A path from broader to narrower grammars:

The acquisition of argument structure in English and Hungarian

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Abstract

In recent years a growing number of theoretical and empirical studies of first language acquisition have cast doubt on the hypothesis that acquiring language is a deterministic process in which the role of experience is restricted to triggering innate principles of grammatical content. The aim of this thesis is to explore areas of language where input-based learning demonstrably plays a role and to find learning mechanisms that account for the construction of observed overgeneral grammars and the process of their restriction.

The thesis is a comparative study of the acquisition of argument structure in English and in Hungarian. The detailed analysis of spontaneous speech samples of two-year-old children reveals that the omission of subjects, objects and prepositions at the so-called telegraphic stage of English child language cannot be explained either by limitations in processing capacity or by postulating an incomplete Universal Grammar. It is suggested that children's implicit arguments and oblique noun phrases lacking case or prepositional marking need not be analysed as syntactically ill-formed, since they conform to permissible abstract structural configurations. The errors may instead be attributed to overgeneral or indeterminate rules of pragmatics, which are fuzzy and variable in the mature grammar.

It is shown that the nature of the children's intake of the primary linguistic data is a good predictor of the nature and extent of overgeneralisation or indeterminacy and of the speed with which the rules are fine-tuned to match the target.

Declaration

I hereby declare that this thesis is of my own composition, and that it contains no material previously submitted for the award of any other degree. The work reported in this thesis has been executed by myself, except where due acknowledgement is made in the text.

Anna Babarczy

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1 Language acquisition in principle

1.1 Introduction

The philosophical background of this study comes from the nature vs. nurture debate in the context of children's acquisition of their first language. I will start by reviewing arguments for and against the two sides of the debate, referring to one approach as nativist and the other as functionalist. On both sides, these arguments may be the outcome of two different research programmes. On the one hand we have theoretical reasoning based on what we know about the nature of human language and about conceivable mechanisms of knowledge acquisition in general. This is the topic of Section 1.2. On the other hand there is a growing pool of empirical data from studies of child language in particular. As we shall see in Section 1.3, the two kinds of evidence are not always easy to reconcile within the same school of thought. The nativist approach has not so far found a satisfactory explanation for some kinds of variation across individual language learners at predefined stages of development or within individual learners over developmental periods. Conversely, the functionalist school has at present difficulty explaining the rapid and uniform acquisition of certain linguistic phenomena which obey abstract principles of language. The solution I will propose is to combine the methods of the two approaches. The study will adopt an essentially nativist stance relaxed by discarding one of the premises, that which disallows learning from the non-occurrence of certain strings in the input to the child.

The arguments for the postulation of a learning mechanism of this kind and the details of its operation are developed in the context of argument mapping in English and Hungarian child language. Following the presentation of the data and the research questions in Chapter 2, Chapter 3 discusses implicit and explicit

subjects and objects in the two languages and Chapter 4 investigates the less well-documented phenomenon of the omission of prepositions from oblique arguments. Finally, Chapter 5 summarises the findings of the study.

1.2 The role of UG

> If we contemplate the classical problem of psychology, that of accounting for human knowledge, we cannot avoid being struck by the enormous disparity between knowledge and experience–in the case of language between the generative grammar that expresses the linguistic competence of the native speaker and the meagre and degenerate data on the basis of which he has constructed this grammar.
> (Chomsky 1972:78)

This puzzle of language acquisition, or "Plato's problem," forces any learning theorist to search for innately specified abilities, in the widest sense of the word, that allow the child to go beyond the input in acquiring language. Language acquisition cannot be thought of as a process of imitation and habit formation but must be viewed as a process of organising available linguistic data in a principled way and abstracting away from them at some level. This much is (largely) uncontroversial. It is subject to debate, however, what those abilities are and how they are used to achieve the learner's task. The general questions that arise in this connection and some suggested answers to them include the following:

1. What is the domain of genetically encoded abilities?
   (a) They mostly belong to cognition in general and they may be relevant for tasks not related to language, such as symbol manipulation or logical operations.
   (b) Most of the relevant abilities are specific to human language, independent of other cognitive modules.
2. What is contained in the genetically encoded abilities?

(a) They guide and constrain the mechanism of learning, such as the process of hypothesis formation and testing, inductive reasoning, the filtering of the input, etc.

(b) Not only the mechanisms, but also the elements that are manipulated are innate. These may include cognitive primitives, linguistic units and categories and syntactic 'rules' (principles and parameters). These objects constitute knowledge rather than abilities.

3. In what way do these abilities apply and what determines change?

   (a) The constraints are best viewed as biases or predispositions. Their outcome greatly depends on environmental influences; the quality and quantity of the child's experiences have a significant effect on the learning process. In general, the learning mechanism is a mechanism of formulating and reformulating hypotheses by observing the properties of the linguistic and non-linguistic environment.

   (b) The working of the constraints is virtually independent of environmental influences. It is primarily the genetic programme that determines the learning process; experience has no more than a triggering role. In general, the learning mechanism is a deterministic mechanism of selecting from a pre-defined set of hypotheses on the basis of simple data.

The approaches suggested by the two different sets of answers are embraced by two different schools of thought. The (a) answers are the answers of functionalists; the (b) answers would be given by nativists in the strict sense. Both agree that some aspects of language acquisition must be innate and other aspects must be learnt; the difference lies in where the emphasis is placed. Accordingly, the two groups pursue different paths to discovering what exactly is genetically given and what is the outcome of social-cultural learning. Functionalists start with the assumption that no language specific abilities are innate and study child language and the input to children to find out how much of language can be mastered on the basis of experience. As MacWhinney (1987a:250) puts it,

> [...] we are guided by a "minimalist" approach that avoids making assumptions whenever possible. This minimalism emphasises the extent

> to which cognitive processes needed by other areas of cognitive functioning can also be involved in language processing. To be sure, any attempt to place language into the Procrustean Bed of "general cognition" must eventually fail when it runs up against aspects of language that are specific adaptations to the task of communicating between human organisms. When the minimalist approach fails, there will then be solid reason to suspect that the skills involved are specific to language.

At the other extreme, the strict nativist approach is to take a theory of Universal Grammar (UG) and search for the minimum of additional mechanisms that can account for the selection of the target grammar from among the hypothesis grammars permitted by UG.

> It follows from the hunch [that the child is successful because a basic linguistic system and the ability to use this system are somehow enshrined in the child's biology] that hypotheses about language should put as small a burden as possible on the child's linguistic experience and as great a burden as possible on the biologically given system, which we call *Universal Grammar* (UG). [...] In practical terms, this means that the linguist's null hypothesis should start with no role for experience. Those linguistic facts that can only be ascribed to experience can then be characterised cautiously.
>
> (Pesetsky 1995:1)

The first method seems to be the default choice by Occam's razor—why postulate a language faculty if we can do without one? There are, however, reasons to adopt the second approach. One of these is the argument from the "Poverty of the Stimulus," Plato's problem applied to language, when the human language-capacity is viewed as an autonomous module of abstract structural descriptions.

> Suppose that we find a particular language has the property P... Suppose, furthermore, that P is sufficiently abstract and evidence bearing on it sufficiently sparse and contrived so that it is implausible to suppose that all speakers, or perhaps any speakers, might have been trained or taught

> to observe P or might have constructed grammars satisfying P by induction from experience. Then it is plausible to postulate that P is a property of [the acquisition device].
> (Chomsky 1977:65)

Given the assumptions, Chomsky's conclusion is indisputable. But that is not sufficient to motivate a UG-first approach to all aspects of child language. An empirical investigation into the learnability of individual properties of language may cast doubts on the unavoidability of a research programme that gives absolute priority to the hypothesis of innate grammatical content. The objection seems all the more reasonable if we consider cross-linguistic variation. Rather than postulate an innate principle for every seemingly abstract property in every language, it may be more economical to search for an adequate generalised learning mechanism. There is, however, a nativist reply to the problem: the linguist's task is to formulate highly general, universally valid principles of grammar and account for at least some variation by the parametrisation of these principles. Parameters are viewed as principles which can have two or more realisations across languages. The value appropriate for the target language is to be 'set' on the basis of minimal experience via a deductive process. The role of learning could then be reduced to the acquisition of any remaining variable properties and irregularities of language, which are listed in the lexicon. The building of the lexicon, however, includes not only the acquisition of the semantic and morphophonological properties of lexical items and idiomatic expressions but also their categorisation and the labelling of categories, as well as the creation of argument frames for predicates. That may mean, reasons the functionalist, that a considerable portion of the language acquisition task cannot be determined by Universal Grammar. In that case we need two separate mechanisms: one for the acquisition of syntax and a different one for the acquisition of the lexicon.

One could contend that this does not really pose a challenge for the UG-first approach, since the acquisition of the lexicon could be a simple case of rote learning, which requires no special learning mechanism. Things do not seem to be that simple, however. First, categories clearly cannot be learnt by imitation, since words are not labelled as Noun, Verb, Subject, etc. in the input. Second, it is unlikely that the

child hears every single predicate in every permissible argument frame a sufficient number of times for memorising to be an effective learning strategy. Moreover, there is convincing experimental evidence demonstrating children's ability (and readiness) to generalise argument structures to novel verbs (Gropen *et al.* 1991a, 1991b). Third, even the apparently simple case of learning the meaning of lexical items poses problems—something that has preoccupied philosophers like Wittgenstein and Quine. It seems, then, that the argument from the Poverty of the Stimulus holds for the lexicon as well. If the lexical component is indeed a list of "irregularities" and thus falls outside the principles of UG, the child needs a powerful learning mechanism that allows the right kind of creativity. The picture that now emerges favours an approach that seeks a powerful learning strategy side by side with innate principles of grammatical content describing those aspects of language which are demonstrably too abstract to be discovered on the basis of experience reasonably available to the learner.

The theoretical problem of cross-linguistic variation is, however, not yet solved. Both theories of learning and theories of parameter setting need to observe the requirement of logical learnability. It is a fairly well established fact that children of at least some, maybe all, cultures get no consistent negative feedback on their grammatical performance (Marcus 1993). It is also claimed, on logical grounds, that the non-occurrence of a string cannot be taken as evidence for its ungrammaticality, since there is an infinite number of correct sentences that do not occur in the input. These assumptions have serious implications for any theory of language acquisition, namely that whenever the child's grammar is analysed as an over-general grammar, the theorist is faced with the burden of explaining how the grammar can be narrowed down eventually in the absence of negative evidence. This problem has become known as the "logical problem of language acquisition", following Baker (1979). If we characterise a grammar as the set of sentences it can analyse, there are four possible ways in which the child's hypothesis grammar may differ from the target grammar, as shown in (1.1). (I shall here present the standard characterisation of the problem—more will be said about it in later chapters.) The hypothesis and the target may generate disjoint languages (1.1a), the

two languages may have an intersection (1.1b), or the hypothesis language may be a subset of the target language (1.1c). In any of these cases, the target language contains data that have not been acquired by the child, i.e., positive evidence is available to the learner to signal the incompleteness or inaccuracy of the hypothesis grammar. These states are therefore taken not to pose problems for learnability. In (1.1d), however, the hypothesis language is a superset of the target language and thus no positive evidence is available.

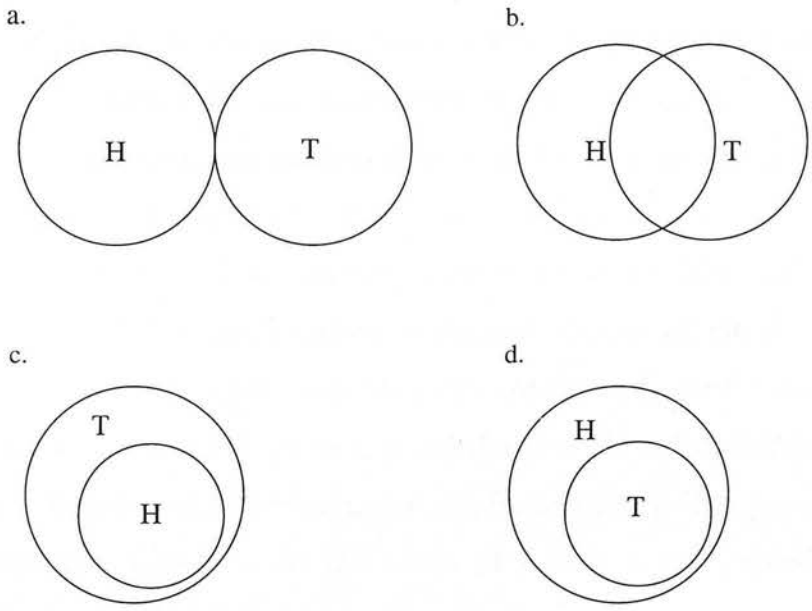


Figure 1.1: Relations between Hypothesis and Target

A further argument for the nativist approach, then, is that any conceivable induction-based learning mechanism is not only insufficient (which is not so much of a problem, since what remains can be attributed to innate principles) but also too powerful (which is a problem, because unlearning is impossible). Therefore, the theorist needs to seek ways of ensuring that the child does not hypothesise an over-general grammar. It follows not only that there must be something that constrains the acquisition process so as to avoid the situation in (1.1d), but also that the analysis of child language must be theory-driven. This reasoning undermines the utility of attempts at characterising language acquisition as a form of learning. Some go as far as suggesting a ban on the very word.

> I, for one, see no advantage in the preservation of the term 'learning'. I agree with those who maintain that we would gain in clarity if the *scientific* use of the term were simply discontinued.
> (Piattelli-Palmarini 1989:2)

The need to minimise the role of learning has therefore led to the formulation of a number of universal constraints relating to the acquisition of the lexicon (the Whole Object assumption (Markman 1989); the Principle of Contrast (Clark 1987); rules of mapping from semantics to syntax (Pinker 1989)), as well as to proposals for the ordering of parameter values (the Subset Principle (Wexler & Manzini 1987)). As was noted, the reason for the postulation of various constraints is to prevent a situation when the language generated by the child's grammar is a superset of the target language. In an ideal world, then, they should ensure that the child does not make mistakes. It is, however, an unquestionable fact that children do not start speaking in fully grammatical sentences. Errors, of course, may be due to performance factors, in which case they are not the output of a rule at all and are no problem for learnability (occasional random errors, or incomplete utterances attributable to limitations to utterance length, for instance). The problem is when we find errors that appear to be the result of inductive overgeneralisation. In this case, adopting the strictest form of learnability theory, the only solution is the assumption that various constraints and principles of the language acquisition device become available at different stages of development and once they are available they will automatically replace the child's erroneous rule. The appeal to maturation is in fact warranted not only by overgeneralisation errors, but by any linguistic behaviour that violates principles of grammar and cannot be accounted for by performance factors. Quite apart from the problem of unlearning, what other explanation can there be for UG violations? What exactly matures is an open question. It may be the principles themselves, or some cognitive function that is necessary for the relevant principle to be utilisable by the cognitive system. Alternatively, it could be a property of the perceptual system that has the effect of "ordering" the input data.

In summary, taking some basic observations about the language acquisition process as premises (that there is a large qualitative gap between the input and what we make out of it; that language can be acquired in the absence of negative evidence; and that the input to the child is not ordered) we have to conclude that the acquisition process is heavily constrained by principles of UG and that these principles may become operative at different stages of development. This holds both for the domain of syntax proper and for the lexicon. In the next section I shall examine specific proposals for principles constraining the acquisition of variable properties of language and for maturational explanations of language development. My aim is to demonstrate that none of the rules or principles in these areas can accomplish their task without the help of sophisticated learning mechanisms. The question the rest of the study will then ask is what these learning mechanisms may be and whether they can provide a solution to the logical problem of language acquisition without innate structural constraints of the kind currently postulated by proponents of UG.

1.3 Where UG is insufficient

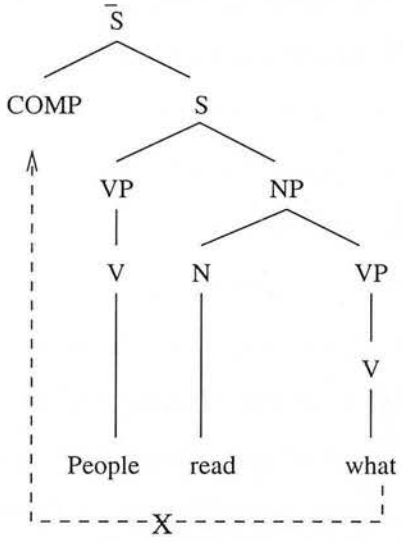
1.3.1 Category labelling

One of the few uncontested facts about language is that lexical items group into categories and the rules, principles or regularities of grammar operate over these categories rather than over individual lexical items. Discovering which words of the target language belong to which category or categories is among the first tasks of the language learner. The problem is particularly important for the nativist approach, since no triggering can occur until the child has identified and appropriately labelled the categories to match those appearing in the mental principles of UG (Grimshaw 1981). Three illustrative examples of strict innatist approaches, random labelling, bootstrapping by innate linking rules and feature-based structure building, will be discussed in this section.

Random labelling of categories

Lasnik (1989) proposes a solution that requires no learning strategy, but is based on a simple process of "trial and error". The child randomly assigns category labels (from the set given by UG) to words or expressions in the input string. If the words come to be attached to the wrong terminal nodes, Lasnik observes, the structural analysis of subsequent input will violate some principle of UG and the child will have to reassign categories. For instance, if the child constructs the tree in (1.1) wh-movement will be blocked by a principle of UG, Subjacency in this case, which prohibits movement across both the S and NP nodes here.

(1.1)



As soon as the child hears the sentence in (1.2), he should know that the category assignment was wrong.

(1.2) What do people read?

Lasnik further assumes that a significant amount of the phrase structure of a language can be acquired on the basis of simple distributional analysis constrained by UG. He proposes the following constraint:

(1.3) Universally a sentence consists of a subject and a predicate phrase, NP VP, and the VP universally must contain exactly one V and may contain a NP.

Given this knowledge, on hearing the sentence in (1.4), once the child has established on the basis of distributional evidence that *people* and *books* must be of the same category, it follows that they must be Ns and *read* must be V, since UG allows only one V in a sentence.

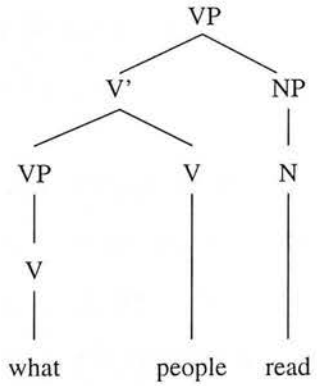
(1.4) People read books.

What is not clear is how the child knows that the problem is with the category labels rather than with some other decision, such as the choice of parameter values or the grouping of lexical items. The task is further complicated by the fact that the labelling problem applies to grammatical relations as well as to syntactic categories. If the child's mapping of individual instances of semantic dependencies onto the structural expressions of syntactic functions is arbitrary, then in (1.1) the category labels may be right but the configuration may be wrong. Although *movement* of the wh-word to COMP is blocked, the child does not know that it has to move (until he has discovered that it has the feature [+wh] and that in the target language [+wh] elements must move) and nothing stops him from generating it in a position consistent with the surface string. The kind of restrictions on possible configurations that Lasnik mentions cannot be a reliable source of evidence, since they can only be formulated for simple sentences. For all the child knows, the sentence in (1.2) may contain an infinitival complement of the verb[1]. Using the strategy of trial and error the child might then reasonably settle on a right-headed structure like (1.5) upon hearing sentences like (1.2).

Generally, until the learner has discovered the right category labels, he will not know what principles should apply to individual lexical items. The best the child can do is generate a permissible surface structure which is compatible with individual input strings. It is of course possible that the child forms categories of known words and observable grammatical markers on the basis of distributional

[1]One could appeal to maturation and propose that the components of UG initially available to the child can only generate simple sentences. This proposal, however, has no empirical support. Infinitival complements with the verb *want* are among the first word combinations of English child language. If the child's grammar does not allow more than one V category, the categorisation algorithm will never converge.

(1.5)



evidence and semantic dependencies before attempting to label or position them. In that case if any one member of the category appears in a construction which is not allowed by the child's grammar, the child will reassign category labels, provided that there is no alternative parameter setting, the child is satisfied that the word is grouped with the right category and it is not a positive exception that should be marked as such in the lexicon. But to satisfy the provisions one needs a powerful learning strategy.

UG-DRIVEN SEMANTIC BOOTSTRAPPING

Another approach to the categorisation problem is to find some properties of the linguistic or non-linguistic environment that are discoverable by a combination of perceptual and general cognitive mechanisms and which correlate with syntactic categories. The main proposals for such properties are prosody (Morgan & Demuth 1996, Cairns *et al.* 1997) morphology/distribution (Maratsos & Chalkley 1981) and semantics (Grimshaw 1981, Pinker 1984, Levy *et al.* 1988). In order to dispense with learning, the links between the reconstructible properties and the syntactic notions must be part of UG and, as a consequence, they must be universal. Since the phonological and distributional properties of words are clearly not universal, the "bootstrap" that can be explored in a strict innatist framework is semantics. (Discussion of the other two proposals will be postponed to a later chapter.)

The idea behind Pinker's (1984) semantic bootstrapping is that given a set of semantic concepts, a set of syntactic concepts and direct mapping from the former to the latter (although not vice versa), the child can effortlessly and accurately label lexical items and argument positions on the basis of the semantic representations

construed by the child of the input data. The links include generalisations such as the following:

(1.6) a. PERSON, THING $\Longrightarrow$ Noun

b. ACTION, CHANGE OF STATE $\Longrightarrow$ Verb

c. AGENT, CAUSE etc. $\Longrightarrow$ Subject

d. PATIENT, THEME $\Longrightarrow$ Object

Since the links are at best canonical, Pinker argues, the child needs to label lexical items and argument positions as soon as the first canonical sentence is heard. Thus suppose the child hears (1.7) and associates it with the correct semantic representation, he will then recognise the semantic categories mentioned in the linking rules and will be able to assign the right syntactic labels to the phonological units corresponding to them.

(1.7) The boy threw rocks.

Once a partial tree-structure has been constructed, labels for forms that do not have semantic correlates mentioned in the linking rules can be added on the basis of "structure-dependent distributional learning". This same mechanism also enables the child to analyse non-canonical sentences, such as (1.8).

(1.8) The situation justified the measures.

For instance, given the phrase structure rule NP $\rightarrow$ Det N, the child can label *the* as Det in (1.7). When exposed to the sentence (1.8), using the same rule in the opposite direction, the learner can deduce that *situation* and *measures* must be Ns. A further rule of UG, S $\rightarrow$ NP_{SUBJ} VP, tells the child that *the situation* must be the subject NP. Pinker is very careful to place the emphasis on "structure-dependent," that is, to view distributional learning as a process determined by rules of UG. As he later explains, (Pinker 1987:411):

> Note that unlike "pure" distributional analysis, this type of learning defines distributions in terms of (earlier-acquired) structural contexts

such as phrase structure positions rather than in terms of absolute serial positions, adjacencies to particular words, and so on. Thus the child will be in no danger of making incorrect generalisations from adventitious surface regularities, e.g., from *this is a hand* and *this is a gift* and *hand me the phone* to *gift me the phone*; nor will he or she miss the generalisation that the verb *amuse* takes a NP subject just because the set of words that can immediately precede it has no common property (e.g., *JOHN amuses me; Babies who SING amuse me; The museum we went TO amuses me; Singing in the shower LOUDLY amuses me*; etc.).

As Pinker acknowledges in later work (Pinker 1987, 1989) there are problems with the linking rules. Most important of all, they are not universal. The clearest example for alternative linking patterns is some ergative languages, where THEMES and PATIENTS, rather than AGENTS, have the syntactic privileges associated with subjects. Furthermore, even if we find universally valid canonical mapping rules, non-basic sentences (e.g., passives) may not be reliably filtered out without additional constraints on learning. Finally, UG of course cannot guarantee that the child's semantic representation is correct.

The second component of semantic bootstrapping, structure-dependent distributional learning, is similarly fallible. As was indicated in connection with Lasnik's proposal of permissible phrase structures, there are too many possible surface structure configurations to sufficiently constrain distributional learning. Although the class of underlying structures is much more restricted, that information remains inoperative until the learner has identified at least some labels. For instance, what tells the child that the NP rule above is relevant rather than, say, NP $\rightarrow$ Adj N? Every mistake made will increase the likelihood of misanalysis at subsequent stages. In analysing the non-canonical sentence in (1.8) the first instance of *the* could be categorised as a predicative adjective, *situation* as a copula, *justified* as a determiner and *measures* as a noun.[2] It may be that pure distributional learning, e.g.,

[2]While the resulting construction would be highly marked in English (e.g., *Merry was the party*), it is unmarked in other languages, such as Hungarian, as is the target construction.

that *the* precedes nouns, the word-final alveolar stop is a suffix that attaches to verbs and the order of constituents is SVO, is in fact *less* prone to error.

In Pinker's (1987) constraint-satisfaction model some of these issues are addressed by the replacement of linking rules and phrase-structure constraints by rule prototypes, referring to semantic, distributional, structural and phonological properties of language. These rules are weighted according to their cross-linguistic markedness. The child's parser at first constructs underspecified representations, which may include discernible features mentioned in the rule prototypes and variables substituting for the labels. When sufficient information has been found, the variable is replaced by the appropriate symbol. Reliance on innate linking rules, however, still poses problems. If rules are weighted according to cross-linguistic likelihood (e.g., the AGENT is Subject rule is assigned a high value, because ergative languages are rare) then we would expect that some languages are harder to acquire than others. A theoretically more interesting consequence of the model, is that the rules that are the most adequate initially are the ones which are independent of other rules, since interdependence between rules can lead to circularity. For instance a rule like "Subject is daughter of S" is relevant both for determining the grammatical functions of arguments and for establishing the right phrase-structure configuration. In a situation when the child does not know either, however, the rule is helpless. Crucially, it is precisely the structural rules of syntax that belong to this class. The semantic, phonological and pure distributional cues avoid circularity because one side of the rule is discernible without any prior linguistic knowledge. That is, bootstrapping needs to work without innate rules of syntax, with only the help of predispositions (probabilistic associations between observable properties and symbols). Returning to the problem of cross-linguistic variation, it can be avoided if the rules are not constraints on valid linking patterns, but are attentional biases constraining the discovery procedure, as in (1.9).

(1.9) The relative semantic roles of arguments can usually predict the relative syntactic behaviour of those arguments[3].

[3]This is a first approximation of the principle and will be revised later.

