUISITION OF LOCATIVE VERBS

by

Meesook Kim

A dissertation submitted to the Faculty of the University of Delaware in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Linguistics

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ABSTRACT

The main goal of this thesis is to determine what kind of learning mechanism allows children to reach adult-like knowledge of their native language, focusing specifically on a cross-linguistic comparison of the syntax and semantics of locative verbs. As a possible learning mechanism, innate and universal "linking rules" have been suggested to solve the learnability problem of how children can learn which verbs allow syntactic alternation and which verbs do not. If consistent mappings between syntax and semantics are universal, and if children can take advantage of them, then learning the meanings of verbs and their syntactic possibilities could be made easier. However, the existence of cross-linguistic variation in syntax-semantics mappings may pose a challenge for learning theories based on universal mappings.

In Chapters 2 and 3, I characterize to what extent there are universal syntax-semantics correspondences, and to what there are language-specific syntax-semantics correspondences across languages, in terms of the syntax of locative verbs. A cross-linguistic survey of locative verb syntax in 13 languages shows that across languages, some syntax-semantics correspondences appear to be universal, some correspondences appear to apply only within one of two broad language groups, and some correspondences appear to involve idiosyncratic language-by-language variation. More specifically, I show that cross-linguistic variation in the syntax of locative verbs is quite restricted, dividing languages into two basic classes. Korean-type languages have a very simple pattern for locative verbs. *All* locative verbs allow Figure frames and there are no Non-alternating Ground verbs in these languages. In English-type languages, basic change-of-state verbs always allow Ground frames. Furthermore, I show that certain

aspects of locative verb syntax correlate with an independent morphological property, namely the availability of V-V Compounding or verb serialization. This simple morphological cue may help children to figure out the properties of locative verbs in their target language.

In Chapter 4, I show how much children have learned about the syntax of locative verbs by age 3-4, and how consistent syntax-semantics correspondences can assist children learn the syntax of locative verbs, given potential problems raised by cross-linguistic variation. This is shown through an elicited production task with child and adult speakers of both English and Korean. In addition to learning mechanisms based on linking rules, I examine another potential learning mechanism based on distributional properties of the input, in order to find out what information is available in the input to learners. Finally, I show to what extent learning strategies based on universal mappings can and cannot help children to succeed in learning the syntax of locative verbs, and to what extent learning strategies based on the use of distributional properties of the input can assist children to reach adult-like knowledge of their target language.

Chapter 1

LEARNABILITY AND SYNTAX-SEMANTICS CORRESPONDENCES

1.1 Learnability Issues in Learning the Syntax and Semantics of Verbs

This study is about how a child learns a verb's meaning and its associated syntactic structures. It has been widely observed that learning the syntax and semantics of verbs has properties that make it difficult for the child (Baker 1979; Pinker 1984, 1989). In learning a verb's meaning, the child needs to identify what events in the world the verb refers to. In learning a verb's syntactic possibilities, the child needs to reach a level where she can generalize beyond the verb-structure pairings in the input, but without *over*generalizing. Furthermore, if individual verbs can appear in multiple syntactic structures, then learning the syntax and semantics of these verbs would be made much harder for the child, because she has to figure out which verbs can occur with which of the syntactic frames, and what the relationship is between the set of syntactic frames and a verb's meaning, again without overgeneralizing.

In this study I primarily focus on locative verbs, which have provided an example of this kind of learnability problem, and I bring a cross-linguistic perspective to bear on this problem. Locative verbs all encode the relationship between a moving object which I will refer to as the "Figure", and a location, which I will refer to as the "Ground". Although locative verbs all show this basic semantic similarity, they fall into at least three different subclasses in English based on their syntactic possibilities, as in (1-3).

(1) a. John poured water into the glass. Figure-frame
Alice spilled soup onto the table.
Tim dripped water onto the floor.

	b.	*John poured the glass with water. *Alice spilled the table with soup. *Tim dripped the floor with water.	*Ground-frame
(2)	a.	*John filled water into the glass. *Alice covered the blanket over the baby. *Tim decorated lights on the Christmas tree.	*Figure-frame
	b.	John filled the glass with water. Alice covered the baby with blanket. Tim decorated the Christmas tree with lights.	Ground-frame
(3)	a.	John sprayed water onto the wall. Alice loaded apples onto the truck. Tim stuffed feathers into the pillow.	Figure-frame
	b.	John sprayed the wall with water. Alice loaded the truck with apples. Tim stuffed the pillow with feathers.	Ground-frame

In English the verbs in (1) only allow the Figure frame, in which the Figure object is encoded as the direct object and the Ground object is encoded as an indirect object PP. In contrast, the verbs in (2) only allow the Ground frame, in which the Ground object is encoded as the direct object and the Figure object is encoded as PP. The verbs in (3) allow both Figure and the Ground frames. The problem is how a child figures out which verbs allow which syntactic structures. For instance, how does the child know that *John poured water into the glass* and *John filled the glass with water* are grammatical, but without being explicitly told that *John poured the glass with water* and *John filled water into the glass* are ungrammatical? Furthermore, how does the child know that some verbs like *spray* or *stuff* in (3) alternate in their syntactic structures, whereas other verbs like *spill* or *fill* do not? How does the child figure out that the two verbs *spray* and *spill* which have similar meanings, occur in different syntactic structures? How could the child avoid overgeneralization without being corrected for her ungrammatical utterances?

1.2 Possible Solutions to The Learnability Problem

Children obviously need some kind of linguistic input in order to acquire a language since they learn whichever language they are exposed to. Parents' speech to children is grammatically near-perfect (Newport et al. 1977), providing children with a reliable source of positive evidence, which refers to the information about which strings of words are grammatical sentences in the target language. If language acquisition is driven only by positive evidence, then children would not make syntactic errors. However, the literature has reported that children do produce ungrammatical sentences which have not occurred in the input (Bowerman 1982; Pinker 1984, 1989). Therefore, the important questions are what could be a useful information for children to solve the problem of learning the syntax and semantics of verbs, and how children can recover from their errors.

1.2.1 Negative Evidence

One possible solution to this learnability problem is to suppose that children might take advantage of negative evidence - information that tells the children that sentences are ungrammatical in parental speech. Parents might react to children's ungrammatical sentences in some consistent way, by making overt corrections or showing disapproval. If there are strong correlations between the ungrammaticality of children's utterances and parental corrections, and if children are sensitive to these correlations, then negative evidence might play some role in learning the syntax and semantics of verbs. In particular, if children take advantage of negative evidence, then this could be very useful with respect to how they recover from their errors.

However, the absence of reliable negative evidence was first reported by Brown and Hanlon (1970) and McNeil (1966), who found no correlation between children's

ungrammatical utterances and parental feedback, such as corrections or disapproval. There is a well-known anecdotal example reported by McNeil (1966), illustrating that parental feedback, even in the form of informative overt corrections, may not be useful in changing the grammar of the child.

(4) Child: Nobody don't like me.
Mother: No, say "Nobody likes me."
Child: Nobody don't like me.
[dialogue repeated eight times]
Mother: Now listen carefully, say "NOBODY LIKES ME."
Child: Oh! Nobody don't likeS me.

Many previous studies report no significant relationship between children's grammatical errors and parental corrections, suggesting that parental feedback does not determine which syntactic frames the child will continue to use and which ones she will eventually give up (Braine 1971; Maratsos 1986 and many others).

Several studies, on the other hand, have suggested that since parents provide children with more subtle and implicit forms of negative evidence, children do receive some kind of implicit feedback from their parents (Hirsh-Pasek et al. 1984; Demetras et al. 1986; Bohannon & Stanowicz 1988). For example, parents might indicate by their requests for clarification, corrective repetitions, or failures to continue the conversation that a child's utterance is ungrammatical.

Hirsh-Pasek and colleagues (1984) report that parents repeat children's ungrammatical utterances more than grammatical ones. Bohannon and Stanowicz (1988) report that parents repeat verbatim children's grammatical utterances more than their ungrammatical ones. Demetras and colleagues (1986) looked at how frequently the replies of four children's parents continued the conversation, or moved it on, and found that "move-ons" were more frequent to grammatical utterances than to ungrammatical

ones. Parents are also more likely to expand in some way on the ungrammatical utterance than on the grammatical utterance.

The Hirsh-Pasek et al. study shows that children in the youngest age-group (2-year-olds) receive parental feedback to some extent in the form of more frequent repetitions of ungrammatical utterances, suggesting that children seem to receive some type of implicit negative evidence.

However, Marcus (1993) claims that implicit negative evidence is not consistent enough for children to determine whether the generalizations they have made are correct. Implicit feedback is not consistent because different parents react in different ways to their children's ungrammatical utterances, and parents also do not react to many forms of ungrammatical sentences at all. Even when parents do react differentially, their reaction may not be enough for children to think that their utterances are ungrammatical, because parents' reactions to their children's ungrammatical utterances are also given nearly as often to grammatical utterances. Furthermore, knowledge that children's utterances are ungrammatical does not provide them with the reason why their utterances are ungrammatical.

These results show that children do not receive sufficient overt negative evidence to determine which verbs allow which syntactic structures, or to help them recover from errors. If so, how could children avoid overgeneralizing or undergeneralizing without the help of negative evidence? In the absence of negative evidence, how can children come to a grammar which does not allow the ungrammatical sentences? The most common response to this would be to assume that children achieve this by means of a conservative strategy, whereby they register and produce verb-frame pairings that they have observed in the input. Several solutions to the No Negative Evidence Problem have been suggested

(Baker 1979; Pinker 1984, 1989; Randall 1987, 1992). Some of these approaches will be presented in the following sections.

1.2.2 Strict Conservative Learning Approach

The second possible solution to this learnability problem is to suppose that children must be conservative, and use a verb only in a syntactic structure that they have heard in parental speech (Baker 1979). Baker (1979) was the first to point out that the acquisition of syntactic structure alternations for verbs poses a learnability problem[1]. Baker's proposed solution to the No Negative Evidence problem is that children simply memorize the syntactic frames they have actually heard verbs appear in, as shown in (5):

(5) spray: (__NP into/onto NP), (__NP with NP)
pour: (__NP into NP)

That is, children learn the possible syntactic information in which a verb may appear only if they have actually observed the verb with that structure in the input. Accordingly, this strict conservatism predicts that children should not use a verb in a syntactic structure if they have never heard it in that frame. If children simply do this, then they will never make errors in learning the syntactic structure of verbs, based on the assumption that they never hear ungrammatical sentences in parental speech.

Nevertheless, there is evidence that children are liberal, not conservative, in producing verbs in syntactic structures. Children have been found to produce ungrammatical sentences like "I filled water into the glass" in both spontaneous speech

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1 Gold (1967) discussed more general learnability problem posed by language acquisition.

and in elicited production tasks (Bowerman 1982; Gropen et al. 1991a,b; see also Chapter 4).

One piece of evidence for children's productivity comes from a study of spontaneous speech by Bowerman (1982). She gives examples of locative verbs produced by her daughters that are ungrammatical for adults:

(6) *Examples of overgeneralization (Bowerman 1982)*
E(4;1): I didn't **fill** water up to drink it; I **filled** it up for the flowers to drink it.
E (4;5): I'm going to **cover** a screen over me.
E(5;0): Can I **fill** some salt into the bear? [= a bear-shaped salt shaker]

Bowerman claims that just as with past-tense morphology, children appear to overgeneralize the Figure frame to the Ground verb *fill*, as in "*Can I fill some salt into the bear?".

Another source of evidence for children's productivity comes from experimental studies (Gropen et al. 1991a,b). In an elicited production study, when taught novel verbs, children productively used them in different syntactic contexts (see Gropen et al. 1991b). For example, the novel verb *keat*, which was introduced to children in a syntactically neutral form (e.g., *This is to keat*), was presented as either a manner verb that named an action in which the object (e.g., sponge) was moved over the surface (e.g., cloth) in a zigzagging manner, or an end-state verb that named an action in which a surface changed color. For some children the motion had a particular zigzag manner, but the cloth didn't change color at all. For others the motion did not have a distinctive manner, but the cloth changed color when the sponge ended up on it. Although none of children heard the verb in a sentence, when asked to describe the event, the first group said that the experimenter was *keating the sponge* (Figure-frame), whereas the second group said that he was

keating the cloth (Ground-frame). More specifically, the older group of children (mean age 5;1) and the adults used the end-state verb exclusively in the Ground-frame, and the youngest children (mean age 3;11) also used the Ground-frame more often than the Figure-frame with the end-state verb, although the manner verb was mainly used with the Figure-frame by all subjects. Therefore, the finding that children productively used novel verbs with the Ground-frame provides evidence that they are not just depending on the specific syntactic structures they had heard verbs used in, and also shows that semantics affects structural choices.

In sum, spontaneous speech and experimental studies provide evidence that children are productive learners for learning syntactic frames of verbs, showing that, contrary to Baker's claim, they do not just produce the syntactic structures given in the input.

Given that children do not seem to take advantage of learning strategies like negative evidence and strict lexical conservatism, which could be useful for learning verbs' syntactic frames, one option is left to us: Children may use either syntactic or semantic criteria to distinguish the Alternators from the Non-alternators. Many linguists have noted that syntactic alternations are not arbitrary, but are constrained by semantic criteria or syntactic criteria (e.g., Mazurkewich and White 1984; Pinker 1984, 1989; Randall 1987, 1992). If children could learn the criteria that describe the Alternating and Non-alternating classes of verbs, they could productively generalize an alternation to verbs that comply with the criteria without overgeneralizing it to those that do not. In the following subsection, I will examine Randall's (1987, 1992) proposal that children may use syntactic representations as a criteria to determine the syntactic frames of verbs. In

the next chapter, I will examine Pinker's (1989) proposal that constraints on lexical rules that provide criteria for choosing verbs can solve the learnability problem in detail.

1.2.3 Syntactic Criteria Approach

Randall (1987, 1992) has proposed a syntactic account to solve the learnability problem of how children figure out which verbs allow the alternation and which verbs do not, and how children retreat from their overgeneralization errors. Randall suggests that the main property distinguishing Alternating from Non-alternating verbs involves the verb's basic argument structure: Alternating verbs take two *obligatory* postverbal (or internal) arguments, whereas Non-alternating verbs take only one. She formulates this generalization as follows:

(7) The Order Principle
If an argument is optional, then it may not intervene between a head and an obligatory argument.

Randall argues that the Order Principle given in (7) governs the order of obligatory and optional arguments with respect to a phrasal head, and it is needed as a characterization of the adult grammar of dative constructions, as illustrated by the following examples:

(8) a. Juliet invited [Doris] [to the art opening].
b. Juliet invited Doris.
c. *Juliet invited to the art opening.
d. *Juliet invited to the art opening Doris.

(9) a. John brought [a candy bar] [to Bill].
b. John brought a candy bar.
c. *John brought to Bill.
d. *John brought to Bill a candy bar.

According to this principle, since verbs like *bring* and *invite* allow optional PP arguments, they do not allow optional arguments in a position between the verb and the

obligatory argument, as shown in (8d) and (9d). Thus, Randall uses the order principle (7) to define a condition that a verb must meet in order to allow the dative and the locative alternations: To allow the syntactic alternation, the verb must take two internal obligatory arguments.

However, Randall's syntactic account based on the order principle does not provide an adequate description for the data of locative verbs, and so it will not be able to support learning of these verbs. Before pointing out the problems with the order principle, let me briefly summarize how Randall attempts to solve the learnability problem.

Locative verbs like *spill* and *fill* allow omission of a PP argument, and they do not allow alternation, as shown in (10):

(10) a. Mary spilled the milk on her sweater./*Mary spilled her sweater with the milk.
Mary spilled the milk.
b. John filled the glass with juice./*John filled the juice into the glass.
John filled the glass.

On the other hand, locative verbs like *stuff* and *stack* do not allow omission of a PP argument, and they allow the alternation, as shown in (11):

(11) a. John stuffed his clothes into the bag./John stuffed the bag with his clothes.
*John stuffed his clothes.
*John stuffed into the bag.
b. John stacked the books on the shelf./John stacked the shelf with books.
*John stacked the shelf.
*John stacked on the shelf.

When the child hears the sentence like "Mary spilled the milk", she would know that the goal argument of *spill* is optional, hence that *spill* cannot have a goal argument

between itself and its obligatory theme argument, hence that *spill* cannot be an Alternator. Positive evidence would be sufficient to avoid or unlearn alternation with *spill*. Randall's account is therefore based on the assumption that children have innate knowledge of the Order Principle, provided by UG. This knowledge enables them to predict the syntactic pattern of a verb. If children know that a verb takes only one obligatory internal argument, they may think that it does not alternate.

Why do children make overgeneralization errors? Randall (1992) assumes that children have the same syntactic representation of Non-alternating verbs like *fill* and *spill* as that of Alternating verbs like *spray* in their lexicon. In other words, according to Randall, children may have incorrectly classified optional arguments as obligatory arguments, so they might assume that the verb alternates. After all, children think that both of the verb's arguments are obligatory, so it satisfies the necessary condition for alternating. Children can move from an incorrect grammar, in which a verb is assumed to allow two syntactic possibilities when it allows only one, to a correct grammar, in which one of the two syntactic possibilities is dropped. Positive evidence tells the child that certain arguments in her lexical representation are optional, and the Order Principle, as part of her innate knowledge, applies on a verb-by-verb basis, in order for the child to distinguish between obligatory and optional arguments.

Nevertheless, Randall's syntactic criteria approach poses serious learnability problems. First, as Pinker (1989: 37-39) points out, Randall's syntactic account based on obligatory vs. optional arguments does not provide an adequate description for the data of locative verbs. For example, some locative verbs do not allow an alternation even though they take two obligatory arguments, as in (12). In contrast, some locative verbs allow an alternation even though they take two optional arguments, as in (13).

Non-alternating verbs: both arguments are obligatory

(12) a. John slopped water onto the floor./*John slopped the floor with water.
*John slopped water.

b. John encrusted the cake with walnuts./*John encrusted walnuts onto the cake.
*John encrusted the cake.

Alternating verbs: both arguments are optional

(13) a. John packed books into the box./John packed the box with books.
John packed the books.
John packed the box.

b. John loaded apples onto the truck./John loaded the truck with apples.
John loaded the apples.
John loaded the truck.

The existence of exceptions indicates that the Order Principle is not sufficient for children to predict which verbs allow an alternation and which verbs do not. Even if it did work, it would not make predictions for novel verbs.

Second, Randall's syntactic account, based on obligatory vs. optional arguments, does not work across languages. For example, since Korean is a discourse-licensed pro-drop language, like Chinese and Japanese, argument-drop is optional in Korean, regardless of whether locative verbs are Alternating verbs or Non-alternating verbs, as in (14) and (15):

Non-alternating Figure verbs in Korean

(14) a. Yumi-ka kuk-ul os-ey ssot-ass-ta.
Nom soup-Acc cloth-Loc spill-past-Decl
'Yumi spilled the soup on her cloth.'

b. Yumi-ka kuk-ul ssot-ess-ta.
Nom soup-Acc spill-past-Decl
'Yumi spilled the soup.'

Alternating verbs in Korean

(15) a. Yumi-ka peint-lul pyek-ey chilha-ess-ta.
Nom paint-Acc wall-Loc paint-past-Decl
'Yumi painted paint on the wall.'

b. Yumi-ka peint-lul chilha-ess-ta.
Nom paint-Acc paint-past-Decl

'Yumi painted paint.'

Given that the argument of both Non-alternating verbs and Alternating verbs is always optional in Korean, we may raise the question of how Korean-speaking children know which verbs allow alternations, and which verbs do not? Positive evidence does not tell the children that an argument is optional vs. obligatory. In the absence of reliable positive evidence, how could the children use syntactic information to distinguish Non-alternating verbs from Alternating verbs?

Therefore, Randall's solution runs into the same problems as any other solutions based on positive evidence. Syntactic criteria, which at least rely heavily on optionality or the obligatory presence of a PP argument, do not seem to solve the learnability problem.

1.2.4 Universal Mappings Between Syntax and Semantics

It has been widely assumed that the problem of learning the syntax and semantics of verbs might be made easier for a child if she can take advantage of consistent syntax-semantics correspondences (Grimshaw 1981; Pinker 1984, 1989; Landau and Gleitman 1985; Gleitman 1990; Gropen et al. 1991a,b). To take a simple example, verbs which take a sentential complement are typically mental verbs in English, as shown in (16):

(16) a. I think [that Mary is smart].
b. I believe [that Mary is smart].
c. I wonder [whether Mary is smart].

(17) *Syntax-Semantics Linking Rule*
Mental verb meaning → $[_{VP}$ V CP]

Many other mental verbs in English also take sentential complements, and the same is true of mental verbs in just about any other language we know of. Thus, if this linking rule in (17) is universal, and if children know this, then it could be a useful clue to the children that the verb has a mental meaning. More specifically, if children already know

that a verb is a mental verb, then they can infer that it allows a sentential complement (Pinker 1989). If children hear a unfamiliar verb that takes a sentential complement, then this could be used as a clue that the verb might be a mental verb (Landau and Gleitman 1985; Gleitman 1990; Fisher et al. 1991).

It has been suggested that locative verbs provide another case of reliable syntax-semantics correspondences (Pinker 1984, 1989; Rappaport and Levin 1985, 1988; Gropen et al. 1991a,b, etc.).

"Pour"-class: Non-alternating Figure verbs in English

(18) a. John poured water$_{\text{Figure}}$ into the glass$_{\text{Ground}}$. Figure-frame
b. *John poured the glass$_{\text{Ground}}$ with water$_{\text{Figure}}$. *Ground-frame

"Fill"-class: Non-alternating Ground verbs in English

(19) a. *John filled water$_{\text{Figure}}$ into the glass$_{\text{Ground}}$. *Figure-frame
b. John filled the glass$_{\text{Ground}}$ with water$_{\text{Figure}}$. Ground-frame

"Pile"-class: Figure-Alternating verbs in English

(20) a. John piled books (into the shelves$_{\text{Ground}}$). Figure-frame
b. John piled the shelves *(with books$_{\text{Figure}}$). Ground-frame

"Stuff"-class: Ground-Alternating verbs in English

(21) a. John stuffed feathers *(into the pillow$_{\text{Ground}}$). Figure-frame
b. John stuffed the pillow (with feathers$_{\text{Figure}}$). Ground-frame

The verb *pour* only allows the Figure-frame, in which the Figure object is encoded as the direct object and the Ground is encoded as a PP, as shown in (18). Other locative verbs with similar syntax to *pour* have semantic features in common with *pour*. What verbs like *dribble*, *spill*, and *ladle* all have in common is that they semantically describe a manner-of-motion and they are syntactically Non-alternating Figure verbs.

Second, the verb *fill* only allows the Ground-frame, where the Ground object is the direct object and the Figure is encoded as a PP, as shown in (19). What other locative verbs with similar syntax to *fill*, such as *cover*, *decorate*, *bandage*, and *soak*, all have in

common, is that they semantically describe a change-of-state and they are syntactically Non-alternating Ground verbs.

In addition to Figure and Ground *Non*-alternating classes, Alternating verbs can be divided into two subclasses, the Figure-Alternating verbs in (20) and the Ground-Alternating verbs in (21), based on which of the two arguments is obligatory in both syntactic frames (Rappaport and Levin 1988; Pinker 1989). Figure-Alternating verbs like *pile* or *spray* denote a manner of motion as their basic meaning component, whereas Ground-Alternating verbs like *stuff* denote a change of state as their basic meaning component, although both classes are syntactically Alternators in English.

Therefore, we seem to have another case of reliable syntax-semantics correspondences: Locative verbs which specify a manner of motion are Figure verbs, locative verbs which specify a change-of-state are Ground verbs.

Linking rules for Locative verbs

(22) a. Manner-of-motion meaning $\leftrightarrow$ V NP_{Figure} PP_{Ground}

b. Change-of-state meaning $\leftrightarrow$ V NP_{Ground} PP_{Figure}

Therefore, if a child knows about these correspondences, then learning the meanings of locative verbs and their syntactic possibilities could be made easier. If the child knows that a verb encodes a manner of motion, then she can infer that it allows Figure syntax. If the child hears a unfamiliar verb that allows Figure syntax, then this could be used as a clue that the verb might be a manner of motion verb.

How does the child know these linking rules? It has been suggested that linking rules may be part of innate universal grammar (Grimshaw 1981; Pinker 1984, 1989; Gleitman 1990; Gropen et al. 1991a,b). If linking rules are part of children's innate knowledge, they do not need to learn these rules. Nevertheless, innate knowledge of

linking itself is not enough for children to figure out the syntactic pattern of locative verbs. Children obviously need some way of discovering either a verb's meaning from the events or its syntax in parents' speech. Once children find either the verb's meaning or the verb's syntactic category, innate linking rules could be very useful for them.

1.3 Motivation and Goals of This study

1.3.1 The First puzzle with the "Linking Rules" Solution

Under the assumption that consistent syntax-semantics correspondences could be very useful for a child to learn verb meanings and verb syntax, there is a puzzle. Despite consistent syntax-semantics mappings in English, there is cross-linguistic variation in the syntax of locative verbs, as shown in (23):

"Fill"-class in Korean: Alternators

(23) a. Yumi-ka mwul-ul cep-ey chaywu-ess-ta.
Nom water-Acc glass-Loc fill-past-Decl
'*Yumi filled water into the glass.'

b. Yumi-ka cep-ul mwul-lo chaywu-ess-ta.
Nom glass-Acc water-with fill-past-Decl
'Yumi filled the glass with water.'

Change-of-state verbs like *fill* are Non-alternating Ground verbs in English, as shown in (19). However, the Korean counterparts of this same class of verbs are syntactic Alternators, which allow both Figure and Ground frames, as shown in (23). This suggests that the linking between change-of-state meanings and Non-alternating Ground frame syntax might not be universal across languages. If this linking rule is not universal, then it is much less obvious how it could be of much use to a child.

To take another example, one of the subclasses of Alternating locative verbs in English - the class that includes verbs like *pile, spray,* and *load* - has Korean counterparts which are consistently Non-alternating Figure verbs, as shown in (24).

"Pile"-class in Korean: Figure verbs

(24) a. Yumi-ka chaek-ul chaeksang-ey ssa-ass-ta.
Nom book-Acc table-Loc pile-past-Decl
'Yumi piled books on the table.'

b. *Yumi-ka chaeksang-ul chaek-elo ssa-ass-ta.
Nom table-Acc book-with pile-past-Decl
'Yumi piled the table with books.'

The two remaining classes of locative verbs in English - the Non-alternating Figure verbs, and the second subclass of Alternating verbs - are syntactically identical in English and Korean, as shown in (25-26):

"Pour"-class in Korean: Figure verbs

(25) a. Yumi-ka mul-ul cep-ey pwu-ess-ta.
Nom water-Acc glass-Loc pour-past-Decl
'Yumi poured water into the glass.'

b. *Yumi-ka cep-ul mul-lo pwu-ess-ta.
Nom glass-Acc water-with pour-past-Decl
'*Yumi poured the glass with water.'

"Stuff"-class in Korean: Alternating verbs

(26) a. Yumi-ka peint-lul pyek-ey chilha-ess-ta.
Nom paint-Acc wall-Loc paint-past-Decl
'Yumi painted paint on the wall.'

b. Yumi-ka pyek-ul peint-lo chilha-ess-ta.
Nom wall-Acc paint-with paint-past-Decl
'Yumi painted the wall with paint.'

The main point is that Korean locative verbs sometimes show the same syntactic possibilities as their English counterparts, as in (25-26), sometimes they are syntactically more liberal than their English counterparts, as in (23), and sometimes they are syntactically more restricted than their English counterparts, as in (24).

Therefore, the existence of cross-linguistic differences in the syntax of locative verbs undermines learning strategies based on universal mapping between syntax and semantics. How can the child succeed in learning the syntax of locative verbs, given the potential problems raised by cross-linguistic differences? Therefore, the first problem is

to show how children can use syntax-semantics correspondences despite the problem of cross-linguistic diversity. Furthermore, this problem is independent of the Pinker (1984, 1989) and Gleitman (1990) controversy - it is a challenge for an assumption which both approaches share.

1.3.2 The Second Puzzle with Conservative Learning

Native speakers of English need to make some kinds of generalizations about verb syntax. For example, native speakers of English can generalize the fact that the verb *send* allows the double object construction to other verbs like *post* or *mail* which have similar meanings, as in (27a) and (28a). These verbs also allow the dative construction, as illustrated in (27b) and (28b).

(27) a. John sent Mary a letter.
b. John sent a letter to Mary.
(28) a. John posted/mailed Mary a letter.
b. John posted/mailed a letter to Mary.

Furthermore, they can generalize the verb *send* to novel verbs like *e-mail*, *fax*, or *ftp*, as shown in (29).

(29) a. John emailed/faxed/ftp'ed Mary the news.
b. John emailed/faxed/fap'ed the news to Mary.

However, native speakers do not overgeneralize the double object verb *send* to verbs like *deliver* and *dispatch*, which have related meanings but only allow the dative construction, as shown in (30):

(30) a. John delivered/dispatched the package to Mary.
b. *John delivered/dispatched Mary the package.

Therefore, we know that native speakers make quite constrained, conservative generalizations about verb syntax. Children must make similarly constrained generalizations, then, if they will be native speakers. Nevertheless, English-speaking children have been found to produce ungrammatical sentences like "I filled water into the glass" in both spontaneous speech and in elicited production tasks, as the work of Bowerman (1982), Gropen and colleagues (1991a,b) has shown.

The second puzzle is the following. If the logic of learnability tells us that constrained generalization is the route to success, and that overgeneralization is hard to recover from, then how is it that children do exactly what they should not be doing, and how do they still manage to end up as native speakers?

1.4 Research Questions and Organization of the Thesis

1.4.1 Research Questions

The main goal of this study is to find out what kind of learning mechanism allows children to reach adult-like knowledge of their native language given the information provided by the learners' environment. More specific questions are as following:

1. Are there any universal syntax-semantics correspondences across languages? If so, what are the syntax-semantics correspondences that hold across all languages? What are language-specific syntax and semantics correspondences?

2. How much have children learned about the syntax of locative verbs by age 3-4 in the face of the potential problem of cross-linguistic diversity in syntax-semantics

correspondences ? What can children learn and what can they not learn by using consistent cross-linguistic syntax-semantics correspondences?

3. In the absence of reliable universal mappings, perhaps children must rely more on statistical information in the input. The question is whether there is adequate information in the input.

1.4.2 Organization of the Thesis

The remaining chapters of this thesis are organized as follows. Chapter 2 lays out Pinker's (1989) lexical semantic approach, which has focused on the correspondence between the finer-grained semantics and syntax of locative verbs in English, and extends his approach to locative verbs in Korean. The main goal of this chapter is to examine the syntactic pattern of locative verbs in Korean, in order to get an initial idea of the range of cross-linguistic similarities and differences in the syntax and semantics mappings of locative verbs. I will show that there are some similarities and differences in the syntax of locative verbs in English and Korean. One aspect of the syntax of locative verbs is very simple, in the respect that in Korean *all* locative verbs allow Figure frames and there are no *Non*-alternating Ground verbs. Therefore, locative verbs in Korean fall into two syntactic subclasses: a Non-alternating Figure verb class and an Alternating verb class. In contrast, locative verbs in English fall into four subclasses: Figure and Ground non-alternating verb classes and Figure and Ground Alternating verb classes. Despite apparent syntactic differences in English and Korean, I will also show that two linking generalizations are still valid in English and Korean: (1) verbs which have manner of motion as a primary meaning component allow Figure syntax and (2) verbs which have change of state as a primary meaning component allow Ground syntax.

The remainder of Chapter 2 discusses in detail whether all locative verbs in Korean fit into the proposed linking generalizations above. I will show that there are two classes that do not follow the linking generalizations: (1) the "smear"-class and (2) the "load"-class. In order to solve these remaining puzzles, I will re-examine Pinker's (1989) classification of basic Figure verbs and basic Ground verbs, and revise his classification by the same PP omission test as Pinker used. In addition, I will review Jackendoff's (1996) account, which highlights the asymmetry of the "spray"-class and the "smear"-class in English, to see whether his account may help the analyses of Korean locative verbs.

Chapter 3 concerns the question of where cross-linguistic variation for locative verb syntax comes from, and why Figure syntax is always available with *all* locative verbs in Korean. First, I will suggest that certain aspects of locative verb syntax correlate with an independent property, namely the availability of V-V Compounding or verb serialization. The availability of verb compounding in a language allows the availability of Figure frames with Ground verbs like *fill* and *cover*. I will further show that the evidence in support of this connection comes from a wide range of languages. Much of the cross-linguistic variation for locative verb syntax is restricted, dividing languages into two basic classes. Korean-type languages, which include Korean, Japanese, Chinese, Thai, Turkish, Hindi, and Luganda, always allow Figure frames with *all* locative verbs. That is, in these languages, there are no Non-alternating Ground verbs. In contrast, English-type languages, which include English, French, Spanish, Singapore Malay, Najdi Arabic, and Hebrew, allow Non-alternating Ground verbs. Furthermore, all of the Korean-type languages, and none of the English-type languages allow V-V compounding or verb serialization.

An important question is why the availability of verb compounding should correlate with locative verb syntax. I will suggest that the semantic packaging of predicate meanings that is needed in order to use Ground verbs with Figure frames involves exactly the kind of process seen overtly in serial verb constructions. More specifically, creating a Figure frame based on a Ground verb like *fill* or *cover* depends on a property of verb serializing systems, namely an argument sharing property.

The next part of Chapter 3 discusses two lexical approaches to cross-linguistic variation. The first lexical approach claims that differences in the syntax of locative verbs originate from differences in the meanings of individual lexical items across languages. I will provide several pieces of evidence for excluding this possibility. The second lexical approach, which is proposed by Talmy (1985, 1991) and Juffs (1996), claims that different lexicalizations of a verb meaning lead to cross-linguistic variation in the syntax-semantic mappings. I will show that their typological approaches do not correctly predict locative verb syntax across languages. Finally, I will further show that the distribution of a number of other properties of the 12 languages I surveyed appears *not* to correlate with their syntax for locative verbs.

The remainder of Chapter 3 is concerned with syntax-semantic correspondences that seem to hold on a language-by-language basis. I explore the syntactic possibilities of the classes of verbs which are syntactic Alternators in English across languages, and show these classes of verbs in English show much broader syntactic variation across languages than the classes which are Non-alternating verbs in English. This may involve idiosyncratic semantic properties which can affect syntactic possibilities in some languages but not others. For example, the ballistic motion verb *spray* is an Alternator in English, Chinese, and Thai, but is an Non-alternating Figure verb in Korean, Japanese,

Turkish, and Hebrew. This may affect some languages but other languages. Interestingly, I find that *fill* is one of the most syntactically variable verbs across languages. For example, in English *fill* is a Ground verb, in Korean it is an Alternator, in Thai it is a Figure verb, and in Singapore Malay it is an Alternator. In contrast, *cover* and *decorate* show much less variation across languages. An important question is how children learn these language specific idiosyncrasies.

Chapter 4 draws together the analyses developed in Chapters 2-3 and the learnability issues raised by the cross-linguistic data in these chapters. First, I will present an elicited production task of child and adult speakers of English and Korean, in order to examine how much children have learned about the syntax of locative verbs by age 3-4, in order to find out what the scope of their syntactic errors is, and in order to demonstrate how consistent syntax-semantics correspondences can help children succeed in learning the syntax of locative verbs despite cross-linguistic variation. Based on the findings from this experiment, I will show what children can and cannot learn by using a learning strategy based on consistent syntax-semantics correspondences.

In addition, I will evaluate the feasibility of a statistical learning approach, based on information about the use of locative frames in maternal input with specific verbs for all of the English CHILDES database. A statistical learning approach claims that learning is possible based on the use of distributional properties of the input (Bowerman 1982, 1990; Elman 1993; Saffran et al. 1996; Allen 1997; Seidenberg 1997; Rohde and Plaut 1999). I will investigate to what extent this statistical learning approach can and cannot help children succeed in learning the syntax of locative verbs. Finally, I will discuss why children's syntactic errors are restricted to the verb *fill,* and how they could recover from their errors, which is the more important problem in explaining their ultimate success.

Chapter 2

SYNTAX AND SEMANTICS OF LOCATIVE VERBS IN ENGLISH AND KOREAN

2.1 Introduction

It has been suggested that there are consistent correspondences between the meanings of verbs and the syntactic frames they can appear in, and that these reliable mappings might help a learner to learn a verb's meaning and its associated syntactic structures (Jackendoff 1972, 1978, 1990; Carter 1976; Grimshaw 1981; Pinker 1984, 1989; Gleitman 1990; Gropen et al. 1991a,b; Levin 1993). If the learner can take advantage of consistent syntax-semantics correspondences, then learning the meanings of verbs and their syntactic possibilities could be made easier. Specifically, if consistent mappings between semantics and syntax are universal, then they could be useful for the learner. If these mappings are different across languages, then it is much less clear how the learner could use them. Furthermore, if the learner cannot use syntax-semantic correspondences, then learning the syntax and the semantics of verbs would be made much harder for her. Therefore, the main goal of this chapter is to explore to what extent there are universal syntax-semantics correspondences, and to what extent there are language-specific syntax-semantics correspondences, in terms of the syntax and semantics of locative verbs in English and Korean.

In section 2.2, I lay out the theoretical framework suggested by Pinker (1989), which claims that syntactic frames may be predictable from a verb's lexical semantics and that the mapping from semantics to syntax is performed by universal and innate

linking rules. I show how Pinker's theory explains why some verbs like *pour* or *fill* do not allow an alternation, but others verbs like *spray* or *load* do allow it, and how he divides locative verbs into four subclasses in English: Figure and Ground Non-alternating verb classes and Figure and Ground Alternating verb classes.

In section 2.3, I explore the syntactic pattern of locative verbs in Korean, in order to get an initial idea of the range of cross-linguistic similarities and differences in the syntax and semantics mappings of locative verbs. One aspect of the syntax of Korean locative verbs is very simple in that in Korean *all* locative verbs allow Figure frames and there are no *Non*-alternating Ground verbs. That is, Korean appears to have two syntactic classes, a Non-alternating Figure verb class and an Alternating verb class. In contrast, English shows more complicated syntactic patterns, which include both Figure and Ground Non-alternating verb classes and two subclasses of Alternating verbs. Therefore, the general syntactic pattern for locative verbs looks rather different in English and Korean. Nevertheless, I show that there are two linking generalizations that hold for both English and Korean locative verbs:

Linking Generalizations

- Verbs which have a manner-of-motion as a primary meaning component allow Figure syntactic frames.
- Verbs which have a change-of-state as a primary meaning component allow Ground syntactic frames.

Despite the existence of these universal mappings in syntax-semantics across languages, there are also some cross-linguistic differences in these mappings. First, Korean always allows Figure syntax as well as Ground syntax with change of state verbs (e.g., *fill* or *cover*) that English allows only in Ground syntax. Second, Korean allows

only Figure syntax with manner of motion verbs (e.g., *pile* or *spray*) that English allows both Figure syntax and Ground Syntax.

Based on the findings so far, I raise three questions that I will answer in section 2.4. First, I examine whether or not all locative verbs in Korean fit into the two generalizations above. I show that there are some exceptions that do not follow these generalizations. In order to explain these remaining puzzles, I re-examine Pinker's (1989) classification of basic Figure verbs and basic Ground verbs, and revise his classification, based on the same PP omission test as Pinker used. I show that the revised classification may explain the remaining puzzles that do not follow the generalizations. In addition, I review Jackendoff's (1996) approach to the asymmetry between the "spray"-class and the "smear"-class in English, in order to see whether his account may provide an account for the remaining problems that do not follow the generalizations for Korean locative verbs.

Second, I examine whether a test of which meaning of a verb is "basic" can distinguish the "fill"-class from the "stuff"-class, which are syntactic Alternators in Korean. I show that although a "sole argument" test, which is also referred to as a "PP omission test", does not seem to work for Korean, another test involving adjectival passives yields a contrast between these two classes in Korean. Third, I examine whether Korean can draw extra syntactic distinctions between the "pour"-class (Non-alternating Figure verb class in English) and the "pile"-class (Figure-Alternating verb class in English), which correspond to Non-alternating Figure verb classes in Korean. I show that the "pour"-class can be distinguished from the "pile"-class in Korean when they are used in serial verb constructions.

2.2 Locative Verbs in English

Locative verbs are generally defined as those verbs encoding the relationship between a moving object, which I refer to as the "Figure", and a location, which I refer to as the "Ground". The fact that, although locative verbs all show this basic semantic similarity, they show different syntactic behaviors, has attracted a good deal of interest in the areas of syntax, semantics, and language acquisition (Rappaport & Levin 1985, 1988; Pinker 1989; Gropen et al. 1991a,b; Levin 1993; Pesetsky 1995). For instance, some verbs like *pour* only allow Figure syntax, where the Figure object is encoded as the direct object and the Ground object is encoded as an indirect object PP, as in (1). In contrast, other verbs like *fill* only allow Ground syntax, in which the Ground object is encoded as the direct object and the Figure object is encoded as a PP, as in (2). In addition, some verbs like *spray* or *load* allow both Figure syntax and Ground syntax, as in (3-4).

"Pour"-class in English: Non-alternating Figure verbs

(1)	a.	John poured water$_{Figure}$ into the glass$_{Ground}$.	Figure-frame
	b.	*John poured the glass$_{Ground}$ with water$_{Figure.}$	*Ground-frame

"*Fill"-class in English: Non-alternating Ground verbs*

(2)	a.	*John filled water$_{Figure}$ into the glass$_{Ground}$.	*Figure-frame
	b.	John filled the glass$_{Ground}$ with water$_{Figure}$.	Ground-frame

Alternating verbs in English

(3)	a.	John sprayed paint$_{Figure}$ onto the wall$_{Ground}$.	Figure-frame
	b.	John sprayed the wall$_{Ground}$ with paint$_{Figure}$.	Ground-frame
(4)	a.	John loaded the apples$_{Figure}$ onto the truck$_{Ground}$.	Figure-frame
	b.	John loaded the truck$_{Ground}$ with apples$_{Figure}$.	Ground-frame

The first point to notice is that the main difference between Non-alternating Figure verbs like *pour* and Non-alternating Ground verbs like *fill* is which argument is mapped onto the direct object. The question is then why some verbs like *pour* only allow the Figure argument as the direct object, whereas some verbs like *fill* only allow the

Ground argument as the direct object. The second point to notice is that some verbs like *spray* or *load* appear in both syntactic frames, as in (3) and (4), whereas other verbs like *pour* or *spill* do not. Thus, we may raise the question of why some verbs like *spray* allow alternation, but other verbs like *spill* do not.

Under the assumption that there appears to be a strong correlation between the meanings of verbs and the syntactic frames they can appear in, many researchers postulate that the syntactic frames of a verb may be predictable from the verb's lexical semantics (Rappaport & Levin 1985, 1988; Pinker 1989; Gropen et al. 1991a,b). I will begin by introducing Pinker's (1989) theory, which focuses on the correspondence between the finer-grained semantics and syntax of locative verbs in English, adopted from Talmy (1985) and Jackendoff (1987).

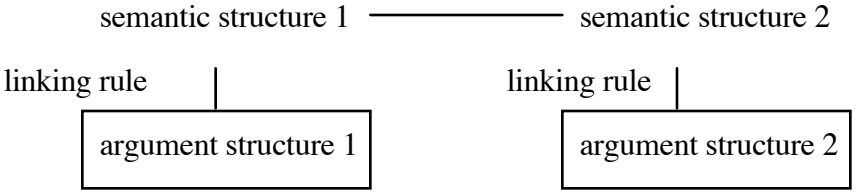
2.2.1 Pinker's (1989) Lexico-semantic Approach

The key feature of Pinker's (1989) theory of lexical semantics is that the syntactic frame of a verb is predictable from the semantic representation of the verb. Different syntactic frames, therefore, reflect differences in the semantic representations of the verb. The mapping from semantic representations to particular syntactic structures is performed by universal and innate linking rules. Therefore, the three main components of Pinker's theory are given in (5):

(5) semantic structures
linking rules
lexical rules

The framework of his theory is summarized in (6):

(6) Lexical Rules



(Pinker 1989: 63)

In the following subsection, I will discuss the framework of Pinker's theory given in (6) in detail.

2.2.1.1 Linking Rules and Semantic Structures

Since the term "linking" is interpreted in different ways, it is necessary that we make clear exactly what notion of the term we are using before we can understand the notion of "linking rules" in Pinker's theory. In many uses, the term "linking" refers to the connection between thematic roles like agent, patient/theme, or source/location/goal, and grammatical relations like subject, object, or oblique object (Fillmore 1968; Jackendoff 1972; Carter 1976; Bowerman 1982, 1990). Furthermore, it is widely assumed that thematic roles are mapped onto underlying syntactic structures, not surface syntactic structures (Perlmutter and Postal 1984; Baker 1988).[1] These linking theories are based on syntactic and semantic hierarchies in that it is assumed that Agent maps onto subject, Patient/Theme maps onto direct object, and Goal/Location maps onto oblique object, which is called a "canonical linking pattern" (or a unmarked linking

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1 Baker (1988) claims that thematic roles are mapped onto underlying syntactic structures, not surface syntactic structures, suggesting the Uniformity of Theta Assignment Hypothesis (UTAH), which states that "identical thematic relationships between items are represented by identical structural relationships between those items at the level of D-structure" (Baker 1988: 46). There is a well-known example for this assumption. Consider the following examples: (a) The ice melted. (b) Bill melted the ice. In the (a) example, the Patient or Theme argument is found in subject position; in the (b) example, it is found in object position. However, the surface subject of the unaccusative verb like *melt* is assumed to be the D-structure object. Therefore, there is no problem for the UTAH.

pattern) (Larson 1988). For example, a child who has acquired a verb such as *spill* in *John spilled the juice on the table* knows that the Agent (John) is linked to subject position, the Theme (the juice) is linked to object position, and the Goal/the location (the table) is linked to oblique object position (Grimshaw 1981). Must the child learn linking patterns on an item-by-item basis? It is widely assumed that UG maps Agent uniformly onto subject, Theme onto object, and Goal onto oblique object.

Gropen et al. (1991b) argue that the syntactic structure of locative verbs poses serious problems for this kind of linking rules. Let me briefly summarize Gropen et al.'s argument.

1) Gropen et al. claim that these linking theories predict that all verbs denoting similar events should show the same linking pattern, but that is not true. Although locative verbs all denote similar events in the respect that they encode the relationship between a moving object and a location, they do not show the same linking pattern. For example, some verbs like *pour* show the canonical linking pattern (the unmarked linking pattern), where the theme argument is mapped onto the direct object (e.g., pour water into the glass/*pour the glass with water). However, some verbs like *fill* violate this canonical linking pattern. That is, they show the noncanonical linking pattern, where the Goal argument is mapped onto the direct object (e.g., *fill water into the glass/fill the glass with water). Furthermore, some verbs like *spray* allow both patterns (e.g., spray water onto the wall/spray the wall with water).

However, a possible response to this point would be to say that it is the theta-role classification that is the problem, not the linking rule itself.

2) Gropen et al. claim that these linking theories predict that verbs with the noncanonical linking pattern would be rarer in the language and harder to learn than

those with the canonical linking pattern, but that is not true. Citing the work of Rappaport & Levin (1985) and Francis & Kucera (1982), Gropen et al. (1991a,b) claim that Ground verbs having the noncanonical linking pattern might outnumber Figure verbs having the canonical linking pattern in English, and English-speaking children acquire both Figure verbs and Ground verbs at the same time (Bowerman 1982, 1990; Pinker 1989).

However, their argument that English-speaking children do not show more difficulty learning Ground verbs than Figure verbs might be less accurate, in terms of the observed asymmetry in syntactic errors. For example, Bowerman's (1982) spontaneous speech study and Gropen et al.'s experimental study (1991a,b) show that the predominant overgeneralization errors of children are with "fill"-type verbs, which have the noncanonical linking pattern, whereas their errors are rare with "pour"-type verbs, which have the canonical linking pattern.

3) Gropen et al. claim that these linking theories cannot explain the semantic difference between two forms of an Alternating verb that involve the same thematic roles but different linking patterns. For example, even though both forms of an Alternating verb have the same thematic roles like agent, theme, and goal, they show subtle meaning differences, depending on which argument is mapped onto direct object. For instance, the sentence *John loaded the truck with apples*, where the Goal argument of the verb is mapped onto direct object, implies that the truck is completely filled with apples. In contrast, the sentence *John loaded apples into the truck*, where the theme argument of the Alternating verb is mapped onto direct object, does not necessarily show this holistic interpretation (see Anderson 1971). Therefore, Gropen et al. claim that this holism effect

provides another problem for these linking rules, because these linking rules assume that the arguments are named with the same thematic roles in both syntactic forms.

However, Colin Phillips (p.c.) points out that if theta-roles map onto underlying positions, this does not necessarily need to determine all meaning relations. It is well known that thematic relations do not fully determine meanings. In addition, one might wonder whether, as Gropen et al. claim, the holism effect associated with Ground syntax is an obligatory interpretation. I will return to more specific discussion of this later.

Instead of these linking theories based on theta roles, Gropen et al. (1991a: 118), following Rappaport and Levin (1985, 1988), suggest the specific linking rule, which is called the Object Affectedness Linking Rule (OALR):

(7) *Object Affectedness Linking Rule* (Gropen et al. 1991a: 118)
An argument is encodable as the direct object of a verb if its referent is specified as being affected in a specific way in the semantic representation of the verb.

Let us see how the OALR in (7) accounts for different syntactic patterns of locative verbs. First, some verbs like *pour* have as part of their lexical meaning notions "cause Y to go to Z" as well as a specification of the manner of motion[2]. For instance, since the meaning of *pour water into the glass* can be expressed by "cause water to go in a downward stream into the glass", it specifies the particular manner of motion of the moving object, *water*, but does not specify the change of state of the location, *the glass*. Note that a crucial point is that some particular manner of motion is specified in the meaning of the verb. The verb *pour* is distinguished from verbs such as *drip* and *dribble*

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2 According to Pinker's semantic notion (1989: 77), X, the agent, is the subject, and Y is the thing that changes location and an affected entity, and is the object only because it is affected in a specific manner. Z defines both the path that Y moves along and the location of Y following the motion.

in the specific manners of motion that they describe, although they all have closely related meanings. Accordingly, the main affected entity, *water*, is encoded as the direct object of the verb *pour*, by the OALR. Therefore, the semantic representation of *pour* licenses only the syntactic Figure-frame V [NP_{Figure} into/onto NP_{Ground}], due to the OALR in (7), as repeated below.

(1) a. John poured water into the glass. Figure-frame
b. *John poured the glass with water. *Ground-frame

Other locative verbs with the same syntax as *pour*, such as *dribble, spill, slop,* and *ladle*, have semantic properties in common with *pour* in that they all describe a specific manner of motion of the Figure object and no change of state of the location. Therefore, the verbs of this class are semantically manner of motion verbs, and they are syntactically *Non*-alternating Figure verbs.

On the other hand, some verbs like *fill* have as part of their lexical meaning notions "cause Z to change its state by means of causing Y to go to Z". For example, since the meaning of *fill the glass with water* can be expressed by "cause the glass to become full of water by means of causing water to be in the glass", it specifies the change of state of the container, *the glass,* but does not specify the particular manner of the moving object, *water*. That is, the verb *fill* specifies the change of state of the location from being not full to being full, but does not specify anything about the specific manner of the moving object. One may *fill* the glass by pouring water into it, dripping water into it, or dipping it into a bathtub, and so on. Accordingly, the main affected entity, *the glass*, is encoded as the direct object of the verb *fill*, thanks to the linking rule. Therefore, the semantic structure of *fill* licenses only the syntactic Ground-frame V [NP_{Ground} with NP_{Figure}], as repeated below.

(2) a. *John filled water into the glass. *Figure-frame
b. John filled the glass with water. Ground-frame

Other locative verbs with the same syntax with *fill*, such as *cover, decorate, bandage, litter,* and *soak*, all describe a change of state of the Ground object. Thus, verbs of this class are semantically change of state verbs, and they are syntactically *Non*-alternating Ground verbs.

In contrast with Non-alternating verbs like *pour* and *fill*, the meaning of the verb *spray* can specify the particular manner of motion of the moving object and the particular change of state of the location at the same time. The question of how an Alternating verb may specify both a manner of motion meaning of the moving object and a change of state of the location will be discussed in detail in the following subsection. At this point, I only focus on how Gropen et al. explain Alternating verbs in terms of their linking theory.

According to the Gropen et al. linking theory, since *spray* describes how the moving object is specified by a particular ballistic manner of motion, the main affected entity, *paint*, can be encoded as the direct object of the verb *spray*. But since *spray* also describes a specific effect on the location (Ground) in that the location *the wall* is completely covered with a mass, the main affected entity, *the wall*, can be encoded as the direct object of the verb *spray*. Therefore, the meaning of *spray* licenses both Figure and Ground-frames, as repeated below.

(3) a. John sprayed paint onto the wall. Figure-frame
b. John sprayed the wall with paint. Ground-frame

(4) a. John loaded the apples onto the truck. Figure-frame
b. John loaded the truck with apples. Ground-frame

Other Alternators with similar syntax to *spray*, like *load, smear,* and *spread*, describe both the manner of motion of the Figure object and the change of state of the Ground object.

So far we have seen how Gropen et al's OALR explains different syntactic patterns of locative verbs. Given that their affectedness can be supported by the holism requirement with Ground frames, we need to consider the question of whether this holistic interpretation associated with the Ground syntax is an obligatory interpretation or just a tendency.

2.2.1.1.1 Comments on the Holism Effect

Gropen et al. (1991a) further claim that the OALR in (7), which states that an argument is linked to object position if it is specified as affected, accounts for the holistic interpretation, which is often associated with the Ground-frame of Alternating verbs. It is often claimed that Ground frames in (3b) and (4b) always describe a completed/filled end-state, whereas Figure frames in (3a) and (4a) do not. For instance, the Figure frame in (3a) implies that all the paint was applied to the wall, but we do not know how much of the wall is covered, whereas the Ground frame in (3b) implies that the wall is entirely covered with paint. Similarly, in (4a), we might understand that all apples are loaded, but we do not know whether the truck is full. In (4b), on the other hand, we might understand that the truck is completely filled with apples. Therefore, Gropen et al. claim that the obligatory presence of the holism effect with the Ground syntax supports their affectedness linking rule.

Gropen et al. (1991b) also tested whether children were more likely to use the Ground syntax when the ground object could be interpreted holistically. Under the assumption that the holism effect with the Ground syntax is obligatory, if children are

affected in their choice of syntactic frame by the OALR, then they should be more likely to use the Ground syntax to describe a completely filled/completed situation than the Ground syntax with a partially filled/completed situation. This hypothesis was tested in an experiment where children were taught a novel verb in either a partial or a holistic condition. As predicted, children responded with more Ground frames when the verb named a holistic action than a partial action. Gropen et al. concluded that children were sensitive to the holistic interpretation because they were more likely to make the Ground argument the direct object when the surface was completely filled or covered rather than partially filled or covered. The completed action may just draw more attention to the change-of-state.

One might doubt whether Ground syntax should show this holistic interpretation, however. For example, the sentence *John sprayed me with water* may not force the holistic interpretation, but the verb *spray* still allows the Ground syntax. Contrary to most claims in the literature, Jackendoff (1996) points out that the Ground syntax shows only a preference of the covered/filled interpretation, but does not force this holistic effect, as illustrated in (8):

(8) a. Bill sprayed/smeared/dabbed/splashed the wall with paint (for ten minutes), but it still wasn't covered.
b. ?Bill loaded the truck with dirt for an hour, but there was still room for more.
c. ?Bill crammed/packed the crack with cement (for five minutes), but it still wasn't full.

Interestingly, he further points out that there is a subtle difference between Figure-Alternating verbs like *spray* or *smear* and Ground-Alternating verbs like *load* or *cram*, in terms of the holism effect. Specifically, basic Figure verbs as in (8a) do not

force the holistic interpretation with the Ground syntax, whereas this effect is stronger for basic Ground verbs as in (8b) and (8c).

The main point of the preceding discussion is whether the holism interpretation associated with Ground syntax is an obligatory interpretation. Gropen et al. assume that the holism effect with the Ground syntax is a requirement, not just a tendency, in order to capture the basic Alternator facts, but their assumption may not be always true. As noted by Jackendoff (1996), the Ground syntax shows only a tendency for the holistic interpretation, but does not force this interpretation, in particular with basic Figure verbs like *spray*. Despite the lack of the obligatory holistic interpretation, therefore, Alternators like *spray* or *sprinkle* can license the Ground syntax. Later I will provide additional evidence for the claim that the holism effect associated with the Ground syntax is just a tendency, not a obligatory interpretation, based on an elicited production task that will be reported in Chapter 4.

In the following section, I will show how Pinker's (1989) broad-range and narrow-range lexical rules account for why some verbs like *spray* and *load* allow the alternation, but some other verbs like *pour* and *fill* do not allow it in English.

2.2.1.2 Broad-range and Narrow-range Classes in English

2.2.1.2.1 Broad-range Classes and Rules in English

According to Pinker (1989), in English each locative verb falls into either a manner of motion broad-range conflation class (a basic Figure verb) or a change-of-state broad-range conflation class (a basic Ground verb). Basic Figure verbs like *pour* and *spray* all have the semantic structure in (9a), which is associated with the syntactic Figure frame V [NP_{Figure}into/onto NP_{Ground}] by the linking rule. In contrast, basic Ground verbs

like *fill* and *stuff* all have the semantic structure in (9b), which is associated with the syntactic Ground frame V [NP_{Ground} with NP_{Figure}] by the linking rule.

(9) a. X cause Y to go to Z ↔ b. X cause Z to change its state by means of [X cause Y go to Z]
e.g., John sprayed paint onto the wall. → John sprayed the wall with paint.

At this point, we may raise two questions: (1) How can Alternating verbs be distinguished from Non-alternating verbs; (2) How can Alternating verbs be divided into basic Figure verbs (Figure-Alternating verbs) and basic Ground verbs (Ground-Alternating verbs). First, in the semantic structure, based on Rappaport & Levin (1985, 1988), Pinker suggests that for a verb to allow the locative alternation, it must undergo a lexical rule which takes as input a verb with semantic structure (9a) and produces as output a verb with the different semantic structure (9b), or vice versa, which Pinker calls it a *broad-range lexical rule*. Once the broad-range lexical rule applies in English, locative verbs allow the alternation.

To take a simple example, when the lexical rule takes the verb *spray* with the semantic representation (9a), in which the Figure argument is specified as affected in a particular manner of motion, it would generate a new semantic representation (9b) in which the target of the motion (or the location) is specified as affected by being covered in a particular way. The linking rules automatically specify *spray paint onto the wall* for the primary meaning, and *spray the wall with paint* for the secondary meaning. Therefore, the verb *spray* is a Figure-Alternating verb which denotes a manner of motion meaning component as the primary meaning.

An important point is that under Pinker's broad-range conflation classes, some Alternating verbs have the basic semantic structure in (9a), which denotes a manner-of-

motion as a primary meaning component, and some of them have the basic semantic structure in (9b), which denotes a change-of-state as a primary meaning component. Following Pinker (1989) and Gropen et al. (1991b), here I assume that Alternating verbs all designate one meaning component (either a manner of motion or a change of state) as a primary meaning (a basic meaning) and the other meaning component as a secondary meaning, independent of the fact that they have both manner of motion and change of state meaning components.

Now I need to clarify how Pinker defines the primary meaning and the secondary meaning of an Alternating verb. If an Alternating verb has the basic semantic structure (9a), then it might have a manner of motion as a primary (or basic) meaning component. In contrast, if an Alternating verb has the basic semantic structure (9b), then it might have a change of state as a primary meaning component. Therefore, Alternating verbs may be divided into Figure-Alternating verbs (basic Figure verbs) and Ground-Alternating verbs (basic Ground verbs), based on which semantic structure is basic.

An obvious question is what could be a criterion for testing primary meanings of Alternating verbs. Pinker's criterion of whether Alternating verbs have either a primary manner of motion meaning or a primary change-of-state meaning is determined by which argument is obligatory in both syntactic frames, which I will call "sole argument effects" or " a PP omission test" (see Pinker 1989: 125). For example, the Alternator *pile* is acceptable without the *into*/*onto* phrase (the Ground argument), but it is unacceptable without the *with* phrase (the Figure argument), as shown in (10):

"Pile"-class: Figure-Alternating verbs in English

(10)	a.	John piled books (into the shelves$_{\text{Ground}}$).	Figure-frame
	b.	John piled the shelves *(with books$_{\text{Figure}}$).	Ground-frame

If the Ground argument is optional in a syntactic frame of an Alternator, then the syntactic Ground-frame would be derived from the syntactic Figure-frame. In other words, optionality of the Ground argument implies that an Alternator has the manner of motion as a primary meaning component. Therefore, verbs with similar syntactic behaviors to the verb *pile* are Figure-Alternating verbs which denote basic manner-of-motion meanings. Verbs in the "pile"-class include *pile, spray, sow, heap,* and *spread.*

In contrast, the Alternator *stuff* is acceptable without the *with* phrase (the Figure argument), but it is unacceptable without the *into*/*onto* phrase (the Ground argument), as shown in (11):

"Stuff"-class: Ground-Alternating verbs in English

(11) a. John stuffed feathers *(into the pillow$_{Ground}$). Figure-frame
b. John stuffed the pillow (with feathers$_{Figure}$). Ground-frame

If the Figure argument is optional in a syntactic frame of an Alternator, then the syntactic Figure-frame would be derived from the syntactic Ground-frame. In other words, optionality of the Figure argument implies that an Alternator has the change of state as a primary meaning component. Therefore, verbs with the same syntactic possibilities as the verb *stuff* are Ground-Alternating verbs which denote basic change-of-state meanings. Verbs in this class include *load, cram, pack,* and *jam.*

Up to now we have seen how PP omission can be used to test the basic meanings of Alternating verbs. We might, however, wonder why PP omission can be used to test these basic meanings. I assume that if a verb is a basic Figure verb, then the Figure argument should be represented in its syntactic structure. In contrast, if a verb is a basic Ground verb, then the Ground argument should be represented in its syntactic structure. Therefore, Figure-Alternating verbs only allow the omission of the Ground argument,

whereas Ground-Alternating verbs only allow the omission of the Figure argument. Table 2.1 summarizes broad-range conflation classes for English locative verbs.

Table 2.1: Broad-range Classes for Locative Verbs in English

Syntactic classes	English	
	Broad-range classes	Broad-range lexical rules
"pour"-class (Non-alternating Figure verbs)	$Figure_{pp\text{-}optional}$	
"pile"-class (Figure-Alternating verbs)	$Figure_{pp\text{-}optional}$	$Ground_{pp\text{-}obligatory}$
"fill"-class (Non-alternating Ground verbs)	$Ground_{pp\text{-}optional}$	
"stuff"-class (Ground-Alternating verbs)	$Ground_{pp\text{-}optional}$	$Figure_{pp\text{-}obligatory}$

To summarize, Alternating verbs can be divided into either basic Figure verbs or basic Ground verbs, based on the PP omission test. Accordingly, Non-alternating Figure verbs and Figure-Alternating verbs belong to the same broad-range conflation class, namely basic Figure verbs. Non-alternating Ground verbs and Ground-Alternating verbs belong to the same broad-range class, namely basic Ground verbs. Once broad-range lexical rules apply, however, Non-alternating verbs are distinguished from Alternating verb.

2.2.1.2.2 Narrow-range Classes and Rules in English

In addition to broad-range conflation classes and rules, following Rappaport and Levin (1988), Pinker (1989) suggests that sufficient conditions for alternation are determined by a set of narrow-range rules which classify verbs into narrowly defined semantic classes. The specific classes that Pinker proposes are given in Table 2.2:

Table 2.2: Narrow-range Classes for Locative Verbs in English (Pinker 1989:126-127)

I. Basic Figure verbs
A. Figure-Alternating verbs ("pile"-class)[3]. 1. "smear"-class (simultaneous contact and motion of a mass against a surface): smear, dab, plaster, rub, spread... 2. "pile"-class (vertical arrangement on a horizontal surface): pile, heap, stack... 3. "spray'-class (ballistic motion of a mass): inject, spray, splash, sprinkle, spatter... 4. "scatter"-class (nondirected motion of a mass): scatter, bestrew, sow, strew...
B. Non-alternating Figure verbs ("pour"-class) 1. "pour"-class (a mass is enabled to move via the force of gravity): pour, dribble, drip, spill, slop, ladle, shake... 2. "coil"-class (flexible object extended in one dimension): coil, spin, twist, wind... 3. "spat"-class (mass is expelled from inside an entity): emit, expel, vomit, spew...
II. Basic Ground verbs
A. Ground-Alternating verbs ("stuff"-class) 1. "stuff"-class (a mass is forced into a container against the limits of its capacity): cram, crowd, stuff, jam... 2. "load"-class (insertion of a designed kind of object): load, pack, stock...
B. Non-alternating Ground verbs ("fill"-class) 1. "fill"-class (covering a surface completely): fill, cover, bandage, blanket, coat, tile… 2. "adorn"-class (addition of an object or mass to a location): adorn, burden, deck, soil… 3. "soak"-class (a mass is caused to be coextensive with a solid or layer like medium: soak, drench, saturate...

For instance, the narrow range rule sensitive to 'ballistic motion along a specific trajectory' allows *spray* to alternate. This rule accounts for why the verbs *spray*, *sprinkle*, and *squirt*, alternate. In contrast, the narrow range rule does not apply to verbs that describe motions in which a mass moves via the force of gravity, which explains why the verbs *spill, slosh, pour,* and *slop* do not alternate. In addition, the narrow range rule sensitive to 'a mass against the limits of its capacity' allows *stuff* to alternate, whereas the narrow range rule sensitive to 'the complete cover of a surface' fails to license *fill* to alternate.

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3 As shown in Table 2.2, there are four Figure-Alternating verb classes, and two Non-alternating verb classes. Here I will use the name "pile-class" to represent all subclasses of Figure Alternating verbs, "pour-class" to represent all subclasses of Non-alternating Figure verbs, "stuff-class" to represent all subclasses of Ground-Alternating verbs, and "fill-class" to represent all subclasses of Non-alternating Ground verbs.

So far we have seen that such sub-generalizations lead Pinker to a distinction between broad-range rules exemplified in (9), which provide necessary conditions for an alternation, and narrow-range rules, which add sufficient conditions. This raises the question of why both broad-range and narrow-range rules need for the alternations. Can the broad-range rules be replaced by the narrow-range rules? Pinker (1989: 152) provides three answers for this question. First, the broad-range rules determine what all narrow-range rules have in common. Second, the broad-range rules provide the motivation for why certain subclasses alternate and others do not alternate. Third, adult's speech errors provide evidence for the on-line operation of broad-range rules. More specific discussion of how adults use broad-range rules will be returned in the following section.

2.2.1.2.3 Predictability

In addition to broad-range and narrow-range lexical rules, Pinker suggests that predictability is one of the key properties that allow a verb to be an Alternator, as follows:

> What is special about an alternating verb is that it specifies the motion of an object or substance (and generally its manner of motion), making it eligible for the *into*/*onto* construction, and that this kind of motion predictably causes an effect on the surface that receives the substance. For example, when a liquid is *sprayed*, it is sent in a mist or fine droplets. However, as a result of causing such movement, a surface to which it moves predictably has an even coat of deposited liquid adhering to it. This predictability is what is crucial (1989: 79-80).

To illustrate this point, Pinker contrasts the verb *spray*, which allows the Ground-frame, with the verb *dribble*, which does not allow it.

(12) a. John sprayed water on the wall.
b. John dribbled water onto the floor.
c. John sprayed the wall with water.

d. *John dribbled the floor with water.

Since the meaning of the verb *spray* allows the speaker to predict the particular state change of the location, it may specify the end state of the wall in (12c). Thus, the verb *spray* licenses the Ground frame as well as the Figure frame. Since the meaning of the manner of motion verb *dribble* does not allow the speaker to predict exactly what the end state of the floor is, it does not allow the Ground frame. Therefore, the verbs in the Figure-Alternating verb classes should have information that allows the speaker to predict a particular state change of the location, and the verbs in the Ground-Alternating verb classes should have information that allows the speaker to predict how something moves. This predictability provides part of the explanation for why some verbs alternate, but some other verbs do not alternate. Therefore, within Pinker's account, this predictability of either a change of state meaning or a manner of motion meaning is one of the main properties that makes a verb an Alternator.

2.2.2 Lexico-semantic Approach As a Solution to the Learnability Problem

Let us turn our attention now to the question of learnability. How can children determine the syntactic frames of verbs? The solution to the learnability problem that Pinker suggests is that syntactic alternations are not arbitrary, but are constrained by lexico-semantic criteria. Pinker claims that in order to acquire a syntactic alternation, children need to be able to represent differing lexico-semantic structures for the verbs. Where alternations exist, lexico-semantic structures for the verbs are related by two kinds of lexical rules: broad-range and narrow-range.

First, the goal of broad-range rules is to capture the semantic properties that all verbs which participate in a particular syntactic alternation share. Pinker claims that both adults and children are exploring broad-range rules in the production of novel syntactic

structures. For example, Pinker's evidence that adults use broad-range rules comes from a database he has collected of adult novel productions, as follows:

(13) a. He squeezed them [fish fillets] with lemon juice.
b. Drizzle them [apple slices] with fresh lemon juice.
c. It's not just all that water filling up ... [in the basement; describing why someone is upset]

(Pinker 1989: 157-158)

His claim is that the existence of ungrammatical utterances given in (13) demonstrates that adults are exploring broad-range rules. Therefore, adults' deviance, which Pinker calls "Haigspeak", can be due to the failure of the more precise narrow-range rules.

In addition, Pinker presents evidence that children use broad-range rules to predict syntactic structures. His idea comes from both spontaneous speech (Bowerman 1982) and experimental evidence (Gropen and colleagues 1991a,b). For example, Pinker claims that children's overgeneralization errors like "*John filled the water into the glass" are due to the applications of systematic and unconstrained broad-range rules.

However, this may not be enough to show that the children are using broad-range rules to do this. If children's overgeneralization errors are due to the application of unconstrained broad-range rules, how can we explain the asymmetry between errors with "pour"-type verbs and errors with "fill"-type verbs? The experimental study by Gropen et al. (1991a) shows that the predominant syntactic errors of children are with "fill"-type verbs, whereas their errors are rare with "pour"-type verbs.[4] Although Bowerman reports that children also produced the ungrammatical sentence like "he's

[4] I confirm the observation that children's overgeneralizations are restricted to "fill"-type verbs in the experiment that is reported in Chapter 4.

pouring the glass", errors with "pour"-type verbs are rare. If children's overgeneralization errors are always consistent with the semantic constraint that characterizes the adult broad-range rule, then why are their errors biased toward "fill"-type errors?

Under Pinker's account, children must learn the correct narrow-range rules to manage to end up as native speakers. Therefore, the crucial clue to solving the learnability problem is how children learn the correct narrow-range rules. It is obvious that verb meanings are crucial to Pinker's theory, because they provide the basis for the critical distinctions between narrowly defined subclasses. For example, since ballistic motion plays a crucial role in distinguishing the "spray"-class from the "pour"-class, children must know that there is a narrow range rule that can change verbs of ballistic motion such as *spray* and *sprinkle* into verbs denoting a specific change of state, and that prevents related non-ballistic verbs such as *pour* and *dribble* from allowing a secondary meaning of change of state.

Therefore, the narrow-range rules carry the burden of acquisition. If narrow-range rules provide the crucial clue to solving the learnability problem, the question is how the learner learns these narrow-range rules. In Pinker's account, narrow-range rules are based on verbs that children hear in the input. However, as pointed out by Ingram (1992) and Naigles (1991), Pinker does not provide evidence that the acquisition of the narrow-range criteria is developmentally linked to the disappearance of syntactic errors.

2.2.3 Summary and Implications

So far we have reviewed how Gropen et al.'s (1991a) affectedness linking rules and Pinker's (1989) broad-range and narrow-range lexical rules account for different syntactic possibilities of locative verbs in English.

The main point of this section is that all locative verbs in English may fall into two broad semantic classes: One class is the basic Figure verb class which specifies the manner of motion as the primary meaning component, and the other class is the basic Ground verb class which specifies the change of state as the primary meaning component. Therefore, this shows that there are consistent correspondences between verb meanings and verb syntax in locative verbs in English, as follows:

Linking Rules with Locative verbs in English

- Verbs with manner of motion meanings ↔ Figure syntax [V NP_{Figure} PP_{Goal}]
- Verbs with change of state meanings ↔ Ground syntax [V NP_{Goal} PP_{Figure}]

It has been suggested that linking rules like these may be part of innate universal grammar (Grimshaw 1981; Pinker 1984, 1989; Gleitman 1990; Gropen et al. 1991a,b). If a child knows about these correspondences, then learning the meanings of locative verbs and their syntactic possibilities could be made easier. Specifically, if the child knows that a verb has a change of state meaning, then she can infer that it allows Ground syntax. If the child hears a unfamiliar verb that allows Ground syntax, then this could be used as a clue that the verb must be a change of state verb. Therefore, the existence of universal linking rules could be very useful for children in learning a verb meaning and/or verb syntax.

Nevertheless, it may not be enough to assume that there are universal syntax-semantics mappings based on evidence from English locative verbs. Therefore, I explore the syntactic structure of locative verbs in Korean in the following section, in order to see whether the proposed universals in syntax-semantics correspondences are valid across languages.

2.3 Locative Verbs in Korean

In this section I present the syntactic pattern of locative verbs in Korean, to get a preliminary idea of the range of cross-linguistic similarities and differences in the syntax and semantics mappings of locative verbs.

2.3.1 The "Pour"-class in Korean: Non-alternating Figure Verbs

Let us first look at verbs in the "pour"-class. Verbs in the "pour"-class in English are *Non*-alternating Figure verbs, which semantically encode manner of motion meanings and syntactically only allow Figure frames in English. The class of Non-alternating Figure verbs is syntactically identical in English and Korean, as shown in (14) and (15)[5]:

"Pour"-class in Korean: Non-alternating Figure verbs

(14) a. Yumi-ka mwul-ul cep-ey pwu-ess-ta.
Nom water-Acc cup-Loc pour-Past-Dec
'Yumi poured water into the cup.'

b. *Yumi-ka cep-ul mwul-lo pwu-ess-ta.
Nom cup-Acc water-with pour-Past-Dec
'*Yumi poured the cup with water.'

(15) a. Yumi-ka mwul-ul patak-ey epsilu-ess-ta.
Nom water-Acc floor-Loc spill-Past-Dec
'Yumi spilled water on the floor.'

b. *Yumi-ka patak-ul mwul-lo epsilu-ess-ta.
Nom floor-Acc water-with spill-Past-Dec
'*Yumi spilled the floor with water.'

Verbs in this class include *pwusta* 'pour', *ssotta* 'spill', *kelta* 'hang', *pyetta* 'spat', *thohata* 'vomit', and *pwuchita* 'stick' (see Appendix 2A, Table 2.8).

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5 Note that prepositions in English like *in* or *with* correspond to suffixes in Korean.

2.3.2 The "Fill"-class in Korean: Alternating Verbs

In English, verbs in the "fill"-class are *Non*-alternating Ground verbs, which semantically encode a change-of-state of the Ground object and syntactically only allow the Ground frame in English. Interestingly, the Korean counterparts to this class of verbs are syntactic Alternators, which allow both Figure and Ground frames, as in (16-18).[6] Verbs following this pattern include *chaywuta* 'fill', *tepta* 'cover', *cangsikhata* 'decorate', *ceksita* 'soak', and *kamta* 'bandage' (see Appendix 2.A, Table 2.11).[7]

"Fill"-class in Korean: Alternating verbs

(16) a. Yumi-ka mwul-ul cep-ey chaywu-ess-ta.
Nom water-Acc cup-Loc fill-Past-Dec
'*Yumi filled water into the cup.'

b. Yumi-ka cep-ul mwul-lo chaywu-ess-ta.
Nom cup-Acc water-with fill-Past-Dec
'Yumi filled the cup with water.'

(17) a. Yumi-ka tamyo-lul chimtae-ey cep-ess-ta.
Nom blanket-Acc bed-Loc cover-Past-Dec
'*Yumi covered a blanket on the bed.'

b. Yumi-ka chimtae-lul tamyo-lo cep-ess-ta.
Nom bed-Acc blanket-with cover-Past-Dec
'Yumi covered the bed with a blanket.'

(18) a. Yumi-ka ccoch-ul pang-ey cangsikha-yess-ta.
Nom flowers-Acc room-Loc decorate-Past-Dec
'*Yumi decorated flowers in the room.'

b. Yumi-ka pang-ul ccoch-ulo cangsikha-yess-ta.
Nom room-Acc flowers-with decorate-Past-Dec
'Yumi decorated the room with flowers.'

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6 Of course, one might argue that meanings of the English verb *fill* and its Korean counterpart *chaywuta* are different. Although I do not go through all the details here, I assume that differences in the syntactic pattern of locative verbs are not due to differences in the meanings of individual lexical items across languages. See Chapter 3 for much more discussion of this possibility.

7 In addition to an earlier grammaticality study by Kim & Landau (1997), others have also reported that Korean counterparts to English Non-alternating Ground verbs, like *fill, cover,* or *decorate*, allow alternation (Hong 1991; Lee 1998).

2.3.3 The "Pile" and "Stuff"-classes in Korean

Let us now examine the syntactic pattern of Korean verbs which correspond to English Alternating verbs. Note that I use the name "pile"-class to represent all subclasses of Figure-Alternating verbs in English (e.g., "spray", "scatter", "smear", and "pile" classes), and I use "stuff"-class to represent all subclasses of Ground-Alternating verbs in English (e.g., "stuff", "load", and "wrap"-classes).

Interestingly, Korean counterparts to English Alternating verbs are divided into two syntactic subclasses: One subclass of Alternating verbs in English corresponds to Non-alternating Figure verbs in Korean, whereas the other subclass of Alternating verbs in English corresponds to Alternating verbs in Korean. More specifically, Korean counterparts to the "stuff" subclass of English Alternating verbs are syntactic Alternators in Korean, as shown in (19) and (20). Verbs in this class include *myewuta* 'cram/pack', *chaewuta* 'stuff', *kamta* 'wrap', *chilhata* 'paint'/brush, *paluta* 'spread/smear', and *munciluta* 'rub' (see Appendix 2.A, Table 2.9).

"Stuff"-class in Korean: Alternating verbs

(19) a. Yumi-ka ttalkiccem-ul ppang-ey pal-lass-ta.
Nom strawberry jam-Acc bread-Loc smear-Past-Dec
'Yumi smeared/spread strawberry jam on the bread.'

b. Yumi-ka ppang-ul ttalkiccem-elo pal-lass-ta.
Nom bread-Acc strawberry jam-with smear-Past-Dec
'Yumi smeared/spread the bread with strawberry jam.'

(20) a. Yumi-ka peint-lul pyek-ey chilha-yess-ta.
Nom paint-Acc wall-Loc paint-Past-Dec
'Yumi painted paint on the wall.'

b. Yumi-ka pyek-ul peint-lo chilha-yess-ta.
Nom wall-Acc paint-with paint-Past-Dec
'Yumi painted the wall with paint.'

Second, Korean counterparts to the "pile" subclass of English Alternating verbs are syntactically *Non*-alternating Figure verbs, as shown in (21-23). Verbs in the "pile"-

class, which are Alternating verbs in English but Non-alternating Figure verbs in Korean, include *ppulita* 'spray/sow', *cuiphata* 'inject', *thwikita* 'spatter/splash, *ssahta* 'pile/heap', *sitta* 'load', *cecanghata* 'stock', and *ssata* 'pack' (see Appendix 2.A, Table 2.10).

"Pile"-class in Korean: Non-alternating Figure verbs

(21) a. Yumi-ka chaek-lul chaeksang-ey ssa-ass-ta.
Nom book-Acc table-Loc pile-Past-Dec
'Yumi piled books on the table.'

b. *Yumi-ka chaeksang-lul chaek-elo ssa-ass-ta.
Nom table-Acc books-with pile-Past-Dec
'Yumi piled the table with books.'

(22) a. Yumi-ka sakwa-lul truck-ey sil-ess-ta.
Nom apple-Acc truck-Loc load-Past-Dec
'Yumi loaded apples onto the truck.'

b. *Yumi-ka truck-ul sakwa-lo sil-ess-ta.
Nom truck-Acc apple-with load-Past-Dec
'Yumi loaded the truck with apples.'

(23) a. Yumi-ka mwul-ul pyek-ey ppuli-ess-ta.
Nom water-Acc wall-Loc spray-Past-Dec
'Yumi sprayed water on the wall.'

b. *Yumi-ka pyek-ul mwul-lo ppuli-ess-ta.
Nom wall-Acc water-with spray-Past-Dec
'Yumi sprayed the wall with water.'