More will be said later about the problems with inductive learning on the basis of surface distribution. While it is recognised that something needs to constrain the process, that something, at least at the initial stages, cannot be structural rules of syntax that make no reference to either the phonological or the semantic interface.

FEATURE-BASED BOOTSTRAPPING

A somewhat different concern for category labelling is the acquisition of functional categories. Similar to Pinker's constraint satisfaction model, in that underspecified representations are allowed until more evidence has been accumulated, is Clahsen *et al.*'s (1996) proposal in the Minimalist framework. It is based on Chomsky's (1995) Merger theory, where functional projections are feature bundles. That is, the head category X of the functional projection XP has the features F_1, F_2, ... F_n. Clahsen *et al.* argue that from the point of view of language acquisition, this approach has the advantage that if the child only knows say F_1, he will not be forced to guess the right label, but can posit a functional projection characterised by nothing but the feature F_1. Phrase-structure representations can then be gradually expanded by adding more features, which will eventually define the functional category in question.

While this approach is plausible as an explanation for underspecified representations, it does not address the issue of how the features are acquired. Presumably, at least some ϕ-features can be identified from semantic content. In order to realise, however, that some feature has phonetic realisation in the target language and therefore projects into syntax, the child needs a sophisticated mechanism for distributional analysis. The acquisition of lexicalised functional categories may then give rise to the same problems as the labelling of lexical categories and grammatical functions.

1.3.2 Development

Another aspect of language acquisition where the standard assumptions about the workings of UG are insufficient is the development of language in the child. There are two reasons why additional properties of the language acquisition device are needed to account for development. One is the empirical observation that children's

language in some cases indicates violations of aspects of UG or overgeneralisation errors. The other is the logical argument that since no role is to be attributed to learning in the language acquisition process, the language faculty must contain a property that effects progression. A plausible solution to both issues is the hypothesis that the transition from one stage of child language to the next is the result of biological maturation. Apparent violations of principles of UG are viewed as a natural consequence of the relevant principles being inoperative.

Felix (1992) argues for the necessity of a maturational schedule by citing experimental evidence for UG violations. A series of experiments investigating children's knowledge of Binding Theory show that children under the age of 7 cannot reliably identify coreference in various constructions with pronouns or anaphors (Matthei 1981, Lust 1986a, Roeper 1986). Crucially, Lust (1986a) demonstrates that children's interpretations are not random but are guided by a directionality constraint that disallows backward pronominalisation. The question is, why should this happen if UG specifically tells the learner that not linear precedence, but structural c-command is the relation to look for?

There have been proposals in the literature to attribute apparent UG violations to performance factors. Grimshaw & Rosen (1990), for instance, suggest that children may be observing a discourse-level constraint that pronouns normally have linguistic antecedents. Felix responds by asking what forces the child at a later stage to give up or modify their rule (Felix 1992:43–44).

> [...] stage-transition is not simply a matter of *expanding* the current grammar to cover new structures, but also a matter of *changing* it in such a way that certain old structures will no longer be generated. This, however, implies that a child moving to a new developmental stage has to realize somehow that there is something "wrong" with his or her current grammar in the sense that it generates structures that turn out to be ungrammatical in the adult language. Consequently, an adequate solution to the stage transition problem must provide a principled answer to the question of what exactly makes the child realize that the

structure he or she has regularly used in the past should be ruled out as ungrammatical in developmentally subsequent grammars.

The logical problem holds, even if it is emerging pragmatic rules that override principles of UG such that the result is an overgeneral grammar. The solution is maturation, since "the theory of Universal Grammar is precisely a theory to explain how children discover ungrammaticalities in the absence of any relevant external evidence." [p44].

Radford (1990) dismisses the idea that some cognitive function, rather than the principles themselves, matures on grounds that the notion of cognitive maturation is too vague to make any predictions, since there is no reliable way of determining a child's cognitive capacity. The maturation of principles, on the other hand, has very specific predictions: the clustering of the acquisition of related linguistic phenomena and cross-linguistic uniformity in the order of acquisition of the relevant constructions.

There have been two influential proposals for characterising delayed acquisition in terms of pure maturation, neither of which have withstood empirical tests in their original formulation. Borer & Wexler (1987) propose that the principles of A-chain formation are initially absent from UG, as an explanation for the late appearance of verbal passive constructions and the simultaneous disappearance of causative over-generalisations (e.g., **Don't giggle me.*, Bowerman 1982). Demuth (1989), however, finds that verbal passives are acquired early in Sesotho, where they are highly frequent in the spoken language. While this finding does not exclude the possibility of maturation, it strongly implies that the cross-linguistic difference needs to be accounted for by positing an additional property of the language acquisition process. If we maintain that A-chains are not available to children before a certain stage of development, we need to find the mechanism that allows Sesotho children, but not English children, to generate constructions that are indistinguishable on the surface from structures involving A-movement.

The other comprehensive theory of maturation is Radford's (1990) explanation for the "telegraphic" stage of child language. Radford discusses phenomena in early child English which, he suggests, indicate that there is a stage of English

language acquisition when functional projections are absent. He proposes that the functional module of UG is genetically programmed to become operative at a later stage of development. Cross-linguistic investigation, however, reveals disconfirming evidence. Hyams (1994) finds that in some languages with rich inflectional paradigms evidence for the presence of functional categories appears very early on. Radford (1996) dismisses the objection by noting that the early appearance of functional projections does not mean that there was not, at some even earlier period, a non-functional stage. While this is true, it leaves the correlation between the type of the target language and the time of transition to the functional stage a mystery. If the onset of the functional stage is controlled by biologically determined maturation, it should be unaffected by the statistical properties of the input. Another correlation of this type, but within languages, is reported in a classic study by Newport *et al.* (1977). The authors find a positive correlation between mothers' use of yes/no questions and the development of the verbal complex in the children's language.

A further prediction of Radford's maturational account is that the various functional categories should appear simultaneously. My investigation of two Hungarian children, however, reveals a uniform two-month delay between the development of the Inflectional-system and the Determiner-system, and that the acquisition of the functional projection of Focus is several months behind both (Babarczy 1998). As before, these findings are not incompatible with the maturational hypothesis, but they call for an explanation other than biological maturation for the observed differences in the schedule of the acquisition of functional categories.

In more recent work, Radford (1996) complements maturation by a process of structure building, where children gradually learn to project increasingly complex structures incorporating functional categories. Development, Radford argues, is the result of the reanalysis of linguistic categories, such as realising that wh-words are operators after a period of analysing them as simple quantifiers. This leads us back to the problem of identifying categories and their defining features.

In summary, the maturation of principles of grammar cannot in itself characterise development because (a) rule-like linguistic behaviour seems to emerge under

some circumstances but not under others even when other evidence suggests that the relevant principles of UG are inoperative; and (b) the statistical properties of the input influence the course of development over and above the proposed availability of given modules of UG. The first observation suggests that there are restrictions on learning, other than syntactic principles, while the second finding shows that one of these might be sensitivity to quantitative differences in relevant data.

1.3.3 Variation

PARAMETERS

The nativist solution to cross-linguistic variation within the syntactic component is the formulation of parametrised principles whose values are to be set on the basis of experience. Considerations of learnability impose strict restrictions on the nature of parameters. A parameter may be such that the languages generated under any two different settings of the parameter are in a subset-superset relation. Since the child needs to be able to select the correct value for the target grammar on the basis of positive evidence only, the triggering mechanism needs to ensure that the child never hypothesises a value that generates a language which is the superset of the target. This requirement is termed the *Subset Principle* by Wexler & Manzini (1987) and is formulated as follows:

(1.10) The learning function maps the input data to that value of a parameter which generates a language:
(a) compatible with the input data; and
(b) smallest among the languages compatible with the input data.

An additional requirement is that the subset relations holding between languages generated by different settings of a parameter must be independent of the settings of any other parameter. Initially, the parameter can be unset, or set to the default value which generates the smallest language. While the ordering restriction solves the problem of learnability in principle, for most parameters the subset relation in fact does not hold. This does not seem to be a coincidental fact. One reason is that the aim of linguistic theory is to postulate as few parameters as possible, which

have as general an application as possible. If a parameter applies to a wide range of linguistic phenomena, it is not surprising if more than one of its values will generate structures which are not part of the language generated by any one of the other values. A case in point is the pro-drop parameter. Although [-pro-drop] seems to be a subset of [+pro-drop], since the former only allows sentences with subjects while the latter also allows subjectless sentences, there is a construction which is licensed by [-pro-drop] only, namely expletive subjects (Hyams 1986, 1987).

Gibson & Wexler (1994) propose an algorithm for the setting of parameters of this kind. Their Trigger Learning Algorithm (TLA) is based on the assumption that the input contains data (a trigger) that can be analysed if and only if the relevant parameter is set to the correct value. Thus if a learner encounters a sentence that he cannot analyse, he selects a parameter, changes its value and attempts to reprocess the sentence. The process of parameter resetting continues until the learner is successful in assigning a structural description to the sentence. Gibson & Wexler find that the algorithm is guaranteed to converge within finite time. Some refinements, however, are necessary. First, in order not to be misled by noise in the input, the learner should only consider sentence types which occur with reasonable frequency. Second, as the authors note, a desirable addition to the TLA would be some strategy that helps the child select the relevant parameter when encountering a trigger rather than search through the hypothesis space at random. Third, a parameter setting will only be changed if the change results in successful analysis of the problem sentence (the "Greediness Constraint"). Without this assumption the learner might reset parameters arbitrarily and "thus move randomly through the parameter space." Note that this assumption is also implicit in the logical problem of language acquisition. The reasoning is that an overgeneral grammar will not be modified by the learner, because there are no data that the current grammar cannot process but the modified grammar can.

This third condition, however, poses a problem. As it turns out, there exist combinations of parameter values for which there is no triggering data. Gibson & Wexler (1994) demonstrate that if the child wrongly hypothesises that the Verb Second (V2) parameter is set to *true* then he may arrive at a grammar where there

is no sentence that can trigger the resetting of any of the parameters. Gibson & Wexler consider a number of solutions to the problem. One is that the [V2] parameter remains inactive for a certain period of time, during which the child can set other word order parameters. If the child is acquiring a [-V2] language, he will never need to touch the parameter, since he will already have the correct settings for word order. Thus a situation where the parameter is mistakenly set to [+V2] will never arise. The arguments for the maturation of [V2] are teleological. Previous proposals tried to account for facts of child language; Gibson & Wexler argue that the [V2] parameter *needs* to mature at a later stage of development because the learner would not be able to arrive at the right parameter settings otherwise. While such an explanation is not entirely implausible, it does not seem to be supported by empirical evidence. While it is true that children learning a [-V2] grammar do not hypothesise a [+V2] grammar, studies of children learning V2 languages show that finite verbs appear in second position very early on (Wexler 1994).

A second way to avoid "local maxima" that the authors propose (and reject) is the removal of the Greediness Constraint. In order to avoid unrestricted parameter resetting, the child would need to consider "deductive triggers".

(1.11) A deductive trigger for value v of parameter P_i, is a sentence S from the target grammar such that S is grammatical only if the value for P_i is v.

For instance, a sentence where the finite verb is not in second position could act as a deductive trigger for the child to change the V2 parameter to the right value of [-V2] even if the grammar resulting from adopting the new setting will still not be able to analyse the sentence in full. Thus the child needs some mechanism to partially analyse input sentences and recognise the relevance of this partial analysis for selecting hypothesis grammars. This process is of course just what a theory of strictly UG-driven language acquisition is meant to replace. Yet, it seems to be unavoidable.

Lightfoot (1997) proposes a similar solution to the V2 problem, although from a different perspective. He criticises what he calls "input-matching" models of language acquisition, on the grounds that they cannot succeed when children

are exposed to a large amount of data which are not matched, as is the case with the development of Creole languages (Bickerton 1997) and the acquisition of sign-language from hearing parents (Goldin-Meadow & Mylander 1990, Newport 1997). He adopts instead Dresher & Kaye's (1990) cue-based model of parameter setting, where children are taken to scan the environment for certain cues specified by UG in matrix sentences. Lightfoot proposes a cue for the V2 phenomenon: an arbitrary XP occurring in the input followed by a finite verb in a matrix clause. (XP cannot be the subject or a wh-expression.) It follows from the principles of UG that such a pattern must have the structural description of $[_{CP}$ XP $[_{C}$ V $][\ldots]]$. If this pattern occurs with sufficient frequency, Lightfoot proposes, the child can set the V2 parameter to positive. This approach is similar to Gibson and Wexler's deductive trigger solution in that the child needs to be able to perform a partial analysis of the relevant input sentences (i.e., needs to determine that the sentence-initial XP is not a subject or wh-expression, that the verb is finite and the construction is a matrix clause) while disregarding any unanalysable aspects of the data. In addition, the frequency of the cue is crucial, since the child may need to filter out a large amount of "noise". Lightfoot illustrates this property by an instance of language change in English. There was a V2 grammar in Middle English in the North and a non-V2 grammar in the South. Lightfoot explains the sudden loss of the V2 dialect by assuming that as a result of migration between the two regions, the frequency of the cue for V2 fell below threshold level for the new generations.

Studies on Creoles and signed languages also support the hypothesis that children do not construct random or default grammars in the absence of consistent input data. Rather, they are sensitive to the dominant properties of the input and generalise from them thereby creating a consistent grammar (Newport 1997). This process, of course, strengthens the argument from the poverty of the stimulus for an innate language acquisition programme. It also shows, however, that the construction of a mental grammar rests on an aptitude for discovering correlations between actual combinations of categories and sentence patterns rather than on the automatic triggering of values of structural principles.

ARGUMENT STRUCTURE

There is ample evidence in child language for the overgeneralisation of some observed argument structure pattern in the domain of the lexicon (e.g., Bowerman 1982, 1988). What is interesting for language acquisition theory is that (a) these patterns are not controlled by parameter values (i.e., overgeneralisation is not the result of a mis-set parameter, but the consequence of UG-independent inductive processes), since they typically involve variation in the lexicon of a single language rather than cross-linguistic or cross-dialect variation; and (b) the children eventually abandon the overgeneralised forms in favour of the adult forms. The first property indicates that UG-independent overgeneralisation may occur in some areas of language but not in others—that is, something other than syntactic principles seems to constrain inductive reasoning. The second property is of course puzzling for the logical problem of language acquisition. How do children get from a larger to a smaller grammar in the absence of negative evidence?

The nativist route to a solution is to search for constraints on the properties of the lexicon, which may be part of the grammar proper or a principle of the larger domain of the Language Acquisition Device. As Pesetsky (1995:2) points out, the general advice holds here as well:

> As with any aspect of language, proposals about the lexicon should proceed from the null hypothesis that *nothing* is acquired through experience, progressing with cautious and conservative steps toward an understanding of exactly what is acquired through experience and how.

With the above considerations in mind Randall (1992) argues for a rule-governed lexicon, where the learner is guided by a set of either/or choices, similarly to the process of parameter setting. For every instance of observed overgeneralisation, Randall proposes, there must be an innate grammatical "catapult" to dislodge the erroneous rule. Catapults take the form of disjunctive principles stating that if the primary linguistic data exhibit property A, the learner must conclude that property B is not the case.

Randall formulates a catapult for recovering from the over-extension of the dative and locative alternations in English. The phenomena are illustrated in (1.12) and (1.13) respectively.

(1.12) a. The Duchess threw the baby to Alice.
b. The Duchess threw Alice the baby.
c. The Duchess pushed the baby to Alice.
d. *The Duchess pushed Alice the baby.

(1.13) a. The March Hare smeared butter onto the watch.
b. The March Hare smeared the watch with butter.
c. The March Hare poured tea onto the watch.
d. *The March Hare poured the watch with tea.
e. *The March Hare filled tea onto/into the watch.
f. The March Hare filled the watch with tea.

Randall observes that of the two internal arguments of non-alternating verbs one is always optional: the GOAL of *push*-class verbs and *pour*-class verbs and the THEME of *fill*-class verbs. Based on this generalisation, she proposes the Order Principle as a constraint on permissible argument frames:

(1.14) Optional arguments cannot precede obligatory arguments.

Thus property A is 'argument X is optional' and property B is 'argument X precedes an obligatory argument Y'. The process of generalisation and self-correction would look something like the following:

1. On the basis of alternating verbs, the child sets up underspecified lexical alternation rules, e.g., *pred* THEME to $\text{GOAL}_{poss} \Longleftrightarrow$ *pred* GOAL_{poss} THEME.
2. On hearing a non-alternating verb in both one-argument and two-argument VP frames,[4] the child constructs the appropriate lexical entry, e.g., *push* THEME (to GOAL_{poss}), where brackets indicate optionality.

[4]The term *argument* refers to internal arguments here and in the following discussion.

3. The output of the lexical rules applied to the new entry will then give the erroneous construction, e.g., *push* (GOAL$_{poss}$) THEME.
4. Since the new frame, however, violates the Order Principle, it will be abandoned.

There are some caveats waiting to be explained. First, why do children fail to make the step from stage 3 to stage 4 instantaneously? Randall's answer is that the data must be reorganised as relevant to the overgeneralisation and it is possible that a trigger threshold needs to be reached in, say, number of tokens. How this would give the desired results is not clear. Free omission of the optional argument generally precedes in time the appearance of the creative frame, indicating that children are aware of the optionality of argument X by stage 3 above. That leaves the option that the learner needs confirmation of the obligatoriness of argument Y. The only reasonable source this confirmation can come from is, however, indirect negative evidence, that is, the non-occurrence, or negligibly infrequent occurrence, of utterances where argument Y of the given predicate is not overtly expressed. One might defend the theory by noting that this kind of indirect negative evidence is simpler than the kind necessary for the rejection of the creative frame as a direct consequence of its non-occurrence in the input, since for the latter the child needs some criterion to determine under what circumstances the alternative frame would be expected. However, not even the catapult solution allows every single utterance with the given predicate to be counted as evidence. This leads us to the second problem, that some alternating verbs too have an optional external argument. These include not only "idiomatic" expressions, such as *tell the time, give a talk, show a movie* but also verbs where the GOAL or THEME are freely omitted (the *for*-dative verbs, e.g., *draw* in the dative alternation class and several manner-of-transfer verbs, e.g., *smear* in the locative alternation class).

Randall proposes that the lexical entries of these predicates are first over-corrected (at stage 4) but at a subsequent stage positive evidence enables the child to restore the alternative frame. This, according to Randall will result in two lexical entries for the verbs. The correct entries for *smear* are shown in (1.15).

(1.15) *smear*$_1$ GOAL (with THEME)

smear$_2$ THEME to GOAL

The entry for *smear*$_2$ in (1.15) specifies an obligatory THEME argument, thus the Order Principle is not violated. The question, not discussed by Randall, is how the learner can arrive at the correct second entry while at the same time excluding the possibility of a similar second entry for non-alternating verbs. One solution is that the Order Principle is applied backwards (by Modus Tollens) allowing the child to conclude that argument X is not optional. Since there is empirical evidence for the optionality of X in one entry, the child is forced to create a second entry. If this option is available, however, the only way to restrict its application would be to specify that it is only a valid option for frames created on the basis of positive evidence but not for frames which are the output of a lexical rule. But this means that the child has to monitor the occurrence and non-occurrence of a particular argument frame with a particular predicate. That is, indirect negative evidence of the complex kind.

A different way to construct a second entry such as in (1.15), is to consider indirect negative evidence which is specific to a construction rather than to a predicate in general.

(1.16) An argument A is obligatory with respect to a construction C iff

a. no (or negligibly few) utterances occur which are equivalent to C except that A is unexpressed; and

b. C occurs with sufficient frequency.

If now the child hears (1.13a) but not **smear on the watch* he will know that the THEME cannot be omitted in (1.13a). Note that condition (b) in (1.16) is necessary to prevent the assignment of obligatory status to the first internal argument of a construction created by the over-application of a lexical rule. Otherwise, if at stage 3 the child creates an entry that licenses (1.13e), the non-occurrence of strings such as **fill into the watch* can be erroneously taken to indicate the obligatoriness of THEME in (1.13e). In summary, the Order Principle presupposes knowledge of the

obligatory or optional status of arguments in specific constructions. This knowledge, however, can only be attained by monitoring the occurrence and non-occurrence of those constructions in the linguistic environment. If this is indeed correct, the Order Principle may not be necessary at all. The principles in (1.14) and (1.16) could be replaced by the single and more general condition on the use of indirect negative evidence in (1.17).

(1.17) The output construction C_o of a lexical rule R is ungrammatical iff

a. no (or negligibly few) utterances occur which are equivalent to C_o; and

b. the input construction C_i of R occurs with sufficient frequency.

The preceding paragraphs argue that the postulation of innate syntactic principles which are to constrain the application of lexical rules is not sufficient to replace a theory of "unlearning". There is, however, another approach to argument structure alternations. Pesetsky (1995) argues for the analysis of alternative subcategorisation frames as instances of variable linking from semantic categories to syntactic positions rather than the outcome of the application of lexical rules. He further proposes that to meet the requirement of learnability the concrete realisation of the principles of linking should follow from the predicate's semantics. If this is so, "children learn pairings of sound and meaning; UG does the rest" [p. 4].

In Pesetsky's model the Projection Principle of UG is satisfied by θ-selection. A selected θ-role may be marked by a preposition, which must select for the same θ-role as the predicate; a process that Pesetsky terms "mediated θ-selection" as opposed to "direct θ-selection". The two syntactic realisations of the English dative and locative constructions are described as the result of the predicate's ability to use both direct and mediated θ-selection of the THEME and GOAL arguments. Mediated θ-selection here occurs via a zero-morpheme, which he calls *G*. *G* selects a THEME object, with some further restrictions, which need not concern us here. The relevant data from (1.12) and (1.13) are repeated here with Pesetsky's notation. Thus in the (b) examples *G* θ-selects a THEME argument and the GOAL is directly selected

by the predicate, while in the (a) examples *to* θ-selects a GOAL argument and the THEME is directly selected.

(1.12') a. The Duchess threw the baby to Alice.

b. The Duchess threw Alice *G* the baby.

(1.13') a. The Hare smeared butter onto the watch.

b. The Hare smeared the watch G_{with} with butter.

Whether both alternatives are available depends on the semantic and morphophonological properties of the predicate as defined by Pinker (1989), and Levin (1993)). For instance, the *G*-marked construction is allowed by predicates that denote "instantaneous causation of ballistic motion", as *throw* in (1.12b), but may not be extended to verbs denoting "motion that requires continuous imparting of force", as *push* in (1.12d). G_{with} is allowed by predicates that express change of state, as *smear* in (1.13b) but not *pour* in (1.13d).

Pesetsky proposes that the syntax and semantics of zero-prepositions is part of UG. Thus the child knows that *G* selects for a certain sub-type of THEME and is selected by predicates with certain semantic properties and G_{with} selects for another sub-type of THEME and is selected by predicates with another set of semantic properties. THEMEs of verbs that satisfy neither condition must be directly θ-selected by the verb. What the child needs to learn, then, is which predicates belong to which class and subclass. Errors, according to Pesetsky, are not the result of overgeneralisation but are due to the inaccurate semantic representation of predicates. The child who constructs a sentence like (1.13d) is claimed to have misinterpreted the verb *pour* as one that can express change of state.

While this account offers a neat and principled description of argument structure 'alternations', it does not solve the logical problem of language acquisition. Whether it is the conditions for the lexical rule or the semantic representations of verbs that are overgeneral, the child needs a mechanism to narrow down one or the other.

A procedure for acquiring lexico-semantic representations is outlined by Pinker (1989), whose alternation classes, termed narrow-range conflation classes, are adopted

by Pesetsky. In Pinker's account a narrow-range conflation class is formed by grouping predicates that share a set of grammatically relevant semantic features and differ only in predicate-specific idiosyncratic features. Conflation classes are linked to characteristic argument structures via a set of linking rules given in Universal Grammar. Pinker proposes three rules of learning predicate meanings. As a first step, Event Category Labelling allows the child to assign approximate event categories to input strings based on isolated situational information. This process may result in ambiguous, erroneous or underspecified semantic representations, which will lead to argument structure errors. At the next stage of learning the child's semantic representations can be refined by Semantic Structure Hypothesis Testing, which consists in "eliminating any incorrect hypotheses as a result of observing how the verb is used across situations" [p. 255]. Finally, once some predicates have been grouped into conflation classes, the third method, Syntactic Cueing, can be used to deduce the grammatically relevant semantic features of newly acquired predicates by noting their argument structures in the input, matching these to the argument structures associated with established conflation classes and applying the semantics-to-syntax linking rules in a reverse direction.

Let us now see how the process might work in the case of locative alternations. The semantic classes corresponding to the two argument structure patterns are defined by Pinker as follows: The THEME-object verbs "all specify the kind of force or direction of motion according to which the theme moves or is caused to move" and the GOAL-object verbs "all specify a [particular] change of state resulting from the addition of material" [p. 128]. The semantic specifications of verbs that alternate between the two argument structures must satisfy both criteria. Semantic Structure Hypothesis testing ensures the learnability of the lack of either of the two properties, given enough exemplars, the right kind of memory and an aptitude for fine-grain event categorisation while filtering out noise. If a verb occurs in the input describing events with a variety of results or carried out in a variety of manners, the child can conclude that the nature of the result or the manner of the motion are not specified by the verb. The question is how the learner can ascertain that the conditions indeed hold when they do. How many times does an action need to

be carried out in a specific manner (or with a specific result) before the child can contend that the verb describing the action encodes that and only that manner (or that and only that result)?

There are three answers to this puzzle to consider. One may be that the learner uses syntactic information: if a verb of transfer is observed in the input with the THEME mapped onto the object function and GOAL embedded in a locative PP, it follows by reverse linking that it must specify the manner of the motion. By the same process, a GOAL-object structure with a THEME-PP implies a change of state predicate. On the assumption, however, that a certain argument structure will not be constructed by the child unless his semantic representation is consistent with it, this solution only allows conservative learning and fails to account for argument structure errors.

A second possibility could be the operation of an inbuilt bias towards constructing as narrow hypothesis meanings as is consistent with the available evidence. If this is the case, children should start with the hypothesis that all verbs of (non-possessional) transfer specify both the manner of the motion and the resulting change of state. This prediction does not appear to be correct. Pinker (1989), in a slightly different context, reports experimental results showing that 2 to 5 year-old children readily label transfer events as *filling* regardless of the end-state of the target container. Of the same subjects, the oldest age-group (4;6–5;5) had a tendency to associate *filling* with a specific manner of motion but the younger groups (2;6–4;5) did not. Initially, therefore, hypothesis meanings may in fact be overgeneral and the puzzle remains unsolved.

The third way of discovering the relevant feature specifications is the use of indirect negative evidence. The child may note the lesser degree of variation in event types associated with the predicate relative to the degree of variation observed for other, similar, predicates. Additionally, the learning mechanism could be sensitive to the non-occurrence of the test predicate in input utterances describing events which are consistent with the child's semantic representation of the predicate. The process could be assisted by observing the occurrence of an alternative predicate describing the event in question and contrasting it with the one to be tested. As

will be discussed in the following section, it is questionable if information of the latter kind can be used without negative evidence. It seems then that the mechanism involved in these processes is not qualitatively different from the indirect negative evidence principle I proposed in (1.17) above. It does, however, place an additional burden on the learner: the fine-grain categorisation of non-linguistic events. According to the theory, the child would need to recover from situational evidence that, for instance, *hang* is a change of state verb while *suspend* is not; and *sew* specifies the manner of the action but *glue* does not. It is arguable whether this is indeed a more efficient strategy in narrowing an overgeneral hypothesis than detecting the presence or absence of a well-defined category in the input string.

More will be said about this problem in Chapter 4. I will also present evidence that an incorrect hypothesis meaning does not necessarily lead to an incorrect hypothesis argument structure consistent with the child's semantic representation; conversely, argument structure errors do not necessarily reflect inaccurate semantic structures; and there exist alternation phenomena (between mapping arguments as direct objects vs. prepositional objects) where no semantic conflation classes can be identified, yet overgeneralisation errors are abundant.

Word meanings and morphology

The over-extension of word meanings and the regularisation of morphological paradigms are ubiquitous features of child language. These errors are taken to belong to a problem-class different from argument structure errors in that there tends to be an adult word which is equivalent in semantic content to the child's word. The principles proposed in the literature as substitutes for negative evidence therefore work with the notion of preemption, that is the replacement of a creative expression by a conservatively acquired expression once the equivalence of the two has been established. One such constraint, the Uniqueness Principle was developed in the transformational paradigm by Wexler & Culicover (1980) and Wexler (1981).

(1.18) In the unmarked case, each deep structure is realized as one and only one surface structure.

The Uniqueness Principle has been applied to the acquisition of irregular morphology. For instance, when both *went* and *goed* are analysed as the surface structure of GO-PAST, *went* preempts *goed*. Pinker's (1984) more detailed and non-transformational description of the process of acquiring morphological properties includes the Unique Entry principle. It states that empty cells identified by semantic and phonological features in a word-specific paradigm are tentatively filled in by entries generalised from the corresponding cells of other word-specific paradigms and are constantly checked against forms with the same features appearing in the input.

Clark (1987) notes that the Uniqueness constraint presupposes semantic analysis, since the child needs to know that *goed* and *went* have the same meaning. In Wexler's terms the common deep structure needs to be established and in Pinker's terms the learner has to realise that the two forms belong to the same paradigm and have the same features. Clark argues that Uniqueness is therefore a specialised form of a general, semantics based strategy of unlearning by preemption, which she formulates as the Principle of Contrast.

(1.19) a. Every two forms contrast in meaning.

b. If a potential innovative word-form would be precisely synonymous with a well-established word, the innovative word is pre-empted by the well-established word, and is therefore considered unacceptable.

As before, the obvious question that comes to mind is, why does overgeneralisation occur at all and why does it sometimes persist for an extended period of time? We could assume that overgeneralisation is the result of some, presumably, discourse pressure to fill a gap in the child's vocabulary. It persists until the child has realised that there is an adult word which is synonymous with the child's entry. The first part of the hypothesis, however, has no empirical support, since the appearance of generalised forms is often preceded by a period of correct usage (e.g., Bowerman 1982). The second part raises new problems: what makes the child realise? Markman (1990) summarises experimental results demonstrating 3 and 4-year-old

children's tendency to interpret a novel term as referring to a part or some property of a familiar object rather than as an alternative label for the same object. While these findings support children's bias against synonymy, they also raise the question of what makes them resolve the conflict by abandoning the old term in real life when this is not the strategy they use in experimental conditions. The two situations are of course different in that in the former case the old term is an unattested form-meaning pairing created by the child while in the latter case it is a conservatively learnt form-meaning pairing. However, assuming an innate preference for witnessed form-meaning pairings over innovative form-meaning pairings is not a solution, since that would not allow a U-shaped learning curve. It seems likely then, that on the one hand the child is driven by a predisposition to go beyond the input by imposing order on irregular data (this time without the help of syntactic principles). On the other hand, he is sensitive to the statistical properties of the input. If the innovative forms do not get reinforced, they will eventually be abandoned. Is the Principle of Contrast necessary for this process? Let me return briefly to the diachronic change in the setting of the V2 parameter. The change can be viewed as the 'overgeneralisation' of the non-V2 sentence pattern. The innovative forms are reinforced by adult speakers of the non-V2 dialect but the primary linguistic data also include their V2 paraphrases. Children choose to ignore these. Now consider the over-extension of argument structure alternations. The child's creative constructions are not reinforced but no exact paraphrases are available. The creative constructions are given up. Finally, in the case of regularised morphology, the creative words are not reinforced and there are synonymous adult forms. Thus, if we are willing to accept the parallel treatment of the three processes, whether an innovative expression will be abandoned does not seem to depend on the presence of an adult alternative but on whether the expected string occurs in the input or not. In other words, children are sensitive to indirect negative evidence.

That still leaves the question of what exactly is an 'expected string' or, more generally, what is the children's basis for generalisation and overgeneralisation. The induction problem in word learning is just as puzzling as the problem of forming hypotheses in the acquisition of grammar. The classic example of learning a new

term by ostension is Quine's (1960) linguist, who tries to establish the meaning of the word *gavagai*:

> For, consider 'gavagai'. Who knows but what the objects to which this term applies are not rabbits after all, but mere stages, or brief temporal segments, of rabbits? In either event the stimulus situations that prompt assent to 'Gavagai' would be the same as for 'Rabbit'. Or perhaps the objects to which 'gavagai' applies are all and sundry undetached parts of rabbits; again the stimulus meaning would register no difference. When from the sameness of stimulus meanings of 'Gavagai' and 'Rabbit' the linguist leaps to the conclusion that a gavagai is a whole enduring rabbit, he is just taking for granted that the native is enough like us to have a brief general term for rabbits and no brief general term for rabbit stages or parts. [pp51–52]

One approach to the problem is to posit that Quine's linguist's assumption and a number of similar assumptions, are universal constraints on likely word meanings. Markman and her colleagues propose the Whole Object constraint and the Taxonomic constraint (see Markman 1990 and references cited therein).

(1.20) A novel label is likely to refer to the whole object and not to its parts, substance or other properties.

(1.21) Labels refer to objects of the same kind rather than to objects that are thematically related.

These principles, however, do not describe facts of language, since there are words that clearly violate them. For instance, *forest* and *root* do not refer to whole objects; *Christopher Robin* and *tableware* do not refer to taxonomic kinds. Assuming that the constraints operate at the initial stages of word learning only will not do, as some of these expressions, proper names and body parts, for instance, are among the first to be acquired. What we have then, is predispositions that facilitate learning, rather than constraints on possible word meanings. But biases of this kind do not

solve the induction problem — we still need a theory that explains why they are observed in some cases but overridden in others.

1.4 Conclusion

The preceding discussion has shown that there are aspects of child language for which the postulation of innate structural universals or language specific constraints is insufficient as an explanation even if they are supplemented with a maturational schedule and some triggering mechanism. To account for these properties, what we need is a theory that allows restricted inductive generalisation and recovery from overgeneralisation. I have also argued that the role of indirect negative evidence, i.e. whether children use the non-occurrence of certain constructions as evidence for the ungrammaticality of those constructions, should be reconsidered. The crucial question is, under what circumstances can non-occurrence be taken as a sign of ungrammaticality? The child must, of course, have expectations as to what he is going to hear. But what is included in these expectations and where do they come from? So far I have assumed that overgeneralisation involves the production of a string which is not part of the target language. There is, however, another class of errors that inductive learning may lead to: the assignment of an incorrect interpretation to a possible string, as in (1.22d) on analogy with (1.22b) (cf. C. Chomsky 1969).

(1.22) a. The Cheshire Cat asked to go to the Queen's party.

b. The Cheshire Cat asked Alice$_i$ PRO$_i$ to go to the Queen's party.

c. The Cheshire Cat promised to go to the Queen's party.

d. *The Cheshire Cat promised Alice$_i$ PRO$_i$ to go to the Queens' party.

In this case reliance on the statistical properties of the input, as proposed in (1.17), is clearly not sufficient. We must contend, then, that the child's "expectation" is an analysed string paired with a structured meaning. It is safe to assume that there exists some genetically determined predisposition that helps the child "realise" that language has a level of form-representation and a level of meaning-representation

and the elements of one level can be mapped onto the elements of the other level. The child's genetic endowment must also include the ability to construct a structured representation of state-of-affairs and the ability to associate this conceptual structure with sound strings occurring in the input. The expected string-meaning object must be the output of the child's incorrect hypothesis grammar. The hypothesis grammar could be the consequence of a default or mis-set parameter or, as the following chapters endeavour to demonstrate, of the learner's incomplete knowledge of lexical and/or pragmatic conventions of the target language.[5] If the grammar over-generates, implicit negative evidence can be used to mark negative exceptions or to restate the rule to exclude ungrammatical instances. 'Restating the rule' can take the form of resetting the parameter, adopting the relevant principle of UG (which has now become operative), or formulating a new hypothesis rule. The latter process presupposes the operation of some inductive learning mechanism, that is, generalisation from observed associations to unobserved associations, which requires the comparison of the form-features and/or the meaning-features and/or the mapping in one form-meaning pairing with those in another form-meaning pairing.

We still do not know what the expected pair of string and meaning may be. To discover that, we need to ask the question how the overgeneralisation occurred in the first place and why it is that some other, 'similar,' overgeneralisation did not occur. By comparing the two, we can get an idea of what can and cannot form the basis of inductive learning, provided that the possibility of a currently proposed principle of UG being at play can be excluded. There must be a learning mechanism or attentional bias (maybe part of the Language Faculty) that helps the learner decide what is similar to what when syntactic principles do not apply. Such a mechanism would provide an answer not only for the logical problem of language acquisition and the non-occurrence of some errors, but also for the problem of categorisation and category labelling and, in general, the acquisition of the lexicon.

[5]Note that it cannot simply be the result of the unavailability of some principle of UG, because that in itself would not lead to any hypotheses; it is possible, though, that the unavailability of some principle is the reason why the wrong hypothesis could be formulated at all.

2 Empirical considerations

2.1 What is relevant evidence?

In the introduction I argued that an overview of basic, essentially uncontested facts about the language acquisition process leads to the theoretical conclusion that infants must possess the ability both to create and to "forget" hypothesis rules as dictated by their current intake of the primary linguistic data. The aim of the following chapters is to investigate empirical evidence for such mechanisms operating in areas of language acquisition where it would otherwise seem necessary to invoke disconcertingly complex *ad hoc* principles of parameter switching, stepwise maturation or lexicon building. The question to find an answer for is what might motivate linguistic behaviour that appears to systematically deviate from what we expect on the assumption of a strictly UG-driven deterministic process of language acquisition. The first task is to identify phenomena in child language which are demonstrably the output products of creative rules. The requirement of creativity excludes from the set of evidence bearing data

(2.1)
a. constructions which may be conservatively acquired form-meaning associations;
b. linguistic behaviour which can be predicted from the (independently established) principles of Universal Grammar and
c. random, idiosyncratic or inconsistent utterances.

To observe the first criterion, the analysis will concentrate on utterances which are ungrammatical in the target language. The source of an error, however, may be other than inductive generalisation. On the assumption that the principles of UG are inviolable constraints, the domain of investigation is naturally restricted to linguistic phenomena which are subject to parametric variation or are considered to

lie beyond the genetically determined constraint system available to the child at any particular stage of development. Since a universally ungrammatical construction constitutes a constraint violation, it can only be accounted for by performance factors or must be traced back to a lexical categorisation error. In order to meet the second requirement, however, relevant evidence can only be provided by those error patterns observed in acquisition data in a particular language which do not match grammatical patterns found in either acquisition data or mature data in some other language. Only then can we be satisfied that the error does not originate in the process of parameter setting. This criterion further excludes error patterns which logically follow from the unavailability of some module of universal grammar, i.e., are predictable from the principles that are currently presumed to be operational. It needs to be emphasised that it is patterns of linguistic behaviour rather than individual constructions that are to be considered, since the latter do not reveal anything about the source of the error. As will be discussed in detail in the following chapters, patterns are defined as probabilities of occurrence of form-meaning pairings, where each probability is calculated from the actual frequency of a certain form F_i associated with a certain context C_i relative to the potential frequency of the F_i/C_i object. The potential frequency of F_i/C_i is estimated from the frequency of occurrence of F_i in contexts other than C_i and/or the frequency of occurrence of C_i expressed by forms other than F_i.

The next step in identifying creative hypothesis rules is to find an association between the errors that meet the above criteria and the nature of the child's linguistic input/intake. As we are interested in behavioural patterns, the statistical properties of the data are to be considered. There are, however, too many degrees of freedom in attempting to find correlations between the actual frequencies of specific constructions in the input and the properties of the learner's generalisations. One difficulty is the question of threshold frequency. A correlation is not predicted between the frequency of some construction in the primary linguistic data and the frequency of an error type in the child's language, since once the child's rule has emerged, the frequency of the data on the basis of which the rule was originally formulated should have no effect on the frequency of the rule's output. In fact, a

simple correlation between some aspect of the input/intake and the error suggests that the erroneous constructions are produced on line and can be dismissed as behaviour determined by psycholinguistic factors. What we would need to test the hypothesis that the rule is induced from the learner's mental representation of some observed construction(s) is knowledge of the threshold frequency which is sufficient for the formulation of the rule. It is unlikely, however, that such a threshold can be independently determined. A second problem is created by the possibility of a time lag. Should we look for correlations between adult and child samples of the same period or two weeks apart or two months apart? Thirdly, an approach looking to the statistical properties of the input as the determinant of the child's erroneous hypothesis rules would either need to assume that these properties undergo changes as the child matures or we would be forced to postulate a separate mechanism for recovering from the error. A solution to these problems would be provided if we could determine the child's *intake* as opposed to his *input*, since the ultimate aim is to characterise the processes by which the language acquisition programme is able to exploit acquired knowledge to go beyond the available data. For these reasons the method of testing employed in the current study is examining to what extent children's target-like linguistic knowledge in two typologically distant languages accounts for variation in error patterns within and across the two linguistic systems. If we find that children's errors differ in the two languages and these differences can be related to typological variation for the mastery of which there is evidence in the children's production then we have evidence for the operation of inductive learning from previously acquired aspects of the target language. We then also have a direct means of collating properties that lead to generalisation with those that do not.

As the final step, the problem of "unlearning" needs to be addressed. If it is found, as predicted, that an inductive rule can be characterised with reference to some aspect of the learner's current linguistic system, it need no longer be assumed that the language acquisition programme may only adjust the grammar if it otherwise fails to process the input. It is then reasonable to assume that changes in the relevant aspects of that system, whether through conservative learning, further inductive processes or biological maturation, should effect the modification of

the hypothesis rule by the same inductive mechanism. If we further find that the statistical properties of some aspect of that system correlate with the probability of error patterns and that changes in these statistical properties can be predicted from the developing grammar, the superset problem discussed in the introduction simply does not arise.

The primary aim of the study then is to find regularities in children's non-targetlike linguistic output and attempt to derive them from independently established properties of the learners' grammars. The study involves the detailed analysis of the development of argument structure in naturalistic speech samples recorded over a period of 6 months from an English-speaking and two Hungarian children. Error patterns are compared across the learners and changes in error patterns are recorded within individuals. The independent variable is the environment in which each pattern is observed. The environment is characterised by any properties of the child's performance other than the erroneous construction itself. The object of our enquiry is to identify those properties which can predict the variations in error patterns. The following list gives an informal, generalised description of possible outcomes:

(2.2)
a. The null hypothesis: The differences between error patterns are random, there is no way of predicting the likelihood of the error occurring in one or the other environment.
b. The differences are due to processing or maturational factors. The distinguishing features of the different environments are varying phonetic salience, utterance length, non-linguistic cognitive maturity, etc.
c. The frequency or nature of the error divides the environments into groups and these groups can be defined by properties of Form. That is, the error may be the overgeneralisation or underspecification of a distributional property that occurs in one environment but not in another environment.
d. The frequency or nature of the error divides the environments into groups and these groups can be defined by properties of Context.

That is, the error may be the overgeneralisation of an (innate or acquired) association between some semantic feature and some syntactic device. This overgeneralisation may be more or less "natural" in different environments depending on their semantic properties.

e. Finally, it is expected that it is the statistical properties of environments that correlate with variations in error patterns rather than the simple absence or presence of a certain phenomenon.

2.2 The Data

The rest of this chapter is a general description of the data and the methods used to achieve the aims outlined above. The details of the three children whose speech samples the study is based on are given in Tables 2.1– 2.3 on the following page. The English data were taken from L. Bloom's corpus of Peter (Bloom 1970) published in the CHILDES database (MacWhinney 1991). The Hungarian analysis is carried out on Zoli's speech samples from the MacWhinney corpus (MacWhinney 1974) in the CHILDES database and an unpublished corpus of Balázs collected by Zita Réger in the Hungarian Academy of Science. All three corpora consist of recordings of unstructured conversations between one or more adults and the children in free play situations. For each of the three children, the first file selected for analysis was the session where evidence for creative word combinations first appeared. During the previous sessions, which took place three to four weeks earlier, all three children produced mostly single word utterances, partial repetitions of adult utterances and a small set of two- or three-word phrases. All subsequent sessions with the Hungarian children are analysed in the study. As Peter, however, was recorded at shorter time intervals, only selected files from his corpus are included. The original file names are given in the first column of Table 2.1 with the identifiers used in the current study in the second column. The files were selected to match the vocabulary size and MLU of the Hungarian children as closely as possible.

The data in the selected files were annotated by hand taking contextual information and the original investigators' notes into account. Only those utterances

Peter						
File	Stage	Age	MLU	V Types	Clauses	Unint
6	1	2;0	2.4	39	310	33
7	2a	2;1	3.0	41	377	46
8	2b	2;2	3.0	38	420	29
10	3a	2;3	3.2	59	601	44
12	3b	2;4	3.2	78	630	56
15	4	2;6	3.6	82	727	52
Total				124	3065	260

Table 2.1: Number of verb types, number of clauses and number of uninterpretable utterances containing verbs in the English data

Zoli						
File	Stage	Age	MLU	V Types	Clause	Unint
3	1	1;8	2.6	51	453	39
4	2	1;10	3.0	78	453	46
5	3	2;0	3.2	70	304	8
6	4	2;2	3.5	74	422	27
Total				139	1634	120

Table 2.2: Number of verb types, number of clauses and number of uninterpretable utterances containing verbs in Zoli's data

Balázs						
File	Stage	Age	MLU	V Types	Clauses	Unint
3	1	2;3	2.5	58	165	17
4	2	2;5	2.9	47	122	7
5	3	2;7	3.0	41	116	6
6-7	4	2;9	3.4	66	170	8
Total				127	573	38

Table 2.3: Number of verb types, number of clauses and number of uninterpretable utterances containing verbs in Balázs's data

were included which contain one or more verbs other than the copula. The annotation scheme uses two layers of coding, with one layer marking argument/adjunct phrases for grammatical function, broad thematic role and positional information. The other layer specifies the morphological makeup of individual words. Somewhat less than 10 per cent of utterances containing verbs were considered to be uninterpretable and were discarded.

Wherever possible, statistical tests are used to check the validity of quantitative differences or similarities in the properties of error patterns and their environments. Naturalistic data, especially from a database of limited size, however, do not lend themselves very well to statistical analysis. For this reason, test results are interpreted more liberally than they should be under ideal circumstances. Such cases are always clearly indicated in the text.

3 Implicit and Explicit Arguments

3.1 Subject omission

3.1.1 Competence or performance?

Subject omission in child English is an interesting test case for different approaches to errors in language acquisition. As was discussed in the previous chapter, for an error to qualify as the output of an inductive rule, it first needs to be shown that its pattern is not predictable from the constraint system imposed on the language acquisition process by UG. We must further be satisfied that the error pattern is not merely the byproduct of cognitive limitations affecting the child's performance. Both of these views have been put forward to account for subject omission in child English and will now be briefly reviewed.

Discontinuous states of Universal Grammar

Theories relying on discontinuity in the properties of Universal Grammar are of two kinds. Radford (1990) adopts a maturational view, where the omission of pronominal arguments is seen as just one aspect of the overall lexical nature of early child grammars, which is explained the biologically determined absence of functional categories at the initial state of UG. As the alternative explanation, Hyams and her colleagues have argued for a more problem-specific parameter setting approach, where early null subjects are attributed to the subject parameter being set to *pro*-drop as default value (Hyams 1986 1987, 1989). In a more recent formulation of the parameter setting account (e.g., Hyams 1994, Hyams & Wexler 1993), the *pro*-drop parameter is associated with the morphological properties of verbs in the target language. Jaeggli & Safir (1989b) argue that null subjects are licensed by morphologically uniform inflectional paradigms. Morphological uniformity is satisfied

by paradigms where verbal morphology either unambiguously marks subject person or does not mark it at all. In the former case subject identification occurs by agreement-identification (as in Italian) and in the latter case by topic-identification (as in Chinese). The topic-identification option and object-identification by agreement also allow the omission of object complements (Huang (1984)). Under this view it is the default [+uniform] setting of the morphological uniformity parameter that initially licenses the omission of subjects and objects.

Since both the biological maturation of components of UG and default parameter settings are independent of the linguistic environment, both competence theories predict that the initial probabilities of overt subject and object expression in English are comparable to the respective probabilities in *pro*-drop/object-drop languages. There is good evidence, however, that these predictions are not borne out. Valian (1990), for instance, finds that subjects are omitted significantly less frequently in English than in Italian and Wang *et al.*'s (1992) results show the same difference in object omission rate in English and Chinese. One might raise the objection that differences at a particular stage of development do not provide counter evidence for the discontinuity hypothesis as long as there is some, earlier, stage when the predicted similarities hold. The following paragraphs will discuss this objection on the basis of argument omission data in English and Hungarian child language.

Hungarian verb morphology marks the person and number features of the subject and indicates whether the direct object is specific/definite or non-specific/indefinite. Both grammatical functions may be covert with no structural constraints on zero anaphora:

(3.1) a. A királyfi és én meghívt-unk egy sárkányt vacsorára.
the prince and I invited-1PL.INDEF a dragon for.dinner
The prince and I invited a dragon for dinner.

b. Sokat evett és megitt-a az összes bort.
much ate.3SG.INDEF and drank-3SG.DEF the all wine
He ate a lot and drank all the wine.

c. A palotában tartott-uk éjszakára.
the in.palace kept-1PL.DEF for.night
We kept him in the palace for the night.

As shown in Table 3.1 on page 49, while the proportion of covert subjects gradually decreases in the English corpus, it remains at a constant high level in Hungarian. As predicted by the approaches under discussion, the probability of subject omission at the earliest stage in the analysis is comparable to Hungarian *pro*-drop rate (around 70%). From the second stage onwards, however, overt subjects are considerably more frequent in English than in Hungarian, even though the traditional 90% accuracy marking the point of acquisition has still not been attained by the end of the studied period. The difference between the two languages in object-drop rate is even more striking. Peter omits objects in less than 20% of obligatory contexts throughout the studied period while the Hungarian children leave around half of object arguments unexpressed.

Putting the results on object mapping aside for the moment, it seems that although the data at the earliest stage is compatible with theories proposing a default null-subject grammar or a grammar missing the components necessary for the projection of subject DPs, the observed developmental sequence cannot be fitted into two consecutive states of UG. We could maintain that the preprogrammed initial state accounts for similarities in the early language of children acquiring distinct targets but we still need to find out what it is that subsequently allows the learner's performance to diverge from the patterns predicted by that initial state but still not match the patterns expected from the properties of the complementary state. One suggestion to consider is that the language acquisition device allows a parameter to be temporarily unset or that the two grammars corresponding to the two value settings may be simultaneously active. We can then account for a period of chance performance between the initial pattern predictable from the default value and the final pattern corresponding to the target value. If this is the case, however, parameter setting can no longer be viewed as a simple deterministic process. Some additional or, possibly, alternative mechanism needs to be identified. The results of

the object omission data of course point to the same conclusion, since the observed differences do not follow from either account.

Processing capacity

The alternative in the literature to theories relying on discontinuities in the properties of UG is to contend that subject omission in child English is a performance error attributable to limitations in processing capacity. Namely, there is an upper bound on the length of the utterance the child can produce at each developmental stage (Bloom 1990, Valian 1991). In support of this claim, Bloom (1990) finds that at a given point in development VP length increases as a function of subject type (lexical, pronominal or null) in number of words. The length-effect results, however, are not replicated in the current study. The slight difference between the mean length of subjectless utterances and the mean length of VPs of utterances with overt subjects shown in Table 3.2 on the following page is not statistically significant in any of Peter's samples.

Since there is a tendency for the VPs of null-subject utterances to be slightly longer, however, it seems worthwhile to further investigate the hypothesis. Bloom reports that the processing load is greater for lexical subjects than for pronominal subjects in support of the processing explanation. It is not clear, however, in what sense the production of lexical subjects places a heavier load on the speaker than the production of pronouns, since determiners are infrequent in early child language and several lexical nouns are monosyllabic. Bloom's results may suggest that the determining factor is not necessarily phonological length but may be information content: lexical NPs typically introduce new information, while the referents of pronouns tend to be given in the linguistic or nonlinguistic environment. If this is the case, it is of course not only the information content of the subject argument but also that of the VP that should increase processing effort. We would then expect the complexity of argument structure rather than the number of words in the VP to correlate with the frequency of subject omission. The simplest measure of the complexity of the argument structure of an utterance is the number of overt internal arguments. If the child's complement phrases are of roughly equal length in number of words, the two measures give equivalent results. Otherwise, we may find

Stage	Subjects						Objects					
	Peter		Zoli		Balázs		Peter		Zoli		Balázs	
	N	% 0	*N*	% 0	*N*	% 0	*N*	% 0	*N*	% 0	*N*	% 0
1	*203*	74	*443*	79	*150*	69	*102*	16	*241*	72	*84*	48
2	*650*	60	*452*	87	*117*	81	*364*	18	*192*	64	*56*	57
3	*998*	33	*297*	77	*110*	81	*640*	6	*147*	60	*70*	44
4	*509*	17	*413*	81	*154*	76	*278*	1	*301*	62	*81*	42
Tot	*2360*		*1605*		*531*		*1384*		*881*		*291*	
Mean		46		81		77		10		64		48

Table 3.1: Proportion of unexpressed subjects and objects in obligatory contexts in English and obligatory or optional contexts in Hungarian

Stage	Mean VP Length	
	Null Subj	Overt Subj
1	3.1	2.1
2a	3.2	2.4
2b	3.5	3.0
3a	3.9	3.1
3b	3.7	3.2
4	4.2	3.9

Table 3.2: Mean VP length in number of words of subjectless utterances and utterances with overt subjects in English

that the length effect only holds if length is defined in terms of argument phrases as opposed to phonological words. Table 3.3 on page 52 compares the frequencies of subject omission in utterances where no overt internal arguments occur and utterances where one or more internal arguments are expressed, as in (3.2) and (3.3) respectively.