I have shown that Korean counterparts to English Alternating verbs are divided into two syntactic subclasses, Non-alternating Figure verb and Alternating verb classes. Recall that under Pinker's (1989) classification, Alternating locative verbs in English may be divided into two syntactic subclasses, the Figure-Alternating verb class ("pile"-class) which has a primary manner of motion meaning, and the Ground-Alternating verb class ("stuff"-class) which has a primary change-of-state meaning. An important point to notice is that Korean counterparts to the class of Figure-Alternating verbs ("pile"-class) in English appear to be Non-alternating Figure verbs, whereas Korean

counterparts to the class of Ground-Alternating verbs ("stuff"-class) in English appear to be Alternating verbs.

2.3.4 Summary and Implications

Let me summarize the syntactic patterns of locative verbs in Korean:

1) Korean locative verbs sometimes show the same syntactic possibilities as their English counterparts in that the class of Non-alternating Figure verbs ("pour"-class) in English corresponds to Non-alternating Figure verbs in Korean, and the "smear" subclass of Alternating verbs corresponds to Alternating verbs in Korean.

2) Korean locative verbs are sometimes syntactically more liberal than their English counterparts in that the class of *Non*-alternating Ground verbs in English ("fill"-class) corresponds to Alternating verbs in Korean.

3) Korean locative verbs are sometimes syntactically more restricted than their English counterparts in that the subclass of Alternating verbs in English ("pile"-class) corresponds to Non-alternating Figure verbs.[8]

Table 2.3 also summarizes the differences and similarities in the syntax of locative verbs in English and Korean.

Table 2.3: Syntactic Patterns of Locative Verbs in English and Korean

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8 Fukui et al. (1985) report that in Japanese locative verbs are syntactically more restricted than English Alternator counterparts. In addition, Juffs (1996) claims that in Chinese locative verbs are also syntactically more restricted than English Alternator counterparts.

Four subclasses	English		Korean		Some other verbs
1. “pour”-class	Figure	~~Ground~~	Figure	~~Ground~~	spill, drip, stick
2. “fill”-class	~~Figure~~	Ground	Figure	Ground	cover, decorate
3. “pile”-class	Figure	Ground	Figure	~~Ground~~	load, spray
4. “stuff”-class	Figure	Ground	Figure	Ground	paint, wrap

As shown in Table 2.3, one aspect of the syntax of Korean locative verbs is very simple, in that in Korean *all* locative verbs allow Figure frames and there are no *Non*-alternating Ground verbs. The only difference is in whether the Ground frame is available for locative verb syntax in Korean. Therefore, Korean appears to have two syntactic classes, the Non-alternating Figure verb class and the Alternating verb class. In contrast, English shows more complicated syntactic patterns, which include both Figure and Ground Non-alternating verb classes and two subclasses of Alternating verbs. Therefore, the general syntactic pattern in Table 2.3 looks rather different in English and Korean.

Nevertheless, there are two generalizations that seem to hold in English and Korean locative verbs.

Two Generalizations for English and Korean locative verbs:

- Verbs which have a manner-of-motion as a primary meaning component allow Figure syntactic frames.
- Verbs which have a change-of-state as a primary meaning component allow Ground syntactic frames.

First, the fact that Korean counterparts to both the English Non-alternating Figure verb class (“pour”-class) and the English Figure-Alternating verb class (“pile”-class) allow only Figure-frames, implies that all verbs with a primary manner of motion meaning allow Figure syntax in both English and Korean. Second, the fact that Korean counterparts to both the English Non-alternating Ground verb class (“fill”-class) and

the English Ground-Alternating verb class ("stuff"-class) allow Ground-frames, implies that all verbs with a primary change of state meaning allow Ground syntax.

Therefore, the existence of these two generalizations suggests that there may still be some consistent syntax-semantics correspondences across languages. Nevertheless, there are cross-linguistic differences in these mappings.

This suggests that consistent mappings between syntax and semantics may not be universal. If these mappings are not universal, it is much less clear how a learner could use them. If the learner cannot use a learning strategy based on universal syntax-semantics mappings, the question becomes how she can succeed in learning the syntax of locative verbs. Therefore, the ultimate goal of this thesis is to show how the learner can use syntax-semantics correspondences despite the potential problems raised by cross-linguistic diversity.

2.4 Semantic Classes in Korean Locative Verbs

2.4.1 Introduction

In section 2.2, we saw how Pinker's (1989) broad-range and narrow-range lexical rules explain syntactic differences among locative verbs in English. Under Pinker's approach, locative verbs in English fall into four subclasses based on their syntactic behaviors: A Non-alternating Figure verb class ("pour"-class), a Non-alternating Ground verb class ("fill"-class), a Figure-Alternating verb class ("pile"-class), and a Ground-Alternating verb class ("stuff"-class).

In contrast to the syntactic patterns for English locative verbs, locative verbs in Korean appear to fall into two classes: Non-alternating Figure verbs ("pour"-class and "pile"-class) and Alternating verbs ("fill"-class and "stuff"-class). Table 2.4 shows

the contrast between subclasses of English locative verbs and those of Korean locative verbs.

Table 2.4: Broad-range Classes in English and Korean (Pinker's (1989) classification)

Syntactic class	English Semantic classification		Korean Semantic classification		Other verbs
	Broad-range	Lexical rules	Broad-range	Lexical rules	
"pour"-class	Figure-frame		Figure-frame		Spill, drip
"pile"-class	Figure-frame	Ground-frame	Figure-frame		Spray, sow
"fill"-class	Ground-frame		Ground-frame, Figure-frame		Cover, decorate
"stuff"-class	Ground-frame	Figure-frame	Ground-frame, Figure-frame		Cram, paint

Recall that, in English, locative verbs fall into a manner-of-motion broad-range conflation class (basic Figure verbs) and a change-of-state broad-range conflation class (basic Ground verbs). Once broad-range lexical rules apply in English, locative verbs fall into four subclasses.

In contrast, in Korean locative verbs fall into basic Figure verbs and Alternators, as shown in Table 2.4. The question is whether Korean uses the broad-range lexical rules to license Alternators. If we assume that this kind of lexical rule applies to Korean locative verbs, it would mean that *all* verbs that fell into the change-of-state broad-range conflation class would be able to undergo a rule which turns them into manner-of-motion verbs. This would then, presumably, mean that verbs of the "fill"-class in Korean all have a different meaning from their counterparts in English. However, in Chapter 3, I will show that verbs of the "fill"-class in Korean do not have a different meaning from their counterparts in English, based on several pieces of evidence. Instead, I will suggest that the availability of Figure-frames with Ground verbs like *fill*, *cover*, and *decorate*, is due to a morphological property, namely the availability of V-V Compounding or verb

serialization in Korean. The one way of creating a Figure frame with a Ground verb depends on an argument sharing property, which both V-V compounding and verb serialization have in common. I will discuss this issue in detail in Chapter 3. The main point is that the availability of a Figure frame with change of state verbs like *fill, cover*, and *decorate* is due to an independent morphological property, not due to a broad-range lexical rule. In the following section, I will also demonstrate that a test of basic semantic components contrasts the "fill"-class with the "stuff"-class in Korean.

An important point is that Korean counterparts to English Alternating verbs are split into two syntactic subclasses: One subclass of English Alternating verbs ("pile"-class) corresponds to Non-alternating Figure verbs in Korean, whereas the other subclass of English Alternating verbs ("stuff"-class) corresponds to Alternating verbs in Korean. Note that the "pile"-class in English is the Figure-Alternating verb class, which specifies a manner of motion as a basic meaning component, and the "stuff"-class in English is the Ground-Alternating verb class, which specifies a change of state as a basic meaning component. Therefore, two generalizations that seem to hold in Korean locative verbs are given in (24).

(24) *Two Generalizations for Korean Locative verbs*

- Verbs which have a primary manner of motion meaning allow Figure frames in Korean.
- Verbs which have a primary of change-of-state meaning allow Ground-frames as well as Figure-frames in Korean.

Based on the observations so far, we may raise the following questions that I will answer in the following section.

1. Do all locative verbs in Korean fit into the generalizations given in (24)? If there are some exceptions that do not fit into the generalizations in (24), how can we explain these remaining problems?

2. The second question is whether a test of which meaning of a verb is "basic" can yield a contrast between the "fill"-class and the "stuff"-class, which are syntactic Alternators in Korean.

3. According to the syntactic pattern shown in Table 2.4, there seems to be no distinction between the "pour"-class (Non-alternating Figure verb class in English) and the "pile"-class (Figure-Alternating verb class in English) in Korean, in terms of their syntactic possibilities. However, the question is whether there is any way of distinguishing between these two classes in Korean, showing that the absence of syntactic contrast should not imply a lack of semantic contrast.

I will begin by considering the first question in the following section.

2.4.2 Remaining Puzzles with Korean Locative Verbs

Assuming that Pinker's classification of basic Figure verbs and basic Ground verbs is essentially accurate, let us consider the question of whether in Korean all locative verbs follow the proposed generalizations in (24). Pinker (1989: 126-127) suggests six narrowly defined classes of Alternating verbs: four classes of Figure-Alternating verbs, which include the "smear"-class, the "spray"-class, the "scatter"-class, and the "pile"-class, and two classes of Ground-Alternating verbs, which include the "stuff"-class and the "load"-class, as repeated in Table 2.5:

Table 2.5: Summary of Pinker's (1989: 126-127) Classification in English

Figure-Alternating verb classes	Ground-Alternating verb classes
(1) "pile"-class: pile, stack, heap (2) "spray"-class: spray, sprinkle, splash (3) "scatter"-class: scatter, sow (4) "smear"-class: spread, smear, paint, rub	(1) "stuff"-class: stuff, cram, jam (2) "load"-class: load, stock, pack

Let us first consider the classes of Figure-Alternating verbs in Korean. The first class of Figure-Alternating verbs is the "pile"-class. Since the Korean verb *ssahta* can correspond to all of *pile*, *heap,* and *stack* in English, the "pile"-class in Korean includes only the verb *ssahta*. The "pile"-class in English corresponds to a Non-alternating Figure verb in Korean. The second class of Figure-Alternating verbs is the "spray"-class. Verbs of the "spray"-class in Korean include *ppulita* 'spray/sprinkle', *cuiphata* 'inject', and *thwikita* 'splash/spatter', and they are also Non-alternating Figure verbs in Korean. The third class of Figure-Alternating verbs is the "scatter"-class. Note that since the single Korean verb *ppulita* corresponds to all of *spray, sprinkle, scatter,* and *sow*, Korean does not seem to have specific verbs corresponding to the "scatter"-class in English. The fourth class of Figure-Alternating verbs is the "smear"-class. Verbs of the "smear"-class include *paluta* 'smear/spread/dab', *chilhata* 'paint/brush', and *munciluta* 'rub'. They are Figure-Alternating verbs in English and are also syntactic Alternators in Korean.

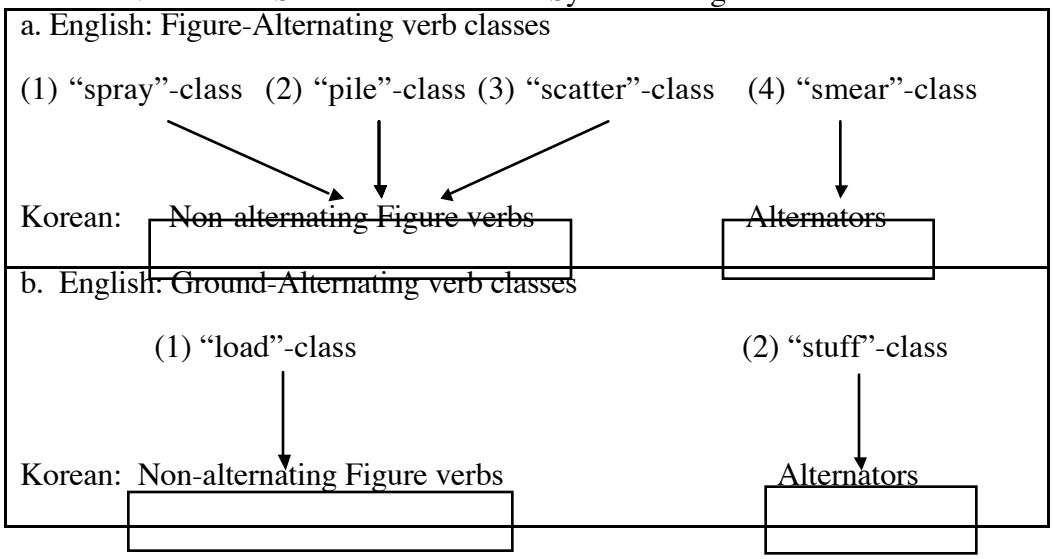
According to the generalizations for Korean locative verbs, we expect that verbs of all Figure-Alternating verb classes in English should correspond to Non-alternating Figure verbs in Korean, because they have a basic manner of motion meaning. Among four subclasses of Figure-Alternating verbs, verbs of the three classes, such as the "pile", the "spray", and the "scatter"-classes, follow the generalizations in that they are Non-alternating Figure verbs in Korean. Nevertheless, verbs of the "smear"-class do not follow the generalizations in that they are syntactic Alternators in Korean.

Let us next consider the classes of Ground-Alternating verbs. The first class of Ground-Alternating verbs is the "stuff"-class. Verbs of the "stuff"-class, which are Ground-Alternating verbs in English, correspond to Alternators in Korean. Verbs of this class in Korean include *meywuta* 'cram/pack', *chaywuta* 'stuff', and *makta* 'wad/stuff'. The second class of Ground-Alternating verbs is the "load"-class. Verbs of the "load"-class, which are Ground-Alternating verbs in English, correspond to Non-alternating Figure verbs in Korean. Verbs of this class in Korean include *sitta* 'load', *cecanghata* 'stock', and *ssata* 'pack'.

According to the generalizations for Korean locative verbs, we expect that both verbs of the "stuff"-class and the "load"-class should correspond to Alternators in Korean, because they have a basic change-of-state meaning. Nevertheless, verbs of the "load"-class do not fit into the generalizations in that they are Non-alternating Figure verbs in Korean.

Table 2.6 summarizes which classes follow the proposed generalizations for Korean locative verbs and which classes do not follow them.

Table 2.6: Verbs with Similar and Different Syntax in English and Korean



As shown in Table 2.6, there are two classes that do not follow the two generalizations I proposed. The smear-class, which is defined as one of subclasses of Figure-Alternating verbs in English, corresponds to syntactic Alternators in Korean. The load-class, which is defined as one of subclasses of Ground-Alternating verbs in English, corresponds to Non-alternating Figure verbs in Korean. Therefore, we are now left with the problem of explaining why verbs of the "smear"-class and the "load"-class do not fit into the proposed generalizations in (24).

2.4.2.1 Revising Pinker's Classification for Korean

In the previous section, we found that there are two subclasses of verbs that do not fit the generalizations in (24): One is the "smear"-class, and the other is the "load"-class. To find a possible solution to these remaining puzzles, I will re-examine Pinker's classification of basic Figure verbs and basic Ground verbs in this section.

Let us first consider verbs of the "load"-class, which do not follow the generalizations for Korean locative verbs. According to Pinker's classification, verbs of

the "load"-class are Ground-Alternating verbs in English, based on evidence from PP omission plus his own intuition. For example, Pinker (1989: 125) notes that "*he loaded the gun* sounds like a complete thought, whereas *he loaded the bullets* is grammatical but feels like a truncated version of *he loaded the bullets into the gun*".

In contrast, Jones & Radhakrishnan (1994),[9] Tenny (1994: 219),[10] and a grammaticality judgement study I conducted[11] show that the Alternating verb *load* in English is equally acceptable without both *into*/*onto* and *with* phrases, as shown in (25):

(25) a. John loaded the hay (into the wagon$_{\text{Ground}}$).
b. John loaded the wagon (with hay$_{\text{Figure}}$).

As shown in (25), the Alternating verb *load* shows optionality of both the Figure and Ground arguments in both syntactic frames. The question we might raise is whether we should follow more subtle intuition, in the case of verbs where both arguments are optional. If so, how can this intuition be justified? Pinker has provided no theoretical or

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9 Jones and Radhakrishnan (1994) claim that the Alternating verbs *spray* and *load* show optionality of the PP argument in both Figure and Ground frames (load the hay/load the wagon), whereas other Alternating verbs like *pile*, *scatter, drizzle,* or *spread*, show optionality of the PP argument in Figure frames only (pile the books/*pile the shelf). They also used adjectival passives to show different syntactic possibilities between the spray/load verbs and other Alternating verbs. For example, 'a piled shelf' and 'some spread bread' are unacceptable, whereas 'loaded hay' and 'a loaded wagon' are acceptable.

10 Tenny (1994: 129) points out that, although speakers may vary on the judgement of whether or not both (25a) and (25b) are acceptable, they both were judged to be acceptable by a large number of English speakers.

11 I examined grammaticality judgments by 10 native speakers of English for 16 Alternating verbs selected from Pinker's (1989) list of locative verbs. I found that both Figure and Ground arguments of verbs like *load, pack,* and *spray,* were judged to be optional (see Appendix 2.B for more detailed results).

experimental basis for anyone to prefer his intuitions in particular. Even if we may happen to agree with his intuition, it will not be much use to a learner.

In addition, the Alternating verb *pack* shows the same syntactic possibilities as the Alternator *load* as in (26).

(26) a. John packed books (into the box$_{Ground}$).
b. John packed the box (with books$_{Figure}$).
(Pinker 1989: 38)

To take another example, the Alternating verb *spray* in English shows the same syntactic possibility as the Alternating verb *load* in that both Figure and Ground arguments are optional, as shown in (27):

(27) a. John sprayed the paint (onto the wall$_{Ground}$).
b. John sprayed the wall (with paint$_{Figure}$).

The example in (27) shows that both Figure and Ground arguments are optional in both syntactic frames of the Alternating verb *spray*. However, Pinker classifies the Alternating verb *spray* as a Figure-Alternating verb based on evidence from PP omission and his own intuition.[12]

An important point is that, although the Alternating verbs *load* and *pack* show the same syntactic patterns as the Alternating verb *spray* in that both Figure and Ground arguments are optional, Pinker (1989) classifies the Alternating verbs *load* and *pack* as Ground-Alternating verbs, and the Alternating verb *spray* as a Figure-Alternating verb. If we strictly follow the PP omission test for distinguishing basic Figure verbs from basic

12 In contrast, a number of studies in the literature report that the sentence (27b) is grammatical, but the sentence (27a) is ungrammatical (Randall 1992; Goldberg 1995).

Ground verbs, then we would expect that verbs like *load, pack,* and *spray* all should belong to the same basic class.

Let us turn our attention now to verbs of the "smear"-class, which do not follow the generalizations for Korean locative verbs. Under Pinker's classification, Alternating verbs like *smear, paint, brush, rub, spread, plaster,* or *dab,* belong to the same narrow-range subclass in that they all describe a "simultaneous contact and motion meaning", and they are Figure-Alternating verbs. If they are Figure-Alternating verbs, according to the generalizations for Korean locative verbs, then we expect that they should correspond to Non-alternating Figure verbs in Korean. But they are syntactic Alternators in Korean.

In contrast to Pinker's classification, Jones & Radhakrishnan (1994) and the grammaticality judgement study reported in Appendix 2.B show that there is a clear syntactic difference between Alternating verbs like *spread*, *smear,* and *dab* and other Alternating verbs like *rub, paint,* and *plaster*: The Ground argument is optional in a syntactic frame of the Alternating verb *spread* in (28), whereas the Figure argument is optional in a syntactic frame of Alternating verbs like *rub, paint,* or *plaster,* as in (29-30).

(28)	a.	John spread the carpet (on the floor$_{Ground}$).	Figure-frame
	b.	John spread the floor *(with carpet$_{Figure}$).	Ground-frame
(29)	a.	John rubbed the water *(on the kittens$_{Ground}$).	Figure-frame
	b.	John rubbed the kittens (with water$_{Figure}$).	Ground-frame
(30)	a.	John painted the oil *(onto the table$_{Ground}$).	Figure-frame
	b.	John painted the table (with oil$_{Figure}$).	Ground-frame

Pinker classifies all of the "smear-class" verbs as Figure-Alternating verbs, based on PP omission. In contrast, I suggest that some verbs like *spread*, *smear,* and *dab* can be defined as Figure-Alternating verbs, whereas the other verbs like *rub* and

paint can be defined as distinguishing Ground-Alternating verbs in English, if PP omission is assumed to be the only way of telling basic meaning components from secondary meaning components.

What I have found so far is as following. First, not all of the "smear"-class listed in Pinker show exactly the same sole argument effect. For example, verbs like *spread* and *smear* show optionality of a Ground PP argument, whereas the other verbs like *paint* and *rub* show optionality of a Figure PP argument. Therefore, I classify verbs like *spread* and *smear* into a Figure-Alternating verb class, whereas I classify the other verbs like *paint* and *rub* into a Ground-Alternating verb class.

Second, verbs of both the "spray"-class and the "load"-class do not show "sole argument effects" at all. Jones and Radhakrishnan (1994) also claim that not all of the Alternating verbs listed in Levin (1993) show the same syntactic possibilities, in terms of PP omission or adjectival passives. For example, verbs like *load* and *spray* do not show sole argument effects (e.g., John loaded the hay/ John loaded the wagon) and allow adjectival passives with both Figure and Ground arguments (e.g., loaded hay/a loaded wagon). In contrast, other verbs like *pile, scatter,* and *spread* show sole argument effects (e.g., John piled the books/*John piled the shelf) and show the restrictions on the adjectival passive (e.g., piled books/*a piled shelf and the scattered seeds/*scattered land).

I suggest that Alternating verbs in English can be classified into three classes: a Figure-Alternating verb class, a Ground-Alternating verb class, and a "pure" Alternating verb class which show no preference for one argument over another, as shown in Table 2.7. The pure Alternators actually project into the syntax in two ways, whereas the other two classes have a basic order and a transformationally derived order.

Table 2.7: Revision of Pinker's Classification

Alternating Verbs in English	Subclasses
Figure-Alternating verb classes	(1) "pile"-class: pile, stack, heap (2) "scatter"-class: scatter, sow (3) "spread"-class: spread, smear
Ground-Alternating verb classes	(1) "stuff"-class: stuff, cram, jam (2) "paint"-class: paint, rub, plaster
Pure Alternating verb classes	(1) "spray"-class: spray, sprinkle, squirt (2) "load"-class: load, pack, stock

We now turn to the question of whether the revised classification in Table 2.7 may explain remaining problems that do not fit into the generalizations given in (24). Let us first consider verbs of the "load"-class. Classifying verbs of the "load"-class as Ground-Alternating verbs, according to Pinker, poses a problem for the generalizations for Korean locative verbs. Instead, I have suggested that verbs of both the "load"-class and the "spray"-class are classified into pure Alternators, which do not show sole argument effects. If we assume that these verbs are basic Figure verbs in Korean, then it would not be surprising that verbs of the "load"-class correspond to Non-alternating Figure verbs in Korean.

Second, Pinker classifies verbs of the "smear"-class (e.g., *smear, paint, brush, rub, spread,* etc.) as Figure-Alternating verbs in English. In contrast with his classification, I have suggested that they can be divided into the "spread"-class, which can be defined as a Figure-Alternating verb class, and the "paint"-class, which can be defined as a Ground-Alternating verb class. According to the revised classification, therefore, we expect that Korean counterparts to the "spread" subclass in English should be Non-alternating Figure verbs in Korean, whereas Korean counterparts to the "paint" subclass in English should be Alternators. As expected, verbs in the "paint"-class, like *chilhata* 'paint' and *munchiluta* 'rub', correspond to Alternators in Korean.

Therefore, the revised classification can explain why these verbs are Alternators in Korean.

However, the "spread"-class does not seem to follow the proposed generalizations. Since the "spread"-class, which is a Figure-Alternating verb class in English by the revised classification, should correspond to a Non-alternating Figure verb, but this is not true. The verb *spread/smear* is an Alternator in Korean. Nevertheless, there is an interesting semantic contrast between the verb *spread* in (31) and the verb *spread* in (32). The English verb *spread* in (31) and (32) corresponds to two different verbs in Korean, depending on the context. For example, the verb *spread* in (31) corresponds to the verb *paluta* in Korean, which can also correspond to *smear* in English, as shown in (33). In contrast, the verb *spread* in (32) corresponds to the verb *phyelchita* in Korean, as shown in (34).

(31) a. John spread/smeared butter on the bread.
b. John spread/smeared the bread with butter.

(32) a. John spread the carpet on the floor.
b. John spread the floor with carpet.

(33) a. Yumi-ka pethe-lul ppang-ey palu-ess-ta.
Nom butter-Acc bread-Loc spread-Past-Dec
'Yumi spread butter on the bread.'

b. Yumi-ka ppang-ul pethe-lo palu-ess-ta.
Nom bread-Acc butter-with spread-Past-Dec
'Yumi spread the bread with butter.'

(34) a. Yumi-ka khaphet-lul patak-ey phyelchi-ess-ta.
Nom carpet-Acc floor-Loc spread-Past-Dec
'Yumi spread the carpet on the floor.'
b. *Yumi-ka patak-ul khaphet-elo phyelchi-ess-ta.
Nom floor-Acc carpet-with spread-Past-Dec
'Yumi spread the floor with carpet.'

An interesting point is that a semantic contrast between the verb *paluta* in (33) and the verb *phyelchita* in (34) leads to different syntactic possibilities in Korean. For example, the Korean verb *paluta* in (33), which describes a change of shape or distribution of a moving object, allows Ground syntax as well as Figure syntax. In contrast, the Korean verb *phyelchita* in (34), which does not describe any change of shape or distribution of a moving object, is exclusively restricted to Figure syntax.

Therefore, this semantic contrast between two verbs may explain why the Korean verb *paluta* corresponding to the English *spread/smear* allows both Figure and Ground frames, but the Korean verb *phyelchita* corresponding to the English *spread* allows only Figure frames.

2.4.2.2 Jackendoff's (1996) Account

In the previous section, we found that there are two classes that do not follow the generalizations for Korean locative verbs: One class is the "smear"-class and the other is the "load"-class. In this section, I focus on the question of why verbs of the "smear"-class allow Ground syntax as well as Figure syntax in Korean, whereas verbs of the other Figure-Alternating verb classes are restricted to Figure syntax in Korean.

Jackendoff (1996) provides an interesting account for the asymmetry between the "spray"-class and the "smear"-class in English. Following Pinker's (1989) Figure-Alternating verb and Ground-Alternating verb classifications, he divides Figure-Alternating verbs into two subclasses, the "spray"-class and the "smear"-class, based on more subtle semantic properties of these verbs. Jackendoff suggests that although verbs of the "spray"-class and verbs of the "smear"-class, which are syntactic Alternating verbs in English, share the basic event type, *process*, they differ according to how the Figure argument (the moving object) is spatially distributed and the finer-

grained subevent structure. For example, while verbs of the "smear"-class like *smear* and *spread* describe the spatial distribution of the Figure argument over its final location, verbs of the "spray"-class like *spray* and *splash* express the spatial distribution of the Figure argument during its travel. Accordingly, Jackendoff refers to the "smear"-class as 'final-distributive' verbs, and the "spray"-class as 'path-distributive' verbs. For 'final-distributive' verbs like *smear*, the agent's action is continuous through the event. These verbs denote processes requiring the direct initiation and continuous participation of a causing agent, whereas 'path-distributive' verbs like *spray* do not. In fact, water can *spray* or *splash* without landing on anything. Spraying events can continue on their own after they have been initiated by an agent, even take place entirely without an initiating agent (i.e., Water is splashing onto the wall.). The agent's acting on and projecting the Figure argument, and the Figure argument's moving along the path are independent and separate events. The semantic distinction in the entailment of whether or not the Figure argument always ends up over the location, is expressed in the structural property of subevent structure of sentences.

The main point is that for 'path-distributive' verbs like *spray*, the process embedded in the event might convey more semantic salience than the property of the final state. They appear to be lexically more 'process-oriented' in meaning than other locative verbs. In contrast, for 'final-distributive' verbs like *smear* or *spread*, the property of the final state embedded in the event might carry more semantic salience than that of the process. They appear to be lexically more 'change-of-state-oriented' in meaning than other locative verbs. Therefore, this explains why 'path-distributive' verbs like *spray* and *splash* are all restricted to Figure-frames in Korean, whereas 'final-distributive' verbs like *spread* and *smear* allow Ground frames in Korean. Furthermore, we expect that

'final-distributive' verbs will be more likely to allow Ground frames than 'path-distributive' verbs will across languages. I will return to this issue in Chapter 3.

Similarly, I pointed out that a semantic contrast between the verb *paluta* and the verb *phyelchita*, which correspond to the English *spread*, leads to different syntactic possibilities in Korean. For example, since the Korean verb *paluta* 'spread/smear' describes a change of shape of a moving object, it allows Ground syntax, whereas since the verb *phyelchita* 'spread' does not entail any change of shape, it does not allow Ground syntax.

In sum, Jackendoff's (1996) distinction between 'path-distributive' verbs and 'final-distributive' verbs based on different semantic weight may affect syntactic possibilities in some languages like Korean, but not others like English. Therefore, this account may explain why verbs of the "spray"-class in English correspond to Non-alternating Figure verbs in Korean, and verbs of the "smear"-class in English correspond to Alternating verbs in Korean.

2.4.2.3 Summary

In this section, I attempted to answer the first question of whether all locative verbs in Korean follow two generalizations I suggested: (1) verbs which have a primary manner of motion meaning component allow Figure frames; (2) verbs which have primary change of state meaning component allow Ground frames as well as Figure frames. Based on finding some puzzles that do not follow these generalizations, I tried to explain these remaining puzzles. First, I re-examined Pinker's classification of basic Figure verbs and basic Ground verbs, and revised his classification, based on evidence from PP omission. I showed how revising Pinker's classification explains the remaining puzzles in Korean

In addition, I reviewed Jackendoff's (1996) account of the asymmetry between the "spray'-class and the "smear"-class. Jackendoff divides Figure Alternating verbs into the 'path-distributive' verb class (the "spray"-class) and the 'final-distributive' verb class (the "smear"-class). The asymmetry between the "spray"-class and the "smear"-class is that verbs of the 'spray'-class appear to be more 'process-oriented', whereas verbs of the 'smear'-class appear to be more 'change-of-state oriented'. This semantic contrast can explain why verbs of the "smear"-class allow both Ground and Figure frames in Korean, but verbs of the "spray"-class are limited to Figure frames in Korean.

2.4.3 Testing Basic Forms in Korean

Let us now turn to the second question I raised: Is there any way of distinguishing the "fill"-class and the "stuff"-class in Korean, in terms of their basic semantic components. In the previous section, we saw how "sole argument effects" distinguish Figure Alternators from Ground Alternators in English.

If PP omission is an important cue to distinguishing basic Figure verbs from basic Ground verbs in English, and if a learner is going to use this cue, then the PP omission test must be usable across languages. Since languages like English do not allow the omission of arguments freely, we can tell which sentences without a PP argument are grammatical or ungrammatical. In contrast, sentences without a PP argument are always grammatical in Korean, given an appropriate context, as shown in (35) and (36):

(35) a. Yumi-ka peint-lul chilha-yess-ta.
Nom paint-Acc paint-Past-Dec
'*Yumi painted paint (on the wall).'
b. Yumi-ka pyek-ul chilha-yess-ta.

Nom wall-Acc paint-Past-Dec
'Yumi painted the wall (with paint).'

(36) a. Yumi-ka mwul-ul chaywu-ess-ta.
Nom water-Acc fill-Past-Dec
'*Yumi filled water (into the cup).'
b. Yumi-ka cep-ul chaywu-ess-ta.
Nom cup-Acc fill-Past-Dec
'Yumi filled the cup (with water).'

The PP omission test for distinguishing Figure Alternators from Ground Alternators might not work across languages. Therefore, this may be a serious problem if the learner is going to need to use this information.

Raising the direct object to subject position can be another possible test for "basic" forms (see Hale and Keyser 1993 etc.) For example, verbs like *pour, pile, spray*, and *sprinkle*, which have a basic manner of motion meaning component, only allow Figure arguments to be raised to subject position, as shown in (37) and (38). In contrast, verbs like *fill* and *stuff*, which have a basic change of state meaning component, only allow Ground arguments to be raised to subject position, as shown in (39) and (40).

(37) a. John poured water into the glass.
b. Water poured into the glass.
c. *The glass poured with water.

(38) a. John piled books on the table.
b. Books piled on the table.
c. *The table piled with books.

(39) a. John filled the glass with water.
b. The glass filled with water.
c. *Water filled into the glass.

(40) a. John stuffed the pillow with feathers.
b. The pillow stuffed with feathers.
c. *Feathers stuffed into the pillow.

However, this test for basic forms also does not work for Korean. For example, even though verbs like *pour*, *spill,* or *pile* are Non-alternating Figure verbs, they do not allow Figure arguments to be raised to subject position, as in (41).

(41) a. Yumi-ka mwul-ul cep-ey pwu-ess-ta.
Nom water-Acc cup-Loc pour-Past-Dec
'Yumi poured water into the cup.'

b. *mwul-i cep-ey pwu-ess-ta.
water-Nom cup-Loc pour-Past-Dec
'Water poured into the cup.'

On the other hand, Jones and Radhakrishman (1994) used adjectival passive forms to distinguish pure Alternators like *load* and *spray* from the other Alternators like *pile* and *spread*. For example, Figure-Alternating verbs fail to participate in the adjectival passive of a Ground argument, as shown in (42), whereas Ground Alternators fail to participate in the adjectival passive of a Figure argument, as shown in (43). In addition, pure Alternators like *load* and *spray* allow the adjectival passive forms of both Figure argument and Ground argument, as shown in (44).

(42) a. *a hung room
b. *a heaped room
c. *a piled shelf
d. *scattered land
e. *some spread bread
(Jones and Radhakrishnan 1994: 26)

(43) a. *stuffed feathers
b. *painted watercolors

(44) a. loaded hay/a loaded wagon
b. packed clothes/a packed suitcase

Let us now see whether these adjectival passive forms can distinguish the "fill"-class and the "stuff"-class in Korean, which are both syntactic Alternators in Korean.

Interestingly, verbs in the "fill"-class allow the adjectival passive forms of both Figure argument and Ground argument, as shown in (45) and (46):

(45) a. chaywe-ci-n mwul
fill-Passive-Adject water
'filled water'
b. chaywe-ci-n cep
fill-Passive-Adject cup
'a filled cup'

(46) a. cangsiktwe-e-ci-n ccoch
decorate-Passive-Adject flower
'decorated flowers'
b. cangsiktwe-e-ci-n pang
decorate-Passive-Adject room
'a decorated room'

In contrast, verbs in the "stuff"-class only allow the adjectival passive of a Ground argument, as shown in (47-49).

(47) a. chilhe-ci-n pyek
paint-Passive-Adject wall
'a painted wall'
b. *chilhe-ci-n peint
paint-Passive-Adject paint
'painted paint'

(48) a. palla-ci-n ppang
spread-Passive-Adject bread
'some spread bread'
b. *palla-ci-n pethe
spread-Passive-Adject butter
'spread butter'

(49) a. makhye-ci-n kumeng
cram-Passive-Adject hole
'a crammed hole'
b. *makhye-ci-n som
cram-Passive-Adject cotton
'crammed cotton'

An important point is that the adjectival passive test for basic forms seems to work for Korean Alternators. The adjectival passive test shows that verbs of the "stuff"-class in Korean can be Ground Alternators, and that the "fill"-class can be distinguished from the "stuff"-class. It is quite surprising, though, that this test makes the "fill"-class more liberal than the "stuff"-class in Korean. The "stuff"-class in Korean is like English, whereas the "fill"-class in Korean is quite different from that in English.

2.4.4 Distinguishing the "Pile"-class from the "Pour"-class in Korean

We now turn to the third question of whether there is any way of distinguishing the "pour"-class (Non-alternating Figure verbs in English) from the "pile"-class (Figure-Alternating verbs in English) in Korean. In the previous section, we found no syntactic distinction between the "pour"-class and the "pile"-class in Korean, in the respect that they are all Non-alternating Figure verbs in Korean. Furthermore, the absence of a syntactic contrast between the "pour"-class the "pile"-class in Korean could imply a lack of semantic contrast. For example, the fact that the verb *pile* in English allows both Figure and Ground frames, implies the availability of both a manner of motion meaning and a change of state meaning. In contrast, the fact that its counterpart *ssahta* 'pile' allows only the Figure-frame, may imply the availability of a manner of motion meaning but lack of a change of state meaning.

In this section, I provide evidence for the claim that Korean does draw a syntactic distinction between the "pour"-class and the "pile"-class. The evidence comes from overt serializing verbs in Korean, which are constructed by combining two verbs. First, note that neither the verb *ssahta* 'pile' in (50) nor the verb *nohta* 'put' in (51) allows syntactic alternation. They are exclusively restricted to Figure syntax when used

individually. However, serializing two motion verbs *ssahta-a nohta* 'pile-put', both of which only allow the Figure syntax, change their syntactic possibilities, as shown in (52)[13]:

(50) a. Yumi-ka chaek-lul chaeksang-ey ssa-ass-ta.
Nom book-Acc table-Loc pile-Past-Decl
'Yumi piled books on the table.'

b. *Yumi-ka chaeksang-ul chaek-elo ssa-ass-ta.
Nom table-Acc book-with pile-Past-Decl
'Yumi piled the table with books.'

(51) a. Yumi-ka chaek-lul chaeksang-ey noh-ass-ta.
Nom book-Acc table-Loc put-Past-Decl
'Yumi put books on the table.'

b. *Yumi-ka chaeksang-lu chaek-elo noh-ass-ta.
Nom table-Acc book-with put-Past-Decl
'Yumi put the table with books.'

(52) a. Yumi-ka chaek-lul chaeksang-ey **ssa-a-noh-**ass-ta.
Nom book-Acc table-Loc pile-put-Past-Decl
'Yumi piled books on the table.'

b. Yumi-ka chaeksang-lu chaek-elo **ssa-a-noh**-ass-ta.
Nom table-Acc book-with pile-put-Past-Decl
'Yumi piled the table with books.'

Adding the motion verb *nohta* 'put' to the verb *ssahta* 'pile', the complex predicate *ssah-a-noh-ta* 'pile-put' in (52) does allow for alternation, suggesting the availability of a change of state meaning. Assuming that a change of state meaning is not coming from the motion verb *nohta* 'put', then it must be coming from the verb root *ssahta* 'pile'. Verbs with the same syntax as *pile*, such as *spray* and *load*, which are syntactically

13 Based on the data in Lee (1998), Sells (1998) also independently points out that although neither *nohta* "put" as a main predicate, nor *ssah-ta* as a main predicate, allows the locative alternation, the complex predicate *ssah-a-noh-ta* allows the locative alternation. His suggestion is that the verbal complex in Korean has properties that are not directly attributable to V_1, but rather seem to come from the combination of V_1 with the specific V_2 which selects for it.

Figure-Alternating verbs in English but Non-alternating Figure verbs in Korean, also show the same syntactic possibilities as the verb *pile*.

(53) a. Yumi-ka mwul-ul pyek-ey **ppuli-e-noh**-ass-ta.
Nom water-Acc wall-Loc spray-put-Past-Dec
'Yumi sprayed water on the wall.'
b. Yumi-ka pyek-ul mwul-lo **ppuli-e-noh**-ass-ta.
Nom wall-Acc water-with spray-put-Past-Dec
'Yumi sprayed the wall with water.'

(54) a. Yumi-ka sakwa-lul truck-ey **sil-e-noh**-ass-ta.
Nom apple-Acc truck-Loc load-put-Past-Dec
'Yumi loaded apples on the truck.'
b. Yumi-ka truck-ul sakwa-lo **sil-e-noh**-ass-ta.
Nom truck-Acc apple-with load-put-Past-Dec
'Yumi loaded the truck with apples.'

In contrast, when the motion verb *nohta* 'put' is overtly serialized to verb roots which are Non-alternating Figure verbs in both English and Korean, the syntactic possibilities do not change, as shown in (55) and (56):

(55) a. Yumi-ka mwul-ul cep-ey **pwu-e-noh-**ass-ta.
Nom water-Acc glass-Loc pour-put-Past-Dec
'Yumi poured water into the glass.'
b. *Yumi-ka cep-ul mwul-lo **pwu-e-noh**-ass-ta.
Nom glass-Acc water-with pour-put-Past-Dec
'*Yumi poured the glass with water.'

(56) a. Yumi-ka mwul-ul patak-ey **epsil-e-noh**-ass-ta.
Nom water-Acc floor-Loc spill-put-Past-Dec
'Yumi spilled water on the floor.'
b. *Yumi-ka patak-ul mwul-lo **epsil-e-noh**-ass-ta.
Nom floor-Acc water-with spill-put-Past-Dec
'*Yumi spilled the floor with water.'

If a change of state meaning is not available to the verb root *ssahta* 'pile' in Korean, then how could we explain the fact that the overtly serialized verb *ssa-a-nohta* 'pile-put'

allows alternation, but the overtly serialized verb *pwu-e-nohta* 'pour-put' allows only the Figure syntactic frame in Korean? Based on this analysis, I suggest that Korean does draw a syntactic distinction between the "pile"-class and the "pour"-class. Nevertheless, there is still a mystery why serialization has this effect.

2.5 Conclusion

The main purpose of this chapter was to find out the range of cross-linguistic similarities and differences in the syntax and semantics mappings of locative verbs. In section 2.2, I reviewed Pinker's lexical semantic approach, in order to examine how his theory explains English locative verbs. In section 2.3, I explored the syntactic pattern of locative verbs in Korean. I found that there are some similarities and some differences in the syntax of locative verbs in English and Korean. Despite obvious differences in the syntax of locative verbs in English and Korean, we found that two linking rules are valid in English and Korean:(1) verbs which have a primary manner of motion meaning allow Figure frames and (2) verbs which have a primary change of state meaning allow Ground frames.

In section 2.4, I began by raising three questions which need to be answered. The first question was whether or not all locative verbs in Korean fit into the two generalizations above. I showed that there are some exceptions that do not follow these generalizations, although most of verbs followed them. In order to find a possible solution to these problems, I revised Pinker's classification of basic Figure verbs and basic Ground verbs, based on evidence from PP omission. Alternatively, I reviewed Jackendoff's (1996) account, which explains the asymmetry of the "spray"-class and the "smear"-class in terms of different semantic weight, in order to find out why verbs

of the "smear"-class correspond to Alternators in Korean, whereas verbs of the "spray"-class correspond to Non-alternating Figure verbs in Korean.

The second question was whether two Alternator classes in Korean, namely the "fill"-class and the "stuff"-class, can be distinguished by using a test for basic forms like PP omission. Although the PP omission test does not work for Korean Alternators, I showed that the "fill"-class and the "stuff"-class can distinguished by using adjectival passive forms. Despite the fact that the adjectival passives can be usable across languages, the question is whether children can use this cue for learning syntactic possibilities of locative verbs.

The third and final question was whether Korean can draw extra syntactic distinctions between the "pour"-class (Non-alternating Figure verb class in English) and the "pile"-class (Figure-Alternating verb class in English), which correspond to Non-alternating Figure verb classes in Korean. I showed that the "pour"-class can be distinguished from the "pile"-class by using overt serialization.

The remaining question is how a learner succeeds in learning the syntax of locative verbs despite the potential problems raised by cross-linguistic differences. In order to answer this question, we need to know where cross-linguistic variation comes from in the syntax of locative verbs, which will be discussed in the following chapter.

APPENDIX 2.A: GRAMMATICALILTY JUDGEMENT TASK FOR LOCATIVE VERBS

2.A.1 Subjects and Procedure

In order to discover the structure of locative verbs in Korean and English, 15 native speakers of Korean and 15 native speakers of English at the University of Delaware were given a task in which they were asked to judge the grammaticality of a set of verbs placed in each of two syntactic contexts, one the Figure version and the other the Ground version, as shown in (57)-(59). There were approximately 20 locative verbs in each language, chosen to cover a range of Figure, Ground, and Alternator locatives in English and their corresponding verbs in Korean. We made a detailed comparison of the Korean equivalents of Levin's (1993) list of locative verbs. In the first syntactic context, each verb was presented with the figure object placed in direct object position, and in the second syntactic context, each verb was presented with the ground placed in direct object position, as follows:

Figure verbs in English
(57) a. John poured water into the glass.
b. *John poured the glass with water.

Ground verbs in English
(58) a. I decorated the tree with flowers.
b. *I decorated flowers onto the tree.

Alternating Verbs in English
(59) a. I loaded apples on the truck.
b. I loaded the truck with apples.

Participants were asked to judge on a 3 point scale how grammatical each sentence was: A rating of 1 meant that the sentence was completely grammatical, 2 meant that the sentence was possible but it was never used, and 3 meant that the sentence was completely ungrammatical.

2.A.2 Results

First, five of the verbs were judged to be Figure verbs in both languages (English: *pour, spill, put, hang,* and *stick*; Korean: *pusta* 'pour', *hullita* 'spill', *nehta* 'put', *kelta* 'hang', and *pwuchita* 'stick'), as shown in Table 2.8:

Table 2.8
Mean Ratings for Verbs that are Figure Verbs in Both English and Korean

Locative verbs (English/Korean)	Figure	Ground
1. E: pour	1	2.93
K:pusta (pour into)	1	3
2. E: spill	1	2.87
K: hullita	1	3
3. E: put	1	3
K:nehta (tamta)	1	3
4. E:hang	1	2.73
K:kelta	1	3
5. E:stick	1	2.73
K:pwuchita	1	2.67

Second, Table 2.9 shows that three of the verbs were Alternators in both languages (English: *paint, smear*, and *cram*; Korean: *chilhata* 'paint', *paluta* 'smear', and *meywuta* 'cram'). Note that in both languages, all ratings were close to "1", indicating that both syntactic contexts were judged to be grammatical.

Table 2.9
Mean Ratings for Verbs that are Alternators in Both English and Korean

Locative verbs	Figure	Ground

1. E: paint[14] K: chilhata	1.93 1	1.13 1.2
2. E: smear (or spread) K: paluta	1.2 1	1.6 1.2
3. E:cram K:meywuta	1.13 1.47	1.4 1

Third, Table 2.10 shows that five of the verbs were Alternators in English, but Figure-object verbs in Korean (English: *pile, load, spray, sow,* and *dab*; Korean: *ssahta* 'pile', *sitta* 'load', *ppwulita* 'spray/sow', and *mwuchita* 'dab'). Note that, in English, all ratings were close to "1", indicating that both syntactic contexts were grammatical, whereas in Korean, ratings were close to "1" in the Figure structure but ratings were close to "3" in the Ground structure, indicating that only the Figure syntactic context was grammatical in Korean.

Table 2.10
Mean Ratings for Verbs that are Alternators in English but Figure Verbs in Korean

Locative verbs	Figure	Ground
1. E:dab K:mwuchita	1 1	1.13 2.6
2. E:pile K:ssahta	1.07 1	1.2 2.73
3. E:load K:sitta	1.07 1	1.2 2.73
4. E:spray	1.07	1.27

14 Even though we put *paint* into an Alternator in English, our study showed that this verb is strongly toward the Ground frame. However, Colin Phillips (p.c.) points out that this might be due to the fact that we used the same arguments in both the Figure and Ground frames. That is, the verb *pain*t works best with different arguments, depending on the frame used, as follows:

a. John painted a picture on the wall./ b ??John painted non-drip emulsion on the wall.

K:pwulita	1	3
5. E:sow	1.07	1.6
K:pwulita	1	2.8

Fourth, Table 2.11 shows that five of the verbs were Ground verbs in English, but Alternators in Korean (English: *cover, bandage, soak, fill,* and *decorate*; Korean: *tepta* 'cover', *kamta* 'bandage', *ceksita* 'soak', *chaywuta* 'fill', and *cangsikhata* 'decorate'). Note that in English, ratings were close to "1" for the Ground structure but were close to "3" for the Figure structure, indicating that only the Ground syntactic context was grammatical in English. In contrast, in Korean, all ratings were close to "1", indicating that both syntactic contexts were grammatical in Korean.

Table 2.11
Mean Ratings for Verbs that are Ground Verbs in English but Alternators in Korean

Locative verbs	Figure	Ground
1. E:cover	2.87	1
K:tepta	1	1.07
2. E:bandage	2.6	1
K:kamta	1	1.2
3. E:soak	2.6	1
K:ceksita	1.07	1.27
4. E:fill	2.73	1
K:chaywuta	1	1.2
5. E:decorate	2.6	1.13
K:cangsikhata	1.4	1

Finally, Table 2.12 shows that only one verb was a Ground-object verb in both languages (English: *dirty*; Korean: *telephita* 'dirty'). Note that in both languages, ratings were close to "1" for the Ground structure, indicating that the Ground syntactic context was grammatical in English and Korean.

Table 2.12
Mean Ratings for Verbs that are Ground Verbs in Both English and Korean

Locative verbs	Figure	Ground
E: dirty	2.93	1
K:telephita	3	1

Interestingly, the only Korean Ground-object verb *telep-hi-ta* 'dirty' we found requires the overt causative morpheme *-hi*, so we may conclude that there are no pure Ground-object verbs in Korean. It is still interesting to ask why this does not allow alternation.

APPENDIX 2.B: A PRELIMINARY STUDY OF PP OMISSION IN ENGLISH

10 native speakers of English were given a task in which they were asked to judge the grammaticality of a set of Alternating verbs in each of two syntactic contexts, one the Figure version in (60a) and (61a) and the other the Ground version in (60b) and (61b), in order to examine optionality of a PP argument. 16 Alternating verbs were selected from Pinker's (1989) list of locative verbs. Pinker used a PP omission test to distinguish Figure-Alternating verbs (basic Figure verbs) from Ground-Alternating verbs (basic Ground verbs). I wanted to know whether all locative verbs in Pinker's narrow-range subclasses accurately follow the PP omission test.

(60) Figure-Alternating verbs
a. John piled the books.
b. *John piled the shelf.

(61) Ground-Alternating verbs
a. *John stuffed the feather.
b. John stuffed the pillow.

According to Pinker's classification, among 16 Alternating verbs, 11 verbs in this study were Figure-Alternating verbs and 5 verbs were Ground-Alternating verbs.

(62) Figure-Alternating verb classes
a. Verbs of the "spray"-class: *spray, splash, spatter*
b. Verbs of the "scatter"-class: *scatter*
c. Verbs of the "pile"-class: *pile* and *stack*
d. Verbs of the "smear"-class: *paint, smear, spread, rub,* and *dab*

(63) Ground-Alternating verb classes
a. Verbs of the "stuff"-class: *stuff* and *cram*
b. Verbs of the "load"-class: *load* and *pack*
c. Verbs of the "wrap"-class: *wrap*

The results of this pilot study show that Alternating verbs can be divided into three classes, based on the PP omission test. One class is a Figure-Alternating verb class, which allows only the Figure frame to occur without a PP argument. Verbs in this class included *spatter, pile, stack, scatter, dab, spread*, and *smear*. Table 2.13 shows the percentage of Figure frames of verbs in this class used by 10 English native speakers.

Table 2.13: Percentage of Figure Frames of Figure-Alternating Verbs

	V-NP only	
	Figure frame	Ground frame
pour	100%	0%
stack	100%	0%
scatter	100%	0%
spatter	100%	0%
dab	100%	0%
spread (1)	100%	0%
spread (2)	100%	40%
smear	100%	40%

Note that in the case of the verb *spread*, I provided 10 participants with two different contexts: (1) John spread the carpet./John spread the floor.; (2) John spread the

butter./John spread the bread. Interestingly, 10 native speakers of English do not allow the Ground frame in the context (1). In contrast, 4 participants allow both Figure and Ground frames in the context (2), although the other participants only allow Figure frames.

Another class is a Ground-Alternating verb class, which allows only the Ground frame to occur without a PP argument. The verbs in this class included *paint, rub, wrap, stuff,* and *cram*. Note that Pinker classifies verbs like *paint* and *rub* as Figure-Alternating verbs. However, these verbs were judged to be Ground-Alternating verbs by 10 native speakers of English, as shown in Table 2.14.

Table 2.14: Percentage of Figure Frames of Ground-Alternating Verbs

	V-NP only	
	Figure frame	Ground frame
paint	0%	100%
rub	0%	100%
wrap	0%	100%
stuff	0%	100%
cram	0%	100%

The third class is a pure Alternator verb class, which allows both a Figure frame and a Ground frame without a PP argument. The verbs in this class included *spray, splash, load,* and *pack*. Note that Pinker classifies the verbs like *load* and *pack* as Ground-Alternating verbs. However, participants in this study allowed both Figure and Ground frames when a PP argument was omitted, as shown in Table 2.15.

Table 2.15: Percentage of Figure Frames of Pure-Alternating Verbs

	V-NP only	
	Figure frame	Ground frame
spray	90%	100%
sprinkle	100%	100%
load	80%	100%
pack	80%	100%

The following table summarizes the results of this study:

Table 2.16: Three Subclasses of Alternators in English

Classes	Verbs
Figure-Alternating verbs	spatter, pile, stack, scatter, dab, spread, smear
Ground-Alternating verbs	paint, rub, wrap, stuff, cram
Pure Alternating verbs	spray, splash, load, pack

Chapter 3

CROSS-LINGUISTIC VARIATION IN SYNTAX-SEMANTICS CORRESPONDENCES

3.1 Introduction

In Chapter 2, I examined the syntactic pattern of locative verbs in English and Korean, in order to find out the range of cross-linguistic similarities and differences in the syntax and semantics of locative verbs. One striking cross-linguistic difference for locative verb syntax is that Korean always allows Figure syntax as well as Ground syntax with change of state verbs that English allows only in Ground frames. For example, "fill"-class verbs (e.g., *fill, cover, decorate,* and *soak*) which allow only Ground frames in English, allow both Figure and Ground frames in Korean. This raises the question of how a learner can take advantage of syntax-semantics correspondences in the face of the problem of cross-linguistic variation. If syntax-semantics mappings are not universal, how could the learner use these mappings?

In order to solve the learnability problem raised by cross-linguistic variation, we need to find out where cross-linguistic variation in the syntax of locative verbs comes from. Therefore, the first part of this chapter accounts for why Korean always allows Figure syntax with all locative verbs. In section 3.2, I suggest that the availability of Figure frames with a Ground verb correlates with the availability of V-V compounding or verb serialization. First, I show that V-V compounding, which is mainly found in SOV languages, share the same properties as Verb serialization, which is typically found in the

Kwa languages of West Africa and a number of other language families, in particular in terms of an argument sharing property.

The generalization is that in a given language the syntax of a locative verb allows Figure-frames with *all* locative verbs only if the morphology of the language freely permits V-V compounding/Verb serialization. The point of cross-linguistic diversity that appears to determine both the availability of complex predicates and the availability of Figure syntax is characterized as follows:

Locative Verb Syntax and V-V Compounds

- In a language all locative verbs always allow Figure frames only if the language allows V-V Compounding/ Verb serialization.

The evidence in support of the striking connection between locative verb syntax and V-V compounding/verb serialization comes from a wide range of languages I have looked at. I show that much of cross-linguistic variation in the syntax of locative verbs is restricted, dividing languages into two basic classes. Korean-type languages always allow Figure frames for *all* locative verbs, whereas English-type languages allow Non-alternating Ground verbs. Furthermore, all of the Korean-type languages, and none of the English-type languages, allow V-V compounding or verb serialization. In addition, I attempt to answer the following question: Why should verb compounding/serialization correlate with locative verb syntax. I suggest that creating a Figure frame based on a Ground verb like *fill* or *cover* depends on a property of verb serializing system like argument sharing.

In section 3.3, I review two different lexical approaches. The first approach is to claim that differences in the syntax of locative verbs are due to differences in the meanings of individual lexical items across languages. I provide several pieces of

evidence for excluding this approach. The second approach is based on Tamly's (1985, 1991) and Juffs' (1996) accounts, which claim that differences in the lexicalization patterns of a verb lead to the cross-linguistic differences in the mapping between syntax and semantics. I show that these typological approaches do not correlate with locative verb syntax. Finally, I also show that the distribution of a number of other properties of languages that I have looked at appears not to correlate with their syntax for locative verbs.

In section 3.4, I examine the classes of verbs across languages which correspond to syntactic Alternators in English (e.g., the "pile"-class verbs and the "stuff"-class verbs), in order to find out to what extent there are language-specific syntax-semantics correspondences across languages. Finally, I show what are universal syntax-semantics correspondences, what are group-specific syntax-semantics correspondences, and what are language-specific correspondences.

3.2 Group-specific Syntax-Semantics Correspondences

The main aim of this section is to answer the question of why Korean always allows Figure syntax as well as Ground syntax with Ground verbs (e.g., "fill"-class verbs) that English allows only in Ground frames. Where does this cross-linguistic variation come from? I show that V-V compounding or verb serialization correlates with the syntactic possibilities for locative verbs in a given language, and explain why V-V compounding should correlate with locative verb syntax. I further show that the evidence in support of this strong connection between locative verb syntax and V-V compounding or verb serialization comes from my survey of 13 languages.

3.2.1 Locative Verb Syntax and V-V Compounding/Verb Serialization

Serial verb constructions (SVCs) are typically defined as a phenomenon where a sequence of verbs and their complements (if any) with one subject and one tense/aspect agreement marker appears in a single sentence without any markers of coordination or subordination, and they are typically found in the Kwa languages of West Africa, Carribean creoles, and some East Asian languages including Chinese and Thai (Li and Thompson 1981; Sebba 1987; Baker 1989; Schiller 1990; Hale 1991; Collins 1997 among others). SVCs are illustrated in the following examples:

(1) a. Wo **da** fufu **du**.
they cooked fufu eat
'They cooked fufu and ate it.' (Ewe)

b. Adha **si-ri** anu **ri-e**.
Ada cook-asp meat eat-asp
'Ada cooked the meat and ate it.' (Igbo)

(2) a. Femi **ti** Akin **subu**.
push fall
'Femi pushed Akin down.' (Yoruba)

b. Me **nya** devi-ɛ **dzo**.
I chased child-Def leave
'I chased the child away.' (Ewe)

The key property of verb serialization for syntactic theory is argument sharing. The examples in (1) illustrate direct-object sharing Serial Verb constructions (SVCs). Since in a SVC the second verb cannot have an independent object, the internal argument of the second verb must be exactly the same as the first object. Second, the examples in (2) illustrate resultative SVCs. When the second verb in the series is unaccusative, it takes the object of the first verb as subject. Assuming that the surface subject of the unaccusative verb is underlying object, a resultative SVC is also an instance of internal argument sharing. Therefore, the main property of SVCs is the following (Baker 1989; Collins 1997):

(3) *Internal argument sharing in SVCs*
In a serial verb construction, V_1 and V_2 must share an internal argument.
(Collins 1997: 463)

In the following section, I will show that V-V Compounding, which is mainly found in SOV languages, has the same argument sharing property as Serial verb constructions.

3.2.1.1 Similarities between V-V Compounding and Verb Serialization

Let us now consider V_1-e-V_2 patterns in Korean, which are claimed as examples of Serial verb constructions (SVCs) (S. Lee 1992; Chung 1993; Yi 1997 among others). First, the common syntactic property between the V_1-e-V_2 pattern in Korean exemplified in (4) and the SVC in (1) is that a succession of two verbs appears in a single sentence with one tense marker.

(4) Yumi-ka koki-lul **kwu-e-mek**-ess-ta.
Nom meat-Acc broil-e-eat-Past-Dec
'Yumi broiled and ate the meat.'

As shown in (4), the first verb *kwu-* 'broil' is not marked with any tense morpheme. Instead, it is only the second verb that is marked with the past tense *-ess*. If we mark the V_1 with tense, or if we mark both the V_1 and V_2 with the same tense, then the sentences given in (5a) and (5b) are ungrammatical.

(5) a. *Yumi-ka koki-lul **kwu-ess**-mek-ta.
Nom meat-Acc broil-Past-eat-Dec
b. *Yumi-ka koki-lul **kwu-ess-mess-ess**-ta.
Nom meat-Acc broil-Past-eat-Past-Dec

Another common property between the V_1-e-V_2 pattern in Korean and the SVC is argument sharing.

(6) *Yumi-ka koki-lul kwu-e tak-ul mek-ess-ta.
Nom meat-Acc broil-e chicken-Acc eat-Past-Dec
'Yumi broiled the meat and ate chicken.'

Since in a SVC the second verb cannot have an independent object, the object of the second verb in (6) must be exactly the same as the first object.

We have seen similarities between SVCs in the Kwa languages of West Africa and V_1-e-V_2 patterns in Korean. However, the question of whether V_1-e-V_2 patterns in Korean are considered as V-V compounds or as SVCs has been controversial (B. Kim 1993; S. Lee 1992; Yi 1997), because SVCs are typically found in the SVO languages, where the verbs are separated by the object, whereas they are rare in the SOV languages (Schiller 1990).[1] Following Nishiyama (1998), however, I assume that V-V compounds are examples of Serial Verb Constructions, well known from the Kwa languages. For example, according to Nishiyama, the main similarity between Serial verb constructions and V-V compounds in Japanese is that V_1 and V_2 in these constructions must share an argument.

(7) a. John-ga Bill-o osi-taosi-ta.
Nom Acc push-topple-Past
'John pushed Bill down.'
b. *John-ga Bill-o Mary-o osi-taosi-ta.
Nom Acc Acc push-topple-Past
'John pushed Mary and topples Bill.'

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1 Yi (1997) provides evidence that KSVCs are not lexical compounds, based on the distribution of the plural marker *-tul* in Korean. It is well known that the plural marker *tul* in Korean is a phrasal suffix, which can float from the subject to any non-argument syntactic phrase in a sentence.

(Nishiyama 1998: 171)

In (7), the object of the second verb *topple* must be exactly the same as the object of the first verb *push*, assuming that the verb *topple* in Japanese is a transitive verb.

Another similarity between SVCs and V-V Compounds, as noted by Kageyama (1993) and Li (1993), is that the actual order of events is reflected in the linear order of the sentence, which is referred to as the Temporal Iconicity Condition (see Muysken 1988; Li 1993). This condition is often discussed in the literature on SVCs, but it also holds in V_1-e-V_2 patterns in Korean and Japanese V-V Compounds.

(8) Temporal Iconicity Condition (Li 1993)
Let A and B be two subevents and let A' and B' be two verbal constituents denoting A and B, respectively; then the temporal relation between A and B must be directly reflected in the surface linear order of A' and B' unless A' is an argument of B' or vice versa.

It has been widely noticed that in SVCs the event which happens first in terms of temporal order comes in V_1 position, and that which happens later is denoted in V_2, regardless of whether a language is head-initial or head-final (Muysken 1989; Li 1993). The examples are given in (9):

(9) a. Ewe (head-initial)
Kofi **tso** ati-ɛ **Fo** Yao.
Kofi took stick-def hit Yao
'Kofi took the stick and hit Yao with it.'

b. Ijo (head-final)
arau zu-ye **aki** buru **teri-mi**.
she basket take yam cover-Past
'She covered a yam with a basket.'

In both SVO and SOV languages, the verb phrase for getting hold of the instrument linearly precedes the activity done by the instrument. Without the temporal iconicity

condition, it is not clear why SVO languages like Ewe cannot have 'hit Yao-take the stick' for (9a) or why SOV languages like Ijo cannot have 'a yam cover-a basket take' for (9b).

The V_1-e-V_2 patterns in Korean also show the same phenomenon, as shown in (10) and (11). The meaning in (10a) corresponds to a temporal sequence of the events denoted by V_1 and V_2. The event in (11a), which is typically a causative verb, denotes an action caused by V_1. The important point is that the event denoted by V_2 never precedes the event denoted by V_1, in (10b) and (11b).

(10) a. John-i koki-lul kwu-e-mek-ess-ta.
Nom meat-Acc broil-e-eat-Past-Dec
'John broiled and ate the meat.'

b. *John-i koki-lul **mek-e-kwu**-ess-ta.
Nom meat-Acc eat-e-broil-Past-Dec
'John ate and broiled the meat.'

(11) a. John-i kemi-lul nwul-e-cwuk-i-ess-ta.
Nom ant-Acc crush-e-dead-Caus-Past-Dec
'John crushed the ant dead.

b. *John-i kemi-lul **cwuk-i-e-nwul**-ess-ta.
Nom ant-Acc dead-Caus-crush-Past-Dec

Furthermore, this condition is also found in Japanese V-V compounds. For example, the sentences in (7) would be ungrammatical if the order of verbs in the compound were reversed. That is, the order of the word denoting the pushing event and the word denoting the toppling event is the same, regardless of whether a language is head-initial or head-final.

At this point, we need to point out the difference between English-type complex predicates and Korean-type complex predicates. For example, Synder (1995) claims that English allows complex predicates, which include resultatives (e.g., John hammered the metal flat.) and verb-particle combinations (e.g., Mary picked up the book.). However,

the clear difference between resultatives in English and resultatives in serializing languages lies in the syntactic category of the resultative predicate. In resultatives of non-serializing languages, resultative secondary predicates cannot be verbs, whereas in resultatives of serializing languages, resultative secondary predicates are always verbs (see Larson 1991; Collins 1997).

So far I have shown that V_1-e-V_2 patterns in Korean have the same properties as Serial verb constructions in the Kwa languages of West Africa. The key point is that argument sharing is the main syntactic property of V-V compounding/verb serialization. In the next section, I will show that the striking connection between locative verb syntax and V-V compounding/verb serialization is supported by data from a variety of languages I have surveyed.

3.2.2 A Cross-linguistic Survey of Locative verb syntax and V-V Compounding

In this section, I investigate a wider range of languages beyond English and Korean, in order to support the claim that there is a striking connection between locative verb syntax and V-V Compounding/verb serialization.

The main findings from my survey of 13 languages are as follows.[2] First, I have found that much of cross-linguistic variation in the syntax of locative verbs is restricted, dividing languages into two basic classes. One class of languages - which includes Korean, Japanese, Chinese, Thai, Turkish, Hindi, and Luganda[3] - has a very simple pattern for locative verbs. All locative verbs allow Figure frames and there are no Non-

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2 Using a questionnaire I made, I gathered some of the cross-linguistic data of locative verb syntax, based on a lot of locative verbs selected from Levin's (1993) list. Later, I discussed all sentences in the questionnaire with native informants.

3 Luganda is one of the Bantu languages spoken in East Africa.

alternating Ground verbs in these languages. The second class of languages - which includes English, French, Spanish, Singapore Malay, Hebrew, and Najdi Arabic[4] - has both Figure and Ground Non-alternating verb classes, and one or more classes of Alternating verbs. Some examples are shown in (12-22):

English-type languages

"Fill"-class in French: Non-alternating Ground verbs

(12) a. *Marie a décoré les lumières colorées sur l'arbre.
Mary decorated lights colored onto the tree
'*Mary decorated colored lights onto the tree.'

b. Marie a décoré l'arbre avec des lumières colorées.
Marie decorated the tree with lights colored
'Mary decorated the tree with colored lights.'
(Adapted from Juffs 1996: 100)

"Fill"-class in Spanish: Non-alternating Ground verbs

(13) a. *Juan llenó agua en el vaso.
John filled water into the glass
'*John filled water into the glass.'

b. Juan llenó el vaso con agua.
John filled the glass with water
'John filled the glass with water.'

"*Fill"-class in Singapore Malay: Non-alternating Ground verbs*

(14) a. *Saya hias bunga dalam bilik ini.
I decorate flowers inside room this
'*I decorated flowers inside the room.'

b. Saya hias bilik ini dengan bunga.
I decorate room this with flowers
'I decorated the room with flowers.'

"Fill"-class in Najdi Arabic: Non-alternating Ground verbs

(15) a. *John mila moya fi l-kaas.
filled water in the-glass
'*John filled water into the glass.'

b. John mila l-kaas b-moya.
filled the-glass with-water
'John filled the glass with water.'

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4 Najdi Arabic is a member of the Semitic language family. It is spoken in the central region of Saudi Arabia. I also found that there is no apparent difference between Classical Arabic and Najdi Arabic in terms of locative verb syntax.

"Fill"-class in Hebrew: Non-alternating Ground verbs

(16) a. *Danny kisa et ha-mapa al ha-shulxan.
John covered Acc the cloth on the-table
'*John covered the tablecloth on the table.'

b. Danny kisa et ha-shulxan be-mapat-shulxan.
John covered Acc the table with-tablecloth
'John covered the table with the tablecloth.'

Korean-type languages

"Fill"-class in Japanese: Alternating verbs

(17) a. Taro-ga mizu-o baketu-ni mitasi-da.
Nom water-Acc bucket-Loc fill-Past
'*Taro filled water into a bucket.'

b. Taro-ga baketu-o mizu-de mitasi-da.
Nom bucket-Acc water-with fill-Past
'Taro filled a bucket with water'

"Fill"-class in Chinese: Alternating verbs

(18) a. Zhang San wang chuang shang gai le tanzi.
Zhang San to bed on cover-Asp blanket
'*Zhang San covered the blanket onto the bed.'

b.? Zhang San young tanzi gai le chuang.
Zhang San use blanket cover-Asp bed
'Zhang San covered the bed with a blanket.'

"Fill"-class in Thai: Alternating verbs

(19) a. Chan toktang dokmai nai hong.
I decorate flower into room
'*I decorated flowers into the room.'

b. Chan toktang hong duay dokmai.
I decorate room with flower
'I decorated the room with flowers.'

"Fill"-class in Turkish: Alternating verbs

(20) a. John bardag-a su-ylu doldur-du.
John glass-Dat water-Acc filled-Past
'*John filled water into the glass.'

b. John bardag-I su-yla doldur-du.
John glass-Acc water-with filled-Past
"John filled the glass with water.'

"Fill"-class in Luganda: Alternating verbs

(21) a. Petero ya-jju a-mazzi mu-gilaasi.
Petero filled the water into-glass
'*Petero filled water into the glass.'

b. Petero ya-jjuza gilaasi na-mazzi.
Petero filled glass with-water
'Petero filled the glass with water.'

"Fill"-class in Hindi: Alternating verbs

(22) a. John-ne gilaas-me panii bharaa.
John-Erg glass-Loc water-Nom filled
'*John filled water into the glass.'
b. John-ne gilaas-ko paanii-se bharaa.
John-Erg glass-Acc water-with filled
'John filled the glass with water.'

Examples given in (12-22) show that Korean-type languages always allow Figure frames as well as Ground frames with Ground verbs (e.g., *fill, cover*, *decorate,* and *bandage*) that English-type languages allow only in Ground frames. What we never seem to find from the survey of these 13 languages is a language that allows Ground syntax with all locative verbs, or a language that allows only restricted Figure syntax.

The more interesting finding is that the two groups of languages may be distinguishable based on an independent property, namely V-V compounding/verb serialization. Table 3.1 shows that all of the Korean-type languages, and none of the English-type languages, allow V-V Compounding or verb serialization.

Table 3.1: Ground Locative Syntax and V-V Compounding Across Languages

Languages	Ground verb syntax ("fill"-class)	V-V Compounds
English	Ground frame only	no
French	Ground frame only	no
Spanish	Ground frame only	no
Singapore Malay	Ground frame only	no
Najdi Arabic	Ground frame only	no
Hebrew	Ground frame only	no
Korean	Figure and Ground frames	yes
Japanese	Figure and Ground frames	yes
Chinese	Figure and Ground frames	yes
Thai	Figure and Ground frames	yes
Turkish	Figure and Ground frames	yes
Hindi	Figure and Ground frames	yes
Luganda	Figure and Ground frames	yes

Examples of V-V compounding or verb serialization are given in (23):

Examples of V-V Compounding/ serialization in Korean-type languages

(23) a. Yumi-ka ttanghong-ul **sa-a-mek**-ess-ta.
Nom peanuts-Acc buy-Link-eat-Past-Dec
'Yumi bought peanuts and ate them.' (Korean)

b. John-ga niwatori-o **naguri-korisi**-ta.
Nom chicken-Acc beat-kill-Past
'John beat and killed a chicken.' (Japanese: Nishiyama 1998)

c. Baoyu **song-gei** Daiyu yiben shu.
send-give one book
'Baoyu sent Daiyu a book.' (Chinese: Li 1990)

d. Chan **pat** kai **kin**.
I fry chicken ate
'I fried chicken and ate it.' (Thai)

e. John tarug-u **pisir-ip-ye**-di.
chicken-Acc cook-Link-eat-past
'John cooked chicken and ate it.' (Turkish)

e. Na **fumba** a-matoke **lya**.
I cook Matoke ate
'I cooked Matoke and ate it.' (Luganda)

f. John-ne mergii **pakaa-khaayaa**
John-Erg chicken-Nom cook-eat-Perf.M.Sg
'John cooked chicken and ate it.' (Hindi)[5]

The data given in (23) show that Korean-type languages all allow the argument sharing property in their serial verb constructions. However, none of English-type languages allow serial verb constructions.

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5 Butt (1997) reports that Urdu, which is structurally almost identical to Hindi, appears to use more restricted complex predicate patterns than other languages like Korean. The two predicates in an Aspectual complex predicate are construed by a light verb like *fall, put* or *give* and a main verb. Peter Hook (p.c.) and a native speaker of Hindi, however, both inform me that the combination of the two main verbs, as shown in (23f), is possible in Hindi. Regardless of whether there are some restrictions on combining two verbs in Hindi, the main point is that V-V compounding /Verb serialization in Hindi has the same argument sharing property as other languages like Korean and Japanese.

So far I have shown that the cross-linguistic data provide evidence for the striking connection between V-V compounding/verb serialization and the syntax of locative verbs. Interestingly, Synder (1995) suggests that the availiability of N-N Compounding correlates with the availability of English-type complex predicates, which include resultative constructions (e.g., John hammered the metal flat), verb-particle combinations (e.g., John picked the book up), and double object constructions (e.g., John sent Mary a letter). Furthermore, he suggests that the cross-linguistic data provide evidence for a striking connection between N-N compounding and English-type complex predicates (see Synder 1995).

In the following section, I attempt to explain how the availability of verb compounding makes Figure frames available with Ground verbs like *fill* and *cover*.

3.2.3 Explaining the Association of V-V Compounds and Locative verb Syntax

The generalization that I have found so far is that Korean-type languages allow Figure-frames for all locative verbs, whereas English-type languages allow Non-alternating Ground verbs. I have shown that the availability of V-V Compounding/Verb Serialization correlates with the syntax for locative verbs. All Korean-type languages, which always allow Figure-frames for the syntax for locative verbs, allow V-V compounding or serialization, whereas none of the English-type languages, which allow Non-alternating Ground verbs, allow this construction. An important question, then, is why the availability of verb compounding/serialization should correlate with locative verb syntax.

I suggest that the semantic packaging of predicate meanings that is needed in order to use Ground verbs with Figure frames involves exactly the same kind of process seen overtly in serial verb constructions. The generalization to explain is that in a

serializing language, all Ground verbs also allow Figure-frames. I suggest that creating a Figure frame based on a Ground verb depends on a property of verb serializing systems, such as (1) argument sharing, or (2) indirect causation.

One possibility is that the formation of Figure frame syntax with a Ground verb has the semantics of the argument-sharing involved in complex verb formation: the predicates (X affects Y) and (Y affects Z) are combined, and an argument is shared between the predicates, as is characteristic of verb serialization, as in (24).

(24) *Possibility I: Argument sharing*
*John decorated the lights on the tree.
[John affects the lights] + [the lights decorated the tree]

As shown in (24), the argument *the lights* is shared between the predicates, which is a key property of verb serialization. In order to allow a Figure frame with Ground verbs like *decorate*, an argument should be shared by complex verb formation. Therefore, this explains why in a serializing language, all Ground verbs also allow Figure-frames.

In contrast, English does not allow Figure syntax with Ground verbs like *fill* and *decorate*. I have suggested that an argument should be shared by complex predicates, in order to allow a Figure frame with all Ground verbs. However, since English does not allow complex verb formation, there is no way of creating a Figure frame with these verbs. Therefore, the sentence in (24) is ungrammatical in English. Furthermore, this explains why all of the English-type languages, which never allow this complex verb formation, allow Non-alternating Ground verbs.

Another possibility is that the Figure frame use of Ground verbs encodes indirect causation of change-of-state, as in (25). Serializing languages typically allow indirect

causation meanings to be expressed overtly, by overt causative marking on the second verb of the serializing pair.

(25) *Possibility II: Indirect Causation*
*John decorated the lights on the tree.
[John caused the lights to cause the tree to be decorated]

The formation of a Figure frame with Ground verbs like *fill* and *decorate* might then depend on whether a language uses overt causative marking on the second verb of the serializing pair. The evidence for this possibility comes from resultative serial verb constructions in Korean. Interestingly, Korean does not allow the type of resultative SVC, which is typically found in other serializing languages. Instead, this construction is allowed only when an overt causative morpheme is marked on the second verb of the serializing pair:

(26) a. *John-i Bill-ul sswa-a-cwuk-ess-ta
Nom Acc shoot-die-Past-Dec
'John shot Bill dead.'
b. John-i Bill-ul sswa-a-cwuk-**i**-ess-ta
Nom Acc shoot-die-Caus-Past-Dec
'John shot Bill dead.'

The same constraint is also found in Japanese and Turkish[6]:

(27) a. John-ga Bill-o osi-tao-**si**-ta.
Nom Acc push-fall-Caus-Past
'John pushed Bill down.' (Japanese)

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6 Nishiyama (1998: 171) uses *taosi* as a transitive verb 'topple' in Japanese. However, a native speaker of Japanese informs me that in Japanese *tao* 'fall' is an unaccusative verb, as shown in (i). I assume that in Japanese a morpheme *-si* is a kind of a causative morpheme.

(i) John-ga **tao**-re-ta 'John fell down.'

b. John-u vur-up-ol-**dur**-du-m
John-Acc hit-Link-die-Caus-past-person
'I shot John dead.' (Turkish)

In contrast, English does not allow the availability of Figure frames with Ground verbs like *fill* or *decorate*, because it does not use overt causative marking on the second verb of the serializing pair. There is no way of creating Figure frames with Ground verbs like *decorate* in English, by using overt causative marking. Therefore, the sentence in (25) is ungrammatical in English.

Although Chinese, Thai, and Luganda, which belong to Korean-type languages, require overt causative morphemes, they allow the type of resultative serializing verb constructions.[7]

(28) a. Zhang San ba Li Si **ji-dao** le
Zhang San BA Li Si knock-fall Asp
'Zhang San knocked Li Si down.' (Chinese)

b. Chan **ying** Mary **tay**
I shoot Mary dead
'I shot Mary dead.' (Thai)

c. N-**go** o-mwaana **genda**
I-chased the child leave
'I chased the child leave.' (Luganda)

It is true that all of the Korean-type languages require overt causative morphemes.[8] However, not all of the Korean-type languages use the same internal

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7 Yi (1997) claims that the combination of transitive V_1-unaccusative V_2 is grammatical in head-initial serializing languages, because unaccusative V_2, which denotes the result of an action denoted by transitive V_1, is the secondary predicate in these languages. In contrast, the combination of transitive V_1-unaccusative V_2 is not allowed in head-final serializing languages, because unaccusative V_2 is the head of VP, not the secondary predicate in these languages. See Yi (1997) for more detailed discussion of this.

8 Juffs (1996) suggests an interesting connection between locative verb syntax and overt causative morphemes across languages. I found that all of the Korean-type languages require overt causative morphemes. However, I also found that there are some languages which do not show the correlation between locative verb syntax and overt

causation strategy as Korean or Japanese, as shown in (28). Therefore, the second possibility, which claims that the availability of a Figure frame with Ground verbs depends on the availability of indirect causation of change-of-state by overt causative marking on the second verb of the serializing pair, may not be maintained.

Therefore, I claim that the availability of Figure frames with Ground verbs like *decorate* is due to the argument sharing property of V-V compounding/verb serialization.

3.2.4 Summary and Implications

In the preceding sections of this chapter I have demonstrated that languages which have distinguishable Figure and Ground frames fall into two basic classes. Korean-type languages, which include Korean, Japanese, Chinese, Thai, Turkish, and Luganda, have a very simple pattern for locative verbs. All locative verbs allow Figure frames, and then there are no Non-alternating Ground verbs in Korean-type languages. In contrast, in English-type languages, which include English, French, Spanish, Singapore Malay, Najdi Arabic, and Hebrew, basic change-of-state verbs always allow Ground frames. Therefore, two syntax-semantics correspondences depend on which broad language group the language belongs to.

- *Group-specific syntax-semantics correspondences*
  English-type languages: change-of-state meaning → Ground frame
  Korean-type languages: *all* locative verbs → Figure frame
  no *Non*-alternating Ground verbs

If a learner does not know which group her language belongs to, then these group-specific correspondences could not be much use. Furthermore, if the cross-

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causative morphemes among English-type languages. Section 3.3 discusses this in greater detail.

linguistic differences for locative verb syntax do not correlate reliably with properties of the language which are quite easily observable, it might not be easy for the learner to deduce these properties from locative verb syntax in the input.