(3.2) a. finished. (2;2)

b. baby go. (2;0)

(3.3) a. want the bologna. (2;1)

b. Lois go home. (2;1)

As predicted, in the English data subjects are more likely to be omitted in complex environments (mean 51%) than in simple environments (mean 36%) as defined above. A χ^2 statistic with a two by two contingency table (subject expressed/omitted by 0/1+ internal argument(s)) gives significant results for all but the last stage ($\chi^2 = 9.34$ $p < .01$; $\chi^2 = 13.55$ $p < .001$; $\chi^2 = 9.91$ $p < .01$; $\chi^2 = 7.75$ $p < .01$; $\chi^2 = 4.42$ $p < .05$ from Stage 1 to 3b).

Before further developing this hypothesis, one issue needs to be clarified. Since the omission of internal arguments is generally rare, the results reported here could suggest that subject omission is correlated with the semantic complexity of predicates. The examination of verb types, however, reveals that the subjects of monovalent verbs are just as likely to be unmapped as the subjects of bi- or trivalent verbs (see Table 3.4 on page 52). What matters is whether the internal arguments are overtly expressed or not in individual utterances. One could argue that verbs subcategorising for an optional object argument or an optional oblique argument have two lexical entries and therefore it is the semantic complexity of the lexical entry that predicts the likelihood of subject omission. Such an assumption, however, has undesirable psycholinguistic consequences for lexical theory, since it fails to show relatedness between entries which intuitively have a common core meaning and whose argument frame specifications are derivable from mapping principles acting on this core meaning. The alternative view of the lexicon, as outlined by Pustejovsky 1995, will be discussed in some detail in the sections on object omission.

For the moment I shall contend that structurally polysemous predicates have single lexical entries with alternative mapping options.

The hypothesis attributing argument omission to performance factors has the advantage over competence-based approaches of allowing gradual progression from null-subject output to target-like linguistic behaviour, since it is reasonable to assume that processing capacity gradually increases over age. It is an open question, however, whether this progression indeed lies in an increase in resources available to the child or in a reduction in processing effort required for the mapping process. The distinction is important, as in the latter case the presumed performance factors may turn out to be dependent on the organisation of the child's grammar. It is also clear, that what has so far been said about the process fails to account for the observed differences in subject and object omission patterns. Before trying to address these problems, the precise nature of the processing limitation will need to be specified.

Not only the cause but also the result of the processing deficit may be interpreted as affecting the child's phonetic production system or as interefering with the mapping process at some earlier level of processing. The phonetic explanation means that the processing of internal arguments places a cognitive load on young children such that it interferes with the production of long strings, i.e., all arguments are present in the child's internal form-representation of the utterance but the production of some of these arguments is blocked. Something along these lines is an implicit assumption behind processing approaches considering the phonological length of the child's utterances as the measure of processing capacity. The syntactic explanation for the complexity effect states that the learner can only process a limited number of arguments and the error resides in his failure to map the feature specifications of all arguments of the semantic representation onto functions in syntactic structure. Under this view omitted arguments are either simply missing from the child's form-representation or are mapped as empty categories of some kind lacking feature specifications. The same suggestion, albeit without empirical evidence, has previously been made by Pinker (1984). It is also implicit in Culicover (1999), who (after Hawkins 1994) argues that the larger the number of elements to be linked between Conceptual Structure and Syntactic Structure, the more difficult

Stage	Subjects				
	0 Int Arg		1+ Int Arg		
	N	% 0	*N*	% 0	*Total N*
1	*90*	63	*113*	82	*203*
2a	*142*	49	*166*	69	*308*
2b	*106*	48	*236*	66	*342*
3a	*118*	29	*351*	43	*469*
3b	*96*	19	*433*	29	*529*
4	*101*	11	*408*	19	*509*
Total	*653*		*1707*		*2360*
Mean		36		51	

Table 3.3: Proportion of omitted subjects in utterances with and without overt internal arguments in English

Mean Subject Omission Rate		
Over 60%	30–60%	Under 30%
close, find, finish,	break, bring, come,	do, show
look, move, need,	cry, draw, fall,	
pick, push, put,	fix, get, go,	
see	have, hold, make,	
	open, play, ride,	
	roll, say, sit,	
	take, try, turn,	
	use, want, write	

Table 3.4: Categories of verbs that occur in four or more files grouped by rate of subject omission

it is to acquire the construction. Although the difference between the two interpretations is subtle, they do make different predictions for subject identification in *pro*-drop languages. If the first explanation is correct, we expect the VP-length effect to show up in young children's subject-drop rate in agreement-identification languages as well. The second explanation, however, makes no such prediction, since the subject identification features are mapped as agreement projections and overt subjects do not require the processing of an additional set of features. To test these hypotheses *pro*-drop rate was calculated in the Hungarian data in utterances with no expressed internal arguments and utterances where one or more overt complements occur, as in (3.4) and (3.5).

(3.4) a. nem kér-em. (Zoli 1;8)
not want-1SG

I don't want it.

b. elvitt-e a néni. (Zoli 1;8)
away.took-3SG the lady

The lady took it away.

(3.5) a. megy-ünk autóval. (Zoli 1;10)
go-1PL by.car

We are going by car.

b. én eltett-em halacskát. (Zoli 1;8)
I away.put-1SG fishy

I put the fishy away.

The results in Table 3.5 on page 55 show no consistent differences between the two classes of environments: the frequencies of implicit subjects are almost identical in all samples for both children. These findings indicate that subject-drop is independent of VP length in Hungarian child language. Limitations in processing therefore do not seem to lie at the level of phonological production or lexical structure construction, but at the level of encoding information present in the semantic representation.

However, if the problem lies with a biological restriction on processing capacity, interfering with the mapping of conceptual arguments onto syntactic structure,

there is no reason why the mapping of arguments as subject or object DPs should be any more affected than the mapping of argument-identifying features as inflections. The present formulation of the processing account therefore predicts that it should be costly to process subjects no matter how they are encoded in the target language. Thus agreement marking in agreement-identification languages is expected to be as inconsistent as overt subjects in English. However, the requirement to mark subject features in syntax seems to be observed early in Hungarian. As shown in Table 3.6 on the following page, both children's performance is over 70% accurate even at the earliest stage under analysis and a significant proportion of subject agreement errors consist in substituting the wrong inflection rather than in omitting the inflection or substituting a non-finite form of the verb. The three error types are illustrated in (3.6) with the targets given in brackets after each utterance.

(3.6) a. hoz-om. (hoz-d) (Zoli 1;8)
bring-1SG (bring-2SG.SUBJ)
Bring it.

b. kér. (kér-ek) (Zoli 1;10)
want (want-1SG)
I want one.

c. *kiven-ni. (ve-dd ki) (Zoli 1;10)
out.take-INF (take-2SG.SUBJ out)
Take it out.

The 90% threshold, however, is only reached at Stage 2 by Zoli and at Stage 4 by Balázs, suggesting that the system of agreement marking is initially incomplete. As will be discussed shortly, where inflection omission or an incorrect non-finite form occurs, these are restricted to a limited range of contexts and are no more frequent in two- or more-argument structures than in single argument structures.

To summarise the results so far, we have seen that both the parameter setting and maturational hypotheses and any patent interpretations of the performance limitations approach fall short of explaining the outcome of a detailed comparison of argument identification patterns in the linguistic behaviour of children acquiring

Stage	Subjects									
	Zoli					Balázs				
	0 Int Arg		1+ Int Arg		*Tot N*	0 Int Arg		1+ Int Arg		*Tot N*
	N	% 0	*N*	% 0		*N*	% 0	*N*	% 0	
1	*241*	79	*202*	79	*443*	*70*	71	*80*	67	*150*
2	*253*	85	*199*	90	*452*	*57*	82	*60*	80	*117*
3	*158*	78	*139*	77	*297*	*28*	82	*82*	79	*110*
4	*187*	80	*226*	83	*413*	*56*	77	*98*	74	*154*
Total	*839*		*766*		*1605*	*211*		*320*		*531*
Mean		80		82			78		75	

Table 3.5: Proportion of dropped subjects in utterances with no expressed internal arguments and with one or more expressed internal arguments in Hungarian

Stage	Subject Agreement							
	Zoli				Balázs			
	N	% Corr	% Err	% 0	*N*	% Corr	% Err	% 0
1	*443*	79	13	8	*149*	73	5	22
2	*448*	93	4	3	*108*	80	7	13
3	*288*	91	4	5	*102*	86	1	13
4	*393*	92	2	6	*147*	91	0	9
Total	*1572*				*506*			
Mean		89	6	5		82	3	14

Table 3.6: Proportion of correct and erroneous subject agreement marking and zero or non-finite inflections with non-zero finite targets. The 'error' category includes morphophonological mistakes. Impersonal verbs are not shown.

pro-drop and non-*pro*-drop languages. The principles governing subject identification in English child language have been shown to be distinct from the Hungarian learner's rules of overt subject expression or subject identification by agreement. I argued that the observed differences point to the conclusion that subject expression in English is affected by some processing limitation that interferes with the mapping of subject identification features. This effect, however, has not been observed in Hungarian child language. The questions that now need to be answered are (a) what, if neither *pro*, nor a phonetically null pronoun, is the categorial status of null subjects in English child language and (b) how can we explain that the processing constraint holds in English but not in Hungarian.

3.1.2 The distribution of unidentified subjects

Two classes of suggestions on factors determining the distribution of null subjects will be discussed. The first concerns the structural configurations in which they occur to identify their syntactic categorial status. Specifically, I shall review evidence that the child's null subjects are assigned the category PRO found in non-finite clauses in the adult grammar or an antecedentless empty category occurring in certain elliptical registers of adult English. The second line of investigation addresses non-structural constraints on the occurrence of implicit subjects. Proposals here include the hypothesis that implicit subjects are empty categories of any kind which are associated with specific verb lexemes and the analysis of subject omission as instances of topic ellipsis, which occurs in certain situation-pragmatic or discourse-pragmatic contexts.

Null subjects as PRO

Sano & Hyams (1994) and Wexler (1998) propose that non-target-like implicit subjects are mapped in syntactic structure as the empty category PRO. PRO is licensed in environments lacking local tense and agreement features, as in (3.7):

(3.7) a. The Never bird didn't give up [PRO trying [PRO to save Peter]].

b. [PRO to die] will be an awfully big adventure.

According to the authors' analysis, the error resides in early grammars licensing root infinitives, which is explained as the availability of *truncation*, the option of projecting clauses at a level below agreement and/or tense projection. If this hypothesis is correct, we should find null subjects to be negligibly rare in finite environments, where PRO cannot occur. Table 3.7 on page 59 divides the subject omission data into finite and non-finite environments as determined by the context and the surface syntax of the child's utterances. The various categories are illustrated in (3.8) and (3.9). Root infinitives (3.8a) and root participle verb forms (3.8b) were classed as non-finite. The finite category includes verbs marked for third person singular agreement (3.9a) or past tense (3.9b) and IPs headed by auxiliary verbs. The latter category is subdivided into utterances with stressed auxiliaries (those that do not allow contraction) (3.9c) and unstressed auxiliairies (those that may be contracted) (3.9d).

(3.8) Non-finite:

a. mama sit down. (2;2)

b. I writing. (2;2)

(3.9) Finite:

a. goes up there. (2;2)

b. barrels fell the train. (2;2)

c. can't do. (2;2)

d. I'm writing tape. (2;2)

The overall figures for the two environments show significant differences between the two groups: the subjects of non-finite verbs are considerably more likely to be omitted than the subjects of finite verbs. Up to the last stage, however, null subjects occur with non-negligible frequency in finite environments as well (51–16%). Breaking down the results to subgroups reveals that within the finite group it is only utterances with unstressed auxiliaries (those that allow contraction) that show a consistently lower proportion of subject omission than non-finite contexts. The subjects of stressed auxiliaries and main verbs marked for third person agreement or past tense are as likely to be unexpressed as the subjects of root infinitives or

root participles in some of the samples. These results are incompatible with the hypothesis that children's null subjects are restricted to the empty category PRO.

The negligibly low rate of subject omission in utterances headed by unstressed auxiliary verbs is worth further consideration. Only two utterances with unexpressed subjects occur in this group. One is a wh-question with the unstressed auxiliary attached to the preceding wh-word:

(3.10) a. am gonna get a horsie see it. (2;1)
b. what're doing? [the people] (2;2)

Of the linguistic environments where subjects may be locally unidentified only coordinate IPs and perfective/progressive infinitival complements allow unstressed auxiliaries in the adult grammar. No such utterances occur in Peter's speech samples. At the initial stages all non-negated auxiliaries are suffixed to the preceding subject or wh-phrase. Free standing auxiliaries do not appear until Stage 3b. Peter's early grammar seems to require unstressed auxiliaries to be phonologically attached to the preceding phrase and this requirement constrains subject optionality in the relevant environments.

Null subjects as the antecedentless empty category

In defence of the PRO-subject hypothesis Wexler (1998) proposes that subject omission in finite and non-finite environments results from two distinct processes and analyses the former as instances of topic-drop. Wexler's claim concerns the structural properties of children's null subjects, which, he proposes, are assigned the syntactic category of null topic in finite environments. In adult grammar implicit topic arguments occur both in *pro*-drop and non-*pro*-drop languages. Reviewing empirical research on speech data and written diary data, Haegeman (2000) finds that their distribution is more restricted in the latter type of language: topic-drop never occurs in embedded clauses or in wh-questions, while *pro*-drop is licensed in these environments as well[1]. Based on these observations, Haegeman analyses

[1]I use the term *topic* here in the non-technical sense, referring to conceptually given subject arguments. Haegeman labels this category *adult null subject* and reserves the term *topic-drop* for implicit object arguments found in certain languages.

Stage	Subjects														
	Non-finite						Finite								
	Total		Uninfl		Part		Total		3sg/past		Str Aux		Unstr Aux		*Total N*
	N	% 0	*N*	% 0	*N*	% 0	*N*	% 0	*N*	% 0	*N*	% 0	*N*	% 0	
1	*186*	77	*141*	81	*45*	64	*17*	41	*9*	55	*2*	100	*6*	0	*203*
2a	*254*	65	*204*	65	*50*	68	*54*	37	*30*	63	*0*	-	*24*	4	*308*
2b	*293*	63	*209*	62	*84*	63	*49*	51	*34*	50	*7*	100	*8*	12	*342*
3a	*257*	52	*203*	44	*54*	81	*212*	25	*59*	66	*19*	74	*134*	0	*469*
3b	*212*	44	*156*	37	*56*	62	*317*	16	*75*	31	*34*	85	*208*	0	*529*
4	*105*	55	*61*	54	*44*	57	*404*	7	*64*	28	*46*	26	*294*	0	*509*
Total	*1307*		*974*		*333*		*1053*		*271*		*108*		*674*		*2360*
Mean		59		57		66		29		49		77		3	

Table 3.7: Proportion of subject omission with VPs uninflected for tense or agreement (root infinitives and participle verb forms) and with inflected VPs (3sg or past tense forms, stressed auxiliary verbs (*cannot* and *do not*) and unstressed auxiliary verbs (*be*, *have* and *will*))

implicit topic in non-*pro*-drop languages as an antecedentless empty category in the sense of Rizzi (1994), which can only occur in the specifier position of the root and is restricted to clauses projected at a level lower than CP. If the child's null subjects are assigned either the category PRO or the antecedentless empty category, subject omission should not occur in finite wh-questions or embedded clauses. This prediction seems to be correct: we find only one finite wh-question and one arguable example of finite subordinate clause with implicit subjects in the data:

(3.11) a. what're doing? (2;2)

b. I said don't know where Daddy is. (2;4)

It must be noted at this stage that subject omission is very infrequent in non-finite wh-questions as well (2 in 22 in total). While this does not follow from the proposed analysis, neither does it constitute counter evidence, similarly to the negligibly low subject-drop rate in utterances with unstressed auxiliaries. I will return to the significance of these results shortly. For now we therefore have convincing evidence that the syntactic category of null subjects in child English is PRO or the antecedentless empty category. The fact that children's null subjects do obey structural constraints strongly suggests that subject omission is not a performance error superimposed on the child's grammar. The discourse distribution of children's topic-drop, however, clearly does not match that of the adult language, since a large proportion of young children's finite null subject utterances are plainly ungrammatical at some level. There must be some principle that restricts the occurrence of the antecedentless empty category in the adult grammar but not in child grammar. Rizzi (2000) tentatively suggests the following economy principles:

(3.12) a. *Structural Economy*: Use the minimum structure consistent with well-formedness constraints.

b. *Categorial Uniformity*: Assume a unique canonical structural realization for a given semantic type.

In Rizzi's analysis structural economy encourages clauses to be projected at the lowest possible level. If no element in the clause requires the projection of CP,

such as in a declarative main clause, the clause will be analysed as an IP and the antecedentless empty category may occupy the specifier position. Structural economy, however, may be in competition with the tendency to assign parallel syntactic structures to parallel semantic structures. Since a declarative clause can occur as a subordinate clause headed by a complementiser, the principle of categorial uniformity will prefer a uniform CP analysis, which excludes the antecedentless empty category. Rizzi proposes that the infrequent occurrence of topic-drop in adult language can be explained by the assumption that categorial uniformity tends to have priority over structural economy. The question of priority, he argues, does not arise for children up to the point when their grammar can analyse declarative clauses as CPs. That is, the frequency of null subjects in finite clauses is expected to significantly decrease sometime after finite embedded declarative clauses appear in the child's language. Looking back at Table 3.7 on page 59 we can see that the subject omission rate with finite inflected verbs is over 50% in the first four samples and is reduced to around 30% at the last two stages. There is, however, only one finite embedded declarative clause in the corpus (3.11b above), which occurs at Stage 3b and happens to lack an overt subject. The ability to produce finite embedded declarative clauses, therefore, does not appear to be a prerequisite for the reduction of subject omission rate.

The question then remains, what, if not the principle of categorial uniformity, restricts subject-drop in child language? In fact, there is no reason why a clause should be projected at the level of CP to preclude the occurrence of null subjects. Although the antecedentless empty category *may* occupy the specifier position of an IP root, nothing in the structural configuration *requires* it to do so. Overt subjects are also licensed in the same position and children must be able to project them, since not all subjects are omitted in finite declarative clauses. The question would therefore be better formulated as what causes child grammar to overuse the option of the antecedentless empty category to the degree that it does at various developmental stages. The above discussion has identified two environments where PRO or the antecedentless empty category are structurally licensed, yet subject omission is negligibly infrequent. One is clauses with unstressed auxiliaries and the

other is non-finite wh-questions. Therefore whatever it is that causes child grammar to overuse subject-drop, it does not uniformly affect all structurally suitable configurations.

Verb specificity

Tomasello (1992) argues that argument structure is acquired conservatively, on a verb-by-verb basis. In his study of a child's first utterances he finds that the best predictor of the argument structure patterns occurring with a particular verb is previous usage of that verb, rather than same-time usage of other verbs. We could hypothesise that although the child is conservative in the sense that constructions learnt for one verb are not generalised to other verbs, ungrammatical argument structure patterns may result if the learner fails to distinguish contexts which select from alternative frames listed for any one verb lexeme. One empirical finding in favour of this hypothesis is the observed variation in subject omission rate across individual predicates. As we have seen in Table 3.4 on page 52, some verbs consistently have their subjects omitted, others almost never do, and with a third set of verbs the probability of subject expression is around chance level. As was already mentioned, valency does not appear to be a grouping factor. We can also see from Table 3.4 that the semantic roles assigned to the subject arguments (agent, theme, experiencer, etc.) are proportionately distributed across the groups; the omission of subjects is not tied to any particular role(s).

Let us then consider previously acquired distributional differences between individual predicates. Target-like null-subject frames occur in the data in five structural types: imperative constructions, VP co-ordination, non-finite VP complements, yes/no questions with state verbs and elliptical answers to wh-questions. Some examples for each of these constructions from Peter's samples are given below:

(3.13) a. help please. (2;1)

b. get out the way! (2;3)

c. watch me! (2;4)

(3.14) a. I'll go get it. (2;3)

b. I'm throwing and skating and gonna fall. (2;3)

c. I'm holding on, don't let go of it. (2;6)

(3.15) a. I wanna write there. (2;1)

b. I trying get a screw. (2;2)

(3.16) a. have a pen? (2;0)

b. wanna little coffee? (2;2)

c. see the light? (2;3)

d. know what this is? (2;4)

(3.17) a. INV: what're you doing?
PET: ride a horsie. (2;0)

b. INV: what're you doing?
PET: make coffee Mommy. (2;2)

c. INV: what's Jennifer doing?
PET: crying. (2;3)

Let us assume that the occurrence of an empty category (ec) is treated as a lexical property in the learner's grammar. The child's verb types can then be grouped into two hypothetical classes. For the verbs in one class, the child can be assumed to have constructed two frames as in (3.18) on the basis of input utterances and associated them with the semantic structure in (3.19) with no further feature specifications. The lexical entries of the verbs in the other class only include a frame of type (b).

(3.18) a. $[ec_x\ \mathrm{V}_i\ (\mathrm{NP}_y)\ \ldots]$

b. $[\mathrm{NP}_x\ \mathrm{V}_i\ (\mathrm{NP}_y)\ \ldots]$

(3.19) verb_i'(x, (y) ...)

As a single occurrence of a null-subject utterance is not necessarily evidence for the existence of a generalised frame in the child's lexicon, frequency information needs to be taken into account. The theory of verb specificity then predicts that those and only those predicates which are likely to occur in target-like null-subject utterances will also be likely to have unexpressed subjects in obligatory subject

contexts. Since we are interested in the possible effects of previously acquired distributional properties, the correlation is tested at Stage_n by plotting for each verb the proportion of licensed implicit subjects up to and including Stage_n against the proportion of erroneous subject omission at Stage_n. In order to obtain independent value sets, proportions were calculated relative to the number of expressed subjects rather than the total number of occurrences of a predicate. The equations are given in (3.20).

(3.20)
$$x = \frac{\sum_{i=1}^{n} licensed.imp_i}{\sum_{i=1}^{n} licensed.imp_i + exp_i}$$

$$y = \frac{err.imp_n}{err.imp_n + exp_n}$$

The results for the six stages are shown in Figure 3.1 on the following page. It is clear from the scattergrams that there is no correlation between the two variables at any of the stages and no threshold value can be identified on the x axis that divides verbs into low subject omission verbs and high subject omission verbs. We find high error rates with predicates that have never or very infrequently occurred in target-like null-subject frames and, conversely, there are predicates whose subjects tend to be expressed in obligatory contexts, even though they have occurred with licensed implicit subjects. Contrary to the predictions of the verb specificity hypothesis, subject omission rate is independent of previous target-like usage of individual predicates.