However, I have suggested that the two groups of language may be distinguishable based on a simple verbal morphology, namely V-V compounding or verb serialization. All of the Korean-type languages, and none of the English-type languages, allow V-V compounding or verb serialization. Therefore, a simple morphological cue like V-V compounding/Verb serialization may help the learner to figure out the properties of her target language.

3.3 Alternative Accounts

In this section, I discuss two lexical approaches to cross-linguistic differences in the syntax of locative verbs. The first approach is that cross-linguistic differences in the syntax of locative verbs are due to differences in the meanings of individual lexical items across languages. If verb meanings differ, then there may be no differences in syntax-semantic mappings across languages. Although it is hard to completely exclude this possibility, I provide several pieces of evidence supporting the claim that all variation cannot be explained in this way.

The second approach, proposed by Talmy (1985, 1991) and Juffs (1996), is that cross-linguistic differences in the lexicalization patterns of verbs lead to the cross-linguistic differences in the mapping between syntax and semantics (Talmy 1985, 1991; Juffs 1996). I show that these two approaches do not correctly predict cross-linguistic variation in the syntax of locative verbs. Finally, I explore other typological properties that might correlate with locative verb syntax.

3.3.1 Is There Cross-linguistic Variation In Semantics?

One possibility is that cross-linguistic differences for locative verb are due to differences in verbs' meanings across languages. For example, the verbs we list as translations of one another may not be perfect translations. Assuming that there exists a set of universal linking rules between semantics and syntax, this possibility suggests that verbs in languages like English and Korean are semantically not equivalent. For example, if meanings of the English verb *fill* and its corresponding Korean verb *chaywuta* 'fill' are different, these two verbs show different syntactic behaviors in English and Korean, indicating that the English verb *fill* is a Non-alternating Ground verb and the Korean verb *chaywuta* is an Alternating verb. H. Lee (1993, 1997) assumes that the different syntactic patterns of Ground verbs in English and Korean might be due to language-specific characteristics, in particular, a verb's idiosyncratic meaning properties.

A first piece of evidence for the claim that the English verb *fill* and the Korean verb *chaywuta* 'fill' might be different in meaning comes from the holism effect. H. Lee (1997) argues that the English verb *fill* requires that the container end up completely full, whereas the Korean verb *chaywuta* requires that the container become increasingly full over time, although not necessarily completely full at the end. However, her argument may not be accurate. It is true that the verb *chaywuta* 'fill' with the Figure-frame, as in (29a), does not concern the state of the container, being full or not being full. In contrast, the verb *chaywuta* 'fill' with the Ground-frame, as in (29b), shows the holistic interpretation in that it describes the state of the container as completely full (C. Lee 1989; H. Lee 1993).

Holistic Interpretation with the Ground-frame in Korean

(29) a. Yumi-ka mwul-ul kulus-ey chaywu-ess-ta.
Nom water-Acc container-Loc fill-Past-Decl
'*Yumi filled the water into a container.'

b. Yumi-ka kulus-ul mwul-lo chaywu-ess-ta.
Nom container-Acc water-with fill-Past-Decl
'Yumi filled the container with water.'

As the English verb *fill* requires the holism effect with a Ground frame, its counterpart *chaywuta* 'fill' in Korean also requires the holism effect with a Ground frame. The only difference is that Korean counterpart to the English *fill* also allows a Figure frame. Therefore, her argument that the English verb *fill* and its counterpart *chaywuta* are semantically different does not seem to be accurate.

A second piece of evidence for the claim that meanings of verbs in English and Korean are different comes from the progressive aspect "-ing" test with a change of state verb in a language. For instance, H. Lee (1997) claims that the progressive aspect with the change-of-state verb *fill* in English is ungrammatical, like the sentence "*John is filling the glass with water", whereas the progressive aspect with the Korean *chaywuta* 'fill' is grammatical. However, the argument that in English the progressive aspect cannot occur with a change of state verb is not true. In fact, a number native speakers of English used the progressive tense with the verb *fill*, when they were asked to describe the events in my elicited production task. Therefore, there is no clear evidence to support the claim that the meaning of the English verb *fill* is different from that of the Korean verb *chaywuta*.

In addition to excluding H. Lee's argument, there is additional evidence that differences in the syntax-semantic mappings across languages are not due to differences in the meanings of individual lexical items. First, if it is true that meanings of verbs are different across languages, then how could we explain the striking regularities in the syntax of Non-alternating Ground verbs across languages? We have seen that cross-linguistic variation in the syntax of Non-alternating Ground verbs is very restricted in

two ways, depending on whether Ground verbs in a language allow Figure frames as well as Ground frames, or they are exclusively restricted to Ground frames. As I mentioned before, for example, Non-alternating Ground verbs in English like *fill*, *cover*, and *decorate*, which only allow the Ground-frame, consistently correspond to Alternators in Korean-type languages. If cross-linguistic variation in the syntax of locative verbs is tied to individual lexical items, as suggested by H. Lee (1993, 1997) and a number of others, and if Korean constantly lexicalizes different meaning components from English, then how could we explain the consistent cross-linguistic patterns, which all contrast with English in the same way, found in Korean, Japanese, Chinese, Thai, Turkish, Hindi, and Luganda? The possibility that meanings of verbs differ across languages cannot explain these systematic differences across languages.

Second, according to the assumption that meanings of verbs are different across languages, and that this is the cause of the syntactic differences, the syntactic difference between the English Alternator *pile* and its counterpart *ssahta* implies that meanings of the two verbs are different. The fact that the verb *pile* in English allows both Figure and Ground frames, implies the availability of both a manner of motion meaning and a change of state meaning. In contrast, the fact that its counterpart *ssahta* allows only the Figure-frame, implies the availability of a manner of motion meaning but lack of a change of state meaning.

However, in Chapter 2, I suggested that the absence of a syntactic contrast should not imply a lack of semantic contrast. It could just mean that syntax does not make such fine-grained distinctions in Korean. I suggested that Korean does, however, draw extra syntactic distinctions between the "pile"-class and the "pour"-class, by using overt serialization. Let me briefly review the data, which we already saw in Chapter 2.

Although neither the verb *ssahta* 'pile' in (30) nor the verb *nohta* 'put' in (31) allows syntactic alternation, serializing the two motion verbs *ssahta-nohta* 'pile-put' in Korean, changes the syntactic possibilities, as shown in (32):

(30) a. Yumi-ka chaek-lul chaeksang-ey ssa-ass-ta.
Nom book-Acc table-Loc pile-Past-Decl
'Yumi piled books on the table.'

b. *Yumi-ka chaeksang-ul chaek-elo ssa-ass-ta.
Nom table-Acc book-with pile-Past-Decl
'Yumi piled the table with books.'

(31) a. Yumi-ka chaek-lul chaeksang-ey noh-ass-ta.
Nom book-Acc table-Loc put-Past-Decl
'Yumi put books on the table.'

b. *Yumi-ka chaeksang-lu chaek-elo noh-ass-ta
Nom table-Acc book-with put-Past-Decl
'Yumi put the table with books.'

(32) a. Yumi-ka chaek-lul chaeksang-ey **ssa-a-noh-ass-ta**.
Nom book-Acc table-Loc pile-put-Past-Decl
'Yumi piled books on the table.'

b. Yumi-ka chaeksang-lu chaek-elo **ssa-a-noh-ass-ta**.
Nom table-Acc book-with pile-put-Past-Decl
'Yumi piled the table with books.'

Adding the motion verb *nohta* 'put' to the verb *ssahta* 'pile', the complex predicate *ssah-a-noh-ta* in (32) does allow for alternation, suggesting the availability of a change of state meaning. Assuming that a change of state meaning is not coming from the motion verb *nohta* 'put', which does not alternate in either Korean or English, then it must be coming from the verb root *ssahta* 'pile'. In other words, if a change of state meaning is not available to the verb root *ssahta* 'pile' in Korean, then it would be hard to explain why the overt serialized verb *ssa-a-nohta* 'pile-put' allows alternation, but the overtly serialized verb *pwu-e-nohta* 'pour-put' allows only the Figure syntactic frame in Korean. I suggest that the English verb *pile* and its counterpart *ssahta* are not

semantically different, at least not in terms of whether they specify a manner and/or change of state.

So far I have provided several pieces of evidence for the claim that the systematic cross-linguistic differences in the syntax of locative verbs are not due to differences in the meanings of individual items. In the next section, I review two lexical approaches to cross-linguistic variation, showing that the typological picture they imply does not correlate with the cross-linguistic differences in the syntax of locative verbs.

3.3.2 Two Lexical Approaches

In this section I review two lexical approaches, which claim that cross-linguistic differences in the lexicalization patterns of a verb lead to the cross-linguistic differences in the mapping between syntax and semantics. (Talmy 1985, 1991; Juffs 1996), in order to see whether these two lexical approaches may be relevant to the cross-linguistic differences in Ground locative verbs.

3.3.2.1 Talmy's (1985, 1991) Approach

The main claim of Talmy's (1985) approach is that differences in lexicalization patterns of a verb lead to differences in the semantics-syntax mapping across languages. For instance, he suggests that typological variation originates from variation in how different languages lexicalize motion events. Talmy defines the basic elements of a motion event, as follows (1985: 61):

(33) *Figure*: the object that is moving or located with respect to another object
Ground: the reference-object with respect to which the Figure is moving or is located
Path: the course followed or site occupied by the Figure object with respect to the Ground object
Motion: the presence of motion or location in the event
Cause/Manner: distinct external events that cause or modify the motion event

Talmy (1985) distinguishes three types of languages with respect to lexicalization of movement. The first class of Talmy's types concerns some languages, such as most Indo-European languages (except Romance), English, and Chinese, which typically lexicalize MANNER or CAUSE in a motion verb. Let us look at the English examples.

(34) a. The lamp stood/lay/leaned on the table.
b. The rock slid/rolled/bounced down the hill.

In English, the motion verbs in (34) are conflated with MANNER, whereas PATH is expressed separately by prepositions or particles, such as *on*, *down*, *off*, *into*, *down*, and *away*.

The second class of Talmy's types includes Romance languages, such as French and Spanish, which typically lexicalize PATH in a motion verb, as illustrated in (35):

(35) a. La botella entró a la cueva (flotando)
the bottle moved-in to the cave (floating)
"The bottle floated into the cave."
b. La botella salió de la cueva (flotando)
the bottle moved-out from the cave (floating)
"The bottle floated out of the cave."

As illustrated in (35), PATH in Spanish is conflated in the motion verb "entró" or "salió", and MANNER is expressed by the separate adverbial "flotando". The third class of Talmy's types concerns other languages, such as Atsugewi (spoken in Northern California), which lexicalize FIGURE in the verb root along with the "fact-of-Motion" in languages. I will not include this pattern in the present discussion.

In Talmy's (1985) typological generalization, languages such as English or Chinese lexicalize both MANNER and MOTION in a verb root, but express PATH separately. In contrast, languages such as Spanish or French do not lexicalize MANNER

and MOTION in a verb root. Instead, these languages lexicalize both PATH and MOTION in a verb root, but express the manner information in an adjunct. These typologically contrasting patterns are mapped onto sentences in English (a "satellite-framed" language) and Spanish (a "verb-framed" language). In other words, on the basis of whether the PATH element of the motion event is encoded in a verb, Talmy (1991) classifies the two typologically different groups into "satellite-framed" languages and "verb-framed" languages. In "satellite-framed" languages, the path is encoded in "satellites" to the verb such as *on* or *down* in (34) above, whereas in "verb-framed" languages, the path is encoded in the verb root as in Spanish *entró* in (35) above. According to Talmy's (1991) suggestion, therefore, "satellite-framed" languages include most Indo-European languages (except Romance languages), English, Chinese, Finno-Ugric, Ojibwa, and Walpiri. "Verb-framed" languages include Romance, Semitic, Japanese, Tamil, Polynesian, most Mayan, and most Bantu languages.

We now turn to the lexicalization pattern of motion verbs in Korean. It has been suggested by Wienold (1992) and Y. Kim (1995) that Korean and Japanese pattern with Romance languages, such as French and Spanish, in their conflation pattern of MOTION plus PATH. Consider the following examples:

(36) John poured water into/out of a container.

(37) a. Yumi-ka mwul-ul kulus-ey pwu-ess-ta.
Nom water-Acc container-Loc pour-into-Past-Decl
'Yumi poured water into a container.'

b. Yumi-ka mwul-ul kulus-eyse phu-ess-ta.
Nom water-Acc container-from pour-out of-Past-Decl
'Yumi poured water out of a container.'

As shown in (36), the manner of motion verb *pour* in English expresses PATH separately by a preposition or particle, such as "into" or "out of". In contrast, the manner of motion verb *pwutta* 'pour' in Korean can be used only for "into", as shown in (37a), whereas the motion verb *phuta* 'pour' can be used only for "out of", as shown in (37b). Therefore, the data from Korean appear to fit the second class of Talmy's types in terms of lexicalization patterns of motion verbs (but cf. Choi and Bowerman 1991).[9]

Let us turn our attention now to the main question of whether Talmy's (1985, 1991) typological classification correlates with these cross-linguistic differences in the syntax of locative verb constructions. Table 3.2 summarizes the connection between Talmy's classification and the syntax of Ground verbs.

Table 3.2: Talmy's Typological Classification and Locative Verb Syntax

Languages	Syntax of Ground verbs	Lexical parameter
English	Ground-frame	Satellite-framed
French	Ground-frame	Verb-framed
Spanish	Ground-frame	Verb-framed
Singapore Malay	Ground-frame	Satellite-framed
Najdi Arabic	Ground-frame	?
Hebrew	Ground-frame	?
Korean	Ground and Figure frames	Verb-framed
Japanese	Ground and Figure frames	Verb-framed
Chinese	Ground and Figure frames	Satellite-framed
Thai	Ground and Figure frames	Satellite-framed (?)
Turkish	Ground and Figure frames	Verb-framed
Hindi	Ground and Figure frames	Verb-framed
Luganda	Ground and Figure frames	Verb-framed

Under Talmy's typological picture, English and Chinese have the same conflation pattern of MOTION + MANNER and they belong to "satellite-framed"

9 Choi and Bowerman (1991) argue that Korean does not fit Talmy's typological picture in the lexical patterns of motion verbs. See Appendix 3.A for more detailed discussion of this issue.

languages, whereas Romance languages like French and Spanish, and Korean and Japanese have the same conflation pattern of MOTION + PATH and they belong to "verb-framed" languages. In contrast to Talmy's typological generalization, French and Spanish show the same syntactic pattern of locative verbs as English, whereas Chinese shows the same syntactic pattern of locative verbs as Korean. Therefore, parametric variation in the lexicon proposed by Talmy (1985, 1991) does not seem to correspond to cross-linguistic variation in the syntax of locative verbs.

3.3.2.2 Juffs' (1996) Approach

In this section, I review Juffs' (1996) suggestion that the cross-linguistic differences in the syntactic structure of locative verbs are due to a different kind of parametric variation in the conflation of meaning components.

3.3.2.2.1 Connection Between Locative Verb Syntax And Causatives Across Languages

Juffs (1996) reports that there are cross-linguistic differences in the syntactic frames of locative verbs in English and Chinese, and suggests that there is a connection between the syntax of Ground locative verbs ("fill"-class) and causativization in psych verbs (e.g., *disappoint* or *angry*) and unaccusative verbs (e.g., *melt* or *freeze*) across languages. A language like English which allows Non-alternating Ground verbs does not require overt causative morphemes when causativizing psych verbs and unaccusative verbs, as shown in (38-40):

Causativization in English psych verbs

(38) a. John is disappointed.
b. The book made John disappointed.
c. The book disappointed John.

Causativization in English unaccusative verbs

(39) a. The ice melted.
b. The sun made the ice melt.
c. The sun melted the ice.

"Fill"-class: Non-alternating Ground Verbs in English

(40) a. John decorated the tree with lights.
b. *John decorated lights on the tree.

Although English allows the periphrastic causatives in (38b) and (39b), it does not require an overt causative morpheme when psych verbs and unaccusative verbs are causativized, as shown in (38c) and (39c).

In contrast, a language like Chinese which allows both Figure and Ground frames in Ground verbs like *fill* or *decorate*, requires overt causative morphemes when casativizing psych and unaccusative verbs, as follows:

Causativization in Chinese psych verbs

(41) a. Zhang San hen shiwang.
Zhang San very disappointed
'Zhang San is very disappointed.'
b. Nei ben shu **shi** Zhang San hen shiwang.
That CL book make Zhang San very disappointed
'That book made zhang San very disappointed.'
c. *Nei ben shu shiwang le Zhang San.
That CL book disappointed Zhang San
'The book disappointed Zhang San.'

Causativization in Chinese unaccusative verbs

(42) a. Xue hua le.
Snow melt Asp
'The snow melted.'
b. Taiyang **shi** xue (rong) hua le.
Sun make snow melt
'The sun made the snow melt.'
c. *Taiyang hua xue le.
Sun melt snow Asp
'The sun melted the snow.'

"Fill"-class: Alternators in Chinese

(43) a. ?Zhang San young tanzi gai le chuang.
Zhang San use blanket cover-ASP bed
'Zhang San covered the bed with a blanket.'
b. Zhang San wang chuang shang gai le tanzi.
Zhang San to bed on cover-ASP blanket

'*Zhang San covered the blanket onto the bed.'

As shown in (41) and (42), it is necessary for Chinese to use the overt causative morpheme *shi* in causativization of psych and unaccusative verbs. As expected, Chinese allows Figure frames as well as Ground frames with Ground verbs, as in (43).

In addition to the contrasting pattern between English and Chinese, Juffs provides additional data in support of the correlation between the syntax of Ground locative verbs and overt/covert causative morphemes. For example, French shows the same syntactic pattern as English, whereas Japanese shows the same syntactic pattern as Chinese, in terms of Ground locative verbs and causativization in psych and unaccusative verbs, as follows:

Causativization in French psych verbs

(44) Le livre m'a deçu.
The book 1pMO-has disappointed
'The book disappointed me.'

Causativization in French unaccusative verbs

(45) a. Le fer fond à 1510 degrés.
the iron melt at 1510 degrees
'Iron melts at 1510 degrees.'

b. Le soleil a fondu la neige.
the sun aux melt-past the snow
'The sun has melted the snow'

"Fill"-class: Non-alternating Ground verbs in French

(46) a. *Marie a décoré les lumières colorées sur l'arbre.
Mary decorated lights colored onto the tree
'*Mary decorated colored lights onto the tree.'

b. Marie a décoré l'arbre avec des lumières colorées.
Marie decorated the tree with lights colored
'Mary decorated the tree with colored lights.'

Causativization in Japanese psych verbs

(47) a. Tanaka-ga sono sirase-o yorokon-da.
Nom that news-Acc be pleased-Past
'Tanaka was pleased at that news.'

a. Sono sirase-ga Tanaka-o yorokob-**ase**-ta.
that news-Nom Acc be pleased-Caus-Past

'Tanaka was pleased at that news.'

Causativization in Japanese unaccusative verbs

(48) a. Yuki-ga toke-ga.
snow-Top melt-Past
'The snow melted.'

b. *Taiyo-ga yuki-o toke-ta.
Sun-Top snow-Acc melt-Past
'The sun melted the snow.'

b. Taiyo-ga yuki-o tok-**asi**-ta.
Sun-Top snow-Acc melt-CAUS-Past
'The sun melted the snow.'

"Fill"-class: Alternators in Japanese

(49) a. tasi-ga heya-ni hana-no kazatta.
I-Nom room-Loc flower-Acc decorated
'*I decorated flowers in the room.'

b. tasi-ga heya-no hana-de kazatta.
I-Nom room-Acc flower-Inst decorated
'I decorated the room with flowers.'

Given that the connection between the syntax of Ground locative verbs and causative constructions across languages appears quite consistent, we now need to ask why these constructions are linked, and how the cross-linguistic differences in these two constructions are uniformly explained by Juffs' approach.

3.3.2.2.2 Juffs' (1996) Conflation Parameter

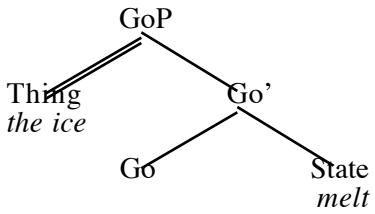
Juffs (1996) claims that the cross-linguistic differences in the syntactic frame of Ground locative verbs and in causative constructions (e.g., overt/covert causative morphemes) originate from variation in whether or not a verb root may conflate with two specific meaning components in different languages: an ACT (CAUSE) meaning and a STATE meaning.

Before I introduce Juffs' conflation parameter in the lexicon, I need to clarify some semantic primitives and their main functions. The representations for locative verbs, which Juffs assumes here, are based on Pinker's (1989) semantic representations, and

Hale and Keyser's (1993) proposal that semantic representations are limited by X-bar theory. According to Pinker and Jackendoff (1987), the meaning components of a verb's meaning which are relevant to the syntax consists of semantic primitives, such as a set of conceptual categories (e.g., THING, STATE, PATH), and functions (e.g., ACT, GO, BE). Instead of using the syntactic categories V, A, and P, for example, ACT(±CAUSE) is used for causative and non-causative ACT events, GO and BE as well as [±MANNER] are used for dynamic and non-dynamic events, and STATE and PATH function as complements of GO and BE. More specifically, let us see how these semantic primitives are represented in the syntactic structure of causative unaccusative verbs and locative verbs

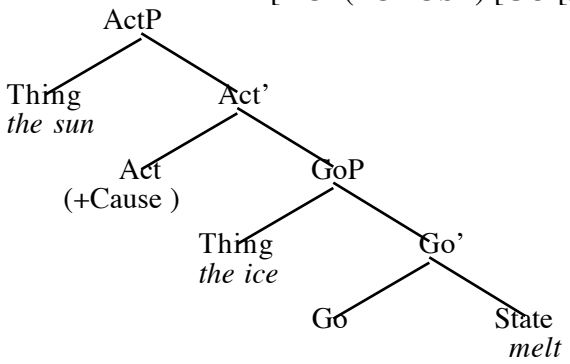
First, unaccusative verbs such as *melt* or *freeze* are represented by a GO function and a STATE function as the complement of GO, as shown in (50):

(50) The ice melted: [GO [STATE]]



An ACT function is added when the sentence is causativized, as shown in (51):

(51) The sun melted the ice :[ACT(+CAUSE) [GO [STATE]]]



Juffs assumes that there is no cross-linguistic variation in the conflation patterns of ACT(+CAUSE) or [GO[STATE]] into a verb root, but there exists cross-linguistic variation in the conflation patterns of two meaning components, ACT and STATE, into a verb root. If, for example, a language like English allows the conflation of ACT and STATE in a verb root, then we would not expect English to require an overt causative morpheme. If, on the other hand, a language like Chinese does not allow the conflation of ACT and STATE in a verb root, then we should expect Chinese to require an overt causative morpheme. In other words, in Juffs' approach, the lexical realization of the meaning components ACT and STATE determines the syntactic possibilities across languages. Therefore, Juffs proposes the following conflation parameter for ACT and STATE in a verb root:

(52) *Root conflation parameter for ACT and STATE*:
±[ACT (+CAUSE) [GO [STATE]]]

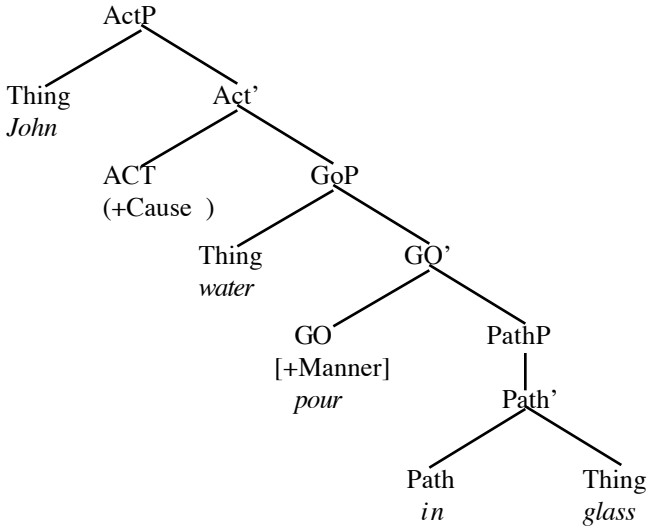
Languages differ with respect to whether ACT (CAUSE) and STATE may co-occur in a verb root. For example, a language like English, which has the [+] value of the parameter for conflation of ACT and STATE in a verb root, does not need overt causative morphemes in causative psych verbs and causative unaccusative verbs, because ACT and

STATE can be expressed by a single root. In contrast, a language like Chinese, which has the [-] value of the parameter for conflation of ACT and STATE in a verb root, *does* require overt causative morphemes in causative unaccusative verbs or causative psych verbs because ACT and STATE cannot be expressed by a single root.

In addition to the causative constructions, Juffs' conflation parameter (52) predicts that a language like English, which has the [+] value of the parameter in (52), only allows Ground syntax in the Ground locative verbs, whereas a language like Chinese, which has the [-] value of the parameter in (52), allows both Ground syntax and Figure syntax in the Ground locative verbs.

Let us see how this conflation parameter for ACT and STATE explains the syntactic frame of locative verb constructions in English and Chinese. First, in Juffs' (1996) framework, the structure of Non-alternating Figure verbs like *pour* in English is the same as that in Chinese, as in (53):

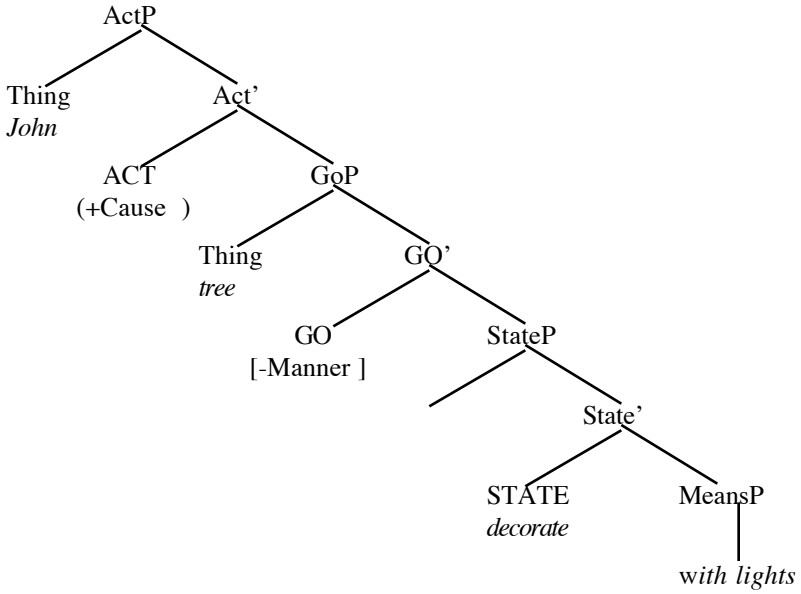
(53) John poured the water into the glass: [ACT(+CAUSE) [GO[PATH]]]



Note that the Figure verb *pour* has a syntactic MANNER feature linked with the GO representation. Under the assumption that both English and Chinese allow the conflation pattern of ACT and PATH in a verb root, Juffs accounts for why there is no cross-linguistic variation in the syntactic behavior of Figure verbs.

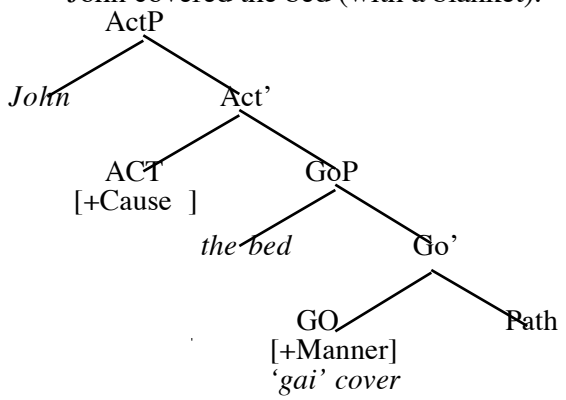
We now turn to the representation of Ground locative verbs which show different syntactic behaviors across languages. The semantic structure of Ground verbs in English, proposed by Juffs (1996), is the following:

(54) John decorated the tree with lights: [ACT(CAUSE) [GO [STATE [MEANS]]]]



In the structure of the Ground verbs in English, he assumes that STATE, which is similar to Hale and Keyser's AP, includes a MANNER phrase but does not have a MANNER feature. Under Juffs' conflation parameter in (52), however, the representation in (54) is not available to an individual verb root in Chinese, because Chinese does not allow conflation of a STATE meaning into a verb root with the functions GO and ACT (CAUSE). Instead, Juffs proposes that the semantic structure of Chinese counterparts to English Ground verbs would be the PATH version in (55), which is the same as the structure of the Figure verbs in (53):

(55) John covered the bed (with a blanket).



(Juffs 1996: 118)

Note that this account requires that the verb *cover* be treated as a kind of *manner*, in contrast to English: This manner could be thought of as "with the purpose of achieving acovered state". He claims that for *gai* ("cover" in English) in monolingual Chinese, the syntactic Figure-frame is fully acceptable, whereas the syntactic Ground-frame is barely acceptable, because the verb *gai* (cover) only focuses on the movement of the event.[10]

However, it is not clear at all whether Juffs considers the verb *cover* to be a Non-alternating Figure verb or an Alternator. As a possible interpretation, assuming that the verb *cover* is an Alternator in Chinese, Juffs claims that the Ground frame of the verb *cover* in Chinese has the semantic representation in (55). The difference between the verb *cover* in English and its counterpart in Chinese is that the Ground frame of the verb *cover* in Chinese has a [+Manner feature], whereas that of the verb *cover* in English does

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10 Juffs (1996) reports that Chinese who live in Canada and speak English as a second language, accept both the Figure and the Ground-frame with the verb *cover*. In contrast, monolingual Chinese barely accept the Ground-frame with the verb *cover*, whereas they fully accept the Figure-frame with the verb *cover*. For example, when sentences were rated from -3 (completely impossible) to +3 (completely possible), for *cover*, the mean score for the Figure-frame is 2.1, and that for the Ground-frame is 0.3. But this is still much better than some of their other ratings.

not. However, if the verb *cover* has a Manner feature with the Ground frame, then what is the difference between the Ground frame and the Figure frame in the verb *cover* in Chinese?

Furthermore, Juffs points out that when a Resultative Verb Compound (RVC) is formed in the lexicon, by the addition of a STATE morpheme, the verb's syntactic possibilities change, as shown in (56):

(56) a. Zhang San yong tanzi ba chuang gai-**zhu** le.
Zhang San use blanket Obj-bed cover-stop
'Zhang San covered the bed with a blanket.'

b. *Zhang San chuang shang ba tanzi gai-**zhu** le.
Zhang San bed on Obj-blanket cover-stop
'Zhang San covered the blanket onto the bed.'

As shown in (56), the addition of the STATE morpheme to the verb root 'cover' prevents alternation in Chinese, and thereby only allows the Ground syntactic frame. The possibility of the Ground frame is clear, but it is not clear how this story explains why the Figure frame is bad in (56b).

3.3.2.2.3 Limitations of Juffs' Conflation Parameter

So far we have reviewed Juffs' explanation for the cross-linguistic differences in the syntactic frames of locative verbs and causative constructions. This section focuses on pointing out several limitations of Juffs' lexical approach, and suggests that his typological generalization does not accurately predict the cross-linguistic differences in the syntax of Ground locative verbs.

Juffs' (1996) main argument is that the conflation parameter for ACT and STATE provides a unified explanation for cross-linguistic variation in the syntactic patterns of Ground locative verbs (e.g., *cover* and *decorate*), and causativization of psych verbs (e.g., *disappoint* and *angry*) and unaccusative verbs (e.g., *melt*, *break*, or *open*).

The first problem with this argument is that the motivation for the cross-linguistic differences in causative constructions is different from that in Ground locative verbs. For example, the cross-linguistic differences in causative constructions originate from how two existing meaning components ACT and STATE, in a verb's lexical entry, can be merged into the syntactic structure of a verb root. In contrast, the cross-linguistic differences in Ground locative verbs come from whether or not the specific meaning component STATE exists in a Ground verb's lexical entry. More specifically, while cross-linguistic variation in causative constructions lies in whether languages should use overt causative morphemes to link an ACT meaning and a STATE meaning, cross-linguistic variation in the Ground verbs lies in whether or not languages may have a STATE meaning component in one area of their lexicon. In other words, the presence or absence of a STATE meaning component in a verb root determines the syntactic possibilities of Ground locative verbs, whereas it does not determine the syntactic possibilities of causative constructions across languages. Instead, whether or not a verb root may conflate with ACT and STATE meaning components determines the syntactic possibilities of causative constructions. Therefore, it is not clear how the cross-linguistic differences in the two constructions are explained by the conflation parameter for ACT and STATE.

The second problem with Juffs' conflation parameter for the cross-linguistic differences of Ground locative verbs is that it does not provide an explicit answer to the crucial question of why Ground locative verbs in Chinese allow both Figure and Ground syntactic frames, whereas in English they allow only Ground syntax. He claims that since locative verbs in Chinese all do not have a STATE meaning component in their

lexical entry, the only way to have a STATE meaning in a Chinese locative verb is to add an extra morpheme which has a STATE meaning.

However, the claim that a STATE meaning component is not encoded in a locative verb's lexical entry in Chinese poses serious problems. First, if this claim is true, why do some Ground locative verbs like *decorate* and *cover* in Chinese, allow both Figure and Ground syntactic frames? In order to rule out this exception, Juffs notes that since the Ground-frame of the verb *cover* in Chinese is barely acceptable, but the Figure-frame of it is fully acceptable, the verb *cover* was judged to be a Non-alternating Figure verb in Chinese. However, the important point to notice is that the acceptance of the Ground syntax in the Chinese verb *cover* is much higher than other Figure verbs, like *pour* or *spill*. This is based both on Juffs' data and my own informant work. Thus, this implies that a change-of-state meaning component is still available to the Chinese verb *cover*. Furthermore, both Figure and Ground-frames are fully acceptable with the verb *zhuangshi* 'decorate'.

Second, if it is true that a STATE meaning component is not available with all Chinese locative verbs, then we would expect that there are no Alternating verbs in Chinese, but this is not true. The Chinese verb *pen* 'spray' is an Alternator, as shown in (57). Other verbs like *mo* 'smear/spread', *sa* 'sprinkle', *tu* 'paint' are also Alternating verbs in Chinese.

(57) a. Nongmin wang guoshu shang pen le nongyao.
Peasant to fruit-tree on spray pesticide
'The peasant sprayed pesticide onto the tree.'

b. Nongmin young nongyao pen le guoshu.
Peasant use pesticide spray fruit-tree
'The peasant sprayed the fruit-tree with pesticide.'
(Adapted from Juffs 1996: 84)

The existence of Alternating verbs in Chinese suggests that Juffs' claim that a STATE meaning component is not encoded in a locative verb's lexical entry in Chinese cannot be sustained. Furthermore, I have showed above that these "fill"-class verbs are clearly Alternators in a number of other languages in the same class.

Let us turn our attention now to the important question of whether the presence of overt/covert causative constructions correctly predicts the syntactic pattern of Ground locative verbs across languages. The interesting finding is that, as Juffs predicts, Korean-type languages - which include Korean, Japanese, Chinese, Thai, Turkish, Hindi, and Luganda - all require overt causative morphemes in causative psych verbs and causative unaccusative verbs.[11] The data in these languages are given in (58-66).

Causativization in Korean

(58) a. elum-i nok-ass-ta.
ice-Nom melt-Past-Dec
'The ice melted.'

b. theyang-i elum-ul nok-**i**-ess-ta.
sun-Nom ice-Acc melt-Caus-Past-Decl
'The sun melted the ice.'

c. * theyang-i elum-ul nok-ass-ta.
sun-Nom ice-Acc melt-Past-Dec
'The sun melted the ice.'

(59) a. Yumi-un ku chaek-e silmang-ha-yess-ta.
Top that book-at disappoint-Past-Dec
'Yumi was disappointed at that book.'

b. ku chaek-i Yumi-lul silmangsik-**hi**-ess-ta.
that book-Nom Acc disappoint-Caus-Past-Decl
'That book disappointed Yumi.'

c. * ku chaek-i Yumi-lul silmang-ha-yess-ta.
that book-Nom Acc disappoint-Past-Decl
'That book disappointed Yumi.'

Causativization in Thai

(60) a. namk^{h}ang lali.

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11 In Korean, there is a causative morpheme *i*, which is realized in 7 allomorphic variations like *i,hi, li, ki, wu, kwu,chwu*. In addition, Turkish employs two causative suffixes /Dir/ and /t/, which are phonologically determined.

ice melt
'The ice melted.'

b. $p^hra?at^hit$ **tamhai** lalai $namk^hang$.
sun make ice melt
'The sun made the ice melted.'

c. * $p^hra?at^hit$ lalai $namk^hang$.
sun ice melt
'The sun melted the ice.'

(61) a. John **thamhai** Mary phitwang.
John made Mary disappoint
'John made Mary disappointed.'

b. *John phitwang Mary.
John disappoint Mary
'Mary disappointed John.'

Causativization in Turkish

(62) a. Buz eri-di.
ice melt-past
'The ice melted.'

b. gunes buz-u eri-**t**-ti.
sun ice-Acc melt-Caus-past
'The sun melted the ice.'

c. * gunes buz-u eri-di.
sun ice-Acc melt-Past
'The sun melted the ice.'

(63) a. socuk kpek-ter kork-tu.
child dog-ABL fear-Past
'The child feared the dog.

b. kpek socug-u korku-**t**-tu.
dog child-Acc fear-Caus-Past
'The dog frightened the child.'

Causativization in Luganda

(64) a. O-muzira gwamelenguka.
the ice melted
'The ice melted.'

b. O-musana gwameleengu-**sa** o-muzira.
the sun melt-Cause the ice
'The sun melted the ice.'

(65) a. Petero yali mu-sanyufu ku-mawulire ago
Ptetero was pleased at-news that
'Petero was pleased at that news.'

b. A-mawulire ago gaa-sanyu-**sa** Petero.
news that pleased-Caus Petero
'The news pleased Petero.'

Causativization in Hindi

(66) a. baccaa kutte-se dartaa hai.
child-Nom dog-Ind feat-Imp be
'The child fears the dog.'

b. kuttaa bacce-ko dar**aa**taa hai.
dog-Nom child-Acc fear-Caus-Imp be
'The dog frightens the child.'

(Adapted from Mohanan 1994: 34)

So far we have seen that Korean-type languages, which show the same syntactic pattern of Ground verbs, all require overt causative morphemes in causative psych and unaccusative verbs. Thus, this appears to support Juffs' proposal that there is a strong correlation between locative verb syntax and the presence/absence of overt causative morphemes.

Let us see whether this correlation holds in English-type languages. Juffs predicts that English-type languages, which include English, French, Spanish, Malay Singapore, Najdi Arabic, and Hebrew, do not require overt causative morphemes in causative psych and unaccusative verbs, since in these languages change of state verbs like *fill* are exclusively restricted to Ground syntax. As he predicts, languages like French and Spanish show the same causative pattern as English in that they do not require overt causative morphemes in causativization of psych and unaccusative verbs. However, some languages such as Singapore Malay, Najdi Arabic, and Hebrew do require overt causative morphemes, as shown in (67-69)[12]:

Causativization in Singapore Malay

(67) a. Buku itu kecewa-**kan** John.
book that disappoint-Caus John
'The book made John disappointed.'

b. *Buku itu kecewa John.
book that disappoint John.

12 In Singapore Malay, the causative morpheme *kan* is often referred to as a transitive morpheme.

'The book John disappointed.'

Causativization in Najdi Arabic

(68) a. Alsams da**wa**bit althalj.
the sun melt-Caus the ice
'The sun melted the ice.'

b. *Alsams dabit althalj.
the sun melt the ice
'The sun melted the ice.'

Causativization in Hebrew

(69) a. ha-mayim ratxu.
the water boiled
'The water boiled.'

b. John **hi**rtiax et ha-mayim.
Caus-boil Acc the water
'John boiled the water.'

Although Singapore Malay, Najdi Arabic, and Hebrew show the same syntactic pattern for locative verbs as English, these languages require overt causative morphemes in causativization of psych verbs and in causative unaccusative verbs. Therefore, the data from Singapore Malay, Najdi Arabic, and Hebrew appear not to support a strong connection between the syntax of Ground locative verbs and causative constructions. The correlation between locative verb syntax and causative constructions across languages is summarized in Table 3.3:

Table 3.3: Locative Verb Syntax and Causative Constructions Across Languages

	Overt causative morpheme	The syntax of Ground verbs
English	no	Ground syntax only
French	no	Ground syntax only
Spanish	no	Ground syntax only
Singapore Malay	yes	Ground syntax only
Najdi Arabic	yes	Ground syntax only
Hebrew	yes	Ground syntax only
Korean	yes	Both Figure and Ground syntax
Japanese	yes	Both Figure and Ground syntax
Chinese	yes	Both Figure and Ground syntax
Thai	yes	Both Figure and Ground syntax
Turkish	yes	Both Figure and Ground syntax
Hindi	yes	Both Figure and Ground syntax
Luganda	yes	Both Figure and Ground syntax

In sum, even though the striking connection between the syntax of Ground verbs and overt/covert causative morphemes across languages, seems to hold in all Korean-type languages, this connection does not hold in all English-type languages. So locative verb syntax may predict causative patterns, but not vice versa. Therefore, this is the wrong kind of connection for a solution to the learnability problem.

In the following section, I will examine whether other typological properties might correlate with the syntax for locative verbs.

3.3.3 Other Typological Correlates

In the previous section, I have shown that the lexical parameter proposed by Talmy (1985, 1991) and overt causative constructions proposed by Juffs (1996) appear not to correlate with syntactic patterns for locative verbs. In addition to these typological approaches, I explore other properties of languages which I have looked at, in order to see whether these properties may correlate with their syntax for locative verbs.

A first possibility is basic "word order". The prediction is that Korean-type languages may be all SOV languages, whereas English-type languages may be all SVO

languages. Most English-type languages except Najdi Arabic are SVO languages, and many Korean-type languages like Korean, Japanese, Turkish, Hindi are SOV languages. However, some languages like Chinese, Thai, and Luganda are SVO languages, even though they belong to Korean-type languages.

A second possibility is the "null subject" parameter (sometimes called "pro-drop") (see Rizzi 1982; Jaeggli and Safir 1989). This parameter corresponds to whether a language allows the speaker to omit the subject in a tensed sentence. Interestingly, Korean-type languages all are "pro-drop" languages. Thus, the "null subject" property seems to hold in Korean-type languages. However, this opposite is not the case in that this property does not hold in English-type languages. English and French are not "pro-drop" languages, whereas the other languages like Spanish, Najdi Arabic, and Hebrew are "pro-drop" languages. Therefore, the pro-drop property does not hold across languages.

A third possibility is overt/null Case marking. The property of overt/null Case marking may contrast English-type languages with Korean-type languages. Korean-type language like Korean, Japanese, Hindi, and Turkish have overt Case marking, whereas English-type languages like English, French, Spanish, Singapore Malay, and Najdi Arabic do not have overt Case marking. However, there are some exceptions to overt/null Case marking. Languages like Chinese and Thai which belong to Korean-type languages do not have overt Case marking, and Hebrew which belongs to English-type languages has overt Case marking.

In sum, Table 3.4 shows that the distribution of a number of other properties of languages which I have looked at appear *not* to correlate with their syntax for locative verbs.

Table 3.4: Locative Verb Syntax and Other Typological Properties

Language	Language-Group	Word-order	Pro-drop	Overt Case marking	V-V Compounds
English	English-type	SVO	no	no	no
French	English-type	SVO	no	no	no
Spanish	English-type	SVO	yes	no	no
Malay	English-type	SVO	?	no	no
Arabic	English-type	VSO	yes	no	no
Hebrew	English-type	SVO	yes	yes	no
Korean	Korean-type	SOV	yes	yes	yes
Japanese	Korean-type	SOV	yes	yes	yes
Chinese	Korean-type	SVO	yes	no	yes
Thai	Korean-type	SVO	yes	no	yes
Turkish	Korean-type	SOV	yes	yes	yes
Hindi	Korean-type	SOV	yes	yes	yes
Luganda	Korean-type	SVO	yes	no	yes

3.3.4 Summary

In this section, I first provided several pieces of evidence supporting the claim that cross-linguistic differences in the syntax of locative verbs are not due to differences in the meanings of individual lexical items. Second, I reviewed two approaches, which claim that cross-linguistic differences in the lexicalization pattern of verbs lead to the cross-linguistic differences in the mapping between syntax and semantics. However, both Talmy's (1985, 1991) typological picture like a "verb-framed" language and "satellite-frame" language, and Juffs' (1996) connection between the presence/absence of causative morpheme and locative verb syntax appear not to correlate with cross-linguistic variation in the syntax of locative verbs.

In addition to these two approaches, I examined other typological properties that might correlate with locative verb syntax. However, it turned out that these typological properties appear not to correlate with locative verb syntax. Therefore, V-V compounding or verb serialization stands as the most promising candidate for an easily observable cue.

3.4 Language-specific Syntax-semantics Correspondences

Up to now I have focused on differences across languages in the "fill"-class. We found two syntax-semantics correspondences which depend on which broad language group the language belongs to. In English-type languages, basic change-of-state verbs always allow Ground frames. In Korean-type languages, all locative verbs allow Figure frames and there are no Non-alternating Ground verbs. However, this systematicity does not entail systematicity in other areas.

In this section, I examine the syntactic possibilities across languages of the classes of verbs which correspond to syntactic Alternators in English, and show that there are syntax-semantics correspondences that seem to vary on a language-by-language basis.

3.4.1 A Cross-linguistic Survey of Alternating Verbs in English

First, I found that there is cross-linguistic variation in the syntactic pattern of verbs which correspond to syntactic Alternators in English, as shown in Table 3.5[13]:

13 In Table 3.5, "A" represents an Alternator, "F" represents a Non-alternating Figure verb, and "G" represents a Non-alternating Ground verb.

Table 3.5: A Cross-linguistic Survey of Counterparts to English Alternators

Language	Group	smear/spread	paint	wrap	stuff	cram	load	spray	sow/scatter	pile
English	E-type	A	A	A	A	A	A	A	A	A
Spanish	E-type	A	A	A	A/G	A	A	A	A	F
Malay	E-type	A	A	A	A	A	A	A	A	F
Arabic	E-type	A	A	A	A	A	A	A	F	F
Hebrew	E-type	A	A	A	A/G	A	A	F	F	F
Chinese	K-type	A	A	A	F	F	F	A	F	F
Thai	K-type	A	A	A	F	F	F	A	F	F
Japanese	K-type	A	A	A	A/F	A/F	F	F	F	F
Korean	K-type	A	A	A	A	A	F	F	F	F
Turkish	K-type	A	A	A	A	A	A	F	F	F
Luganda	K-type	A	A	A	A	A	A	A	A	A
Hindi	K-type	A	A	A	A	A	A	A	A	A

It is important to notice that language groups based on the syntax of the classes of Non-alternating verbs appear not to show the same syntactic possibilities in the classes of verbs which are syntactic Alternating verbs in English. First, although Hindi and Luganda belong to Korean-type languages in terms of the syntactic pattern of Ground verbs, they show the same syntactic possibilities as their English counterparts in terms of the classes of verbs which are syntactic Alternating verbs, as shown in Table 3.5. All of the subclasses of Alternating verbs in English correspond to Alternators in both Hindi and Luganda.

Second, there is another case of languages which appear to show similar syntactic patterns in the classes of verbs which are Alternators in English, although they belong to different language groups. For example, Hebrew is an English-type language and Turkish is a Korean-type language, in terms of the syntactic pattern of Ground verbs like *fill* and *cover*. However, as shown in Table 3.5, they appear to show very similar syntactic patterns to one another in that verbs like *spray*, *sow*/*scatter,* and *pile* are Non-alternating Figure verbs, whereas other verbs are Alternating verbs.

Therefore, these findings suggest that the classes of verbs across languages which are syntactic Non-alternating verbs in English should be separated from the classes of verbs across languages which are syntactic Alternating verbs in English.

Let us now examine cross-linguistic variation in Alternators verb by verb. First, verbs like *scatter* and *sow*, which are Figure-Alternating verbs in English, correspond to Alternators in English, Spanish, Luganda, and Hindi, but they correspond to Non-alternating verbs in the other languages. Second, the verb *pile*, which is a Figure-Alternating verb in English, corresponds to a Non-alternating Figure verb in most of languages. Third, verbs like *load* and *spray*, which can be classified as pure Alternators in English, correspond to Alternators in all English-type languages. However, they can correspond to either Alternators or Non-alternating Figure verbs in Korean-type languages.

So far we have seen that there is much cross-linguistic diversity in the classes of verbs which correspond to either Figure-Alternators or pure Alternators in English. However, cross-linguistic diversity in these classes is limited to two syntactic patterns, namely Alternators and Non-alternating Figure verbs. What I have never found with verbs of these classes is a language that allows the restricted Ground syntax.

Third, verbs like *stuff* and *cram*, which are Ground-Alternating verbs in English, correspond to either Alternators or Non-alternating Ground verbs in most of languages which I have looked at. However, in Chinese and Thai these verbs are Non-alternating Figure verbs.

Finally, let us consider verbs like *paint, wrap, smear*, and *spread*. According to the revision of Pinker's classification, verbs like *paint* and *wrap* can be classified into Ground-Alternators in English, whereas the other verbs *smear* and *spread* can be

classified into Figure-Alternators in English. Interestingly, I found that verbs like *paint, wrap, smear,* and *spread* show no cross-linguistic variation in their syntactic possibilities, in the respect that they are all Alternators across languages.

So far we have seen that the classes of verbs which correspond to Alternators in English show syntactic variation across languages. Interestingly, we have found that *fill* is one of the most syntactically variable verbs across languages. In English-type languages, it is a Non-alternating Ground verb, in Korean-type languages it is an Alternator. However, in Singapore Malay, which belongs to English-type languages, the verb *fill* is an Alternator, as shown in (70), and in Thai, which belongs to Korean-type languages, it is a Non-alternating Figure verb, as shown in (71). In contrast, *cover* and *decorate* show much less variation across languages, closely fitting the division between English-type and Korean-type languages

"*Fill" in Sinpare Malay: An Alternator*

(70) a. Saya isi gelas dengan air.
I fill glass with water
'I filled the glass with water.'

b. Saya isi air ke dalam gelas.
I fill water to inside glass
'*I filled the water into the glass.'

"*Fill" in Thai: A Non-alternating Figure verb*

(71) a. Chan term nam longnai kaew.
I fill water into glass
'*I filled the water into the glass.'

b. *Chan term kaew duay nam.
I fill glass with water
'I filled the glass with water.'

So far we have seen that counterparts of English Alternators show greater variability across languages. Nevertheless, variation in syntactic possibilities for Alternators seems to be systematic. As shown in Table 3.5, if verbs like *stuff* and *cram*

only allow Figure frames in some languages like Chinese and Thai, then we may predict that the other verbs like *load, pile,* or *scatter/sow* will allow only Figure frames. In contrast, if verbs like *stuff, crame, load,* and *spray* allow alternation in some languages, then we may predict that the other verbs like *scatter* and *pile* will correspond to Alternators. Therefore, the fact that variation in syntactic possibilities for Alternators is quite systematic, can be very useful for children to learn the syntax and semantics of Alternator verbs.

3.4.2 Possible Explanations

In Chapter 2, I proposed two generalizations that hold in English and Korean: (1) verbs which have a manner of motion as a primary meaning component allow Figure frames and (2) verbs which have a change of state as a primary meaning component allow Ground frames. By revising Pinker's (1989) classification of basic Figure verbs and basic Ground verbs, I showed that these two generalizations appear to hold in Korean.

Let us consider whether these generalizations hold across all the languages that I have looked at, based on the revised classification. First, the one generalization that seems to hold across *all* the languages that I have looked at is that manner-of-motion verbs allow the Figure frame. Both verbs of the "pour"-class and verbs of the "pile"-class always allow Figure frames across all of the languages I have surveyed (see Appendix 3.B). Furthermore, verbs like *load* and *spray*, which are classified as pure Alternators, always allow Figure frames across all of the languages. What I have never found with these verbs is a language that allows the restricted Ground frame.

However, the other generalization, which claims that change-of-state verbs allow the Ground frame, does not seem to hold across languages. Since verbs like *stuff*, *cram,*

paint, and *wrap* are classified as basic change of state verbs in English, we expect that they should allow Ground syntax across languages. Although *paint* and *wrap* allow Ground frames across languages, some languages like Chinese and Thai do not allow Ground frames with verbs like *stuff* and *cram.*

In addition, I reviewed Jackendoff's (1996) account, which explains the asymmetry between the "spray"-class and the "smear"-class in English based on a different semantic salience, to see whether his account might give an answer for the following question: Why do verbs of the "smear"-class allow Ground frames as well as Figure frames, whereas the other verbs of Figure-Alternating verb classes are restricted to Figure frames in Korean?

Jackendoff divides Figure-Alternating verbs into two subclasses, namely 'path-distributive' verbs ("spray"-class) and 'final-distributive' verbs ("smear"-class). While the 'path-distributive' verbs are more 'process-oriented' in meaning than other verbs, the 'final-distributive' verbs are more 'change-of-state oriented' in meaning than other verbs. According to his account, verbs of the "smear"-class are more likely to allow Ground frames than verbs of the "spray"-class, if this semantic weight affects syntactic possibilities in a language. As predicted by this account, verbs of the "smear'-class allow Ground frames in all of the languages I have looked at, whereas there is much cross-linguistic variation in the syntactic possibilities of the "spray"-class. It is not surprising that 'final-distributive' verbs like *smear, spread,* and *paint*, always allow Ground frames as well as Figure frames across languages, whereas 'path-distributive' verbs like *spray, scatter,* and *pile* are restricted to Figure frames in many languages. Therefore, Jackendoff's account of the asymmetry between the "spray"-class and the "smear'-class seems to work in all of the languages that I have looked at.

3.5 Conclusion

In this chapter, we found that languages which have distinguishable Figure and Ground frames fall into two basic classes: One class of languages which includes Korean, Japanese, Chinese, Thai, Turkish, and Hindi, and the second class of languages which includes English, French, Spanish, Singapore Malay, Najdi Arabic, and Hebrew. In Korean-type languages, *all* locative verbs allow Figure frames. And then verbs which have change-of-state as a primary meaning component typically allow Ground frames too. These languages never have Non-alternating Ground verbs. In contrast, English-type languages allow both Figure and Ground Non-alternating verb classes, plus one or more classes of Alternating verbs.

Across languages, some syntax-semantics correspondences appear to be universal, some correspondences appear to apply only within one of the two broad language groups, and some correspondences appear to be subject to idiosyncratic language-by-language variation.

First, the one generalization that seems to hold across *all* the languages that I have looked at is that manner-of-motion verbs allow the Figure frame.

- *Universal Syntax-semantics Correspondences*
  manner-of-motion meaning → Figure frame

Second, two syntax-semantics correspondences depend on which broad language group the language belongs to. In English-type languages, basic change-of-state verbs always allow the Ground frame. In Korean-type languages, *all* locative verbs allow the Figure frame, and there are no Non-alternating Ground verbs.

- *Group-specific Syntax-semantics Correspondences*
  English-type languages: change-of-state meaning → Ground frame
  Korean-type languages: *all* locative verbs → Figure frame

If a learner does not know which group her language belong to, then these group-specific correspondences could not be much use. However, I suggested that the two groups of language may be distinguishable based on an independent property. I have suggested that there is a strong correlation between locative verb syntax and complex predicates, which is known as V-V compounding or verb serialization. All of the Korean-type languages, and none of the English-type languages, allow V-V compounds/ verb serialization. A simple morphological cue may help the learner to figure out the properties of locative verbs in her target language.

Finally, there are syntax-semantics correspondences that seem to vary on a language-by-language basis. We found that the classes of verbs which are syntactic Alternators in English show much broader syntactic variation across languages than the classes which are Non-alternators in English. This may be related with idiosyncratic semantic properties which can affect syntactic possibilities in some languages but not others, as suggested by Pinker (1989) and Levin (1993). For example, in English verbs of ballistic motion such as *spray* and *sprinkle* are Alternators, whereas related non-ballistic verbs such as *pour* and *dribble* only allow the Figure frame. This affects some languages but not others: For example, *spray* is an Alternator in Chinese and Thai, but is a Non-alternating Figure verb in Korean, Japanese, Hebrew, and Turkish.

An interesting finding was that one of the most syntactically variable verbs across languages is *fill*. For example, in English *fill* is a Non-alternating Ground verb, in Korean it is an Alternator, in Singapore Malay it is an Alternator, and in Thai it is a Non-alternating Figure verb. In contrast, *cover* and *decorate* show much less variation across languages. Having establishing the range of cross-linguistic variation, the remaining

question is how the learner learns these language specific idiosyncrasies. I will discuss this question in the next chapter.

APPENDIX 3.A: LEXICALIZATION PATTERN OF MOTION VERBS IN KOREAN

Choi and Bowerman (1991) claim that Korean shows different verb lexicalization patterns for expressing spontaneous and caused motion. For example, motion verbs expressing spontaneous motion conflate with the deictic element, whereas they do not conflate with the PATH, as shown in (72). In contrast, motion verbs expressing caused motion conflate with the PATH and may express MANNER separately, as shown in (73).

(72) *Spontaneous motion in Korean*

Yumi-ka	pang-ey	ttwi-e-tul-e-o-ass-ta.
Nom	room-Loc	run-conn-enter-conn-com-Past-Decl
[Figure]	[Ground]	[Manner][Path][Motion + Deixis]

'Yumi came into the room, running.'

(73) *Caused motion in Korean*

Yumi-ka	selap-ey	chek-lul	neh-ess-ta.
Nom	drawer-Loc	book-Acc	put in-Past-Decl
	[Ground]	[Figure]	[Motion + Path]

'Yumi put the book into the drawer.'

English uses the same PATH marker to express both spontaneous and caused motion, such as "go in(to) vs. "put in(to), and uses the same [Motion + Manner] conflation pattern to express both spontaneous and caused motion. In contrast, certain Korean verbs seem to use lexically different expression of spontaneous and caused motion, as illustrated in (72) and (73). On the basis of the data shown in (72) and (73), Choi and Bowerman (1991) claim that such a split in the lexicalization patterns between spontaneous and caused motion events does not fit Talmy's (1985) typological generalization of lexicalization patterns.

As pointed out by Y. Kim (1995), however, the problem with this argument is that the existence of morphologically unrelated roots for expressing spontaneous and caused

motion in Korean (e.g., *tul-e-ka-/-o-* 'go into/ come into' vs. *neh-* 'put in'), may not be enough to determine these status of the whole language for the typological parameter. In contrast to Choi and Bowerman's argument, Y. Kim (1995) suggests that Korean uses the same motion-conflation pattern for expressing spontaneous and caused motion, as shown in (74):

(74) *Morphologically related pairs of spontaneous and caused-motion verbs:*
a. *yel-li-* 'open' (intransitive) ; *yel-* 'open' (transitive)
b. *ephcill-e-ci* 'spill' (intransitive); *ephcilu-* 'spill' (transitive)
c. *mut-* 'liquid/ soil sticks to a surface (intransitive);
mut-hi- 'put liquid substance onto a surface' (transitive)
(Y. Kim 1995; 508-509)

Note that if the verb root expresses spontaneous motion, the causative morpheme *-i-* (in 7 allomorphic variations *-i-/-hi-/-li-/-ki-/-wu-/-kwu-/-chwu-*) is added in Korean to derive a causative expression. These data show that expressions for spontaneous and caused motion in Korean share the same verb root, and therefore the same motion-conflation pattern. Furthermore, she provides more examples of a unified motion-conflation pattern in expressing spontaneous and caused-motion verbs, as follows:

(75) *Directed spontaneous-motion expressions without a deictic element:*
ttwi-e-olu- 'jump-move up' ('jump up')
ttwi-e-nayli- 'jump-move down' ('jump down')
ki-e-olu- 'crawl-move up' ('crawl up')
tte-e-olu- 'float-move up' ('rise onto a surface')

(76) *Directed caused-motion expressions containing a deictic verb*
ol-li-e-ka- 'move up-Caus-go' ('move an object up away from the speaker')
ol-li-e-o- 'move up-Caus-come'
nayli-e-ka- 'move down-Caus-go'
nayli-e-o- 'move down-Caus-come'
(Y. Kim 1995; 511-514)

As shown in (75) and (76), motion verbs expressing both spontaneous and caused-motion may or may not conflate with deictic elements. Therefore, the fact that a lot of motion verbs in Korean have the same lexicalization pattern in expressing spontaneous and caused-motion events, seems to be enough to rule out Choi and Bowerman's argument.

APPENDIX 3.B: A CROSS-LINGUISTIC SURVEY OF LOCATIVE VERBS

3.B. 1 Universal Syntax-semantics Correspondences: "Pour" and "Pile"-classes

I suggested that one generalization that holds across all the languages that I have looked at is that manner-of-motion verbs allow the Figure frame. First, the class of the Non-alternating Figure verbs is syntactically identical across *all* of the languages that I have looked at, as follows:

English-type languages

(77) *"Pour"-class in Spanish: Non-alternating Figure verbs*

a. Juan vertí agua en el vaso.
John poured water into the glass
'John poured water into the glass.'

b. *Juan vertí el vaso con agua.
John poured the glass with water
'*John poured the glass with water.'

(78) *"Pour"-class in Singapore Malay: Non-alternating Figure verbs*

a. Saya tuang air ke dalam gelas.
I pour water in inside glass
'I poured water into the glass.'

b. *Saya tuang gelas dengan air.
I pour glass with water
'*I poured the glass with water.'

(79) *"Pour"-class in Najdi Arabic: Non-alternating Figure verbs*

a. John sabb moya fi l-kaas.
poured water in the-glass
'John poured water into the glass.'

b. *John sabb al-kaas b-moya.
poured the glass with-water
'*John poured the glass with water.'

(80) *"Pour"-class in Hebrew: Non-alternating Figure verbs*

a. Danny shafax mayim letox ha-kos.
John poured water into the glass
'John poured water into the glass.'

b. *Danny shafax et ha-kos be-mayin.
John poured Acc the glass with water
'*John poured the glass with water.'

Korean-type languages

(81) *"Pour"-class in Japanese: Non-alternating Figure verbs*

a. Taro-ga mizu-o baketu-ni sosoi-da.
Nom water-Acc bucket-Loc pour-Past
'Taro poured water into a bucket.'

b. *Taro-ga baketu-o mizu-de sosoi-da.
Nom bucket-Acc water-with pour-Past
'*Taro poured a bucket with water.'

(82) *"Pour"-class in Chinese: Non-alternating Figure verbs*

a. Zhang San zai beizi li dao-le shui.
Zhang San at cup in pour-ASP water
'Zhang San poured water into the cup.'

b. * Zhang San yong shui dao-le beizi.
Zhang San use water pour-ASP cup
'*Zhang San poured the cup with water.'

(83) *"Pour"-class in Thai: Non-alternating Figure verbs*

a. Chan t^he nam longnai kaew.
I pour water into glass
'I poured water into the glass.'

b. *Chan t^he kaew duay nam.
I pour glass with water
'*I poured the glass with water.'

(84) *"Pour"-class in Turkish: Non-alternating Figure verbs*

a. John suy-u bardag-e bosalt-ti.[14]
John water-Acc glass-Dat pour-Past
'John poured water into the glass.'

b. *John suy-la bardag-i bosalt-ti.
John water-with glass-Acc pour-Past
'*John poured the glass with water.'

(85) *"Pour"-class in Luganda: Non-alternating Figure verbs*

a. Petero ya-yiwa a-mazzi mu-gilaasi.
Petero poured the water into-glass
'Petero poured water into the glass.'

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14 Note that in Turkish, the verb *bosalt* has two different meanings. For example, the verb *bosalt* can correspond to either the verb 'pour' or the verb 'empty' in English. If we translate the verb *bosalt* as the verb 'empty' in the sentence (84b), it may be grammatical.

b. *Petero ya-yiwa gilaasi na-mazzi.
Petero poured glass with-water
'*Petero poured the glass with water.'

(86) *"Pour"-class in Hindi: Non-alternating Figure verbs*

a. John-ne gilaas-me paanii uRelaa.
John-Erg glass-Loc water-Nom poured
'John poured water into the glass.'

b. *John-ne gilaas-ko paanii-se uRelaa.
John-Erg glass-Acc water-with poured
'*John poured the glass with water.'

Second, consider verbs in the "pile"-class, which are Figure-Alternating verbs in English. Verbs in the "pile"-class include *pile, spray, scatter/sow,* and *load*. In some languages, verbs of the "pile"-class are syntactic Alternators, whereas in some languages they are Non-alternating Figure verbs. However, I have never found a language that allows the restricted Ground frame with these verbs.

English-type languages

(87) *"Pile"-class verbs in Spanish: An Non-alternating Figure verb*

a. Juan apiló las cajas en el pasillo.
John piled the boxes in the corridor
'John piled the boxes in the corridor.'

b. * Juan apiló el pasillo con cajas.
John piled the corridor with boxes
'John piled the corridor with boxes.'

(88) *"Pile"-class verbs in Singapore Malay: An Alternator*

a. Saya longgok-kan epal ke dalam lori.
I load-Caus apple to inside truck
'I loaded the apples into the truck.'

b. ??Saya longgok-kan lori dengan epal.
I load-Caus truck with apple
'I loaded the truck with apples.'

(89) *"Pile"-class verbs in Najdi Arabic: Non-alternating Figure verbs*

a. jammaat al halu ala al tabaq.
piled the cookies on the plate
'I piled the cookies on the plate.'

b. *jammaat al tabaq fi al halu.
piled the plate with the cookies
'I piled the plate with cookies.'

(90) *"Pile"-class verbs in Hebrew: Non-alternating Figure verbs*

a. Danny aram sfarim al ha-shulxan.
John piled books on the table.
'John piled books on the table.'

b. *Danny aram et ha-shulxam im sfarim.
John piled Acc the table with books.'
'John piled the table with books.'

Korean-type languages

(91) *"Pile"-class verbs in Japanese:Non-alternating Figure verbs*

a. Taro-ga hoshikusa-o niguruma-ni tsumu.
Nom hay-Acc wagon-Loc load
'Taro loaded hay on the wagon.'

b. *Taro-ga niguruma-o hoshikusa-de tsumu.
Nom wagon-Acc hay-with load
'Taro load the wagon with hay.'

(92) *"Pile"-class verbs in Thai:Non-alternating Figure verbs*

a. Chan kong nagsur bon to.
I pile book on table
'I piled books on the table.'

b. *Chan kong to duay nangsur.
I pile table with book
'I piled the table with book.'

(93) *"Pile"-class verbs in Chinese: Non-alternating Figure verbs*

a. Zhang San wang kache shang zhuang le pingguo.
Zhang San to truck on load-Asp apple
'Zhang San loaded the apples onto the truck.'

b.?? Zhang San yong pingguo zhuang le kache.
Zhang San use apple load-Asp truck
'Zhang San loaded the truck with apples.'

(94) *"Pile"-class in Turkish: Alternators*

a. John kamyon-e elmalar-i yukle-di.
John apple-Acc truck-Dat load-Past
'John loaded the apples on the truck.'

b. John kamyon-u elmalar-la yukle-di.
John apple-with truck-Acc loaded
'John loaded the truck with apples.'

(95) *"Pile"-class in Luganda: Alternators*

a. Na-tindikira ebitabo ku mmeeeza.
I-piled books on table
'I piled book on the table.'

b. Na-tindikira e-mmeezaa ne-bitabo.
I-piled table with books

'I piled the table with books.'

(96) *"Pile"-class in Hindi: Alternators*

a.	John-ne	gaaRii-par	seb	laade.
	John-Erg	car-Loc	apples-Nom	loaded
	'John loaded apples with the truck.'			
b.	John-ne	gaaRii-ko	seb-se	laadaa.
	John-Erg	car-Acc	apples-with	loaded
	'John loaded the truck with apples.'			

3.B.2 Verbs of the "Smear"-class Across Languages

I found that there is no cross-linguistic variation in syntactic patterns of verbs in the "smear"-class. Verbs of the "smear"-class included *paint, spread, smear,* and *rub*. Here are examples from all of the languages I have looked at:

English-type languages

(97) *"Smear"-class verbs in Spanish: Alternators*

a.	Juan	manchó	pintura	en	la	pared.
	John	smeared	paint	on	the	wall
	'John smeared paint on the wall.'					
b.	Juan	manchó	la	pared	con	pintura.
	John	smeared	the	wall	with	paint
	'John smeared the wall with paint.'					

(98) *"Smear"-class verbs in Singapore Malay: Alternators*

a.	Saya	cat	minyau uat	tembou.	
	I	paint	oil	at	wall
	'I painted oil on the wall.'				
b.	Saya	cat	tembou dengan	minyak.	
	I	paint	wall	with	oil
	'I painted the wall with oil.'				

(99) *"Smear"-class verbs in Najdi Arabic: Alternators*

a.	dahintu al	ziiytah	ala	al	haat.	
	painted the	oil	on	the	wall	
	'I painted the oil on the wall.'					
b.	dahintu al	haat	bi	al	ziiyt.	
	painted the	wall	with	the	oil	
	'I painted the wall with the oil.'					

Korean-type languages

(100) *"Smear"-class verbs in Japanese: Alternators*

a.	Taro-ga	kabe-ni	penki-o	nuru.

Nom wall-Loc paint-Acc smear
'Taro smeared paint on the wall.'

b. Taro-ga kabe-o penki-de nuru.
Nom wall-Acc paint-with smear
'Taro smeared the wall with paint.'

(101) *"Smear"-class verbs in Chinese: Alternators*

a. John zai qiang shang mo qi.
on wall on smear paint
'John smeared paint on the wall.'

b. John young qi mo qiang.
with paint smear wall
'John smeared the wall with paint.'

(102) *"Smear"-class verbs in Thai: Alternators*

a. Chan t^ha namman bon kampang.
I paint oil on wall
'I painted oil on the wall.'

b. Chan t^ha kampang duay namman.
I paint wall with oil
'I painted the wall with oil.'

(103) *"Smear"-class verbs in Turkish: Alternators*

a. John boyay-i duvar-de boya-di.
John oil-Acc wall-Dat paint-Past
'John painted the oil on the wall.'

b. John boyay-la duvar-i boya-di.
John oil-with wall-Acc paint-Past
'John painted the wall with oil.'

(104) *"Smear"-class verbs in Luganda: Alternators*

a. Petero ya-siiga langi ku-kisenge.
Petero smeared paint on-wall
'Petero smeared paint on the wall.'

b. Petero ya-siiga e-kisenge ne-langi.
Petero smeared the wall with-paint
'Petero smeared the wall with paint.'

(105) *"Smear"-class verbs in Hindi: Alternators*

a. John-ne diivar-par rang potaa.
John-Erg wall-Loc paint-Nom smeared
'John smeared paint on the wall.'

b. John-ne diiver-ko rang-se potaa.
John-Erg wall-Acc paint-with smeared
'John smeared the wall with paint.'

Chapter 4

LEARNABILITY AND CROSS-LINGUISTIC VARIATION

4.1 Introduction

In the previous chapters I have raised the learnability problem of how a learner succeeds in learning a verb's meaning and its associated syntactic structures, in particular focusing on the syntax and semantics of locative verbs, and I have extended this learnability problem with a cross-linguistic perspective. As a possible aid to learning, it has been suggested that reliable mappings between syntax and semantics could help the child learn a verb's meaning and its associated syntactic structures (Grimshaw 1981; Landau and Gleitman 1985; Pinker 1989; Gleitman 1990; Gropen et al. 1991a,b). If the learner can take advantage of consistent syntax-semantics correspondences, then learning the meanings of verbs and their syntactic possibilities could be made easier for the learner. However, if mappings between syntax and semantics are not universal, and if the learner cannot use learning strategies based on consistent syntax-semantics mappings, it is much less clear how the learner can succeed in learning the syntax of verbs.

Therefore, the main goal of Chapter 2 was to find out to what extent there are universal syntax-semantics correspondences and what extent there are language-specific syntax-semantics correspondences, in terms of the syntax of locative verbs. I showed that there is cross-linguistic variation in syntax-semantics mappings, although some universal syntax-semantics mappings are still valid across languages. The question becomes how

the learner can use syntax-semantic correspondences despite the problem of cross-linguistic variation.

The existence of cross-linguistic variation in the syntax of locative verbs undermines learning strategies based on consistent syntax-semantics correspondences. However, in Chapter 3, I suggested that certain aspects of locative verb syntax correlate with an independent property, namely the availability V-V compounding or verb serialization, and that this simple morphological cue may help the learner to figure out the properties of locative verbs in her target language. If the learner can use this information to determine whether she is speaking an English-type language or a Korean-type language, if this morphological cue is readily available, and if the connection between this cue and locative verb syntax is transparent to the learner at a young age, then perhaps by age 3-4 children have figured out the syntax of locative verbs in their target language.

Furthermore, in Chapters 1-2, I raised the question of how children make similar constrained generalizations as native speakers do. Native speakers of English make some kinds of generalizations about verb syntax. For example, native speakers of English can generalize the fact that the verb *spray* allows the locative alternation to other verbs like *squirt* or *sprinkle*, which share similar ballistic motion meanings. However, they do not generalize the verb *spray* to related non-ballistic verbs like *pour* and *dribble*, which allow only Figure frames. Therefore, we know that native speakers make quite constrained, conservative generalizations about verb syntax. Learners must make similarly constrained generalizations, then, if they become native speakers.

Nevertheless, it is widely reported that English-speaking children overgeneralize Figure frame syntax to Ground verbs like *fill*, and produce ungrammatical sentences like "she filled the water into the glass" (Bowerman 1982; Pinker 1989; Gropen et al.

1991a,b). For example, Bowerman's (1982) spontaneous speech study reports that children between the ages of 4 and 7 often overuse Figure frames with Ground verbs like *fill* and *cover*. This kind of error was also found in experiments by Gropen et al. (1991a), in which children aged 3-8 were asked to describe pictures of locative verbs using verbs like *pour, dump, fill* and *empty*.

The second question is how children manage to end up as native speakers, under the assumption that constrained generalization is the key to success, and that overgeneralization errors are hard to recover from.

In order to answer these questions, we now need to find out how much children have learned about the syntax of locative verbs by age 3-4, especially in the light of the potential problem of cross-linguistic diversity, and we also need to find out what the scope of their overgeneralization errors is. Knowing about 3-4 year old children's knowledge of the syntax of locative verbs may allow us to assess what they can and cannot learn by using consistent cross-linguistic syntax-semantics correspondences.

In this chapter, I present spontaneous descriptions of locative events produced by Korean and English speaking children and adults, in order to find out 3-4 year old children's knowledge of the syntax of locative verbs, and in order to demonstrate how syntax-semantics correspondences can assist the learner despite cross-linguistic variation. In addition to production data, I evaluate the feasibility of specific learning mechanisms, based on information on the use of locative frames in the maternal input with specific verbs for all of the English CHILDES database. Finally, I discuss how children recover from their errors.

Before moving to an experiment that I have run on children and adults in English and Korean, let me briefly review three possible reasons for why children might produce ungrammatical sentences like "she filled the water into the glass", in section 4.2.

4.2 Theoretical Predictions

In this section, I present three hypotheses about children's Figure frame overgeneralization errors with Ground verbs like *fill*, and show what each hypothesis may predict about the experiment I conducted.

4.2.1 Input Frequency Hypothesis

The first hypothesis, which is proposed by Bowerman (1982, 1990), is that Figure frame overgeneralizations are parallel to well-known overgeneralizations of past tense morphology, based on the idea that Figure frames might outnumber Ground frames in the parental input. More specifically, Bowerman (1982) suggests that since the Figure syntactic frame is more dominant than the Ground syntactic frame for expressing English locative events, children's overgeneralization of the Figure frame to the Ground frame (e.g., "fill"-errors) is due to the frequency of the input available to them. If children conclude that Figure-frames are the dominant syntactic pattern for expressing English locative events in parental speech, then they may generalize this pattern to all locative verbs. Therefore, frequency effects may lead to children's well-known syntactic errors with "fill"-type verbs.

This suggestion is based on the idea that children are responding to global frequency properties of their input. I will call it the Input Frequency Hypothesis. From the input frequency hypothesis, we could predict that English-speaking children should overgeneralize the Figure frame to Ground verbs like *fill, cover*, and *decorate*.

Furthermore, we could predict that English-speaking children should overuse the Figure frames with Alternating verbs like *paint, load*, or *spray*.

In contrast, Gropen et al. (1991a) claim that Bowerman's input frequency effect cannot explain children's syntactic errors with Ground verbs like *fill*, based upon Rappaport & Levin's (1985) verb type frequency and Francis & Kucera's (1982) token frequency analyses. For example, Rappaport & Levin's (1985) type frequency analysis shows that among 125 locative verbs in English, the Non-alternating verbs (92) overwhelmingly outnumber the Alternators. Among the Non-alternating verbs, Ground verbs (73) overwhelmingly outnumber Figure verbs (19). In addition, Francis & Kucera's token frequency analysis based on a million-word corpus shows that the Non-Alternators (1295) outnumber the Alternators (658), and that among Non-Alternators, Ground verbs (944) outnumber the Figure verbs (351) in English. Therefore, Gropen et al. claim that since Ground verbs obviously outnumber Figure verbs in English, in terms of token frequencies as well as type frequencies, Bowerman's input frequency effect cannot be true.

From this standpoint, it would be interesting to explore the maternal input data from the English CHILDES database, in order to evaluate Bowerman's argument and Gropen et al.'s argument about the input frequency effect. I will return to more specific discussion of this in this chapter.

4.2.2 Perceptual Bias Hypothesis

The second hypothesis is that children's Figure frame errors result from the greater perceptual salience of moving objects compared to stationary ground objects (Gentner 1975, 1978; Gropen et al. 1991a,b). This could bias children to encode the Figure object as the direct object, and this effect may be strong enough to give rise to

Figure frames to all locative verbs, even when this is ungrammatical. Therefore, the perceptual bias of Figure objects could induce children's overgeneralization errors of Figure frames to all Ground verbs.

Gentner (1975, 1978) provides evidence for an asymmetry between manner-of-motion verbs and change-of-state verbs in the acquisition of verb meaning components. She suggests that children between the ages of 5 and 9 are more sensitive to manner of motion meaning components than to change of state meaning components, based on the contrast between the change of state verb *mix* and the other manner of motion verbs *stir, beat,* and *shake*. For example, *mix* specifies a particular change of state (something becomes mixed) but does not specify any particular change of action, whereas verbs like *stir, beat,* and *shake* specify a particular manner of motion but do not specify an end state. Gentner (1978) asked children whether they could describe a variety of events as cases of *stirring* or *mixing*, and found that 5-year-olds applied *mixing* to events in which no state change occurred, treating it as an action verb like *stir*. If children frequently misinterpret a change-of-state verb as a manner-of-motion verb, due to the perceptual bias of moving objects, then they may overgeneralize Figure frames to all locative verbs.

One possibility based on the perceptual bias hypothesis is that the perceptual bias of moving objects is due to the encoding of the event, regardless of syntax. If the perceptual salience of moving objects alone is strong enough to influence children's syntactic choices, independent of syntactic input, then both English-speaking children and Korean-speaking children should show the same tendencies to encode the same events as Figure verbs vs. Ground verbs. Therefore, based on the perceptual bias hypothesis, we could predict that the bias to use a Figure frame over the different events should be identical for both English-speaking children and Korean-speaking children.

Second, we could predict that the bias to overgeneralize to use the Figure frame should be the same in both English-speaking children and Korean-speaking children.

A variant of this idea is suggested by Gropen et al. (1991a), who claim that the salience of the figure object may cause learners to semantically misanalyze Ground verbs. A manner of motion that is *characteristic* of a verb, such as the pouring that often co-occurs with a filling event, may be treated as an *essential* property of the semantics of the verb, with the result that the Figure frame is predicted to be possible. For example, the verb *fill* might be taken to mean "fill-by-pouring", which has the manner of motion meaning required to license Figure frames. Children who have an incorrect meaning for *fill* would therefore make syntactic errors with the verb *fill*, like "fill the water". In other words, children's semantic errors directly induce their syntactic errors.

From this view, we could expect that children are more likely to produce Figure-frame errors with a "filling" event caused by a "pouring"-manner than with a "filling" event not caused by a "pouring"-manner.