Pragmatic constraints

A second hypothesis for a non-structural filter on subject omission is a pragmatic predisposition whereby children are more likely to omit the subject when its referent is highly salient. Greenfield & Smith (1976) and more recently Bloom (1990) invoke the Principle of Informativeness, omit the information which is most easily recoverable in context, to explain why subjects rather than objects are dropped in English child language. Children's sensitivity to information content is demonstrated by Valian *et al.* (1996) under experimental conditions. The authors find

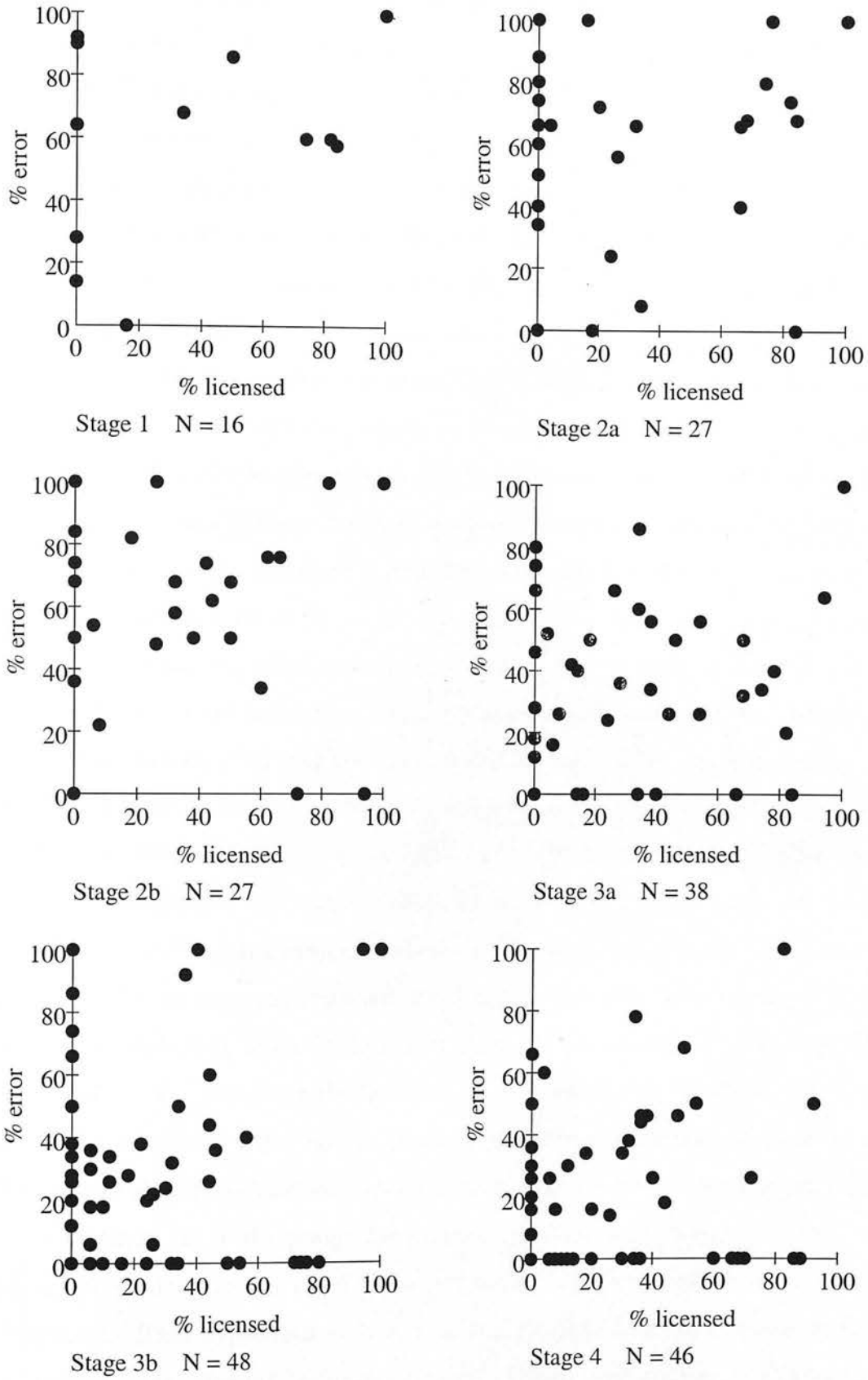


Figure 3.1: Correlation between target-like and non-target-like subject-drop rate.

that in a sentence imitation task two-year-old children are more likely to omit the subject if its referent has previously been visually presented to them. For the purposes of the following discussion I shall define salient information as an argument whose referent is uniquely identifiable either (a) from the non-linguistic context, as for instance in the elliptical questions in (3.16) above or (b) from discourse context, as for instance in elliptical replies to wh-questions illustrated in (3.17) or (c) from agreement identification features as in non-third person contexts in Hungarian. As it is difficult to determine with a reasonable degree of confidence from transcripts of conversation whether an object is given in non-linguistic context, the discussion will concentrate on the other two conditions. If the pragmatic rule operates in child language, in Hungarian we should find a higher omission rate for non-third person subjects, the referents of which are predominantly uniquely identified by agreement (i.e. the speaker or the addressee), than for third person subjects, which may or may not be identified by context. As this option of subject identification is not available in English, no differences are expected in Peter's data. Table 3.8 on the next page breaks down the subject-drop statistics into first/second and third person contexts with singular and plural conflated for each. The pragmatic effect on subject-drop clearly manifests itself at all stages for both children in the Hungarian samples ($p < .001$; from Stage 1 to 4 for Zoli: $\chi^2 = 102.42, 99.86, 37.19, 16.64$; from Stage 1 to 4 for Balázs: $\chi^2 = 55.52, 23.66, 21.86, 39.02$). The difference also holds in the first of the English samples, where third person subjects are significantly less likely to be unexpressed than non-third person subjects ($\chi^2 = 6.55$, $p < .05$). From the second stage onwards, however, there are no significant differences between persons. The results at the first stage could tentatively be attributed to an early tendency to omit information 'given' in the physical environment, which, as will be shown shortly, is later overridden by a more restrictive pragmatic principle.

Condition (b) of the pragmatic principle predicts that those arguments are likely to be omitted by the child whose referents have previously been identified in discourse. This hypothesis is tested in the English data on utterances with third person actor referents. Adapting Rispoli's (1995) methodology, the actor was classed as given in discourse if it was referred to by any participant in any of the

Stage	Subjects													
	Peter					Zoli					Balázs				
	1st/2nd		3rd		*Tot N*	1st/2nd		3rd		*Tot N*	1st/2nd		3rd		*Tot N*
	N	% 0	*N*	% 0		*N*	% 0	*N*	% 0		*N*	% 0	*N*	% 0	
1	*120*	87	*83*	56	*203*	*248*	96	*195*	57	*443*	*85*	94	*64*	37	*149*
2	*434*	61	*216*	60	*650*	*323*	97	*125*	62	*448*	*82*	90	*26*	46	*108*
3	*768*	33	*230*	35	*998*	*200*	87	*88*	55	*288*	*68*	93	*34*	53	*102*
4	*340*	17	*169*	19	*509*	*301*	85	*92*	66	*393*	*105*	89	*42*	40	*147*
Total	*1662*		*698*		*2360*	*1072*		*500*		*1572*	*340*		*166*		*506*
Mean		49		42			91		60			91		44	

Table 3.8: Proportion of subject omission as a function of targeted subject person

utterances preceding the test utterance within the same episode. It was classed as new otherwise. The four conditions, expressed new subject, omitted new subject, expressed given subject and omitted given subject, are illustrated below:

(3.21) PET: open [radiator cover door].
INV: hm?
PET: warm.
INV: is it warm?
PET: baby go. (2;0)

(3.22) PET: I said thank you.
MOT: good boy.
PET: ok?
MOT: good boy.
PET: goes down there. (2;3)

(3.23) PET: Mommy's not here.
INV: Mommy's not here?
PET: right.
INV: she's gone shopping.
PET: Mommy's gone shopping. (2;4)

(3.24) PET: tape, tape huh.
INV: tape huh, yeah, that's tape.
PET: goes around. (2;1)

As the results in Table 3.9 on page 74 show, subject omission rate is considerably higher in given contexts than in new contexts. The difference between the two conditions is statistically significant at all stages ($\chi^2 = 9.36$ $p < .01$, $\chi^2 = 15.02$ $p < .001$, $\chi^2 = 6.72$ $p < .01$, $\chi^2 = 10.51$ $p < .01$, $\chi^2 = 9.28$ $p < .01$, $\chi^2 = 20.12$ $p < .001$). The child is therefore sensitive to discourse environment in that subject arguments that have previously been identified are more likely to be unexpressed than unidentified arguments. As we have seen, the tendency to omit uniquely identified arguments holds in Hungarian as well. It therefore seems plausible that a pragmatic predisposition is responsible for the fact that English children

overuse the option of mapping subjects as empty categories. We can speculate that the gradual reduction in subject omission rate is related to successive revisions of what is considered given or identified by the grammar. Our definition of discourse salience may approximate Peter's initial hypothesis, which is later refined. If this is correct, we should find that the child differentiates more and more contexts within the structural domain of optional topic-drop. As was mentioned before, two such contexts, wh-questions and IPs headed by unstressed auxiliary verbs seem to have been isolated by the first stage under analysis. Positive differentiation seems to occur at various stages in the four well-defined semantic/discourse contexts that allow null subjects in the adult grammar: in commands; in coordinate structures; with a group of state denoting predicates in yes/no questions with addressee actor referents; and a heterogeneous class of predicates in replies to wh-questions (see Figure 3.2 on the next page). For all four contexts, after the initial high proportion of implicit subjects, a period of decline in the probability of subject ellipsis follows in parallel with the subject omission curve in given contexts. After this period subject ellipsis becomes more frequent again, while subject omission in given contexts continues to decrease. It is at this point when the evidence suggests specific elliptical contexts are differentiated from the generic given context.

Note that although differences exist between environments, we rarely find 100% or 0% null subjects. The discourse effect in general is only a tendency rather than an absolute rule. Looking back at Table 3.9 on page 74, it can be seen that up to the last stage, subject omission occurs with non-negligible frequency in new contexts as well (mean 23%). Some of these utterances may be accounted for by assuming that the subject is salient in the nonlinguistic environment; such an explanation, however, must remain speculative. Further, a significant proportion of identifiable subjects are expressed even at the earliest stage (28–70%). If we compare these figures with *pro*-drop rate in non-third person in the Hungarian data (3–15%, see Table 3.8), we see that the tendency to leave identified subjects unexpressed is considerably weaker in English. Subject-drop in given contexts is therefore an option, not a requirement. It may then be the case that, rather than formulating well-defined hypothesis rules, the grammar assigns probabilities (a)

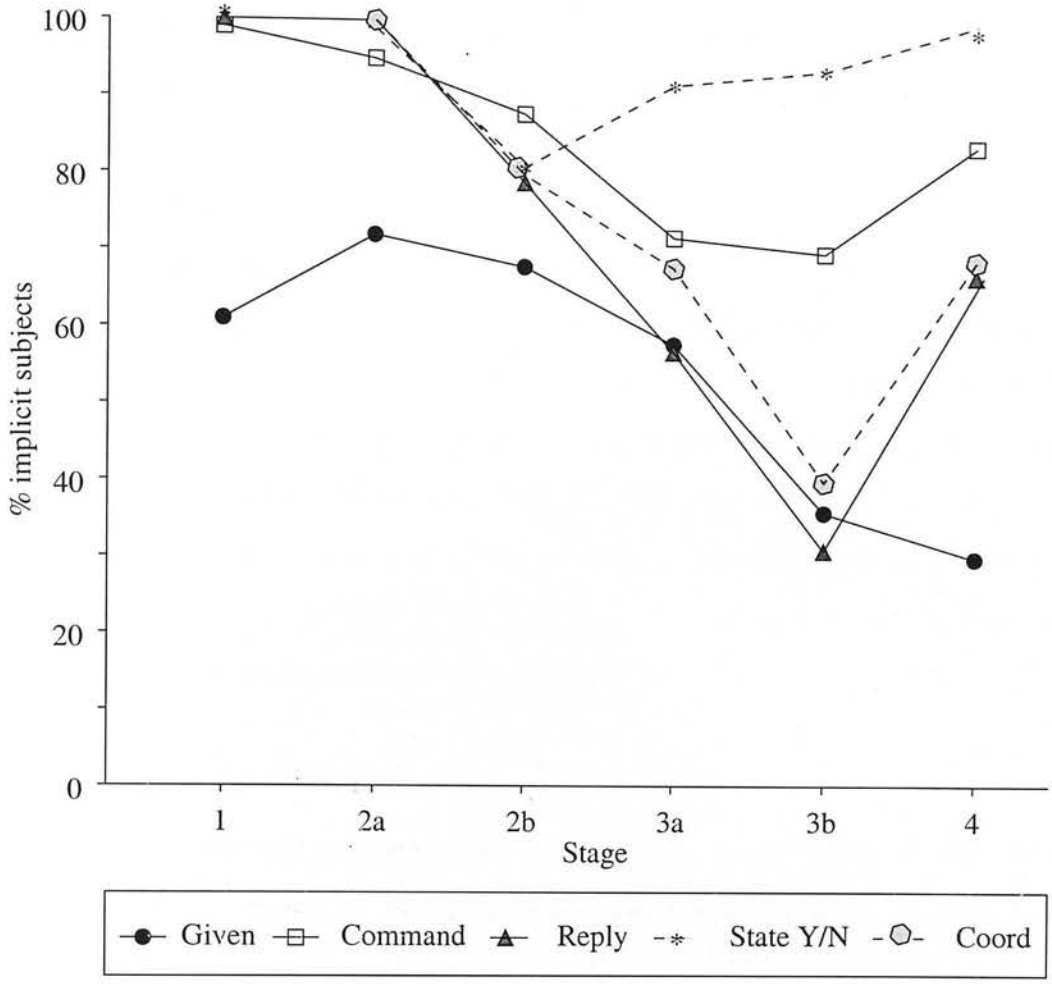


Figure 3.2: Null subjects in given contexts, commands, co-ordination and question and reply elliptical contexts.

to the membership of individual conceptual structures in the 'discourse-identified subject' and 'non-discourse identified subject' sets and (b) to the occurrence of empty subjects in the two pragmatic contexts and their subcontexts. It is then these probabilities which are revised at successive stages of development until they approximate the properties of the mature grammar.

If this is correct, the VP-length effect can now be explained. Let us assume that the processing restriction is to be viewed not as a biological limit that gradually relaxes with age but as an age-independent tendency to put as little cognitive effort as possible in encoding the information given in conceptual structure. Whether the cognitive load can be reduced by not mapping conceptual subjects onto an overt syntactic function would then depend on the learner's hypothesis grammar of the target language. If two mapping options are in free variation according to the

grammar, the simpler of the two will be preferred. The greater the processing load, the greater the tendency to select the simpler option. This seems to be the case in English child language: within the structural constraints of Universal Grammar, implicit subjects are assigned non-marginal probabilities both in contexts where the subject is not uniquely identified in discourse and in contexts where it is (with the exception of two formal environments). If on the other hand only one option is specified by the grammar, or alternative options are assigned marginal probabilities, the economy principle cannot take effect. This is what we find in Hungarian, where the learner assigns a very high probability of subject identification by agreement. On this interpretation the processing hypothesis is no longer seen as an explanation for subject omission in English child language. The VP-length effect is not the cause but the consequence of subject optionality.

3.1.3 Frequency effects in subject identification

TARGET-LIKE NULL SUBJECT CLAUSES

In the previous section I argued that subject omission is explained by a predisposition to omit arguments whose referents are in some way identified. I have also shown that this tendency is not imposed on performance by processing factors but must be part of the child's competence. The evidence suggests that children acquiring English initially divide semantic representations into those where the subject argument is given in discourse (or, possibly, by the non-linguistic environment) and those where the subject is new information. At various stages in development contexts are further differentiated according to their syntactic, lexical and discourse-semantic properties and assigned distinct probabilities of occurring with implicit subjects. As a result, the child's patterns of subject identification gradually come to match those of the adult grammar. While the initial predisposition may be a manifestation of a more general universal principle of economy of syntactic representation, the developmental process clearly must indicate language-specific learning. This conclusion is supported not only by the child's isolation of specific linguistic structures but also by the general probabilistic nature of the pragmatic principle — it seems unlikely that actual probabilities are built into the cognitive

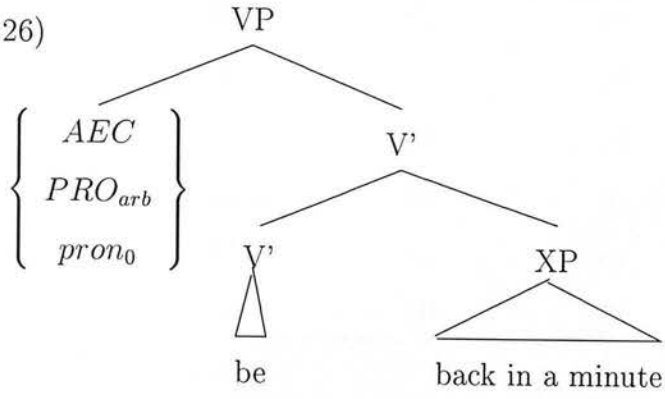
system. The answer to the question what causes child grammar to assign the probabilities that it does to the occurrence of implicit subjects in various contexts must therefore lie in the surface properties of the child's linguistic environment or, more precisely, in the previously acquired aspects of the child's linguistic environment.

One objection to an input-based account is that in some languages, French for instance, topic-ellipsis is virtually non-existent in the spoken language. Yet, French children go through a stage when subjects are frequently dropped and early French null-subjects too obey the structural constraints of PRO and the antecedentless empty category (Rasetti 2000). This fact clearly falsifies the hypothesis that children's subject omission is the result of the overgeneralisation of subject ellipsis. But we need not assume that it is specifically subject ellipsis that is overgeneralised. It could be the case that the learner notes an overt-subject clause structure and an ambiguous null-subject clause structure on the basis of input utterances. The latter includes imperative constructions, VP-coordination, non-finite complement clauses and, in some languages, elliptical utterances. The categorial status of null subjects is different in each of the above construction types. The subject of imperative constructions is a phonetically null pronoun, coordinate V-bars have no structural subject position, the subjects of non-finite complements are assigned to the empty category PRO and elliptical subjects are analysed as instances of the antecedentless empty category. Of these categories the distribution and interpretation of PRO is under current assumptions specified by principles of UG. On the assumption that the child's grammar allows unrestricted truncation, however, it is not clear how the interpretation of PRO is analysed. The occurrence of the remaining construction types is determined by a combination of structural, semantic, pragmatic and discourse principles. The various categories of null subject are not in complementary distribution in syntactic structure: finite declarative clauses truncated to a projection level below CP license the phonetically null pronoun, the antecedentless empty category and a co-ordinate structure analysis. Root infinitives license the latter two structures and PRO. When the child parses a null-subject input utterance, the principles of universal grammar do not determine which empty category occupies

the subject position. The clause in (3.25), for instance, may be analysed as any of the structures in (3.26), where AEC stands for the antecedentless empty category.

(3.25) be back in a minute.

(3.26)



The learner's problem is one of category labelling. Initially, therefore, the child may only distinguish two clause-structures: null subject and overt subject. The two clause structures may be associated with overlapping, fuzzy sets of conceptual structures and pragmatic contexts. The probabilistic nature of subject expression can be explained on the assumption that the child's grammar initially registers probabilities of occurrence of the two underspecified clause types. These probabilities may then be distorted in the child's production depending on the type and token frequencies of semantic representations associated with one or the other clause type. If the null-subject form-meaning pairings are varied and frequent enough, the child's grammar will formulate a generalised rule of subject expression as dictated by his predispositions. The rule, however, will be probabilistic since at this stage no categorial distinctions can be observed in the input. Empirical support for this explanation is given by the observation that target-like null-subject clauses are frequent and productive in the child's language, as shown in Table 3.10 on the next page. The different types of null-subject constructions in the table were categorised on the basis of the context of the utterance. In most cases it is impossible to determine what the underlying structural properties of the utterances are. Although imperatives are the most frequent context type, nothing in the data indicates that they are analysed as finite clauses with phonetically null pronouns.

Stage	Subjects				
	Given		New		*Total N*
	N	% 0	*N*	% 0	
1	*62*	61	*21*	28	*83*
2a	*81*	72	*38*	34	*119*
2b	*71*	68	*26*	38	*97*
3a	*64*	58	*34*	23	*98*
3b	*81*	36	*51*	12	*132*
4	*99*	30	*70*	3	*169*
Total	*458*		*240*		*698*
Mean		54		23	

Table 3.9: Subject omission in utterances with third person actor referents in given and new contexts. Contexts where subject ellipsis is licensed in adult English are excluded.

Stage	Target-Like Subjects							
	Tokens						V Types	
	N	% Imp	% Coord	% Compl	% Ell	% Total	*N*	% Null Subj
1	*160*	62	0	1	4	67	*39*	36
2a	*191*	28	1	2	5	36	*52*	40
2b	*213*	26	2	2	7	37	*78*	41
3a	*415*	18	3	5	5	31	*79*	45
3b	*485*	13	1	3	5	22	*104*	41
4	*639*	8	2	12	11	33	*124*	43
Total	*2103*	19	2	6	7	34	*124*	

Table 3.10: Proportion of target-like null-subject clauses to all correct clauses and cumulative proportion of verb types occurring in target-like null-subject frames in English

The claim made here is therefore not that the child overgeneralises topic-ellipsis or imperative constructions, but that he assigns a probability to the occurrence of null-subjects in general on the basis of the salience of conceptual structures associated with null-subject clauses. The total token frequency of target-like null-subject frames is 67% of all target-like clauses at the first stage of the analysis. Token frequencies, however, may give a distorted picture of the child's competence, since a construction may turn out to be specific to a small set of frequently repeated rote-learnt expressions. An indication of type frequency is therefore given in the last column of Table 3.10. The figures in each row show the proportion of verb types that occur in target-like null-subject frames at the current or any of the previous stages to the total number of verb types occurring at the current or any of the previous stages. There are two assumptions behind this method. Firstly verb type is taken to give a conservative measure of utterance type, merging potentially 'slotted' semi-productive phrases such as *open this* and *open that.* The other assumption is that if at some stage in development a verb V_i is used by the child with a certain frame F_i, that $V_i[F_i]$ construction remains part of the child's linguistic knowledge-base at subsequent stages. While this assumption is not uncontroversial, the method has the advantage of showing whether the frame tends to be applied to newly acquired predicates and of reducing the effect of accidental fluctuations due to the small sample sizes. Type and token frequency together then give an indication of how productive a pattern is relative to the rest of the child's grammar. Looking at Table 3.10, we can now see that at Stage 1 the high token frequency of the target-like null-subject frame is accompanied by a fairly high type frequency: over a third of Peter's verbs appear in this frame. At the next stage, even though token frequency is significantly reduced, the increase in type frequency indicates that the frame is applied to newly acquired verbs. These results suggest that the null-subject frame is highly salient in the child's grammar.

The distribution of erroneous null subjects is, as we have seen, influenced by a pragmatic predisposition and economy principles throughout the null-subject period. Development partly consists in the identification of specific environments which meet both the default structural and pragmatic conditions of subject-drop

but mostly occur with overt subjects in the adult language. There is no reason, however, why this in itself should affect the probabilities of implicit subjects in other environments. A second process reducing error rates may then be the full specification of target-like null-subject clauses. When the child's grammar can disambiguate null-subject utterances, the probabilities of overt vs. implicit subjects will apply to distinct sets of conceptual structures. The general mechanism of this process will be outlined in the last section of this chapter and I now turn to the acquisition of subject agreement in Hungarian.

Target-like null agreement

As was discussed in the previous section, null subjects are structurally licensed in child language because the option of projecting clauses at a level lower than CP, be it IP or VP, is available. The same option makes it possible to project clauses lacking agreement identification and is taken to account for what Wexler (1994) terms the optional infinitive stage. The analysis of children's uninflected verb forms as infinitives is justified by the observation that in languages where finite lexical verbs show different word order patterns depending on the finiteness of the verb, children's uninflected verbs conform to the non-finite pattern. The clause truncation hypothesis makes no predictions about subject-drop in *pro*-drop languages, since finite declarative root clauses may equally be analysed as IPs with antecedentless empty category specifiers or CPs with *pro* subjects. It does, however, predict that root infinitives should occur in both types of language. Interestingly, the optional infinitive stage is not a universal characteristic of child language. It has been attested in overt subject languages, e.g., English, German, Swedish, Norwegian, Dutch (Wexler 1994), French (Rasetti 2000) and Danish (Hamann & Plunkett 1998) but not in *pro*-drop languages, e.g., Turkish (Aksu-Koc & Slobin 1985), Italian (Hyams 1986) or Brazilian Portuguese (Rubino & Pine 1998). As we have seen, root infinitives are infrequent in Hungarian as well. The syntactic properties of agreement features do not distinguish the two types of language, as we find both weak and strong agreement features in the sense of Chomsky (1995) in both groups. The languages only contrast in the relative functional role of agreement in subject identification. The pragmatic effect in subject omission indicates that children are programmed to

assume that subjects must in some way be identified. I argued that the salience of null-subject clauses may lead to a grammar where overt subjects are optional and identification occurs by discourse antecedents. By the same process, the salience of finite verb forms homophonous with the infinitive may lead to the hypothesis that subjects are not identified by agreement. In this case, if the grammar obeys the least effort principle, agreement features with no phonetic content will not be projected and the clause structure will correspond to the structure of non-finite VPs in adult grammar.

The situation is different in languages with rich agreement paradigms. Let us look at the surface properties of Hungarian subject agreement. In contrast to English, subject identification in Hungarian involves little surface ambiguity or optionality. The verb stem marks 3rd person singular indicative only. The only pragmatic function expressed by deviation in agreement is formal register, for the awareness of which there is no evidence in the children's language. Subject agreement marking is essentially noise free with no overlap of verb forms within individual tenses and moods[2]. There are, however, three modal-like verbs that inflect for tense but not for subject agreement, all of which occur in the Hungarian corpora. These verbs take infinitival complements, as shown in (3.27) below[3]. Their implicit subjects are ambiguous between having arbitrary or specific referents.

(3.27) a. Alud-ni kell.
sleep-INF must

It's necessary to sleep.

b. Szabad játsza-ni.
be.allowed play-INF

Playing is allowed.

c. Lehet főz-ni.
may cook-INF

Cooking is possible.

[2]There is some overlap of verb forms but these cut across tenses (2pl.pres/3pl.past), or involve neutralisation of object agreement or of the indicative/subjunctive distinction in certain persons of certain morphological classes of verbs. This, in fact, seems to be the source of a significant proportion of inflection errors.

[3]The examples show "neutral" constituent order, which is determined by the higher predicate. The details of ordering principles need not concern us here.

The sentences in (3.27) also illustrate a further class of locally unidentified subjects, non-finite verb forms, of which only infinitives occur in the data. Infinitival complements and adjuncts are also licensed by certain regular finite main verbs, as shown in (3.28):

(3.28) a. Alud-ni akar-ok.
sleep-INF want-1SG

I want to sleep.

b. Segít-ek főz-ni.
help-1SG cook-INF

I'll help to cook.

If, as I have claimed, children assume minimal clause structure for which they have evidence, why don't impersonal predicates and non-finite clauses lead the Hungarian learner to believe that subject marking is optional? The answer to this question may be a simple statistical fact: target-like non-finite verb forms are far less frequent and far more restricted in their use in Hungarian child language than target-like null-subject utterances in English child language. As can be seen in Table 3.11 on page 80, the proportion of target-like infinitives and impersonal predicates is around 15% of all correct clauses in Balázs' samples and even smaller in Zoli's data. This figure seems negligible compared to the fact that the subject is implicit in two thirds of Peter's target-like clauses in his first sample and in around a third of his grammatical clauses at later stages (see Table 3.10 on page 74). The comparison of type frequencies gives similar results. While around 40% of Peter's verb lexemes appear in target-like null-subject clauses, the corresponding proportions are 15–18% for Balázs and 5–24% for Zoli.

The comparison of target-like subject identification patterns in the two languages is then compatible with the suggestion that the Hungarian learner does not overgeneralise null-agreement across the board because it is tied to a small set of contexts in his grammar. It is of course difficult to independently determine how small is small enough for overgeneralisation not to occur. What can provide some support for the claim is evidence that differences in the frequencies of target-like

constructions correlate with variations in error patterns. We would further expect that the nature or magnitude of differences in probabilities affects the nature or magnitude of the errors. In support of this hypothesis, the following paragraphs will discuss the two Hungarian children's subject agreement errors. We will see that although the children do not formulate a general rule of agreement optionality, they do overapply null-agreement in a restricted domain. It will further be shown that the two error patterns differ in ways which are predictable in part from the token and type frequencies of the target-like null-agreement constructions presented in Table 3.11.