4.2.3 Parameter Mis-setting Hypothesis

A third hypothesis, which is suggested by the cross-linguistic differences that we have already seen, is that learners of English think that their language has the properties of Korean, in which verbs like *fill* allow Figure-frame syntax. For example, in Korean Ground verbs like *fill* and *cover* allow Figure frames as well as Ground frames, whereas in English they allow only Ground frames. Therefore, we could think of this in terms of Korean being the simpler or unmarked system for the syntax of locative verbs, or we could think of it as a mis-set parameter.

Based on this hypothesis, we could predict that English-speaking children should perform like Korean-speaking adults, in terms of the patterns of acquisition and the overgeneralization patterns.

4.2.4 Summary

So far we have seen three hypotheses, which provide different explanations for children's well-known syntactic errors with "fill"-type verbs. Let me briefly summarize the predictions of these hypotheses about the experiment that is reported in the following section. First, from the input frequency hypothesis proposed by Bowerman (1982), which claims that children respond to the global frequency distribution of Figure frame in the input, English-speaking children are expected to overgeneralize Figure frames to all Ground verbs I tested, which included *fill, cover,* and *decorate*, and to overuse Figure frames with Alternators.

Second, from the perceptual bias hypothesis proposed by Gentner (1975, 1978), we could predict that both English-speaking children and Korean-speaking children should show the same bias to use a Figure frame over the different events. Second, as predicted by the input frequency hypothesis, we could predict that English-speaking children should overgeneralize Figure frames to all Ground verbs like *fill, cover*, and *decorate*, and they should overuse Figure frames with Alternators.

In addition, from the perceptual bias view proposed by Gropen et al. (1991a,b), English-speaking children are expected to be more likely to produce Figure-frame errors with a "filling" event caused by a "pouring"-manner than with a "filling" event not caused by a "pouring"-manner.

Third, from the parameter mis-setting hypothesis, English-speaking children are expected to perform like Korean-speaking adults, with regard to the proportions of Figure frames with individual verbs that I used.

4.3 Production Experiment

The main goal of this experiment is to examine how much children have learned about the syntax of locative verbs by age 3-4, and to examine if we can find independent evidence for children's Figure-frame bias, the input matching effect, and parameter mis-setting, using an elicited production task of child and adult speakers of English and Korean. In particular, production data would provide the opportunity to evaluate the three possible hypotheses - the perceptual bias hypothesis, the input frequency hypothesis, and the parameter mis-setting hypothesis.

4.3.1 Method

4.3.1.1 Participants

The 60 participants consisted of 30 speakers each of English and Korean. Within each language group, three groups were tested: (1) children: 10 English-speaking children aged 2;11-4;0 and 10 Korean-speaking children aged 3;0-4;0 in Korea; (2) adults: English-speaking 10 undergraduate/graduate students and Korean-speaking 10 graduate students at the University of Delaware; (3) mothers: 10 mothers of English-speaking children aged 2;0 to 3;0 and 10 mothers of Korean-speaking children aged 2;0 to 3;0 who live in Korea. I specifically chose these mothers because I wanted to be sure that I was looking at the kind of language input that children aged 3;0 to 4;0 had been exposed to. Therefore, mothers were asked to describe each event as they would describe it to a child.

4.3.1.2 Design, Materials, Procedures

The events represented by 14 different locative verbs were shown to participants. The 14 locative verbs that I used came from each of 4 subclasses of locative verbs, as follows[1]:

(1) Group 1 ("pour"-class verbs): Figure verbs in both English and Korean (*pour, spill, hang,* and *stick*)
Group 2 ("paint-class verbs): Alternators in both English and Korean (*paint, wrap, stuff,* and *spread*)
Group 3 ("pile"-class verbs): Alternators in English but Figure verbs in Korean (*spray, pile,* and *load*)
Group 4 ("fill"-class verbs): Ground verbs in English but Alternators in Korean (*fill, cover,* and *decorate*)

This is a broader class of verbs that has been used in previous studies (Gropen et al. 1991a). For example, Gropen et al. (1991a) used two Figure verbs *pour* and *dump,* which specify a particular manner of motion of the moving object, and two Ground verbs *empty* and *fill*, which specify a particular change of state of the container. There are two main reasons to use this larger set of verbs. First, I wanted to see whether children and adults treat all verbs in the same class alike. Second, I wanted to include a number of Alternating verbs in both languages, in order to see what syntactic choices speakers make when their native language grammar gives them an option for syntactic frames.

All participants were tested individually in a separate room: English-speaking children were tested individually in a lab, and Korean-speaking children were tested individually in a Kindergarten. In all conditions one experimenter interacted with all

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1 The classes in (1) are based on the results of an earlier grammatical study (Kim & Landau 1997; see Appendix 2.A). We examined grammaticality judgments by adult native speakers of English and Korean for 20 locative verbs selected from Levin's (1993) list of locative verbs. Although Levin reports that verbs like *hang* and *stick* are Alternators in English, we found that those verbs were judged to be Figure verbs in English in the contexts we used in our experiment.

subjects. The only difference was that for the English-speaking children only there was a separate person to control the VCR/camera.[2]

Before testing their knowledge of locative verbs, the experimenter introduced participants to two samples of a video-clip depicting sample actions of dropping and shaking, in order to familiarize two participants showed a hand shaking with the procedures. For example, clip showed that one was dropping a pen on a sheet of paper, the other was shaking a can of soda with a hand. The experimenter would say 'Look at the movie: there is a woman, a piece of paper, and a pen. She is dropping... Can you tell me what she did? She dropped__'. If participants failed to produce a full sentence with a PP argument like "she dropped the pen on a piece of paper", the experimenter encouraged them to use it, like "she dropped the pen____".

Participants were shown a series of a videotaped events, one at a time. After watching each video-clip, participants were asked to describe the event using a specific verb that was provided to them. For example, the experimenter would say 'Look at the movie: there is a *woman*, a *glass*, and *some water*. She is *pouring*. Can you tell me what she did? She *poured*____'. In particular, in order not to give participants any bias for choosing syntactic frames, the figure object and the ground object were introduced in different orders for each trial. For example, in one trial the ground object (e.g., table or a piece of paper) was introduced to participants before the figure object (e.g., water or juice), and in the next trial the figure object was introduced to them first.

This was enough to elicit complete sentences with Figure and Ground arguments from adult participants. But this was often not enough to elicit complete sentences with

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2 I would like to thank Andrea Zukowski and Nicole Kurz for their help in running the experiments.

Figure and Ground arguments from children. In a pilot study, children often omitted one or more of the arguments, which was compatible with the pragmatics of the situation. The problem with the omission of a PP argument is that children may not have an option to choose for syntactic frames of Alternating verbs. As discussed in Chapter 2, Figure-Alternating verbs show different "sole argument effects" from Ground-Alternating verbs, depending on which argument is obligatory. For example, Ground verbs like *paint* or *stuff* allow only Ground-frames when the PP argument is omitted (e.g., stuffed the pillow/*stuffed the feather), although they allow both Figure and Ground frames with complete sentences (e.g., stuffed the pillow with feather/stuffed the feather into the pillow). In contrast, Figure-Alternating verbs like *pile* allow only Figure-frames when the PP argument is omitted (e.g., piled books/*piled the shelf). If children produce Alternating verbs without a PP argument, their syntactic choices would be restricted to either Figure frames or Ground frames. Therefore, since children's PP omission could block some Figure frames, it might not provide an opportunity to see independent evidence for the Figure-frame bias.

As shown in Table 4.1, the pilot study I conducted showed that the 10 English-speaking children omitted the PP argument 73% of the time, and the 3 Korean-speaking children omitted the PP argument 82% of the time.

Table 4.1: PP Omission Used by 10 English-speaking Children and 3 Korean-speaking Children (Original Method)

	Without contrastive scene		
	V-NP only	V-NP-PP	total
English children (10)	221 (73.7%)	79 (26.3%)	300
Korean children (3)	74 (82%)	16 (18%)	90

When children failed to produce complete sentences, they were encouraged to add the PP argument at the second trial, like "she poured the water___". Although the second trial could lead to a higher success rate in eliciting full sentences, it might not be useful for the main goal of this experiment. Since children already produced the direct object without a PP argument, adding the PP argument did not change the syntactic frame with a specific verb. For example, if children produced the sentence "she painted the canvas", and if they were encouraged to use the PP argument at the second trial, then they could add it, as in "she painted the canvas with watercolors". That is, once children have made a choice for the syntactic frame, adding the PP argument might not be useful because they would not change the syntactic possibility. Therefore, in order to see independent evidence for the Figure frame bias, we should encourage children to use complete sentences when a specific verb was provided to them.

Therefore, in order for children to produce complete sentences with Figure and Ground arguments, before showing each video-clip to them, a contrasting event was acted out using the same verb but different objects.[3] For example, when the video-clip showed juice being poured into a glass, the experimenter first acted out an event in which water was poured into a bowl. The details of this procedure are shown in Table 4.2.

Table 4.2: Sample Story for Children

Locative verb "pour"	*Pragmatic Set-up* (children only) I have water and a bowl. I'm going to ***pour…*** I ***poured***. Did you see what I did? Let's watch the movie.
	Test Event on TV screen (all subjects) She has different things. She has a glass and some sugar. She's going to ***pour…*** She ***poured***. Can you tell me what she did?

[3] The new method involving use of a contrastive event was suggested by Colin Phillips and Andrea Zukowski.

	She ***poured***___. Can you tell me what I did? I ***poured*** ____.

Table 4.3: Contrastive Events and Test Events on TV Screen

Verbs	Contrastive events	Events on a TV screen
Pile	bricks being piled on a box	cookies being piled on a plate
Load	cars being loaded on a trailer	apples being loaded on a truck
Paint	nail-polish being painted on a brick	watercolors being painted on a piece of paper
Fill (1)	bowl being filled with water	glass being filled with juice
Fill (2)	basket being filled with crayons	bowl being filled with toys
Cover	table being covered with a table-cloth	doll being covered with a blanket
Decorate	cup-cake being decorated with an icing	Christmas-tree being decorated with ornaments
Spread	cream-cheese being spread on a cracker	peanut-butter being spread on a slice of bread
Pour	coke being poured into the cup	sugar being poured into a glass
Spray	water being sprayed into a paper-towel	soap being sprayed on a sponge
Wrap	scarf being wrapped around a puppet	bandage being wrapped around a hand
Stuff	tissue being stuffed into a puppet's mouth	cotton being stuffed into a small bag
Hang	keys being hung on some nails	caps being hung on a coat-rack
Spill	water being spilled on a towel	juice being spilled on a piece of paper
Stick	bear-stickers being stuck on a card	animal-stickers being stuck on a piece of paper

This change made the Figure and Ground objects in the video clip contrastive and led to a much higher success rate in eliciting full sentences, as shown in Table 4.4.

Table 4.4: PP Omission Used by 10 Children of English and Korean (Modified Method)

	With contrastive scene		
	V-NP only	V-NP-PP	total
English children	28 (9.3%)	272 (90.7%)	300
Korean children	195 (65%)	105 (35%)	300

English-speaking children produced complete sentences 90.7% of the time, compared to 26% without the contrasting event. Therefore, the contrasting event acted out led to a

much higher success rate in eliciting complete sentences with Figure and Ground arguments.

In addition, Korean-speaking children were more willing to elicit full sentences with the contrast event than without the contrast event. However, Korean-speaking children did not show such a large increase in PP-production as the English-speaking children did, as shown in Table 4.4. This may be because argument-drop in Korean is prevalent. However, it is less clear why Korean-speaking children often omitted a PP argument even when the pragmatics of the situation overrode argument-drop.

The comparison between the original method and the modified method is given in Table 4.5:

Table 4.5: Comparison between Original Method and Modified Method

	Without contrastive scene		With contrastive scene	
	V-NP only	V-NP-PP	V-NP only	V-NP-PP
English children	73.7%	26.3%	9.3%	90.7%
Korean children	82%	18%	65%	35%

Second, two different scenes were used for each of the verbs that I tested, one in which the ground object was completely affected by the action, and another in which it was only partially affected by the action. This manipulation was included because it has often been pointed out that the ground frame is associated with a "holistic interpretation" of how the ground object is affected (Anderson 1971). Gropen et al.'s (1991b) study shows that children were more likely to use the Ground frame with a novel verb when the surface was completely filled/covered rather than when it was only partially filled/covered. Therefore, participants are expected to be more likely to produce the ground frame when the ground object is completely filled or covered than when it was only partially affected by the action.

Finally, two versions of the "filling" event were included- one which could be interpreted as "fill" caused by "pouring", and another which involved still "filling", but not caused by "pouring". Gropen et al. (1991a) claim that children's overgeneralization errors are due to the incorrect representation for *fill*. For example, the verb *fill* might be taken to mean "fill-by-pouring", which has the manner of motion meaning required to license Figure frames. If the use of a "pouring"-manner leads to children's errors with *fill*, then children could be expected to be more likely to produce Figure-frame errors when the "filling" event involves a "pouring"-manner than with the "fill" event involves a "loading"-manner.

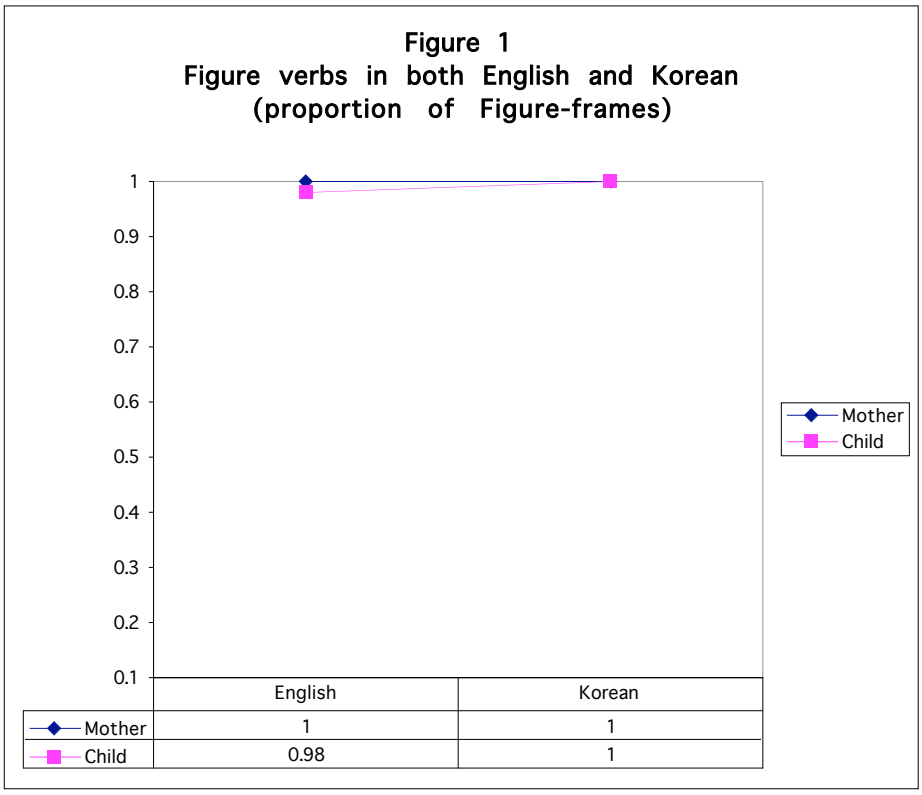
4.3.2 Results and Discussion

In all of the results, I compared the performance of children to the group of mothers, and ignored the adults, although this group performed almost identically to the mothers. Two-way ANOVA analysis of variance on the proportion of Figure frame responses revealed no significant difference between adults and mothers ($F(1,36)=.56$, $p=.11$), and no significant interaction between Age Group (adults and mothers) and Language ($F(1,36)=1.59$, $p=.07$).

I performed all other analyses on individual verb classes, because I would like to know whether children and adults treat all verbs in the same class alike in this experiment.

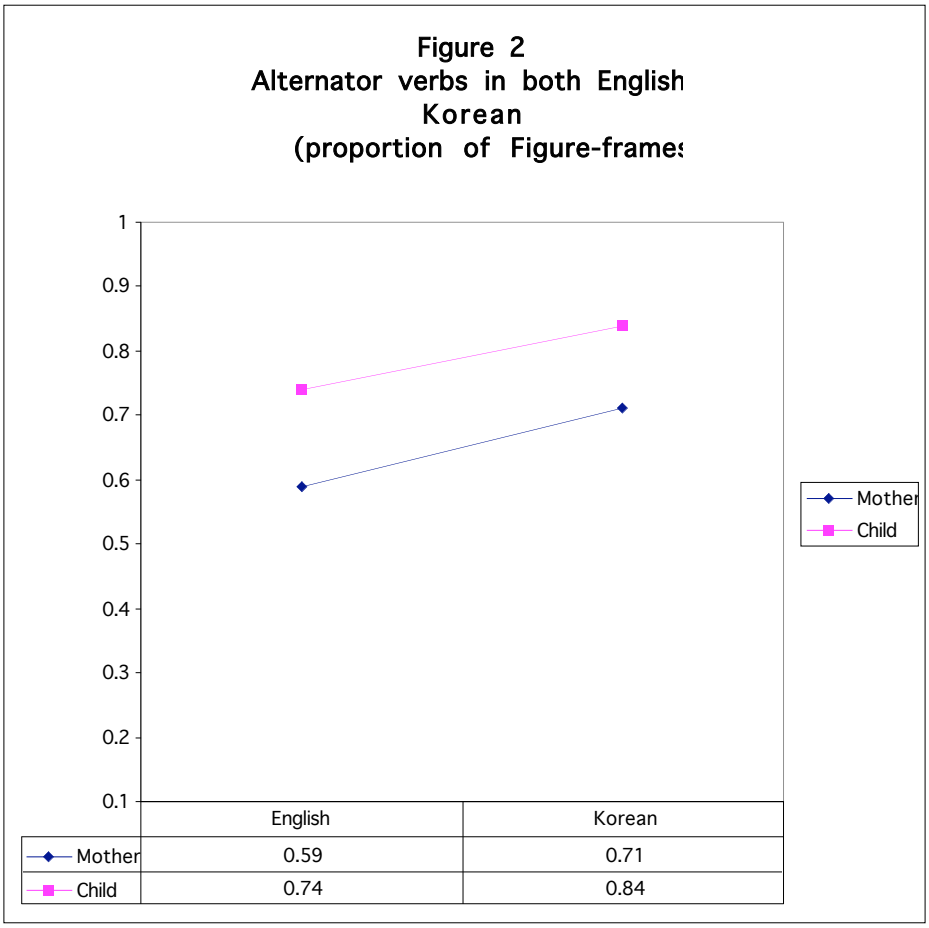
The first group of verbs is the "pour"-class, as shown in Figure 1. The verbs in this class included *pour, spill, hang,* and *stick*. Semantically, these verbs tend to encode manner of motion meanings. Syntactically, they only allow Figure frames in either language. Mothers performed as expected, and children in both languages responded in a target-like manner, using only Figure frames. A two-way analysis of variance on the

proportion of Figure-frame responses showed no reliable effect of Age (F (1.36)=2.25, p=.14) or Language (F (1,36)=2.25, p=.14), and no significant interaction between Age and Language (F (1,36)=2.25, p=.14). Even if this results approach significant, the absolute differences between groups are minute.



The second group of verbs is the "paint"-class. The verbs in this class included *paint, wrap, stuff,* and *spread*. This group of verbs is important because it consists of verbs which allow both Figure and Ground frames in both English and Korean. The fact that both languages allow a choice provides the opportunity to see independent evidence for any grammar-independent bias for Figure frames. Figure 2 shows that children do indeed use more Figure frames than mothers with this class of verbs. However, this

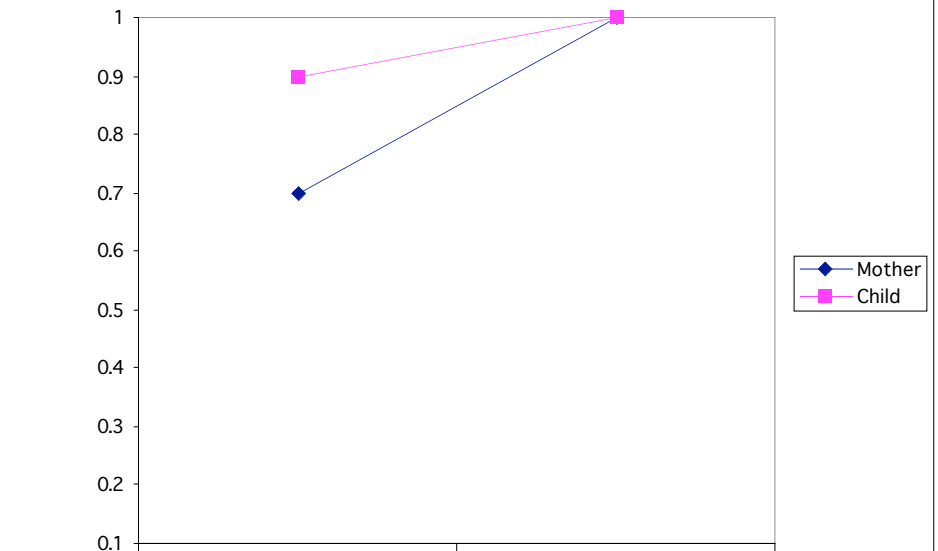
effect is relatively small, in the 10-20% range. This is an effect that we will see again. There is also an effect of language, with Korean speakers overall producing more Figure frames. A two-way analysis of variance on the proportion of Figure-frame responses showed a reliable effect of Age ($F(1,36)=11.11$, $p<.01$) and Language ($F(1,36)=7.44$, $p<.01$), but no significant interaction between Age and Language ($F(1,36)=.09$, $p=.76$).



The third group of verbs is the "pile"-class. The verbs in this class included *pile, load,* and *spray*. These verbs allow both Figure and Ground frames in English but only allow Figure frames in Korean. The Korean participants used Figure frames 100% of the

time, as Korean grammar requires. This matches the result shown in Figure 1. The results for the English participants parallel this results in Figure 2 - mothers and children mostly used Figure frames, but children used Figure frames about 20% more often than the mothers. A two-way analysis of variance on the proportion of Figure frame responses showed a reliable effect of Age ($F(1,36)=7.35$, $p<.01$) and Language ($F(1,36)=18.15$, $p<.01$). Note that the effect of Age is just due to the English group. Moreover, there was a reliable interaction between Age and Language ($F(1,36)=7.35$, $p<.01$). However, since Korean speakers were at ceiling in their use of Figure frames, we cannot make too much of this interaction.

Figure 3
Alternator verbs in English but Figure verbs in Korean
(proportion of Figure-frames)



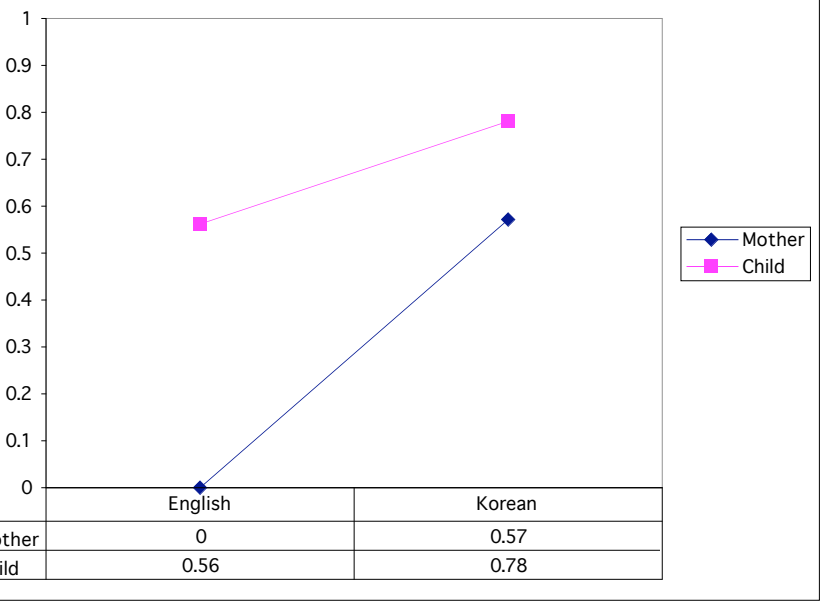
	English	Korean
Mother	0.7	1
Child	0.9	1

An interesting finding to notice is that although both the "pile"-class and the "paint"-class are syntactically Alternators in English, the English participants produced Figure frames about 10-15% more often with the "pile"-class than with the "paint"-class. As mentioned in Chapter 2, Alternating verbs may fall into at least two subclasses: One class consists of Figure-Alternating verbs which have a primary manner of motion meaning component, and the other class consists of Ground-Alternating verbs which have a primary change of state meaning component. Verbs of the "pile"-class belong to Figure-Alternating verb classes, and verbs of the "paint"-class belong to Ground-Alternating verb classes in English. In the light of this, it is not so surprising that the English participants used Figure frames more often with the "pile"-class than with the "paint"-class.

Finally, the fourth group of verbs is the "fill"-class. The verbs in this class included *fill, cover*, and *decorate*. These verbs only allow Ground-frames in English but are Alternators in Korean. The results for Korean shown in Figure 4 are not surprising. Both the Korean mothers and the Korean children treat these verbs as Alternators, but the children produce Figure frames about 20% more often than the mothers. So again this is a small Figure frame bias in the children, within the bounds of what the target language allows. The English-speaking mothers used no Figure frames at all with these verbs, as one would expect from the grammar of English. In the light of this, the fact that English-speaking children produced Figure frames at a rate of over 50% is quite striking. Not only is this the first time in these results that we have seen anybody speaking ungrammatically; the difference between children and adults are much larger than in any of other verb groups. A two-way analysis of variance on the proportion of Figure frame responses showed significant effects of Age ($F(1,36)=38.43$, $p<.01$), Language (F

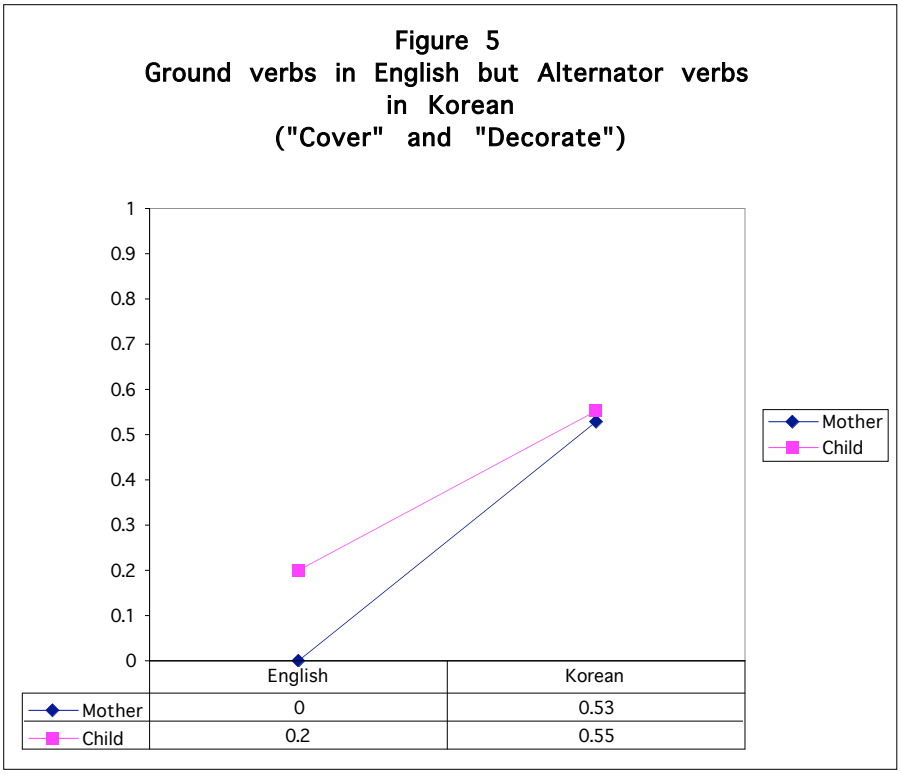
(1,36)=41.89, p<.01), and an interaction between Age and Language (F (1,36)=7.8, p<.01).

Figure 4
Ground verbs in English but Alternator verbs in Korean
(proportion of Figure-frames)

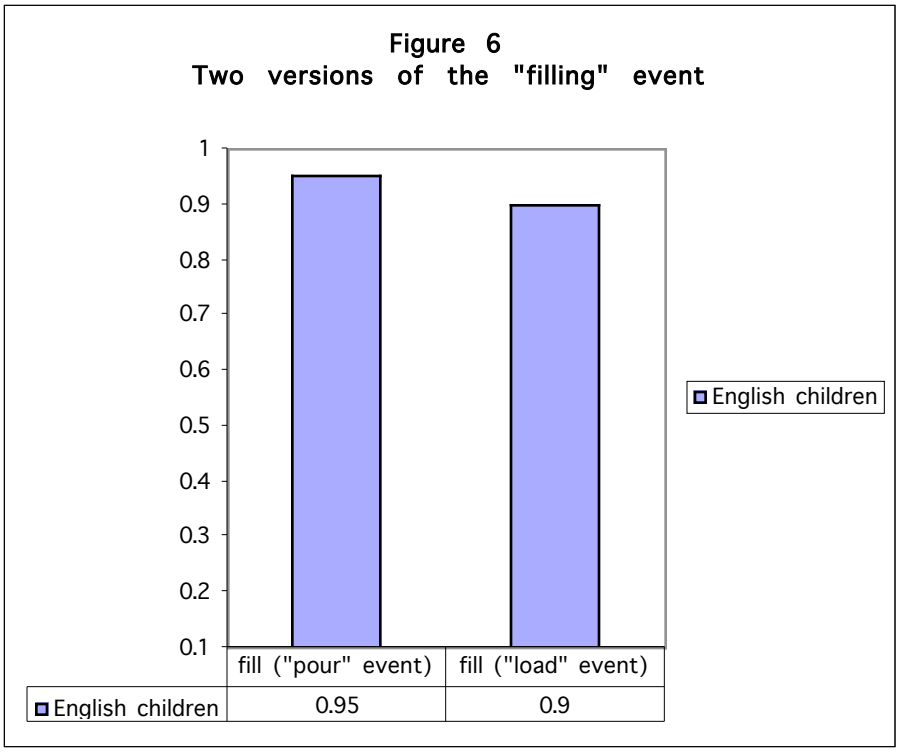


	English	Korean
Mother	0	0.57
Child	0.56	0.78

In fact, Figure 4 is a little misleading, because it masks important differences among the verbs. Considering the verbs *cover* and *decorate*, as shown in Figure 5, the English-speaking children only produced ungrammatical Figure frames about 20% of the time. This is much more like the child-adult differences that we have seen a number of times already.



In contrast, the 10 English-speaking children used *fill* with a Figure frame almost 100% of the time. In fact, this effect was found in both types of scene involving *fill* - both the version involving pouring of juice, and the version involving loading of toys, as shown in Figure 6. This indicates that the use of a "pouring" manner is not necessary to elicit Figure-frame errors with *fill* in children. Therefore, it does not seem that English-speaking children's overgeneralization errors are due to the incorrect representation for *fill* (e.g., *fill* means "fill-by-pouring"). But one caveat to the finding is that children were forced to use *fill* in this experiment, and may not have realized previously that it can be used with a "loading" event.



In addition, two different scenes were included for each of the verbs, one in which the ground object was completely filled/covered, and another in which it was only partially affected by the action. This manipulation was included to see whether a "holistic interpretation" (Anderson 1971) could induce participants to produce more Ground-frames than Figure-frames. But it turned out that this manipulation had no effect on any of the results: English-speaking children, ($F(1,1)=.019$, $p=.88$); English-speaking mothers, ($F(1,1)=.015$, $p=.90$); Korean-speaking children, ($F(1,1)=.03$, $p=.85$; Korean-speaking mothers, ($F(1,1)=.17$, $p=.67$).

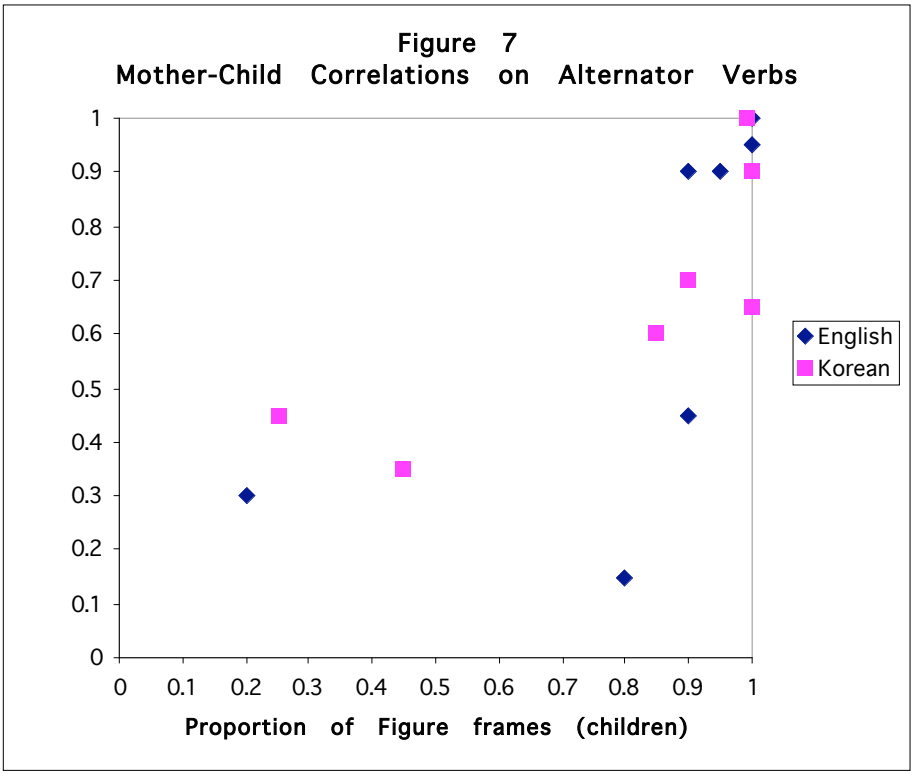
4.3.3 General Discussion

Let me briefly summarize the results of this experiment. First, the finding was replicated that English-speaking children make errors with Ground verbs like *fill*, but

they do not make errors with Figure verbs like *pour* (Gropen et al. 1991a). Furthermore, Korean children do not make errors with their Non-alternating Figure verbs. Korean does not have any Non-alternating Ground verbs, so this was a parallel that I could not test.

Second, the results provide us with independent evidence that children use more Figure frames than adults, in this across languages and across verb groups. This confirms the suggestion of a Figure frame bias, unless this was caused by the difference in method between the children and adults (use of contrastive event for children only). However, the results also allow us to rule out this bias as the source of children's well-known syntactic errors with *fill*. The 'Figure-frame bias' is a consistent but small effect in both languages. What the English-speaking children did with *fill* was vastly different from this.

Based on the findings so far, we need to spell out the specific predictions from the three hypotheses. First, from the input frequency hypothesis, English-speaking children were expected to overgeneralize Ground verbs like *fill, cover*, and *decorate* to the Figure frame, and to overuse Figure frames with Alternators. The data can be used to evaluate the suggestion that "fill" errors are an overgeneralization error, caused by the global frequency distribution of Figure frames in the input. The proportions of Figure frames used by mothers and children with the seven Alternating verbs that I used in each language showed that there is a reliable positive correlation between mothers and children, even on individual verbs (r^2=0.47; F (1,12)=10.52, p<.01), as shown in Figure 7.

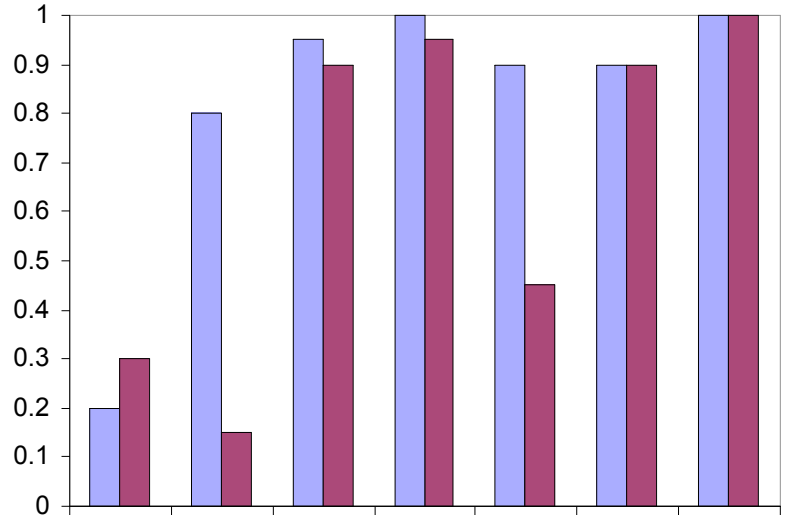


If children are so similar to adults on a verb-by-verb basis, then it does not seem very likely that their high percentage of errors with *fill* can be explained in terms of how they match *global* input frequencies. Of course, an alternative might be that children are biased by more local input frequencies, e.g., based on individual semantic classes of verbs, but this would fail to predict "overgeneralizations" with verbs like *fill*.

Second, from the parameter mis-setting hypothesis, English-speaking children were expected to perform like Korean-speaking mothers on a verb-by-verb basis. However, it does not seem likely that English-speaking children have mistakenly adopted a Korean-style syntax for locative verbs, although it is hard to completely rule out this possibility. As shown in Figures 8 and 9, the correlation between mothers and children on individual verbs shows that the children in both languages generally conform to what

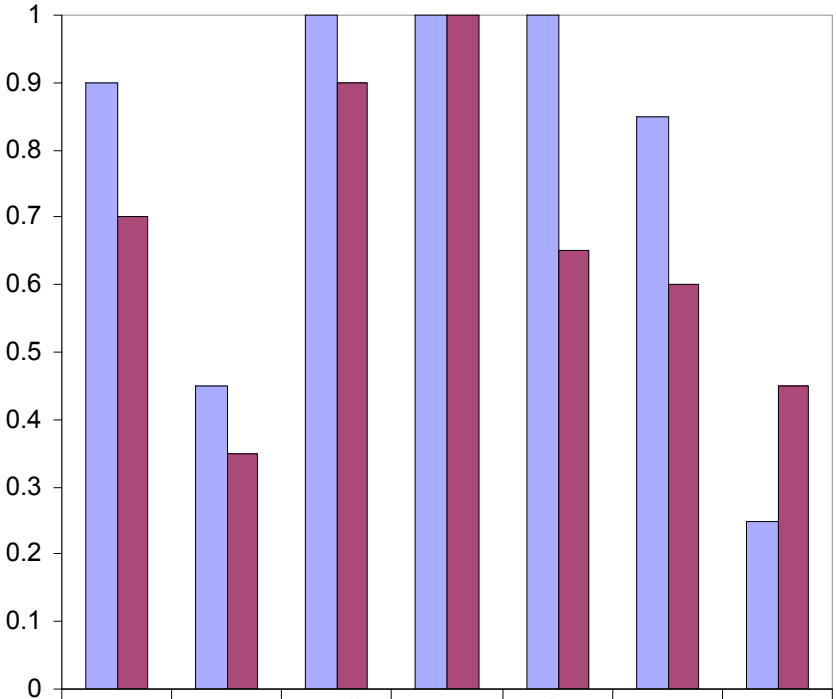
the grammar of the target language allows, and in most cases they closely track the behavior of mothers speaking the same language.

Figure 8
Comparison between English Mothers and Children on Alternator Verbs
(proportion of Figure frames)



	paint	wrap	stuff	spread	spray	load	pile
English child	0.2	0.8	0.95	1	0.9	0.9	1
English mother	0.3	0.15	0.9	0.95	0.45	0.9	1

Figure 9
Comparison between Korean Mothers and Children on Alternator Verbs
(proportion of Figure frames)



	paint	wrap	stuff	spread	fill	cover	decorate
Korean child	0.9	0.45	1	1	1	0.85	0.25
Korean mother	0.7	0.35	0.9	1	0.65	0.6	0.45

Third, from the perceptual bias hypothesis, which assumes that moving objects are very salient and this bias is independent of syntactic input, both English-speaking children and Korean-speaking children were expected to show the same tendencies to encode the same events as Figure verbs vs. Ground verbs. Even for the very same scenes showing the very same manner of motion, children used the syntactic frame that is appropriate for the supplied verb in their target language. This shows that the salience of

the manner of motion meaning alone cannot guide the children's control over the verb. The correlation within a language (mother-child) is higher than the correlation across languages (between English and Korean children).