Tables 3.12 and 3.13 on the following page show the details of morphosyntactic subject agreement errors that make up at least 3% of all errors for Zoli and Balázs respectively. Sporadic and morphophonological errors are not shown. The first column lists the person-denotation of the agreement suffix erroneously used by the child and the second column indicates the target person for each of the morphemes in the first column as determined by contextual information. The frequencies express the proportion of cases where the erroneous form is substituted for the target at each stage. The first data row of Table 3.12, for instance, reads as: the verb stem is used for 1st or 2nd person agreement in 11% of all 1st or 2nd person targets at stage 1, in 3% of all 1st or 2nd person targets at stage 2, etc. The first data rows of the tables show that inflection omission is an infrequent error for both children. A large proportion of these verb forms are phonological fragments with not only the agreement suffix but also the final consonant of the stem omitted, which indicates a production error:

(3.29) a. ebú. (elbúj-ok) (Zoli 1;8)
hide (hide-1SG)

I'll hide.

b. ké. (kér-em) (Zoli 1;8)
want (want-1SG)

I want it.

Stage	Target-Like Subject Agreement							
	Zoli				Balázs			
	Tokens		V Types		Tokens		V Types	
	N	% Unid	*N*	% Unid	*N*	% Unid	*N*	% Unid
1	*361*	3	*51*	8	*125*	13	*58*	15
2	*422*	1	*87*	5	*100*	14	*74*	16
3	*279*	6	*103*	15	*102*	14	*92*	17
4	*392*	8	*139*	24	*157*	15	*127*	18
Total	*1454*		*139*		*484*		*127*	

Table 3.11: Proportion of target-like clauses with no subject identification to all target-like clauses and cumulative proportion of verb types that correctly occur uninflected for subject agreement

Zoli	Target	% of target at each stage				
		1	**2**	**3**	**4**	**Total**
stem	1st/2nd	11 (27)	3 (11)	3 (7)	4 (13)	5 (58)
1st	2nd	29 (23)	1 (1)	2 (1)	3 (2)	8 (27)
2nd	1st	11 (18)	2 (4)	2 (3)	0 (1)	3 (26)
inf	imp/subj	2 (2)	2 (3)	6 (5)	15 (10)	5 (20)

Table 3.12: Frequency of types of Zoli's subject agreement errors expressed as percentage of each target verb form. The number of error tokens is given in brackets.

Balázs	Target	% of target at each stage				
		1	**2**	**3**	**4**	**Total**
stem	1st/2nd	1 (1)	2 (2)	10 (7)	1 (1)	3 (11)
1st	2nd	12 (2)	0 (0)	7 (1)	0 (0)	3 (3)
2nd	1st	6 (4)	0 (0)	0 (0)	0 (0)	1 (4)
inf	imp/subj	88 (23)	42 (10)	22 (12)	43 (12)	51 (49)

Table 3.13: Frequency of types of Balázs' subject agreement errors expressed as percentage of each target verb form. The number of error tokens is given in brackets.

From Stage 3 onwards in Zoli's data inflection omission mostly affects the verb *kér* (want), which is similar both in its phonology and in its argument-semantics to the impersonal modal verb *kell* (need). The data show clear evidence for the child's association of the two verbs — but discussion of this will be deferred till the next chapter.

The second and third data rows show person reversal errors, where the child marks the verb for first person agreement in utterances whose conceptual subject is the addressee or for second person agreement in utterances intended to refer to the speaker as actor:

(3.30) a. hoz-om a malacot, jó? (hoz-d) (Balázs 2;3)
bring-1SG the pig good (bring-2SG.SUBJ)
Bring the pig, will you?

b. szeret-ed. (szeret-em) (Balázs 2;3)
like-2SG (like-1SG)
I like it.

This error type is relatively common at the first stage for both children. Person reversal errors are generally attributed to young children's conceptual difficulty with the reference shifting properties of deictic items and will not be discussed here (see Werner *et al.* 2001 for a recent discussion of the effects of the nature of the input on the development of person deixis).

The last rows of Tables 3.12 and 3.13 show errors where we find root infinitives in contexts where imperative forms or 1st person plural subjunctive would be appropriate:

(3.31) a. fölmen-ni, jó? (men-jünk föl) (Balázs 2;3)
up.go-INF good (go-1PL.SUBJ up)
Let's go up, shall we?

b. fog-ni, jó? (fog-d) (Balázs 2;3)
hold-INF good (hold-2SG.SUBJ)
Hold it, will you?

The frequency patterns of this error type differ greatly between the two children. In Zoli's data root infinitives are negligibly rare at the first two stages (2% of imperative/subjunctive contexts) and become somewhat more frequent at subsequent stages (6% and 15% of imperative/subjunctive contexts). In other contexts root infinitives do not occur. For Balázs, this is the most common error type throughout the corpus, with an error rate of 88% of imperative/subjunctive contexts at the first stage and 22 to 43% at later stages. Initially root infinitives sporadically occur in descriptive contexts as well (2%) but from the second stage onwards their use is restricted to command/request contexts. Examining the children's target-like infinitival constructions, we find that root infinitives become frequent at the same time as infinitival verb forms start to be productively used as complements of verbs of wanting and the modal verb *kell* (need). In the first two of Zoli's samples both the token and type frequencies of target-like infinitives are low (see Table 3.11 on page 80) and their contexts are largely restricted to adjuncts of the verb *megy* (go). At the third stage, however, we see a a sudden increase in verb type frequency, suggesting that infinitival complements now form part of the child's grammar. In Balázs's data infinitives frequently appear as complements of verbs of wanting and *kell* from the beginning of the studied period and a fairly large proportion of verb types are used in infinitival form in target-like constructions. When infinitival complement structures become productive, the children have two ways of expressing requests/obligation: by using a verb of wanting or obligation with an infinitival complement and by inflected subjunctive/imperative verb forms. They formulate a third option, root infinitives. Table 3.14 on page 86 shows the distribution of the three types of construction and indicative or indeterminate verb forms uttered to express requests/obligation by the two children. As we can see, of the two target-like options Zoli's preference is imperative/subjunctive verb forms, while Balázs prefers infinitival complement constructions and this bias is strongly reflected in the probabilities of root infinitives being produced. It seems then that if the infinitive is generated in a large enough set of subcontexts, it may be generalised and associated with the pragmatic function of request, which, in some cases, allows

unidentified subject arguments. The increased probability of target-like infinitives at the early stages of acquisition seems to encourage this process.

3.1.4 Summary

The above discussion has shown that subject identification may be optional both in English and in Hungarian child language. The domain of optionality is to some extent restricted in both languages: to contexts where subjects are identified in discourse in English and to certain modal contexts in Hungarian. Within these environments subjects are unidentified with different degrees of probability at various developmental stages. I have suggested that this variation is not accidental but can be attributed to differences in the relevant properties of the target languages and their representations in the children's grammars. Target-like null-subject clauses in English are frequent and productive and their analysis is indeterminate. Hungarian infinitives, on the other hand, are restricted in their use and are structurally unambiguous. Root infinitives in Hungarian further demonstrate that error patterns may be derived from the properties of individual learners' grammars. It was shown that the size of a context set with which a target-like construction is associated and the frequency of that construction within that context set are important parameters in predicting the domain and the extent of the error based on that construction.

3.2 Object omission

3.2.1 Pragmatic and processing explanations

As was shown in Table 3.1 at the beginning of this chapter, object omission is significantly less frequent than subject omission both in English and in Hungarian child language. These findings are typical of object-drop and non-object-drop languages (Valian 1991, Bloom 1990, Wang *et al.* 1992). Greenfield & Smith's (1976) Principle of Informativeness seems to account for differences in object and subject-drop rates in languages where implicit arguments are freely allowed. The data from the two Hungarian children support this hypothesis. Subject-drop rate is only higher

in non-third person contexts (around 90%), where identification occurs by agreement, while *pro*-drop rate in third person contexts, where identification occurs by discourse, is not consistently different from object-drop rate (both around 40–60%, see Table 3.1 on page 49 and Table 3.8 on page 67). We have also seen that the pragmatic principle is to some extent observed in the acquisition of English. Provided that object omission is not simply a random performance error, it is expected to be affected by pragmatic context similarly to the subject-drop phenomenon. If this is the case and argument omission is independent of other factors, we should further find that the frequency of object omission in contexts where the referent of the THEME argument is identified in discourse is comparable to the frequency of subject omission.

The discourse pragmatic analysis of referent identification described previously was carried out on Peter's clauses with verbs that subcategorise for an obligatory NP object complement. Examples for expressed given objects, omitted given objects, expressed new objects and omitted new objects are given below:

(3.32) PET: more tape.
INV: what are you gonna do with it?
PET: put it on there. (2;1)

(3.33) PET: want that barrette.
INV: what?
PET: that barrette, that barrette.
INV: what about that barrette?
PET: put in my hair. (2;4)

(3.34) PET: sit down, sit down here, down.
INV: sit down? uhu, sit down.
PET: all finished. put this down. (2;1)

(3.35) INV: you tired?
PET: there.
INV: there, what do you do?
PET: put in there. (2;1)
INV: what did you put in there?

The difference between the likelihood of object omission in given and new contexts shown in Table 3.15 on the next page is statistically significant for all but the last stage (χ^2 =12.75 $p < .001$; χ^2 =4.88 $p < .05$; χ^2 =12.38 $p < .001$; χ^2 =10.85 $p < .001$; χ^2 =13.18 $p < .001$ from Stage 1 to 3b). In given contexts object omission occurs with non-negligible frequency (26–1%), suggesting that the mapping of the object arguments of obligatory transitive verbs is to some extent optional in the child's grammar. The probability of implicit discourse-identified objects, however, is still considerably lower than the frequency of dropped subjects (72–30%).

Bloom (1990) suggests a processing explanation for the subject-object asymmetry. The processing load, he argues, is heaviest at the beginning of the utterance and gradually decreases thereafter. When the child plans the production of the utterance, the most effective strategy in reducing processing effort is to omit utterance initial elements. This hypothesis predicts that if for some reason, say because the subject argument is new information, the subject is overt, the heavy processing load will be alleviated by omitting internal arguments. Object omission should then be more frequent in utterances with overt subjects than in null-subject utterances. In Table 3.16 on page 89 obligatory transitive contexts are divided into four conditions: (a) utterances with no non-object argument; (b) utterances where the subject is expressed and no oblique arguments occur; (c) utterances with unexpressed subjects and one or more oblique arguments; and (d) utterances with overt subjects and one or more oblique arguments:

(3.36) a. make a car. (2;2)
b. I writing circles. (2;2)
c. put this in there. (2;3)
d. I'm writing my name on bag. (2;3)

Contrary to predictions, the likelihood of object omission is independent of the presence of overt subjects. It is also evident, however, that not only utterance initial elements are affected by the processing pressure. While null objects are negligibly rare both in null subject and overt subject clauses where no oblique arguments occur (under 10%), the likelihood of object omission does increase with

Stage	Request/Obligation Contexts									
	Zoli					Balázs				
	N	%Imp	%V+inf	%Inf	%Ind	*N*	%Imp	%V+inf	%Inf	%Ind
1	*115*	66	2	2	30	*43*	7	32	53	7
2	*186*	91	2	2	6	*39*	36	26	26	13
3	*96*	77	10	5	8	*32*	44	31	12	12
4	*89*	64	21	11	3	*45*	35	35	27	2

Table 3.14: Frequency of subjunctive/imperative verb forms, verb + infinitive constructions, root infinitives and indicative or indeterminate verb forms to express requests/obligation

Stage	Objects				
	Given		New		*Total N*
	N	% 0	*N*	% 0	
1	*61*	26	*41*	0	*102*
2a	*93*	22	*58*	9	*151*
2b	*127*	26	*86*	7	*213*
3a	*143*	17	*134*	4	*277*
3b	*176*	7	*187*	0	*363*
4	*142*	1	*136*	1	*278*
Total	*742*		*642*		*1384*
Mean		16		3	

Table 3.15: Rate of object omission in given and new contexts with obligatory transitive verbs in English

the projection of oblique arguments regardless of subject expression (up to 53%). The difference in object omission rate between the 'no non-object arguments' and the 'oblique arguments' contexts is highly significant ($p < .001$) at the first three stages ($\chi^2 = 13.64$; $\chi^2 = 13.34$; $\chi^2 = 10.95$); and significant at the 5% level at Stage 3b ($\chi^2 = 6.07$). It does not reach statistical significance at Stages 3a or 4.

An alternative processing explanation is proposed by Gerken (1991). Gerken provides experimental evidence that two-year-old children are more likely to omit the unstressed syllable of an iambic foot (e.g., he RUNS) than the unstressed syllable of a trochaic foot (e.g, EAT it). This difference provides a convincing account of the subject-object asymmetry in argument omission, as well as of the omission of determiners and the unstressed first syllable of words (e.g., baNAna) in child language. The tendency to omit unstressed first syllables seems to be independent of the position of the iambic foot in the utterance. In a sentence imitation task, subject pronouns were as likely to be omitted (32%) as the articles of object NPs (28%) in iambic feet (e.g., he KISSED + the LAMB) and both were more likely to be omitted than object pronouns (PETE + KISSED her) (1%) or object articles (PETE + KISSED the + LAMB) (12%) in trochaic feet. Based on these results Gerken argues that the effect of metrical structure is independent of the syntactic organisation of the sentence. If this is the case, we should find that the omission of object pronouns in iambic feet is as frequent as the omission of subject pronouns. The relevant utterances are those with overt unstressed subject pronouns and overt stressed adverbs or particles as in (3.37):

(3.37) a. she PUT + it THERE
b. you TURNED + it DOWN

As the number of test utterances is small in Peter's samples, the results in Table 3.17 on page 89 are combined for Stages 2a and 2b and for Stages 3a and 3b. The utterances are classed into four categories: (a) where both the subject and object pronouns are overt (*she put it there*); (b) where the subject is omitted (*put it there*); (c) where the object is omitted (*she put there*); and (d) where both arguments are omitted (*put there*). If the omission of unstressed pronouns is independent

of syntactic categorisation, we should find that utterances of type (b) and (c) occur with equal frequency, as both involve the deletion of the unstressed syllable of an iambic foot and utterance length is held constant. The results show, however, that while the object-only pattern occurs in 56–33% of utterances, the subject-only pattern makes up only 5–0% of cases. A possible explanation may be that when the subject is omitted, the metrical structure of the utterance is reanalysed, such that the object pronoun forms part of a trochaic foot with the verb (PUT it + THERE). As a similar reanalysis is not available when the object is omitted (she PUT + THERE), subject omission is a more effective strategy in converting metrical structure. Gerken, however, reports no significant differences in the sentence imitation task between the likelihood of subject pronoun omission (39%) and object article omission (28%) in utterances of the type "she KISSED the LAMB", which are identical in metrical structure to sentences of type (3.37). The contradiction may be resolved on the assumption that metrical analysis is not independent of syntactic analysis. The results suggest that while children are reluctant to group the verb and the following article into a metrical foot, they readily do so with the verb and the following object pronoun. Note, however, that syntactic constituent analysis does not in itself motivate the grouping of objects with the preceding verb in sentences like (3.37), it merely allows it. The motivation may come from either of two sources: the child's grammar may assign a low probability to object omission on syntactic/semantic grounds, in which case the metrical reanalysis of object pronouns is simply a by-product of other processes and the metrical advantage of object position will only have a secondary lowering effect on omission rates; or the child's cognitive system may obey some processing principle which has the effect of imposing the trochaic foot analysis on syllable sequences whenever the metrical properties and the constituent analysis of the sentence allow it.

Gerken proposes that children have available (innate or acquired) phonological templates, whose production requires less processing effort than the generation of novel phonological structures. To alleviate processing load, young children resort to templates in their production of utterances. One such template would be the trochaic foot. The omission of a weak syllable preceding the head of the metrical

Stage	Objects								
	No Args		Subj		Obl		Subj+Obl		*Total N*
	N	% 0	*N*	% 0	*N*	% 0	*N*	% 0	
1	*60*	7	*10*	0	*29*	40	*3*	33	*102*
2a	*55*	2	*23*	4	*54*	26	*19*	53	*151*
2b	*63*	9	*37*	0	*86*	32	*27*	18	*213*
3a	*79*	9	*103*	7	*56*	18	*39*	15	*277*
3b	*75*	0	*176*	2	*51*	8	*61*	6	*363*
4	*43*	2	*111*	0	*54*	4	*70*	1	*278*
Total	*375*		*460*		*330*		*219*		*1384*
Mean		5		2		21		21	

Table 3.16: Proportion of unexpressed objects with obligatory transitive verbs according to utterance complexity

Stage	*"she put it there"*				
	N	% Subj+Obj	% Obj	% Subj	% None
1	*18*	5	56	5	33
2	*63*	16	41	5	38
3	*57*	54	33	2	10
4	*41*	56	41	0	2
Total	*179*				
Mean		33	43	3	21

Table 3.17: Overt pronominal and omitted objects and subjects in utterances with stressed oblique arguments

foot allows the trochaic template to be applied and thus processing load will be reduced. As the author notes, however, positing an innate trochaic template is undesirable, as the dominance of trochaic feet is not a universal property of languages. The alternative is that children create the template on the basis of the metrical properties of the target language. Children acquiring English create a trochaic template, she suggests, because this is the most common foot type in English words. It is not clear, however, why children should create the template on the basis of their perception of isolated words but apply it in their production across word boundaries. If, on the other hand, the template is created on the basis of the child's perception of word combinations, it needs to be explained why trochaic feet such as the verb-object pronoun sequence are more salient for the child than iambic feet such as the subject pronoun-verb sequence. It does not appear to be the case that children have a biological difficulty perceiving foot initial weak syllables. In Gerken's experiments the children with a mean MLU of 2.54 successfully repeated pronominal subjects in 68% of utterances.

A second problem for the processing explanation is that, as we have seen, economy considerations do not seem to override syntactic constraints. Subjects will only be omitted to alleviate processing load if they are specified as optional by the grammar. Factors of competence are known to surface not only in spontaneous production but also in a sentence imitation task. An example for this effect in Gerken's study is the finding that children substituted pronouns for lexical subjects in over 20% of trials, which suggests that the test sentences were analysed prior to imitation and the children's production may have been affected by syntactic factors in addition to metrical factors. If neither the creation nor the application of the trochaic template is independent of the child's grammatical competence, it is plausible that object pronouns tend to be grouped with the preceding strong syllable, and thus placed in a preferred metrical position, because the grammar assigns a low probability to the licensing of implicit objects with obligatory transitive verbs.

3.2.2 *Classes of transitive verbs*

DISTRIBUTIONAL CLASSES

To maintain that the child is motivated by his experience of unexpressed conceptual subjects in hypothesising subject optionality, it needs to be explained why unexpressed conceptual objects do not lead to a similar degree of optionality in object mapping. I have posited three parameters that predict the extent of overgeneralisation of optionality: the overall probabilities of the two alternatives as determined by the learner's intake of the primary linguistic data; the probability of conceptual structures, lexical and extra-lexical, associated with the null-argument construction; and the degree of indeterminacy in the process of matching semantic representations to labelled syntactic structures and vice versa. The following sections look at these parameters with reference to transitivity.

The low rate of object omission with obligatory transitive verbs suggests that different distributional types of bivalent verbs are distinguished by the child. Table 3.18 on page 93 summarises the object expression data for all transitive verb types. Peter's verbs fall into four distributional classes: transitive predicates subcategorising for an obligatory NP object; predicates subcategorising for an event or proposition type argument which may be syntactically realised as an object NP or a finite or non-finite clausal complement (*want, say*); ergative verbs allowing both causative and unaccusative mapping patterns (*break, close, roll* etc.); and predicates allowing object drop in certain pragmatic contexts (*eat, drive, watch, catch* etc.). As before, it is assumed that each transitive predicate has a single lexical entry, some with alternative mapping options. Homonymous verb forms are treated as separate lexical items, e.g., *get a pen* vs. *get on the horsie.* The figures in the 'event', 'ergative' and 'optional' columns refer to the proportion of unexpressed THEME arguments to all clauses headed by the verbs in the respective groups. For ergative predicates an expressed THEME may appear pre- or post-verbally, for predicates subcategorising for event or proposition complements, expressed THEMEs include non-NP complements. As Table 3.18 shows, there are large differences between predicates of different distributional types. The object is very infrequently omitted with verbs whose THEME arguments must be expressed and can only be

mapped as postverbal complements. THEME omission is somewhat more frequent with ergative predicates whose mapping options allow empty object slots. With these predicates utterances containing expressed actors and unexpressed themes (e.g., *I broke*), which unambiguously indicates the omission of the object function, occur negligibly infrequently (0 to 6% in individual files). Overt themes tend to appear postverbally (e.g., *broke that*). Finally, object drop rate with predicates whose THEME arguments are optionally expressed is comparable to the proportion of implicit objects in Hungarian child language.

The child's grammar therefore allows unexpressed conceptual objects but object optionality, unlike subject optionality, is verb specific. Why should this be so? One possible reason may be found in the relative frequencies of verbs subcategorising for an obligatorily expressed object NP and verbs whose THEME arguments may be implicit under certain pragmatic conditions. The proportions of target-like implicit objects to all target-like utterances with the two classes of verbs are shown in Table 3.19 on the next page. An utterance was classed as target-like if the argument frame conforms to the mapping patterns licensed by the predicate regardless of whether the pragmatic conditions of object-drop are met. The discourse pragmatics of the child's utterances will be discussed shortly.

Null object frames make up 10% of target-like utterances at the first stage and occur with 17% of transitive verb types. In contrast, the subject is implicit in 67% of Peter's target-like utterances and the proportion of verb types occurring with null subjects is 36% (see Table 3.10 on page 74 above). Type frequencies were calculated cumulatively, as described previously. Although at later stages the probability of object-drop increases, neither token frequency nor lexical type frequency reaches the corresponding proportions of subject-drop.

STRUCTURAL AND PRAGMATIC CLASSES

The process of acquiring object mapping patterns is different from subject identification in that the structural analysis of implicit objects involves less complex category labelling options. The implicit objects of optional transitive verbs occurring in the data fall into two major structural classes, which are also distinguished by the pragmatic specifications licensing them: unspecified THEMEs and dropped

Stage	Objects/Themes											
	Peter								Zoli		Balázs	
	Tr		Event		Erg		Optional					
	N	% 0	*N*	% 0	*N*	% 0	*N*	% 0	*N*	% 0	*N*	% 0
1	*102*	16	*0*	-	*48*	23	*20*	55	*241*	72	*84*	48
2	*351*	18	*18*	0	*50*	32	*121*	70	*192*	64	*56*	57
3	*614*	7	*51*	2	*44*	28	*247*	51	*147*	60	*70*	44
4	*252*	2	*105*	0	*15*	11	*139*	58	*301*	62	*81*	42
Total	*1319*		*174*		*157*		*527*		*881*		*291*	
Mean		11		1		23		58		64		48

Table 3.18: Proportion of unexpressed objects/themes in English and Hungarian

Stage	Target-like Objects			
	Tokens		V types	
	N	% Impl	*N*	% Impl
1	*106*	10	*30*	17
2a	*186*	24	*33*	18
2b	*234*	20	*39*	20
3a	*371*	18	*51*	21
3b	*474*	13	*64*	20
4	*397*	21	*67*	21
Total	*1768*		*67*	

Table 3.19: Proportion of target-like implicit objects to all target-like utterances with optional and obligatory transitive verbs and cumulative proportion of verb types occurring with target-like implicit objects in English

topic THEMEs. The unspecified object subclass comprises 8 verbs in the data, which occur in a total of 58% of utterance tokens with optional object predicates. The remaining 6 verbs in the optional object class allow topic-drop. In adult grammar in addition to these two classes the object of a verb subcategorising for an obligatory object argument may be shared with co-ordinate predicates resulting in a structural configuration where the object is unsaturated in the local surface argument frame. This occurs in sentences with discontinuous VPs, as in (3.38a) or co-ordinated Vs, as in (3.38b). However, neither of these structures occurs in the corpus.

(3.38) a. The pirates tossed and Hook tied the children.

b. The pirates tossed and then tied the children.

Indefinite THEME arguments of events denoting processes are not mapped onto the syntactic representation when covert (Williams 1987). To avoid violation of the uniform theta assignment hypothesis (Baker 1988), which requires a uniform mapping between thematic structure and syntactic structure, either two lexical entries need to be postulated for predicates allowing unexpressed object arguments or we need a mechanism that allows selection from among alternative thematic specifications incorporated in a single entry. As was mentioned previously, the single entry approach is adopted here, as it has the advantage of capturing the intuition that the core meaning of a verb is shared by its different uses. In Pustejovsky's (1995) framework, multiple syntactic argument frames may be derived from a single lexical entry by decomposing the event denoted by predicate P into a set of temporally ordered subevents, each of which selects its argument specifications from the pool of arguments that P may subcategorise for. For each act of uttering a sentence with P, one and only one subevent is selected as the head of the event and it is the arguments specified by the head which are projected into syntactic structure. The events in the unspecified object alternation class can be analysed as denoting two partially overlapping subevents. In the lexical structure of the verb *eat*, for instance, the first subevent, e_1, may be conceptualised as an intransitive process of 'feeding',

selecting only argument x from the pool; and the second, e_2, as a transitive process of 'consuming food', selecting both x and y[4]:

(3.39)
$$\left[\begin{array}{ll} \textbf{eat} & \\ \text{ARGSTR} & \left[\begin{array}{ll} \text{ARG1} & x : animate\_ind \\ \text{ARG2} & y : food \end{array}\right] \\ \text{EVENTSTR} & \left[\begin{array}{ll} E_1 & e_1 : process \\ E_2 & e_2 : process \\ \text{RESTR} & < \circ_\alpha \\ \text{HEAD} & \end{array}\right] \\ \text{QUALIA} & \left[\begin{array}{ll} \text{AGENTIVE} & eat\_act(e_1, x), \\ & consume\_act(e_2, x, y) \end{array}\right] \end{array}\right]$$

If e_1 is foregrounded in conceptual structure, it is selected as the head of the event and its argument specifications (x) are mapped onto syntactic structure, while any non-selected arguments remain unexpressed. Conversely, when the transitive subevent e_2 is foregrounded, arguments (x,y) are mapped. Whether a predicate allows the unspecified object alternation is then determined by its event semantics. Whether an implicit object is felicitous in individual utterances, i.e., the conditions of event-head selection, is on the other hand determined by pragmatic context. The THEME may be unexpressed provided that it is indefinite (Fillmore 1986, Levin 1993):

(3.40) A: What's Owl doing?
B: He's reading./He's reading Christopher's notice.

(3.41) A: What's Owl doing with Christopher's notice?
B: *He's reading./He's reading it.

Unmapped objects are also licensed by predicates whose lexical semantics specifies a default THEME argument. Levin (1993) lists two major subgroups of this type. Certain verbs receive reflexive or reciprocal interpretation when the THEME

[4]Pustejovsky's generative mechanism is interpreted loosely in this analysis. The technical details, however, are irrelevant for my discussion.

is unexpressed (e.g., *dress, wash, meet, fight*); others can be used to describe some characteristic property of the subject argument and the implicit THEME receives generic interpretation (e.g., *bite, sting, cut*).

The second structural class of implicit objects may occur in contexts where the referent of the object is salient in discourse. Unexpressed objects of this type are analysed by Haegeman (2000) as phonetically null operators occupying the left peripheral position of the clause, which is the surface position of topicalised arguments when overt. The option of topic-drop is not intrinsically tied to the semantic properties of lexical items. However, to what extent object topics are licensed to be implicit is a language specific property. In English object-drop seems to be restricted to quasi-idiomatic usage. Verbs that allow the omission of topic objects, do not allow the omission of arbitrary individuated THEME arguments and vice versa. The examples in (3.43c) are infelicitous when the understood object is some individual entity not recoverable from context:

(3.42) A: There is something$_i$ in there.
B: Let me see ec_i./Show ec_i me!/I can't reach ec_i.
B': *Let me eat ec_i./*Read ec_i me!

(3.43) a. Owl's trying to read/eat/draw ...
b. *Owl's trying to catch/throw/show.
c. %Owl's trying to reach/see/watch.

Since the analysis of the first structural type follows from the semantics of the verb, knowledge of the verb's meaning determines its mapping options. Young children's sensitivity to correspondences between event semantics and syntactic subcategorisation frames has been demonstrated in a series of experiments (e.g., Naigles & Kako 1993, Fisher *et al.* 1994, Naigles 1996). In particular, Naigles (1996) reports that two-year olds associate novel verbs presented in the two syntactic frames defining the unspecified object alternation with unbounded contact activity rather than with causative telic events. Conversely, for novel verbs presented in pairs of causative and unaccusative frames, the causative telic interpretation is preferred. Although these experiments are aimed at providing evidence for the plausibility of acquiring

verb meanings from syntactic cues, what they unquestionably show is that children can categorise events and different event categories are expected to correspond to distinct distributional classes.

A predisposition of this kind, however, cannot be exploited in the acquisition of the restrictions on implicit subjects. Although imperatives and elliptical answers tend to occur with bounded or unbounded activities and elliptical questions with states or unbounded activities, the classification is fuzzy and there is some overlap between structural classes. Moreover, there do not seem to be verb-type specific restrictions on topic drop in non-reply declarative utterances:

(3.44) a. Come!/Put it down!
b. *Like that!/*Want one!
c. Don't be afraid!/Believe me!

(3.45) a. Like that?/Want one?/Believe me?/Coming?
b. ??Put(ting) it down?

(3.46) a. Came home late.
b. Believed every word she said.
c. Like that.

Children's sensitivity to lexical structure in determining mapping options is, however, insufficient as an explanation for the infrequent occurrence of omitted objects with obligatory transitive verbs. As was discussed in Chapter 1, overgeneralisation of lexical alternation rules (or mapping patterns) is a common phenomenon in child language. In particular, the occurrence of causativised intransitive verbs observed by e.g., Bowerman (1982) suggests that event structures corresponding to unattested syntactic frames may be created:

(3.47) a. don't giggle me.
b. baby fall down Daddy shirt.
c. I disappeared it.

What prevents the child from overgeneralising the unspecified object alternation? Since object omission does occasionally occur, it is in principle possible that it is

the result of an overgeneralisation process. We have seen, however, that the objects of obligatory transitive verbs are more likely to be omitted in given contexts than in new contexts. This tendency does not correspond to the pragmatic restrictions on object optionality with *eat*-type verbs. Provided that the child observes the pragmatic conditions of the latter type, it is safe to conclude that the unspecified object alternation is not overgeneralised. Rispoli (1995) reports results on 40 children's expression of the THEME argument of the verb *eat*. The author finds that when MLU reaches 2.4, which corresponds to Peter's MLU at Stage 1, children start distinguishing contexts where the theme is accessible (given in discourse) versus non-accessible (not given in discourse, non-specific). In the following analysis the object of the test utterance is taken to be accessible if one or more of the preceding utterances within the same episode include verbal reference to it. It is classed as non-accessible otherwise[5]. Examples for expressed accessible, omitted accessible, expressed non-accessible, and omitted non-accessible object contexts are given below:

(3.48) INV: can you give me the other ones like this?
PET: this?
INV: mmhm.
PET: [...] gonna eat them. (2;2)

(3.49) INV: did you make that one? I thought that was Patsy's [drawing of a] car.
PET: my write. (2;1)

(3.50) INV: now what are they going to do? shall they all ride around in a circle?
PET: yeah.
INV: can you put them in a circle?
PET: circle, and a circle, and a baby, this is gonna ride a cow. (2;6)

(3.51) INV: where's the daddy? would he like to ride?
PET: where's a daddy? ride, the daddy ride. (2;1)

[5]This method is slightly less stringent than Rispoli's, who discarded the first utterances of child initiated episodes. The method here was relaxed for direct comparability with the results of the given/new distinction in subject omission and object omission with obligatory transitive verbs.

As Table 3.20 on page 105 shows Rispoli's findings are replicated in Peter's data with all verbs that the discourse rule holds for (*eat, drink, play, write, draw, read, ride, drive*). Although numbers are too low at the first stage for statistical analysis, the difference is highly significant ($p < .001$) in the remaining samples ($\chi^2 = 17.30$; $\chi^2 = 10.86$; $\chi^2 = 13.71$; $\chi^2 = 18.48$; $\chi^2 = 34.67$). Erroneous omission of accessible objects occurs with non-negligible frequency at the initial stages (36–28%), although this is not significantly higher than object omission with obligatory transitive verbs in given contexts (26–22%, see Table 3.15 on page 86). Unexpressed unspecified objects, however, are several times more likely to occur with this class (90–55%) than with the obligatory transitive class (9–0%). That is, while the probability assigned to mapping conceptual objects as an empty category is not specific to predicate types, intransitive subevents are not hypothesised in the lexical representations of obligatory transitive verbs.

The lack of overgeneralisation could be explained on the assumption that whether a predicate allows an atelic process interpretation can be deduced from the meaning components established from extra-linguistic situational cues. The core meaning of punctual achievements, such as *pop*, for instance, conceptually excludes the possibility of an unbounded process interpretation. However, the syntactic contrast between pairs of predicates such as *eat/devour* and *drink/gulp* demonstrates that overlap in core meanings does not necessarily imply shared Aktionsart type:

(3.52) a. Dorothy ate her last biscuit quickly.
b. Dorothy ate quickly.

(3.53) a. Dorothy devoured her last biscuit.
b. *Dorothy devoured.

Some empirical evidence *against* the hypothesis that the child builds syntactic frames on the basis of verb meanings comes from Peter's usage of the verb *make*. This verb occurs as a synonym of the verbs *draw* and *write*, as well as in other uses:

(3.54) a. INV: what are you going to write?
PET: a car. make a car. (2;1)
b. INV: you're writing circle, ok.
PET: circles. make daddy circles. (2;2)

(3.55) a. make coffee Mama. (2;2)
b. make the train go. (2;2)

In utterances with the verbs *draw* and *write* 72% (77/108) of objects are implicit, while the object of *make* is omitted in only 2% (1/40) of utterances referring to writing/drawing events and 10% (2/20) of utterances in other contexts. This suggests that the verb *make* is syntactically categorised with verbs denoting telic events, even though it may be used apparently synonymously with verbs that can denote unbounded activities. But if the occurrence versus non-occurrence of intransitive frames contributes to the acquisition of event structure, the argument that the low probability of object omission is explained by the learner's ability to categorise events becomes circular. The statistical properties of the child's input/intake combined with the fact that there is a relatively straightforward correspondence between syntactic structure and semantic structure to which children are sensitive, however, can account for the rapid acquisition of object mapping patterns. The details of this process and its comparison to the acquisition of subject projection are discussed in the last section.

3.2.3 Summary

In summary, the main findings of the analysis of Peter's transitive utterances are the following. The pragmatic predisposition to omit recoverable information manifests itself in object omission in that discourse-given objects of obligatory transitive verbs are more likely to be omitted than new objects. Erroneous omission of given objects was also observed in utterances with optional transitive verbs. The frequency of implicit given objects, however, does not approach the frequency of implicit subjects. It was shown that neither the least effort principle nor a metrical approach can account for this difference. It is a fact of the child's competence that objects specified in conceptual representation should be mapped onto the syntactic representation.

The pragmatic principles governing the unspecified object alternation are observed by the child: non-specific THEME arguments of alternating verbs are more likely to be unexpressed than specific THEMEs. The availability of an event structure type where an intransitive subevent may be selected as the head, however, does not lead to a hypothesis that it can be freely created. The lack of overgeneralisation does not seem to follow from principles determining possible lexical-conceptual structures. It can only be explained by assuming that children exploit syntax-to-semantics correspondences in building event structures.

3.3 The learning process

As there appear to be no conceptual constraints preventing the overgeneralisation of the unspecified object alternation and there is evidence in the data that the topic-drop option is overused, let us consider the possibility that not only topic-drop but also the unspecified object alternation *may* in principle be overgeneralised to some extent. The observed differences can then be attributed to the hypothesis that recovery from the latter error is effectively instantaneous. In Chapter 1 I argued that sensitivity to the statistical properties of lexical alternation phenomena in the input/intake seems to be a prerequisite to recovery from overgeneralisation on logical grounds. The proposed principle in (1.17) underlying the use of indirect negative evidence in this process is repeated here as (3.56):

(3.56) The output construction C_o of a lexical rule R is ungrammatical iff
   a. no (or negligibly few) utterances occur which are equivalent to C_o; and
   b. the input construction C_i of R occurs with sufficient frequency.

Since the above discussion characterised the unspecified object alternation in terms of alternative mapping options rather than lexical rules, the principle will need to be reformulated:

(3.57) Given two alternative subcategorisation frames C_1 and C_2 observed for predicate P_i, C_2 is ungrammatical with reference to $P_{j \not\equiv i}$ iff

a. no (or negligibly few) utterances occur which are equivalent to C_2; and

b. C_1 occurs with sufficient frequency.

The indirect negative evidence principle should ensure recovery from overgeneralisation whether we consider the creative application of syntax-to-semantics or semantics-to-syntax mapping principles. In the first case, the child observes that predicate P_i occurs with both transitive frames and intransitive frames where the THEME is non-specific and concludes that the event structure of the predicate must specify a two-place and a one-place subevent, since the projection principle would otherwise be violated. Should this event structure be extended to predicate P_j, the generalisation will be corrected if the relative frequencies of the two frames for P_j are sufficiently different from their relative frequencies for P_i. In the second case, the child may hypothesise a process event structure of the type in (3.39) for predicates P_i and P_j on the basis of extra-linguistic situational evidence. The application of innate linking rules will then result in both transitive and intransitive frames for the two predicates. If both frames are confirmed in the input for P_i, but only one for P_j, the lexical structure will be adjusted.

The process of statistical generalisation and unlearning seems to account for differences in the acquisition of subject expression and object mapping. As was argued earlier, the extent of generalisation primarily depends on the type frequencies of the generalised construction. As the child's lexicon lists a small set of verbs that can denote both unbounded processes and causative events (regardless of whether the entries are created from situational or syntactic cues), the event structure will not be extensively generalised to verbs that in the child's experience either denote one or the other. Similarly, the set of verbs that are analysed on the basis of the input as allowing object topic-drop is small enough not to assign a high probability to implicit topic objects, even though the syntactic mechanism of topic-drop is available and the learner is predisposed to omitting given information. In the first part of this chapter I characterised subject omission in child English as the lack of

non-structural constraints on the occurrence of empty category subjects of various undifferentiated kinds. The child's tendency to omit subjects with a high probability was primarily attributed to the fact that target-like implicit subjects are frequent and occur with a large number of verb types. The domain of generalisation is not restricted, as the implicit subject "alternation" is not tied to any particular lexical semantic structure.

The speed of recovery from overgeneralisation in part depends on token frequencies as dictated by the indirect negative evidence principle. This may in turn affect type frequencies. The removal of verbs from the alternating class will increase the type frequency of non-alternating verbs and thus reduce the likelihood of further generalisation. Type frequencies, however, can only be affected if the grammar links the alternation in syntactic structure to an alternation in lexical structure. A second parameter affecting error correction is then the transparency of linking patterns between the syntactic representation and the lexical-conceptual structure. The smaller the number of available structural analyses and the number of semantic consequences, the easier the unlearning process.

Consider the unspecified object alternation. The child's predisposition to build a lexically-based grammar coincides with the lexical nature of the alternation in the grammar and, necessarily, with the lexical nature of the alternation in the input. If it is established on the basis of statistical evidence that a predicate cannot occur in an intransitive frame when the conceptual object is non-specific, it follows (given the grammar's sensitivity to syntax-semantics correspondences) that its event structure does not specify a one-place subevent and the predicate can be removed from the set of alternating verbs. The same observation for given objects, however, does not force the removal of the predicate from the set licensing object topic-drop, since the empty operator is not a lexical feature. The lexical expectations of the language acquisition device are in competition with the extra-lexical structural definitions of universal grammar. The error is therefore expected to persist up to the point when the evidence for lexical-specificity in the input/intake is robust enough to constrain the grammar. Similarly, from the observation that a predicate does not occur in a null-subject frame it cannot be deduced that it must have an

overt subject, since the structural licensing of empty category subjects is not a property of lexical items. Moreover, unlike in the case of object topic-drop, the input does not support the child's lexical expectations in fine-tuning the licensing conditions of UG. Even if some predicates happen to occur very frequently with overt subjects and only overt subjects in the input, their removal from the null-subject verb set is unlikely to tip the balance of type frequencies such that it might inhibit further generalisation. Fine-tuning can only occur once the child has formed some hypothesis categories of null-subject utterances in the input in terms of extra-lexical semantic/pragmatic features. At this point pairs of conceptual features may be juxtaposed and the probabilities of implicit subjects adjusted in a process similar to the indirect negative evidence principle in (3.57):

(3.58) Given two alternative surface structures C_1 and C_2 associated with a set of conceptual features $[+f_{i,\ldots,n}]$, C_2 is ungrammatical/infelicitous with reference to $[-f_i, +f_{j,\ldots,n}]$ iff

a. no (or negligibly few) utterances occur which are equivalent to C_2; and

b. C_1 occurs with sufficient frequency.

The lexically based principle of indirect negative evidence can in fact be viewed as shorthand for that particular instantiation of the more general feature-based principle in (3.58) where the sets of features define lexical items. What makes the lexical process simpler is that it does not require full featural analysis. The assumption that any two lexical items contrast in some aspect of their meanings (see the discussion in Chapter 1) is a sufficient condition for the process of learning from the statistical properties of the input. If the hypothesis of lexical specificity is then reinforced, no further feature analysis is needed. If it is not reinforced, however, the restricting of the overgeneral hypothesis will be delayed by the large number of possible contrasting features.

Stage	Objects				
	Access		Non-access		*Total N*
	N	% 0	*N*	% 0	
1	*9*	33	*7*	86	*16*
2a	*14*	28	*30*	90	*44*
2b	*23*	36	*26*	85	*49*
3a	*21*	5	*27*	55	*48*
3b	*29*	10	*33*	64	*62*
4	*32*	6	*56*	71	*88*
Total	*128*		*179*		*307*
Mean		20		75	

Table 3.20: Rate of object-drop in accessible and non-accessible contexts with the verbs *eat, drink, write, draw, play, read, ride, drive*

4 Mapping Oblique Arguments

4.1 Introduction

4.1.1 The underlying structure of oblique NPs

This chapter extends the statistical learning hypothesis by examining a phenomenon in child language where the alternation is not between the overt versus covert expression of arguments but, it will be proposed, between alternative patterns of argument mapping. The phenomenon in question is children's oblique NP complements, which are required to be mapped as prepositional objects in the adult grammar[1]. These constituents in child English have previously been analysed as incomplete — with the prepositions being omitted for reasons to do with performance factors or inoperative syntactic principles. Under this view the child's constructions with oblique NP complements may be assigned the structure in (4.1a), where the argument is projected onto an empty-headed prepositional phrase; or the structure in (4.1b), where the argument is a caseless lexical NP adjoined to the VP:

(4.1) I gonna write two pens.

a. $[_{VP}$ write $[_{PP}$ $\emptyset$ $[_{DP}$ two pens]]]

b. $[_{VP}$ $[_{VP}$ write][$_{NP}$ two pens]]

In either case, the child's output is taken to violate principles of the mature grammar and some problem-specific psycholinguistic or syntactic maturational schedule needs to be invoked to account for recovery from the error.

[1]Unless stated otherwise, in the following discussion the term NP is used in the pretheoretical sense referring both to the lexical category NP and the functional category DP of modern syntactic theory. The term DP is reserved for cases where the distinction is relevant.

Children's oblique NPs may alternatively be analysed as thematically oblique arguments mapped onto the object function in syntactic structure, as illustrated in (4.2).

(4.2) $[_{VP}$ write $[_{DP}$ two pens]]

In this analysis the construction is structurally well-formed and the error lies in the inaccurate or overgeneral semantic representation of the predication or some aspect of the mapping process. In this particular example the problem may be that the verb *write* is categorised as being able to directly assign an INSTRUMENT thematic role to its complement. The aim of this chapter is to show that the latter approach provides a better account of the data; and allows the phenomenon to be placed in the class of errors that are corrigible by a mechanism based on the indirect negative evidence principles outlined in the previous chapters.

4.1.2 Summary of the data

The term oblique argument is interpreted in its broadest sense in the study. Any entity identifying a participant in the event which requires oblique case marking or receives its thematic role from a preposition is included in the analysis, whether obligatory or not and whether the selection of its case/preposition is uniquely governed by the verb or not. True adjuncts, which locate the event in time or space or specify the manner of the action, are not analysed.

The following is a brief description of the general principles of the Hungarian case system. Details and idiosyncrasies will be discussed in the relevant sections of the chapter. Hungarian marks the θ-roles of arguments by overt case morphology. There are over 20 distinct cases. Nominative, the case assigned to subjects (with a few exceptions), receives zero-marking. With the exception of demonstratives, determiners and attributive adjectives do not agree with the case of the noun. Nominal pro-form adjectives inflect for case similarly to nouns. Cases have default semantic content and predicates select for cases that correspond to their θ-requirements if these are available, as in (4.3b–d). When a thematic role is not expressed by any

available case, the predicate determines case selection, often arbitrarily, and its thematic specifications override the canonical sense of the case. In (4.3e), for instance, the predicate *proud* selects for a locative case to mark its THEME argument.

(4.3) a. A sárkány elaludt.
the dragon slept

The dragon fell asleep.

b. A királylány elrabolta a sárkány-t.
the princess kidnapped the dragon-ACC

The princess kidnapped the dragon.

c. A királyfi adott a sárkány-nak egy varázspálcá-t.
the prince gave the dragon-DAT a magic.wand-ACC

The prince gave the dragon a magic wand.

d. A sárkány béká-vá változtatta a királylány-t a varázspálcá-val.
the dragon frog-RES turned the princess-ACC the magic.wand-INSTR

The dragon turned the princess into a frog with the magic wand.

e. A sárkány nagyon büszke volt magá-ra.
the dragon very proud was himself-GOAL

The dragon was very proud of himself.

Table 4.1 on page 111 summarises the data on the marking of oblique arguments in English and Hungarian. A notable feature of the table is that the likelihood of preposition expression in English exhibits a U-shaped learning curve. At Stage 1 21% of prepositions are omitted; the error rate increases to 55% at Stage 2 and subsequently decreases to 25% and 9% at Stages 3 and 4 respectively. Errors in the selection of prepositions are negligibly rare (2–0%). In the Hungarian data the number of oblique arguments is unfortunately small. Errors occur in up to 38% of utterances in any one sample and may involve the omission of the case marker (see (4.4a)) or the substitution of the accusative (4.4b) or an inappropriate oblique case (4.4c):

(4.4) a. *elveszi a homok. (homok-ot) (Zoli 1;10)
away.takes the sand (sand-ACC

She's taking the sand away.

b. *vágni belőle olló-t. (olló-val) (Balázs 2;3)
cut from.it scissors-ACC (scissors-INSTR)

Cut out of it with scissors.

c. *kell még az iskolá-ba tanulni. (iskolá-ban) (Zoli 2;0)
must still the school-GOAL study (school-LOC)

We must still study at school.

None of the cases appears to have default status in the children's grammar.

4.2 Preposition omission

4.2.1 Perceptual salience

As with any seemingly incomplete constructions, one approach to oblique NPs in English child language is to look for a reason why children might drop prepositions in their production. One explanation to consider concerns the perceptual properties of function words. In terms of the phonological processes affecting lexical items in connected speech, prepositions pattern with function morphemes in that in non-focused non-phrase-final position they tend to be unstressed and often undergo vowel reduction, in some cases to the extent of desyllabification (Selkirk 1996). Although evidence suggests that infants can perceive weak syllables, Gleitman & Wanner (1982) find that children do have difficulties with highly reduced phonetic material. Children's oblique NPs may then be categorised as performance errors, which may in principle be the result of their difficulty perceiving phonologically reduced morphemes or could perhaps be attributed to production difficulties. In either case we should find that prepositions which are highly prone to reduction in connected speech (*of, for, on*, etc.) are more likely to be absent from the child's speech than prepositions that tend to preserve their strong forms (*with, off, down*, etc.). Furthermore, an abrupt change in the likelihood of prepositional marking is expected in the child's performance at the point when the child can integrate prepositions into his phonological system.

This is not what we find in the data, however. Table 4.2 on page 111 shows the omission rates for individual prepositions in the English corpus. The 'Other'

category includes very infrequent prepositions (3 tokens or less in the corpus), erroneous prepositions and those cases where it was not clear from the context which preposition was intended. With the exception of *of*, which is invariably omitted at the first five stages (3 occurrences in total) and invariably expressed at the last stage (3 occurrences), omission rates for individual prepositions vary seemingly unpredictably from sample to sample. The phonologically strong prepositions, *with* and *off*, are no less likely to be omitted than phonologically weak prepositions.

The Hungarian data similarly suggest that case marking errors cannot be fully explained by phonological factors. Oblique case omission is no more frequent than case substitution errors; none occur in Balázs's samples. In Zoli's data 3 out of the 8 nominative oblique arguments are the EXPERIENCER arguments of verbs that subcategorise for dative-marked EXPERIENCER subjects. The child's utterances are listed in (4.5) with the targets given after each erroneous utterance. (Note that the first of these does not in fact involve the omission of a case marker suffix as personal pronouns are not inflected by suffixing case markers to the nominative form.) Dative subjects will be discussed in more detail at a later point in this chapter.

(4.5) a. i. *én is kell. (1;10)
I.NOM too need

ii. Nekem is kell.
I.DAT too need

I need one too.

b. i. *Barna nem kell. (1;10)
Brian.NOM not need

ii. Barná-nak nem kell.
Brian-DAT not need

Brian doesn't need one.

c. i. *nem fáj Andika. (2;0)
not hurt Andika.NOM

ii. Nem fáj Andiká-nak.
not hurt Andika-DAT

It doesn't hurt Andika.

Stage	Oblique arguments										
	Peter			Zoli				Balázs			
	N	%NP	%Err	*N*	%0	%Acc	%Othr	*N*	%0	%Acc	%Othr
1	*58*	21	0	*17*	12	0	6	*13*	0	23	15
2	*100*	55	1	*31*	10	10	3	*8*	0	0	0
3	*167*	25	2	*28*	11	0	11	*7*	0	14	14
4	*146*	9	1	*45*	0	2	7	*21*	0	0	0
Tot	*471*			*121*				*49*			
Mean		27	1		8	3	7		0	9	7

Table 4.1: Case/preposition omission rate and proportion of erroneous case/preposition selection for oblique arguments in English and Hungarian. The morphemes of the composite preposition *out of* are counted separately. The column heading '%0' stands for the proportion of zero-marked nominative case.

Stage	Omitted/Expressed Prepositions									
	Of	With	For	Off	On	To	In	At	Other	Total
1	-	3/0	-	-	7/3	-	2/2	0/41	-	12/46
2a	1/0	4/1	1/0	0/1	8/9	3/2	4/4	0/3	0/1	21/21
2b	-	1/2	10/0	2/1	17/4	2/2	1/9	0/5	1/1	34/24
3a	2/0	16/4	3/1	0/2	1/11	5/8	1/10	0/12	0/14	28/62
3b	-	10/9	0/3	1/1	1/12	0/11	0/16	1/5	1/6	14/63
4	0/3	7/27	0/12	0/2	4/33	1/18	1/30	0/1	0/7	13/133
Tot	3/3	41/43	14/16	3/7	38/72	11/41	9/71	1/67	2/29	122/349

Table 4.2: Number of omitted and expressed prepositions.

The remaining 5 omission errors involve various locative cases, all of which also occur overtly expressed.

Further evidence against the hypothesis that, at least initially, only processing factors shape children's oblique complements comes from preposition insertion errors and the U-shaped learning curve. Although preposition insertion errors are rare in the data, the fact that they do occur suggests that prepositions are observed and form part of the child's system of grammar:

(4.6) a. look at in there. (2;0)
b. look at down there. (2;0)
c. I talk to bye-bye. (2;4)

A processing explanation also fails to account for the fact that preposition omission rate is considerably *lower* at the first stage of Peter's data (21%) than at the second stage (55%) (see Table 4.1 on the page before above). Admittedly, the U-shaped curve of the data needs some qualifications. The low preposition omission rate at the first stage is due to the high proportion of the "slotted" frame [look at X] (41 out of 58 oblique arguments). The preposition *at* is never omitted from this frame and the X slot may be filled by an adverb (see (4.6a) and (b) above). It could be the case that the string *lookat* is an unanalysed whole, possibly created by the partial segmentation of the frequently occurring utterance *Look at that*!. Looking at all the frames that the verb *look* occurs in, however, does not support this explanation. There are several utterances at this stage with *look* followed by a bare adverb (*Look there*!) or in utterance final position (*Look*!), while utterances where the string *look at* is not followed by an argument or adjunct do not occur. This indicates that the prepositional frame does not originate in a segmentation error resulting in the lexical entry *lookat* but in the child's grammar requiring the argument of *look* to be embedded in a prepositional phrase. As performance factors do not seem to

override this requirement, we may conclude that where oblique NPs occur, it is the child's grammar that licenses them[2].