In addition, the ungrammatical sentences produced by English-speaking children are overwhelmingly due to the single verb *fill*, suggesting that their syntactic knowledge for Ground verbs is not uniformly incorrect. Therefore, any account of children's "fill" errors is going to need to be one which does not automatically generalize to all other Ground verbs in English, such as *cover* and *decorate*.

4.4 Learning Mechanisms

So far, I have found a strong connection between how the children and mothers performed in this experiment, and I have characterized what 3-to-4-year old learners of English and Korean know about the syntax of locative verbs. This experiment shows that by age 3-4, children learning in both English and Korean performed like mothers speaking their target languages, and their errors with the syntax of locative verbs are extremely restricted. Although English-speaking children still make syntactic errors with the verb *fill*, and both English-speaking and Korean-speaking children show a small Figure bias with Alternators, they have basically figured out the syntactic possibilities for the different classes of locative verbs by age 3-4. This finding leads to the question of how they do this, especially in the light of the potential problems raised by cross-linguistic differences.

The question is how children succeed in learning the syntax of locative verbs: How did children get where they are, and how can they proceed from there to the adult state?

In this section I discuss two possible learning mechanisms that might help the children succeed in learning the syntax of locative verbs. One is a learning mechanism based on consistent cross-linguistic syntax-semantic correspondences (Grimshaw 1981; Landau & Gleitman 1985; Pinker 1989; Gleitman 1990; Gropen et al. 1991a,b), and the other is a statistical learning approach, which claims that learning is possible based on the use of distributional properties of the input, without explicit negative evidence or innate learning mechanisms (Bowerman 1982, 1990; Elman 1993; Allen 1997; Seidenberg 1997; Rohde and Plaut 1999).

The production data from this experiment allows us to evaluate to what extent a learning mechanism based on consistent syntax-semantics correspondences can and cannot help children succeed in learning the syntax of locative verbs, whereas naturalistic data of the maternal speech from all of the English CHILDES database allows us to evaluate to what extent a statistical learning approach can help them.

4.4.1 Universal Linking Rule Mechanism

One possible learning mechanism is to take advantage of consistent cross-linguistic syntax-semantics correspondences for locative verbs. In Chapter 3, we found that across languages, some syntax-semantics correspondences appear to be universal, some correspondences appear to apply only within one of the two broad language groups, and some correspondences appear to be subject to be idiosyncratic language-by-language variation. Let me briefly summarize what are universal correspondences, what are group-specific correspondences, and what are language-specific correspondences.

First, we found that the one generalization holds across *all* the languages that I have looked at: Manner-of-motion verbs allow the Figure frame.

Second, two syntax-semantics correspondences depend on which broad language group the language belongs to. In English-type languages, basic change-of-state verbs always allow the Ground frame. In Korean-type languages, *all* locative verbs allow the Figure frame, and there are no Non-alternating Ground verbs. If a learner does not know which group her language belongs to, these group-specific correspondences could not be much of use. Therefore, the question is how the learner determines the properties of locative verbs in her target language.

Fortunately, the two groups of language may be distinguishable based on a simple morphological property, namely complex predicates. In Chapter 3, I suggested that there is a strong correlation between locative verb syntax and one syntactic type of complex predicates, known as V-V compounding or verb serialization. All of the Korean-type languages, and none of the English-type languages, allow V-V compounds/verb serialization. It is widely reported that Korean-speaking children produce complex predicates at quite a young age (Choi and Bowerman 1991; Y. Kim 1995, 1997; Kim and Phillips 1998). Thus, this raises the possibility that children may know enough at a fairly early stage to determine what the syntax-semantics correspondences are for locative verbs in their particular language.

If the learner can determine at an early age whether or not her language allows verbal complex predicates, then she might be able to use this information to determine which broad language group her target language is in. Therefore, the learner can use this information either to constrain her syntactic generalizations or as a zoom lens to help identify the meanings of specific locative verbs.

The next question is how the learner figures out whether or not her language allows verbal complex predicates. At least for Korean, we know that there is plenty of

evidence in the input. In a pilot study for the experiment reported here, I also found that Korean-speaking adults used complex predicates when a specific verb was not provided to them (e.g., *tep-e-cwu-ta* 'cover-give' or *ssa-a-oli-ta* 'pile-lift' (pile-up))[4]. Such verbal forms are common in Korean adult speech. Based on this experiment, it appears plausible that the 3-4 year olds already know enough to determine whether they are speaking an English-type language or a Korean-type language. If the cue for this distinction is as simple as I have suggested, then this is not so surprising.

Finally, there are syntax-semantics correspondences that seem to vary on a language-by-language basis. In Chapter 3, we found that the classes of verbs which are syntactic Alternators in English show much broader syntactic variation across languages than the classes which are Non-alternators in English. As Pinker (1989) and Levin (1993) have shown for English, this may involve idiosyncratic semantic properties which can affect syntactic possibilities in some languages but not others. For example, in English verbs of ballistic motion such as *spray* and *sprinkle* are Alternators, whereas related non-ballistic verbs such as *pour* and *dribble* only allow the Figure frame. This affects some languages but not others. For example, *spray* is an Alternator in Chinese and Thai, but is a Non-alternating Figure verb in Korean, Japanese, Hebrew, and Turkish.

Interestingly, we found that *fill* is one of the most syntactically variable verbs across languages. In English, it is a Non-alternating Ground verb; in Korean, it is an Alternator; in Thai, it is a Non-alternating Figure verb; and in Singapore Malay, it is an Alternator. In contrast, *cover* and *decorate* show much less variation across languages. Therefore, it is perhaps not so surprising that the English-speaking children in this experiment are making errors in an area where there is greatest cross-linguistic variation.

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4 See Appendix 4 more detailed results.

Fill is a verb which is affected by an idiosyncratic rule in some languages but not others. What the children in the experiment have not yet learned is that *fill* is not affected by one of these idiosyncratic rules in English.

To summarize the points so far: The results of this experiment show what children can and cannot learn by using a learning mechanism based on consistent cross-linguistic syntax-semantics correspondences. By age 3-4 children appear to have mastered syntactic generalizations based on universal correspondences, and they also appear to have mastered syntactic generalizations based on correspondences which hold across broad classes of languages. Errors are confined to areas where syntax-semantics correspondences are most variable and idiosyncratic across languages.

The remaining question, then, is how children learn these language-specific idiosyncrasies. I will return to this remaining question later.

4.4.2 Input: Distributional Analysis

A number of researchers have paid attention to the importance of the distributional properties of the input in learning (Bowerman 1982, 1990; Elman 1993; Allen 1997; Seidenberg 1997; Rohde and Plaut 1999). For example, Bowerman (1982, 1990) suggests that children acquire verbs' syntactic structures individually entirely from the input, without relying on innate and universal linking patterns between syntax and semantics.

According to a statistical learning approach, the learnability problem can be solved by a mechanism that relies heavily on statistical evidence in the input. Learning the syntax of locative verbs may be possible in the absence of explicit negative feedback, and in the absence of learning mechanisms like innate linking rules, making use of distributional properties of the input. If some sentences or syntactic frames are more

frequent than others, then language is generated by distributional properties of the input. In essence, if a particular syntactic frame is not observed during some extended but finite period of exposure, a learner will assume that it is not part of the language. With more exposure, the probability of making errors decreases.

Now we can evaluate this statistical learning approach, in terms of both frequency effects and the distributions of syntactic frames of specific locative verbs in the maternal input.

4.4.2.1 Data Analysis

I searched through all English-speaking mothers' speech in CHILDES database - corpus of ~1100 utterances, based on all locative verbs selected from Pinker's (1989) list. A statistical learning approach claims that verbs with similar statistical distributions or similar meanings are assumed to have the same syntactic possibilities. The main purpose of the distributional analysis in the input is to examine whether verb classes can be reliably distinguished based on distributional properties of parental speech to children.

First, I wanted to find out how many different verbs were used in the maternal input, and how frequently Figure and Ground syntactic frames were used in the maternal input. Second, I wanted to find out how reliable the input is, and I wanted to know the distribution of frames of locative verbs in the maternal input.

In order to determine whether locative verbs were used with an appropriate argument as direct object, I excluded the following utterances in this analysis: (1) utterances which involve intransitive clauses (e.g., water spills on the floor/I painted on the floor); (2) utterances which do not have any internal arguments (e.g., I poured); (3) utterances where the context does not provide an appropriate argument as direct object

(e.g., You poured it), making it impossible to classify the utterance as Figure or Ground frames.[5]

4.4.2.2 Frequency Effect

When dealing with a statistical learning approach, the frequency effects of the input can be used in two different ways. First, the frequency effects of the input could be enough information for children to figure out the syntax of locative verbs in their target language, with no further evidence. Second, the frequency effects of the input could lead children to make overgeneralization errors. This is consistent with Bowerman's (1982) argument that children's overgeneralization errors with Ground verbs (e.g., *fill* or *cover*) are due to the fact that Figure frames outnumber Ground frames in the input. However, as I pointed out before, Gropen et al. (1991a,b) argue against Bowerman's input frequency account, based on evidence from both type and token frequencies in English.

The two kinds of frequency information need to be distinguished. On the one hand there is token frequency, which refers to the number of times a particular verb is used in a particular frame; on the other hand there is type frequency, which refers to the number of distinct verbs that occur in a particular frame.

Now let us investigate type frequency in the maternal input. According to Pinker's (1989) list of Non-alternating locative verbs, there are at least 34 Figure verbs and 77 Ground verbs in English. However, in the maternal input 15 different types of Figure verbs and only 7 different types of Ground verbs were used, as shown in Table 4.6.

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5 As Brinkmann (1997: 65) points out, Pinker's list of locative verbs contains about 29 denominal verbs (e.g., *pile, cover, spray, stack,* etc.). Therefore, the first thing I had to do in this analysis was to find out whether these verbs were used as a verb in each context.

Table 4.6: Type frequency of Non-alternating Verbs in the Maternal Input

Non-alternating verbs	Number of Verbs	
	Pinker's list	Maternal input
Figure verbs	34	15
Ground verbs	77	7

The data in Table 4.6 shows that while it may be true that locative verbs with Ground-frames outnumber those with Figure frames in English, children do not necessarily hear more Ground-frames than Figure frames from their parental speech. If Bowerman's global input frequency account is based on verb type frequencies, then this finding could support her argument that Figure frames are more dominant than Ground frames in maternal speech.

Let us next consider token frequency in the maternal input. Even though 15 different types of Figure verbs and 7 different types of Ground verbs were used in the maternal input, a lot of verbs were used only once or twice with an appropriate argument as direct object. I chose to include two additional verbs, *hang* and *stick,* in this analysis, even though these two verbs were not included in Pinker's list of locative verbs. Since *hang* and *stick* were included in the first group of verbs ("pour"-class verbs) in the experiment reported here, it would be interesting to find out how frequently these verbs were used in the maternal input. Therefore, the four frequent verbs were examined as well as the three Ground verbs, as shown in Table 4.7:

Table 4.7: Token Frequency of Non-alternating Verbs in the Maternal Input

Non-alternating Verbs	Number of Uses
Figure verbs	total (500)
pour	135
spill	194
hang	108
stick	63
Ground verbs	total (213)
fill	33
cover	169
decorate	11

In considering token frequencies of Figure and Ground frames, it would be hard to tell whether Figure frames outnumber Ground frames in the maternal input based on such a small number of verbs, and it would not be fair to compare Figure frames with Ground frames using different numbers of verbs. However, I could not find Ground verbs which were used more than twice with an appropriate argument as direct object in the maternal input. As shown in Table 4.7, the global frequency effect based on token frequencies shows the same pattern as that based on type frequencies in the maternal input: Figure frames are more common.

These findings, therefore, support Bowerman's argument that Figure frames are more frequent than Ground frames in the maternal input. Nevertheless, an important point is that children might hear the Ground verb *cover* as often as they might hear Figure verbs like *pour* and *spill*, and that children might not hear the Ground verbs *fill* and *decorate* as often as they might hear the other Ground verb *cover*.[6]

6 "Cover your mouth" accounts for a lot of the tokens.

4.4.2.3 Distribution of Frames of Locative Verbs in the Maternal Input

In this section, I investigate whether verb classes can be reliably distinguished based on distributional properties of parental speech to children. According to a statistical learning approach, children may learn syntactic possibilities of locative verbs in parental speech. Therefore, the statistical learning approach requires that the input data must be grammatical and complete (i.e., all grammatical forms used), and that the input data must make all relevant syntactic/semantics distinctions.

Randall (1987, 1992) has proposed that children can distinguish Alternating verbs from Non-alternating verbs, by using the distribution of syntactic frames in the input. For example, she claims that Non-alternating verbs allow the omission of a PP argument, whereas Alternating verbs do not allow PP omission. As discussed in Chapter 1, Randall's description of the data for locative verbs does not seem to be complete. However, PP omission could be very useful for English-speaking children to figure out whether Alternating verbs have basic manner-of-motion meanings or basic change-of-state meanings.

Let us first investigate the distribution of frames for the Non-alternating locative verbs in the maternal input. Note that verbs of the "pour"-class are grammatical only with Figure frames, whereas verbs of the "fill"-class are grammatical only with Ground-frames. As mentioned before, even though a lot of different types of verbs in both the "pour"-class and the "fill"-class were used in the maternal speech, most of them were not frequently used. Thus, the four most frequent verbs from the "pour"-class and the three most frequent verbs from the "fill"-class were used in this analysis, as shown in Table 4.8:

4.8: Distribution of Frames of Non-alternating Verbs in the Maternal Input

Non-alternating Verbs	V-NP Only (PP omission)	V-NP-PP	error	total (713)
Figure verbs	Figure-frame	Figure-frame	Ground-frame	total (500)
Pour	96 (71%)	39		135
Spill	163 (84%)	30	1(?)	194
Stick	69 (63.9%)	39		108
Hang	52 (82.5%)	11		63
Ground verbs	Ground-frame	Ground-frame	Figure-frame	total (213)
Fill	30 (90.9%)	3		33
Cover	157 (92.9%)	11	1(?)	169
Decorate	11(100%)			11

First, let us look at the distribution of syntactic frames of the Non-alternating Figure verbs in the maternal input. Verbs like *pour*, *spill, stick,* and *hang* were predominantly used in the maternal input in a Figure frame without a PP argument. These verbs were also sometimes used in a Figure frame with a PP argument. However, these verbs were never used in the ungrammatical Ground frame (99.8% error-free).

Next, let us look at the distribution of frames of Non-alternating Ground verbs *fill*, *cover*, and *decorate*. Verbs like *fill, cover,* and *decorate* were predominantly used in the maternal input without a PP argument. However, it is much less clear whether children would hear these verbs in a Ground frame with a PP argument. In particular, children might not know that the verb *decorate* occurs in a ditransitive sentence, if they are relying heavily on the use of the distribution of frames of the input. Nevertheless, these verbs were never used in the maternal input in the ungrammatical Figure frame (99.5% error-free).

Now consider the distribution of syntactic frames of Alternating verbs in the maternal input. Here, I divide Alternating verbs into three classes, based on "sole argument effects": (1) a Ground-Alternating verb class which allows optionality of a

Figure PP argument; (2) a Figure-Alternating verb class which allows optionality of a Ground PP argument; (3) an Alternating verb class which allows optionality of both Figure and Ground PP arguments. These classifications are supported by judgment data that I reported in Appendix 2.B in Chapter 2.

Let us first investigate the distribution of frames of Ground-Alternating verbs in the maternal input. Verbs in the Ground-Alternating verb classes selected from the CHILDES database included *paint*, *rub, wrap,* and *stuff*. These verbs allow only Ground frames when a PP argument is omitted, although they all allow both Figure and Ground frames with PP arguments, as shown in (2).

(2) a. John stuffed the feathers into the pillow. Figure-frame
b. John stuffed the pillow with feathers. Ground-frame
c. *John stuffed the feathers. *Figure-frame
d. John stuffed the pillow. Ground-frame

The results of the analysis of the maternal input data are shown in Table 4.9:

Table 4.9: Distribution of Frames of Ground-Alternating Verbs in the Maternal Input

	V-NP only		V-NP-PP		total
Ground-Alternating verbs	Figure	Ground	Figure	Ground	
a. paint	1	81	8	2	92
b. rub		15	8	1	24
c. wrap	2	36	11	2	51
d. stuff	1	3	8	1	13
total (percentage)	4 (2.3%)	135 (75%)	35 (19.4%)	6 (3.3%)	180

The first and most important point is that the verbs in Table 4.9 were predominantly used in the maternal input in a Ground frame without a PP argument. This is exactly what we have seen in Non-alternating Ground verbs like *fill* and *cover*. However, the verbs in Table 4.9 were also used in a Figure frame with a PP argument, which was never found in the distribution of frames of Ground verbs like *fill*. Therefore,

this syntactic pattern in the maternal input may provide children with an important cue for distinguishing Non-alternating Ground verbs and Ground-Alternating verbs. Nevertheless, it is not clear how children can figure out that a Figure frame with a PP argument is ungrammatical, whereas a Ground frame without a PP argument is grammatical, if learning is only driven by the statistical evidence in the input, because they have almost identical frequency in the input.

Another point to consider is an effect of the distribution of frames of Figure-Alternating verbs in the maternal input. Verbs of the Figure-Alternating verb classes in this analysis included *stack, spread,* and *sprinkle*. These verbs allow both Figure and Ground frames with a PP argument, whereas they allow only Figure frames when the PP argument is omitted, as shown in (3).

(3) a. I stacked books on the shelf. Figure-frame
b. I stacked the shelf with books. Ground-frame
c. I stacked books. Figure-frame
d. *I stacked the shelf. *Ground-frame

Table 4.10 shows the results of my analysis of the maternal input data.

Table 4.10: Distribution of Frames of Figure-Alternating Verbs in the Maternal Input

	V-NP only		V-NP-PP		total
Figure-Alternating verbs	Figure	Ground	Figure	Ground	
a. stack	64		6	1	71
b. spread	18		2		20
c. sprinkle	3				3
total	85 (90.4%)		8 (8.5%)	1 (1.1%)	94

One thing to notice is that these verbs were predominately used in the maternal input in a Figure frame with or without a PP argument. However, these verbs were never used in a Ground frame with a PP argument, which is grammatical. This syntactic pattern is exactly what we have found in the distribution of frames of Non-alternating Figure verbs like *pour* and *spill*. If children only hear Figure-Alternating verbs with or without a PP argument, they may not distinguish these verbs from Non-alternating Figure verbs like *pour* or *spill*. It is not clear how the learning strategy based on the statistical evidence in the input can tell the children that these verbs are different from verbs like *pour* and *spill*.

Finally, let us examine the distribution of frames of verbs for which PP omission is optional in both syntactic frames. Verbs in this class included *load, pack*, *spray*, and *squirt*. According to Pinker's (1989) classification, the verbs *load* and *pack* were classified as Ground-Alternating verbs, whereas the verbs *spray* and *squirt* were classified as Figure-Alternating verbs. However, the judgment data that I gathered suggests that these verbs allow PP omission in both Figure and Ground frames, as follows:

(4) a. I loaded the apples onto the truck. Figure-frame
b. I loaded the truck with apples. Ground-frame

c. I loaded the apples. Figure-frame
d. I loaded the truck. Ground-frame

The results of my analysis of the maternal input data are shown in Table 4.11:

4.11: Distribution of Frames of "Pure"-Alternators in the Maternal Input

	V-NP only		V-NP-PP		total
Pure Alternators	Figure	Ground	Figure	Ground	
load	6	2	9	2	19
pack	8	12	2	2	24
spray		8	3	3	14
squirt	4	17	2	1	24
total	18 (22.2%)	39 (48.1%)	16 (19.8%)	8 (9.9%)	81

Since PP omission with these verbs is optional in both Figure and Ground frames, there are no ungrammatical patterns in this class. An interesting finding is that both Ground frames and Figure frames were used without a PP argument in the maternal input. Based on the use of distributions of syntactic frames in the maternal input, children may conclude that these verbs are Alternators.

4.4.2.4 Results and Discussion

So far we have examined the possibility of a statistical learning mechanism based on information about the use of locative verbs in the maternal input from the English CHILDES database. First, frequency counts based on both token and type frequencies showed that Figure verbs outnumber Ground verbs in the maternal input, so this finding supports Bowerman's (1982) global frequency account. However, as I pointed out before, this global frequency account does not provide a good answer for why children's syntactic errors are restricted to the verb *fill*, and not to other Ground verbs like *cover* and *decorate*.

Second, we found that mother's speech is highly grammatical, 99%+ error-free. However, even this level of accuracy may not be enough, if certain grammatical structures are no more frequent than ungrammatical structures. For example, as shown in Table 4.9, the distribution of frames of Ground-Alternators in the maternal input showed that a Ground frame without a PP argument, which is a grammatical structure, is no more frequent than a Figure frame with a PP argument, which is a ungrammatical structure.

Third, the distribution of frames in the maternal input might provide children with sufficient information on the syntactic possibilities of basic Figure verbs and basic Ground verbs. For instance, both Non-alternating Figure verbs and Figure-Alternating verbs were predominantly used in a Figure frame without a PP argument, and both Non-alternating Ground verbs and Ground-Alternating verbs were predominantly used in a Ground frame without a PP argument. Based on the distribution of syntactic frames of the maternal input, the first thing that children could figure out easily is which verbs allow Figure syntax and which verbs allow Ground syntax. Therefore, this may explain how 3-4 year old children have basically figured out the syntactic possibilities for the different classes of locative verbs, without the help of consistent syntax-semantics mappings.

Furthermore, the distribution of frames of Ground-Alternating verbs in the maternal input seem to provide children with sufficient information, which can be distinguished from Non-alternating Ground verbs. Specifically, the only syntactic cue for distinguishing Ground-Alternating verbs from Non-alternating Ground verbs is a Figure frame with a PP argument, which is only allowed in Ground-Alternating verbs. As shown in Table 4.9, the distribution of frames of the maternal input provides children with this information.

Although most verbs are used in most syntactic frames that they allow, this may not be enough. For example, the distribution of Non-alternating Figure verbs and Figure-Alternators is essentially identical, as shown in Table 4.12:

Table 4.12: Comparison between Figure-Alternating Verbs and Non-Alternating Figure verbs in the Distribution of Frames in the Maternal Input

	V-NP Only		V-NP-PP	
Alternating verbs	Figure	Ground	Figure	Ground
a. stack	64		6	1
b. spread	18		2	
c. sprinkle	3			
Non-Alternators				
a. pour	96		39	
b. spill	163		30	
c. stick	69		39	
d. hang	52		11	

In the following section, I will suggest how this statistical learning approach can explain why children make errors with the verb *fill*, and how they could recover from those errors.

4.4.3 Recovering from "Fill" Errors

Finally, let us turn our attention to the problem of how children might recover from their overgeneralization errors. Although many existing accounts have paid a lot of attention to the question of why children make errors with Ground verbs like *fill*, as discussed in section 4.2, they have given less attention to the problem of how children could recover from their errors. This is, however, the more important problem in explaining children's ultimate success.

Under the existing accounts of the errors that we have considered, Gropen et al. (1991a,b), following Pinker (1989), provide the one clear suggestion of how children

could recover from errors. They claim that children's errors with Ground verbs like *fill* and *cover* are due to their misunderstanding of verb meanings. For example, the verb *fill* might be taken to mean "fill-by-pouring", which has the manner of motion meaning required to license Figure frames. Therefore, children's semantic errors directly induce their syntactic errors. In order to relearn the correct meaning of the verb, however, their account would require negative evidence to disconfirm the children's incorrect hypothesis. Therefore, Pinker's approach faces the same unlearning problem as other approaches do.

How could children first make errors with the verb *fill*, and how could they recover from those errors, using only positive evidence, and without 'unlearning' the meaning or syntax of that verb? One possible suggestion is based on the use of distributional properties of the input.

First, I assume that positive evidence can provide children with sufficient information that some verbs allow both Figure and Ground frames, and that some other verbs allow either Figure or Ground frames. Based on this positive evidence, children can make constrained generalizations, and assume that verbs which have a similar meaning have the same syntactic properties.

However, at an early stage children draw more broad distinctions of syntactic categories. For example, children can distinguish basic Ground verbs from basic Figure verbs, whereas they have not drawn the specific distinction between Non-alternating verbs and Alternating verbs at some point. This may induce children's overgeneralization errors. For example, at an early stage the Non-alternating Ground verb *fill* might be overgeneralized from a Ground-Alternator like *stuff*. However, as distributional syntactic categories are more finely differentiated over time, children can draw more distinctions.

Therefore, the verb *fill*, which at an early stage might be overgeneralized from the Alternator *stuff*, could be distinguished from *stuff* later, by adding new knowledge to children's distributional categories.

An obvious question is why children's errors are restricted to the verb *fill*. One possibility is that the verb *fill* is semantically close to the Alternators like *stuff* in English. This can be supported by the fact that the verb *fill* is an Alternator in many languages, such as all Korean-type languages and Singapore Malay, which is one of English-type languages. As children's syntactic categories become more differentiated over time, verbs which were once semantically close later become further from each other in their semantic space. For example, the verb *fill* may at some point be very close to the Alternators like *stuff*, but later it may move much further from *stuff* by using new syntactic information. Namely, by adding new knowledge to the syntactic categories, the Non-alternating verbs can be distinguished from the Alternators. In other words, "change" occurs just by adding new syntactic knowledge. This account at least avoid the need to unlearn anything, because this learning strategy does not require "change" in knowledge, and requires the addition of syntactic information, which is needed under Pinker's approach.

4.5 Conclusion

The conclusions that I can draw in this chapter are as follows. First, children can learn the syntax of locative verbs by using knowledge of universal syntax-semantics mappings and independent knowledge of group-specific syntax-semantics mappings.

Second, the standard linguistic account of the acquisition of argument structure must be made more complex, but it can still be made to work. The existence of cross-linguistic variation in syntax-semantics mappings does not seem to pose a more serious

learnability problem than the standard problem posed for English by Baker (1979), Pinker (1989) and others.

Third, approaches based on sophisticated statistical analysis of the input data can probably do better than was once thought. However, there are significant limitations in these learning approaches. Furthermore, statistical learnability story can be made more complex, but still has significant limitations, especially when faced with cross-linguistic data. For example, PP-omission can be used to distinguish certain verb classes in English, whereas in Korean (also Japanese) it is irrelevant, because these languages allow liberal omission of arguments.

APPENDIX 4: A PRELIMINARY STUDY OF ELICITED PRODUCTION TASK OF ADULT SPEAKERS OF ENGLISH AND KOREAN

The main goal of this experiment is to find out if each videotaped event constitutes a felicitous occasion for using a specific verb. For example, I wanted to know whether adult native speakers would use the target verb in a spontaneous production, when a specific verb was not provided to them. In the case of that the participants did not produce the expected target verb, I wanted to know what verb would use to describe the event.

4. 1 Method

4.1.1 Participants and Materials

10 adult native speakers of English and 10 adult native speakers of Korean participated in this experiment. As in the main experiment reported in Chapter 4, the same videotaped events, which consisted of 30 video-clips (2 conditions for each verb, such as holistic and non-holistic conditions) were used with participants, thought in this experiment a specific verb was not provided to them. After watching each video-clip, participants were asked to describe the event. For example, the experimenter would say 'Look at the movie: there is a *woman*, a *glass*, and *some water*. Can you tell me what she did?'. In order not to give participants any bias for choosing syntactic frames, the figure object and the ground object were introduced in different orders for each trial.

4.2 Results and Discussion

First, let us consider the locative events, which consisted of scenes designed to elicit verbs in the "pour"-class. The verbs in this class, which included *pour*, *spill, hang*, and *stick*, syntactically only allow Figure frames in both English and Korean. Adults used only Figure frames 100% of time, when they produced the expected target verbs.

Table 4.13 shows the percentage of correct use of the expected target verbs in the "pour"-class. First, adult speakers of both English and Korean used the target verbs in both a "spilling" event and a "hang" event 100 % of the time. However, English adults used the verb *put* in a "sticking" event 70% of the time (14/20), whereas Korean adults used the target verb *stick* in a "sticking" event 100% of the time. In addition, English adults used the verb *pour* in a "pouring" event 80% of the time (16/20), whereas they used the verb *fill* in this event 20% of the time. Korean adults used the target verb *pour* in a "pouring" event 100% of the time.

Table 4.13: Percentage of Correct Use of Target Verbs in the "Pour"-class

Target verbs	English adults	Korean adults
Pour	80%	100%
spill	100%	100%
hang	100%	100%
stick	70%	100%

Second, let us consider the locative events, which consisted of scenes designed to elicit verbs in the "paint"-class. The verbs in this class, which included *paint, wrap, stuff*, and *spread*. syntactically allow both Figure and Ground verbs in both English and Korean. Table 4.14 shows the percentage of correct use of the expected target verbs in the "paint"-class.

First, adult speakers of both English and Korean used the target verbs in a "paint" event, a "wrap" event, and a "spread" event. Interestingly, English adults used the target verb *stuff* in a "stuff" event 80% of the time (16/20), whereas they also used the verb *fill* 10% of the time (2/20) and the verb *put* 10% of the time (2/20). In contrast, Korean adults mainly used the verb *put* in a "stuff" event 80% of the time (16/20), whereas they used the target verb *stuff* in this event 20% of the time (4/20).

Table 4.14: Percentage of Correct Use of Target Verbs in the "Paint"-class

Target verbs	English adults	Korean adults
Paint	100%	100%
Wrap	100%	100%
Spread	100%	100%
Stuff	80%	20%

Furthermore, the verbs in this class allow us to see what syntactic choices participants make when their native grammar gives them an option for syntactic frames. Table 4.15 shows the percentage of Figure frames when participants used the expected target verbs.

Table 4.15: Percentage of Figure Frames Used by Adult Speakers of English and Korean for Verbs in the "Paint"-class

	English adults	Korean adults
paint	20%	75%
wrap	30%	60%
spread	80%	100%
stuff	75%	100%

Third, let us examine the locative events, which consisted of scenes designed to elicit verbs in the "pile"-class. The verbs in this class, which included *pile, load,* and *spray*, allow both Figure and Ground frames in English but only allow Figure frames in Korean. First, both English and Korean adults used the target verb *spray* in a "spraying" event 100% of the time. Second, English adults used the verb *stack* in a "piling" event 70% of the time (14/20), whereas they used the target verb *pile* in this event 30% of the time (6/20). In contrast, Korean adults used the target verb *pile* in a "piling" event 50% of the time (10/20), whereas they used the serial verb *ssah-a-oli-ta* 'pile-lift (pile up)' 50% of the time (10/20). Third, English adults used the target verb *load* in a "loading" event 10% of time (2/20), whereas they predominantly used *put* and *place* in this event 90% of the time (18/20). On the other hand, Korean adults used the

target verb *silta* 'load' 30% of the time (6/20), whereas they used the verb *nohta* 'put' 70% of the time (14/20). The percentage of correct use of the target verbs in the "pile"-class is given in Table 4.16:

Table 4.16: Percentage of Correct Use of Target Verbs in the "Pile"-class

Target verbs	English adults	Korean adults
Spray	100%	100%
Pile/Stack	100%	100%
Load	10%	30%

Furthermore, the Korean adults used Figure frames 100% of the time, as Korean grammar requires. In contrast, the expected target verbs in English give the English adults an option to choose syntactic possibilities. First, the English adults used Figure frames with the verb *pile/stack* 100% of the time. Second, they used Figure frames with the verb *spray* 50% of the time. Third, the English adults used Figure frames with the verb *load* 50% of the time (1/2). However, we have to notice that, as shown in Table 4.16, the verb *load* in English was used two times (2/20) by the English adults.

Table 4.17 shows the percentage of Figure frames used by adult speakers of English and Korean.

Table 4.17: Percentage of Figure Frames Used by Adult Speakers of English and Korean for Verbs in the "Pile"-class

Target verbs	English adults	Korean adults
Spray	50%	100%
Pile/Stack	100%	100%
Load	50%	100%

Finally, let us examine the locative events, which consisted of scenes designed to elicit verbs in the "fill"-class. Verbs in this class, which included *fill, cover,* and *decorate*, only allow Ground frames in English but allow both Figure and Ground frames in Korean. First, the English adults used the target verb *cover* 85% of the time

(17/20), whereas they also used the verb *put* 15% of the time. On the other hand, the Korean adults used the target verb *cepta* 'cover' 70% of the time, whereas they used the serial verb *cept-e-cwu-ta* 'cover-give' 30% of the time. Second, the English adults used the target verb *decorate* 30% of the time (6/20), whereas they mainly used *put* or *place*. Also, the Korean adults used the verb *kelta* 'hang' 90% of the time, whereas they only used the target verb *cangsikhata* 'decorate' 10% of the time (2/20). Third, the English adults used the target verb *fill* 30% of the time, whereas they used the verb *pour* 70% of the time. On the other hand, the Korean adults used the target verb *chaywuta* 'fill' 10% of the time (2/20), whereas they main used the verb *pwutta* 'pour' 90% of the time. Table 4.18 shows the percentage of correct use of the target verbs in the "fill"-class.

Table 4.18: Percentage of Correct Use of Target Verbs in the "Fill"-class

Target verbs	English adults	Korean adults
Fill	30%	10%
Cover	85%	100%
Decorate	30%	10%

Furthermore, the English adults used Ground frames 100% of the time, when they used the target verbs, as English grammar requires. Recall that in Korean, verbs in this class allow both Figure and Ground frames. Table 4.19 shows the percentage of Figure frames used by adult speakers of English and Korean.

Table 4.19: Percentage of Figure Frames Used by Adult Speakers of English and Korean for Verbs in the "Fill"-class

Target verbs	English adults	Korean adults
Fill	0% (0/6)	100% (2/2)
Cover	0% (0/17)	70% (20/20)
Decorate	0%(0/6)	0% (0/2)

Chapter 5

CONCLUSIONS IN SUMMARY

The ultimate goal of this study was to show how a child can succeed in learning a verb's meaning and its associated syntactic structures, in the face of cross-linguistic variation in syntax-semantics correspondences.

It has been widely observed that learning the syntax and semantics of verbs has properties that make it difficult for the child. In learning a verb's meaning, the child needs to figure out what events in the word the verb refers to. In learning a verb's syntactic possibilities, the child needs to reach a level where she can generalize beyond the verb-structure pairings in the input, but without overgeneralizing. As a possible learning strategy, it has been suggested that consistent syntax-semantics correspondences might help the child learn the syntax and semantics of verbs. Grimshaw 1981; Pinker 1984, 1989; Gleitman 1990; Gropen et al. 1991a,b). If the child can take advantage of consistent syntax-semantics correspondences, then learning the meanings of verbs and their syntactic possibilities could be made easier for the child. In contrast, if mappings between syntax and semantics are not universal, and if the child cannot use learning strategies based on consistent syntax-semantics mappings, we could expect that learning the syntax and semantics of verbs would be made much harder for the child, and it would be much less clear how she can succeed in learning the syntax of these verbs.

Therefore, the first thing that we need to do was to find out to what extent there are universal syntax-semantics correspondences and to what extent there are language-specific syntax-semantics correspondences, in terms of the syntax of locative verbs.

Chapter 2 examined similarities and differences in the syntactic possibilities of locative verbs in English and Korean, and Chapter 3 investigated the syntactic possibilities of locative verbs in terms of a wider range of languages beyond English and Korean. A cross-linguistic survey of locative verb syntax in 13 languages showed that across languages, some syntax-semantics correspondences appear to be universal, some correspondences appear to apply only within one of two broad language groups, and some correspondences appear to involve subject to be idiosyncratic language-by-language variation.

First, I found that one generalization that holds across all the languages that I have looked at is that manner-of-motion verbs allow the Figure frame.

Second, two syntax-semantics correspondences depend on which broad language group the language belongs to. I found that cross-linguistic variation in the syntax of locative verbs is quite restricted, dividing languages into two basic classes. Korean-type languages, which include Korean, Japanese, Chinese, Thai, Turkish, Hindi, and Luganda, have a very simple pattern for locative verbs. All locative verbs allow Figure frames and there are no Non-alternating Ground verbs in these languages. In English-type languages, which include English, French, Spanish, Singapore Malay, Najdi Arabic, and Hebrew, basic change-of-state verbs always allow Ground frames. Furthermore, I suggested that certain aspects of locative verb syntax correlate with an independent morphological property, namely the availability of V-V compounding or verb serialization. All of the Korean-type languages, none of the English-type languages, allow V-V compounding/verb serialization, and this simple morphological cue may help the learner to figure out the properties of locative verbs in her target language. If the learner can use this information to determine whether she is speaking an English-type

language or a Korean-type language, and if this morphological cue is readily available, then we could expect that children at a fairly early stage might know enough to determine what the syntax-semantics correspondences are for locative verbs in their particular language.

Third, there are syntax-semantics correspondences that seem to vary on a language-by-language basis. Some idiosyncratic semantic properties can affect syntactic possibilities in some languages but not others. For example, in English verbs of ballistic motion such as *spray* and *sprinkle* are Alternators, whereas related non-ballistic verbs such as *pour* and *dribble* only allow the Figure frame. This affects some languages but not others. For example, *spray* is an Alternator in Chinese and Thai, but is a Non-alternating Figure verb in Korean, Japanese, Hebrew, and Turkish.

Furthermore, one of the most syntactically variable verbs across languages is the verb *fill*. In English, it is a Non-alternating Ground verb; in Korean, it is an Alternator; in Thai, it is a Non-alternating Figure verb; and in Singapore Malay, it is an Alternator. In contrast, cover and decorate show much less variation across languages.

Based on these findings, the existence of cross-linguistic variation in syntax-semantics correspondences may undermine learning strategies based on consistent syntax-semantics correspondences. The next thing we need to do was to find out how much children have learned about the syntax of locative verbs by age 3-4, and how consistent syntax-semantics correspondences can assist the child learn the syntax of locative verbs, despite cross-linguistic variation.

In Chapter 4, I investigated how much children have learned about the syntax of locative verbs by age 3-4, by an elicited production task with child and adult speakers of both English and Korean. I found that children have basically figured out the syntactic

possibilities of locative verbs, and their errors are restricted to the verb *fill*. How do children reach where they are, given the potential problem raised by cross-linguistic variation in syntax-semantics correspondences? How could children recover from their errors?

I discussed two possible learning approaches that might help children succeed in learning the syntax of locative verbs. One is a learning approach based on consistent syntax-semantics correspondences, and the other is a statistical learning approach in the input, which claims that learning is based on the use of distributional properties of the input (Bowerman 1982, 1990; Elman 1993; Allen 1997; Seidenberg 1997; Rohde and Plaut 1999). To what extent can learning strategies based on syntax-semantics correspondences help and not help children to succeed in learning the syntax of locative verbs? To what extent can learning strategies based on the use of distributional properties of the input help children to succeed in learning the syntax of locative verbs?

First, children can learn the syntax of locative verbs based on universal syntax-semantics correspondences, which means that manner-of-motion verbs allow Figure syntax. Second, children can learn the syntax of locative verbs based on correspondences which hold across broad class of languages. A simple morphological cue like V-V compounding or verb serialization can help the children to figure out the properties of their target languages. Children's errors are limited to areas where syntax-semantics correspondences are most variable and idiosyncratic across languages. The remaining question was how children could learn these language-specific idiosyncrasies. How could children recover from their errors?

The analysis of the maternal input from all of the English CHILDES database allowed us to know the distributional properties of the input. The main aim of the

distributional analysis in the input was to examine whether verb classes can be reliably distinguished based on distributional properties of parental speech to children.

First, we found that mother's speech is highly grammatical, 99% error-free. Second, the distribution of syntactic frames in the maternal input might provide children with sufficient information on the syntactic possibilities of basic Figure verbs and basic Ground verbs. Although most verbs were used in most syntactic frames that they allow, this may not be enough for children to figure out which verbs allow alternation, and which verbs do not it. For example, the distribution of Non-alternating Figure verbs and Figure Alternators is essentially identical in the maternal input.

In addition, based on the findings from the analysis of the maternal input, I suggested the learning strategy for how children could make errors with the verb *fill*, and how they could recover from their errors.

In conclusion, the existence of cross-linguistic variation in these mappings does not seem to pose a more serious learnability problem than the standard problem posed for English by Baker (1979), Pinker (1984, 1989) and many others, because learning strategies based on universal syntax-semantics correspondences and group-specific syntax-semantics correspondences can help children learn the syntax of locative verbs. Second, although approaches based on a statistical analysis of the input data could probably do better than was once thought, there are still significant limitations in these learning approaches, especially when faced with cross-linguistic data. For example, PP-omission can be used to distinguish certain verb classes in English, whereas in Korean (also Japanese) it is irrelevant, because these languages allow liberal omission of arguments.

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