4.2.2 *The Case filter*

An alternative explanation for preposition omission and lack of case contrasts is provided by Radford's (1990) maturational theory, arguing that the initial unavailability of the functional modules of Universal Grammar disables abstract Case marking. In more recent work Radford (1997) adopts the Minimalist Program (Chomsky 1995) and reformulates the proposal as the unavailability of the mechanisms required for the checking of uninterpretable features, i.e., purely syntactic features which are invisible to the semantic component of the grammar. A similar conclusion is reached by Ouhalla (1992) based on a study of normal language development and agrammatism revealing that it is formal grammatical features which are affected in both cases.

Briefly, the theory of Case states that in order to make an argument chain *visible* for θ-marking, the argument must be assigned abstract Case at some position in the chain (Aoun 1986). Successful derivation then requires the Case of the argument to be checked against the Case features specified by the predicate (Chomsky 1995). Case is assigned under certain configurational conditions by [−N] categories (V and P), but cannot be assigned by [+N] categories (N or A). The complements of nouns and adjectives will therefore be Case-marked by a preposition. Prepositions in English may have not only purely Case marking functions but also predicative functions. Predicative prepositions, which have the ability to assign their own thematic roles, are taken to be conceptually selected during derivation and are interpreted by the semantic component. If preposition omission is indeed the manifestation of an incomplete syntactic component, it is only the purely Case-marker class of prepositions, then, that are expected to be absent in child English.

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[2]Helen Goodluck notes that *lookat* could in fact be an entry in the child's lexicon subcategorising for an obligatory complement. Since we also find the verb without a preposition, we would either need to assume that the two entries *look* and *lookat* are unrelated or treat *lookat* as a morphologically complex form marked for transitivity. The latter analysis is not substantially different from the prepositional analysis suggested in the main text

The classification of English prepositions is far from straightforward. At least four prepositional functions may be distinguished at different points on the scale from structural to contentive. The border dividing the argument marking class from the predicative class is drawn at different points by different authors mainly on the basis of theory internal arguments. As these are of no concern for the purposes of this study, the following classification is based on distributional and lexico-semantic distinctions and no attempt will be made to class borderline cases with either argument markers or predicates.

Class 1 At one end of the scale we find purely syntactic (uses of) prepositions which carry no semantic content and are required by the grammar to satisfy Case marking constraints. Schütze (2001) analyses these as heading an extended K(ase) projection of DPs and puts the preposition *of* and, based on discussion by Tremblay (1996), THEME-marking uses of *with* (as in (4.7)) in this class.

(4.7) a. Hagrid presented Harry with an owl.
b. Neville filled his cauldron with quills.

Class 2 Schütze (2001) argues for a second class of semantically empty prepositions, which has as its only member the preposition *with* in instrumental, comitative and absolute uses:

(4.8) a. Stromboli split the puppet with an axe.
b. The fox celebrated in the bar with the cat.
c. Pinocchio left for school with an apple in his hand.

Similarly to Case markers, these uses of *with* do not seem to assign θ-roles to their complements. The axe in (4.8a) is in turn the affected and the actor entity in a chain of causative events (cf. Jackendoff 1990, Van Valin & Polla 1997); The cat in (4.8b) shares its θ-role with the fox; and the absolute in (4.8c) is an adjunct which may be paraphrased as a bare DP. Schütze argues that these uses should be structurally distinguished from Case marking uses, as the former, but not the latter, may be negated by substituting *without* for *with*. Accordingly, *with* in (4.8)

heads a PP projection but, similarly to K and unlike contentful Ps, it is required by formal (as opposed to thematic) principles of grammar.

Class 3 The next class of prepositions are those which are uniquely selected for by the predicate's thematic specifications (cf. Van Valin & Polla 1997) or through, often idiosyncratic, lexical selection (cf. Sag & Wasow 1999). We can include in this class the complements of relational predicates subcategorising for possessive GOAL or SOURCE arguments (as in (4.9)) and the complements of prepositional verbs (as in (4.10)).

(4.9) a. The White Knight gave a bow and arrow to Mog.
b. Mog took the bow and arrow from the White Knight.
c. The astronauts sold a strawberry drink to Meg.
d. Meg bought a strawberry drink from the astronauts.

(4.10) a. Meg and Mog could rely on the Sherpa's expertise.
b. Meg resorted to a spell.
c. The yak looked at the yeti and fled in panic.

In these cases the prepositions seem to have no other function but to mediate the θ-requirements of the predicates. That is, they are required by thematic principles but do not assign independent θ-roles.

Class 4 Finally, clearly predicative uses of prepositions are those where the predicate subcategorises for a thematically broadly specified oblique argument whose narrow specifications are supplied by the preposition (as in (4.11)); and those where the PP, in Pustejovsky's (1995) terms, introduces a subevent and its arguments into the event structure of the predicate, thus turning an activity into an accomplishment (as in (4.12)), or introduces an adjunct into the predication (as in (4.13)):

(4.11) a. The winged monkeys put the Lion in a cage.
b. Dorothy poured the bucket of water over the Witch of the West.

(4.12) a. The raft floated to the river bank.

b. The Woodman and the Scarecrow carried Dorothy out of the poppy field.

(4.13) a. The carpenter made a tin leg for the Woodman.

b. The house cut the Witch of the East into pieces.

Preposition omission rates in the four classes of oblique arguments/adjuncts in Peter's data are shown in Table 4.3 on page 119. The morphemes of the only attested composite preposition, *out of*, as in (4.12), are counted separately, *out* being classed as a predicative preposition (that assigns a θ-role but cannot assign Case in this use) and *of* being classed as a Case marker. (I will return to this problem shortly.) As predicted by the hypothesis that the child's grammar lacks Case marking constraints, prepositions in uses towards the Case marker end of the scale are frequently omitted. However, at the first three stages of the studied period Class 4 predicative prepositions are similarly likely to be omitted (55 in 92 in Class 4; and 9 in 12 in Classes 1 and 2). In the second half of the data Case markers continue to be dropped (35 in 79), while the likelihood of omitting predicative prepositions is significantly decreased (14 in 189). Preposition omission rate is lowest in the indeterminate Class 3 (9 in 99 in total).

One approach to account for the findings is to contend that Class 1 and Class 2 prepositions are omitted because of the unavailability of Case checking mechanisms and look for some other explanation for the omission of predicative prepositions. As the remaining sections of the chapter will show, however, that explanation seems to account for preposition omission in all classes with the exception of the few errors of *of*-omission. I will deal with these first.

All three instances of Case marker omission, listed in (4.14), occur in PPs headed by the preposition *out*. No utterances occur with the complement of *out* marked by *of* at these stages. (Target-like utterances in Class 1 are given in (4.15)). This pattern is fully compatible not only with the maturational hypothesis but also with the possibility that the child has simply not marked this sense of *out* as one that cannot assign Case. That is, the errors in Class 1 may be one of categorisation rather than an indication of a deficit in syntactic competence.

(4.14) a. smoke is come out chimneys. (2;1)

b. get out the way. (2;3) (twice)

(4.15) a. what a did with it? (2;3)

b. I'm not gonna let go with it. (2;6)

c. I didn't do it let go of it. (2;6)

d. I let go of it. (2;6) (twice)

Radford's (1990) original hypothesis of course concerns *of*-omission within noun phrases as well. The explanation based on lack of Case feature checking mechanisms, however, does not seem to apply to this phenomenon. As only verb argument structures are analysed in the present study, the following comments are based on empirical evidence given by Radford. Radford observes *of*-omission in noun phrases headed by unit nouns, as in (4.16a), and genitive constructions (4.16b) but no examples are given for *of*-omission in constructions headed by deverbal nouns, i.e., nouns derived from verbs, as in (4.16c):

(4.16) a. a cup of tea

b. the wheel of the car

c. the destruction of the city

It is only in deverbal noun constructions, however, where the head assigns a θ-role to its complement, which therefore needs to be Case-marked by a preposition given that nouns cannot assign Case. The prepositional phrase in (4.16b) seems to be an expression of inherent genitive case denoting a relation of possession and the noun *tea* appears to be a modifier rather than a complement of the head unit noun. (The sentence cannot be paraphrased as **a/some tea's cup*, for instance.) Crucially, neither NP receives a θ-role from the head. The requirement to mark possessors and the modifiers of unit nouns does not follow from abstract Case marking principles. The omission of *of* in child English therefore does not provide evidence for the hypothesis that preposition omission is explained by the unavailability of Case checking mechanisms.

4.3 Oblique NPs as objects

4.3.1 Object-like properties

The alternative to analysing children's oblique NPs as incomplete constituents is to contend that these oblique arguments are mapped onto the object function in structurally well-formed surface configurations. The occurrence of accusative substitution errors in Hungarian child language supports the plausibility of this analysis. That the accusative is indeed the default case to mark objects but not the default case to mark non-object arguments in the Hungarian data is demonstrated by the high proportion of accusative-marked objects (64–90% for Zoli, 81–96% for Balázs) relative to the proportion of accusative-marked subjects (0–2% for both children) and oblique arguments (0–10% for Zoli, 0–23% for Balázs). Objects and subjects are shown in Table 4.4 on the next page; see Table 4.1 on page 111 above for oblique arguments.

These results suggest that while the three grammatical functions are distinguished by the children, some property of the early grammar allows certain oblique arguments to be categorised as objects. Before discussing the nature of this property, the following paragraphs look at the English data to find evidence for the hypothesis that oblique NPs are arguments mapped onto the object function.

As was discussed in the previous chapter, Peter distinguishes transitive events from intransitive events very early on. I also argued, citing experimental evidence and discussing Peter's use of the verb *make*, that the child must to some extent rely on distributional evidence in constructing event structures. If oblique NPs are indeed analysed as objects by the child's grammar, we should find that they are significantly more likely to occur with predicates that are listed in the learner's lexicon as transitive, with the following refinements. The simple grouping of verbs into transitive and intransitive disregards the fact that a verb may occur with both an object and an oblique complement. If the object argument is expressed, the grammar is forced to create a new slot for the second complement. Provided that the learner is familiar with the mechanism of prepositional marking (which we can assume), this second slot should be assigned the PP category unless the predicate is

Stage	Oblique arguments								
	Class 1		Class 2		Class 3		Class 4		*Total N*
	N	% NP	*N*	% NP	*N*	% NP	*N*	% NP	
1	*0*	-	*3*	100	*42*	2	*13*	61	*58*
2a	*1*	100	*5*	80	*5*	20	*31*	48	*42*
2b	*0*	-	*3*	33	*7*	14	*48*	67	*58*
3a	*3*	67	*19*	84	*21*	28	*47*	8	*90*
3b	*0*	-	*20*	50	*11*	0	*46*	9	*77*
4	*4*	0	*33*	21	*13*	0	*96*	6	*146*
Total	*8*		*83*		*99*		*281*		*471*
Mean		56		61		11		33	

Table 4.3: Omission of 4 classes of prepositions on a scale from case marking to predicative functions

Stage	Zoli				Balázs			
	Obj		Subj		Obj		Subj	
	N	% Acc	*N*	% Acc	*N*	% Acc	*N*	% Acc
1	*67*	64	*93*	2	*44*	81	*46*	2
2	*69*	90	*58*	2	*24*	92	*22*	0
3	*59*	89	*68*	2	*39*	95	*21*	0
4	*114*	85	*78*	0	*47*	96	*37*	0
Total	*309*		*297*		*154*		*126*	
Mean		82		1		91		0

Table 4.4: Accusative-marked objects and subjects in Hungarian

known to be ditransitive. That is, oblique arguments of transitive verbs should be be less likely to be mapped as NPs if they appear in combination with an object NP than if they are the only complement of the verb. Second arguments of ditransitive verbs that occur in the double object construction form a separate class, regardless of thematic role, since for these verbs the child has evidence for the [V NP NP] frame. In this environment preposition omission following the object NP does not provide counter-evidence for the distributional hypothesis.

Table 4.5 on page 125 compares the frequencies of oblique NP complements with the different distributional classes of verbs. Oblique arguments of ditransitive verbs in utterances lacking overt objects are grouped with monotransitive verbs. The verb *go* is classed on its own as it appears with the complement *home*, which also occurs as a noun following a determiner and as a predicative noun (as in the examples in (4.17)). In distributional terms therefore it is unclear whether *home* should be considered as an object NP in the data.

(4.17) a. man's home. (2;0)
b. mama's home. (2;1)
c. my a home. (2;1)
d. this is home. (2;1)

Examples for the verb types in Table 4.5 are given in (4.18): a) *go*, b) intransitive verb, c) transitive verb with expressed object, d) transitive verb with no expressed object, e) ditransitive verb.

(4.18) a. it goes on lips. (2;1)
b. car belong in a box. (2;0)
c. put it in hair please. (2;1)
d. write on tape. (2;0)
e. take coffee to Mama. (2;1)

The results show that the distributional hypothesis seems to be correct. The oblique arguments of intransitive verbs are mapped as NPs in 30–0% of utterances, while the corresponding proportion for transitive predicates with no expressed object

complements is 78–33%. A χ^2 test comparing the frequency of preposition omission in the two conditions gives significant results at each stage ($\chi^2 = 32.55$, $p < .001$; $\chi^2 = 4.53$, $p < .05$ (expected frequency is less than 5 in two cells); $\chi^2 = 6.55$, $p < .05$; $\chi^2 = 14.33$, $p < .001$; $\chi^2 = 6.04$, $p < .05$; $\chi^2 = 20.28$, $p < .001$). Although numbers are too low for statistical analysis in the expressed object and the ditransitive verb conditions, differences in the likelihood of preposition omission are observed in the expected direction: the preposition is on the whole more likely to be absent in second argument position with ditransitive verbs (78–0%) than with monotransitive verbs (33–0%). We also see that the verb *go* patterns with null-object transitive verbs in the first three files (67–37%) and with intransitive verbs in the remaining files (15–3%). This result is expected on the assumption that *home* is initially categorised as a NP complement and later reanalysed as an adverb, although, as will be discussed shortly, this process itself needs an explanation.

The observed differences between distributional types of predicates strongly suggest that the analysis of the child's oblique NPs as syntactic objects is along the right lines. The question that now needs to be asked is what property of the grammar licenses mapping patterns that deviate from the target. The following sections examine three, not necessarily mutually exclusive, suggestions:

(4.19) The error lies in

a. inaccurate and/or underspecified semantic representations of events or the misalignment of semantics to syntax correspondence rules;

b. the generalisation of a statistically dominant distributional pattern overriding semantic distinctions;

c. a delay in the acquisition of restrictions on mapping pattern alternations.

4.3.2 *Emergent categories*

It could be the case that the child encodes certain semantic properties as objects and mistakes occur either because the child's hypothesis linking rules do not correspond to the linking rules of the target language or because the learner's semantic

representation of elements of the event is inaccurate. Proposals for children's grammaticised semantic categories have been put forward by the cognitivist approach to language acquisition. Slobin (1985a) argues that children are born with a prestructured species-universal semantic space, which determines the set of meanings they may assign to linguistic expressions. Evidence for this hypothesis is provided by conceptually motivated linguistic categorisation in child language which fails to correspond to the categories of the exposure language. Clark (2001) reviews empirical findings demonstrating the occurrence of what she calls *emergent categories*, which include shape-biased object word overextensions in English closely resembling patterns observed in languages with noun classifier systems (Clark 1977); the overuse of the preposition *from* to mark spatial or causal SOURCE arguments (Clark & Carpenter 1989); the differential case marking of subject pronouns reflecting the degree of agency attributed to the actor (Budwig 1989); and restricting the accusative marker in overt case languages to objects of verbs that specify direct physical manipulation (Slobin 1985a). Emergent categories are described as covert categories, which reflect some underlying conceptual similarities perceived by children and thus offer evidence for the conceptual representations that universally underlie linguistic categories and that may have linguistic consequences. At present it is an open question what these conceptual categories may be and why some candidate categories surface in children's language while others do not. The cognitivist approach therefore, rather than making precise predictions about child language, aims to identify emergent categories by investigating the semantic features of children's errors.

The second version of the account based on the conceptual-semantic properties of linguistic entities in the predication is the view that the semantics-to-syntax correspondence rules are target-like even in early child grammars (they may be innate or acquired early) but errors occur if the child's semantic analysis of the predicate or argument is inaccurate or incomplete (see e.g., Pinker 1984, 1989; Levy *et al.* 1988, Bowerman 1989, Bowerman & Choi 2001, Braine & Brooks 1995). This suggestion has been put forward as an explanation for children's overapplication of lexical alternation rules, some of which were briefly discussed in Chapter 1. Pinker (1989), for instance, argues that the two argument frame patterns of

alternating predicates are best analysed as being mapped from distinct conceptual structures by applying the relevant linking rules taken from the universal set. Pinker further proposes that the alternative conceptual structures may be derived by lexico-semantic transformation rules. An inaccurate conceptual structure may lead to the application of inappropriate lexical rules and, consequently, to erroneous argument frames. If the process is based on innate or acquired prototypical semantics-to-syntax correspondence rules and is independent of the child's experience of distributional variation, errors may of course occur without the step of conceptual structure conversion.

Applying the two proposals to the oblique NP problem, it could be the case, then, that the child's choice of mapping pattern reflects real or presumed semantic distinctions which are grammaticised by his early linguistic system. Without a thorough semantic analysis of each oblique argument, it is of course impossible to determine whether such emergent categories or event misconstruals contribute to the children's mapping errors. What the following discussion aims to establish is whether semantic (mis-)categorisation could reasonably be the only source of oblique NP errors.

Dative subjects in Hungarian

Before discussing oblique objects let me return to Hungarian dative subjects, which seem to provide an example for the grammaticisation of a semantic category in Zoli's data. Three types of subject case errors occur in Zoli's samples: (a) the occasional substitution of accusative for nominative (see Table 4.4 on page 119 above); (b) the substitution of nominative for dative with the impersonal EXPERIENCER-subject verbs *kell* (need) and *fáj* (hurt); and (c) the substitution of dative for nominative, which is restricted to the subject of the regular verb *kér* (want). The nominative substitution errors shown in (4.5) above are repeated here as (4.20) and some examples with *kér* are given in (4.21) with the targets given after each of the child's utterances:

(4.20) a. i. *én is kell. (1;10)
I.NOM too need

ii. Nekem is kell.
I.DAT too need

I need one too.

b. i. *Barna nem kell. (1;10)
Brian.NOM not need

ii. Barná-nak nem kell.
Brian-DAT not need

Brian doesn't need one.

c. i. *nem fáj Andika. (2;0)
not hurt Andika.NOM

ii. Nem fáj Andiká-nak.
not hurt Andika-DAT

It doesn't hurt Andika.

(4.21) a. i. *most nekem kér-ek. (2;2)
now I.DAT want-1SG

ii. Most én kér-ek.
now I.NOM want-1SG

I want one now.

b. i. *nekem is kér-ek. (2;2)
I.DAT too want-1SG

ii. Én is kér-ek
I.NOM too want-1SG

I want one too.

Although the number of relevant utterances is unfortunately small, the pattern that emerges from the data is that the EXPERIENCER arguments of the three verbs tend to be nominative at the first three stages (which is appropriate for *kér* and an error for *kell* and *fáj*) and dative at the last stage (which is appropriate for *kell* and *fáj* and an error for *kér*). The figures are shown in Table 4.6 on the next page.

The child's early errors of nominative EXPERIENCERS cannot be attributed to difficulties with dative-marking in general, since the dative consistently marks RECIPIENT/BENEFICIARY arguments even at the earliest stage:

Stage	Oblique arguments										
	Go		Intr V		Tr V				Ditr V		*Tot N*
					Exp Obj		Null Obj				
	N	% NP	*N*	% NP	*N*	% NP	*N*	% NP	*N*	% NP	
1	*6*	67	*43*	2	*0*	-	*9*	78	*0*	-	*58*
2a	*9*	55	*6*	17	*5*	0	*18*	67	*3*	67	*41*
2b	*8*	37	*10*	30	*4*	0	*22*	77	*14*	78	*58*
3a	*25*	8	*29*	17	*3*	33	*25*	68	*6*	17	*88*
3b	*13*	15	*14*	0	*9*	0	*30*	33	*11*	18	*77*
4	*30*	3	*44*	0	*27*	0	*31*	39	*14*	0	*146*
Tot	*91*		*146*		*48*		*137*		*48*		*469*
Mean		31		13		19		60		36	

Table 4.5: Preposition omission rate in oblique arguments with the verb *go*; other intransitive verbs; transitive verbs with expressed and unexpressed objects; and ditransitive verbs. The absence of *of* from the composite preposition *out of* is disregarded.

Stage	Subject Cases					
	Kér		*Kell*		*Fáj*	
	N	% Dat	*N*	% Dat	*N*	% Dat
1	*2*	0	*0*	-	*0*	-
2	*2*	0	*3*	33	*0*	-
3	*0*	-	*0*	-	*1*	0
4	*14*	64	*3*	100	*1*	100

Table 4.6: Dative subjects with the verbs *kér* (want), *kell* (need) and *fáj* (hurt)

(4.22) a. visszaadta Zoliká-nak. (1;8)
gave.back Zolika-DAT

She gave it back to Zolika.

b. csinálok neked. (1;10)
I.make you.DAT

I'll make you one.

c. hozd neki csak sört. (1;10)
bring he.DAT just beer

Just bring him beer.

This suggests that the child's first hypothesis is that subjects receive nominative case. At some later point exceptional dative subjects are identified and the pattern is extended to the regular verb *kér* but not to any other verb.

A semantic explanation can be built on the observation that the EXPERIENCER arguments of both the verb *kér* and the impersonal verb *kell* are intended recipients. The prototypical case assigned to recipients is dative in Hungarian. Dative marked indirect objects first appear at Stage 1 with the verb *ad* (give) as shown in (4.22a) above, and become frequent at Stage 4, where they occur with seven verb types and make up 31% of all oblique arguments. It is a reasonable assumption that the child identifies the cognitive category RECIPIENT and associates it with the syntactic device of dative case on the basis of evidence from verbs of giving. As the argument pattern of *kell* is acquired, the category is extended to 'actual or intended recipients'. The semantic features of this concept can now be matched against the semantic structure of *kér* and they are found to be compatible. As a result, the child's hypothesis linking rule can be applied.

THE SEMANTICS OF OBLIQUE OBJECTS

The Hungarian children's utterances with accusative substitution errors are listed in (4.23). The sentences in (f) and (h) occur twice within the same sample. The target cases are given in brackets following each utterance.

(4.23) a. *verekedem a Moncsi-t. (Moncsi-val) (Zoli 1;10)
I.fight the Moncsi-ACC (Moncsi-INSTR)

I'm having a fight with Moncsi.

b. *homok-ot ülünk. (homok-ba) (Zoli 1;10)
sand-ACC we.sit (sand-GOAL)

We're sitting in the sand.

c. *nem félsz a halacská-t. (halacská-tól) (Zoli 1;10)
not you.fear the fishy-ACC (fishy-SOURCE)

You're not afraid of the fishy.

d. *játszunk a halacská-t. (halacská-val) (Zoli 2;2)
we.play the fishy-ACC (fishy-INSTR)

We're playing with the fishy.

e. *vágni belőle olló-t. (olló-val) (Balázs 2;3)
cut from.it scissors-ACC (scissors-INSTR)

Cut out of it with scissors.

f. *nagy-ot felfújni. (nagy-ra) (Balázs 2;3)
big-ACC blow.up (big-GOAL)

Blow it up big.

g. *most kezdjük a pöttyös-et. (pöttyös-sel) (Balázs 2;7)
now let's.start the spotted-ACC (spotted-INSTR)

Now let's start with the spotted one.

h. *ez-t sem táncoltuk. (er-re) (Balázs 2;9)
this-ACC neither we.danced (this-GOAL)

We haven't danced to this either.

With the exception of (4.23b) and (e), the erroneous utterances involve conceptual structures where the arguments marked by the accusative by the children could be mapped as direct objects in the adult grammar in a slightly different structural or referential pattern. They do not constitute a semantic class, however. The verb in (4.23a) is derived from the verb *ver* (beat), which subcategorises for an accusative-marked object complement. *Fél* (fear) from example (c) may take an accusative THEME in certain quasi-idiomatic collocations, such as:

(4.24) Féli az isten-t.
fears the god-ACC
He fears god.

Játszik (play) in (4.23d) takes accusative GAME or MUSIC arguments, although TOYS must be marked for instrumental case. Similarly in (h) the child maps an argument referring to MUSIC as the direct object of the verb *táncol* (dance), while this option is only available for DANCE arguments in the adult grammar. In (f) the adjective *nagy* (big) is a modifier of the implicit object of the utterance. Finally, *pöttyös* (spotted one) in (g) refers to the object of the event which is the implicit argument of the verb *kezd* (start). These examples are compatible with the hypothesis that the errors originate in inaccurate event-representations. In most cases, however, it is not the semantic structure of the predicate in isolation but that of the entire clause that seems to influence the children's selection of case. In (c), (d) and (h) the category of the argument determines its relation to the predicate and, consequently, the selection of case. (Games and music are created by the act of playing and a dance is created by the act of dancing. Toys, on the other hand, exist independently of the act of playing and music exists independently of the act of dancing.) In (f) and (g) the accusative case seems to point to an unexpressed element in the conceptual structure of the clause. In none of these utterances are the errors accounted for by the assumption that the child hypothesises inaccurate or overgeneral meaning components. To maintain that the problem is with semantic representations and not with mapping rules, we would need to conclude that the error lay in building inaccurate semantic structures of events out of appropriate meaning components. But that conclusion seems indefensible.

The alternative hypothesis, that the children encode meaning distinctions which are not grammatically relevant in the target language, similarly fails to provide a unified account of the accusative substitution errors. Although for some of the utterances in (4.23) an analysis in terms of the misalignment of semantic categories and syntactic categories may provide a reasonable explanation, this is based on the grouping of argument types of individual predicates rather than on the formation of predicate-general emergent categories. For each of the predicates

in (c), (d), (h) and possibly (g) it could be argued that direct object arguments form a semantic or functional class with oblique arguments. The error could then be attributed to the underspecification of the predicate's argument structure, i.e., the semantic categories that the child's grammar links with the object function of individual predicates are broader than the semantic categories of the adult grammar. Similar errors can also be found in the English data. The English verb *play*, as its closest Hungarian equivalent, specifies different mapping patterns dependent on the semantic properties of its complements. Arguments denoting games or music are mapped as direct objects while expressions referring to toys are marked by the preposition *with*. The requirement to mark toy arguments frequently fails to be observed by Peter (in 29 out of 51 utterances in total):

(4.25) a. let's play this barrel. (2;3)
b. play the this car. (2;4)
c. no play the blocks now. (2;4)

As was mentioned earlier, the argument structure alternation does not appear to be accidental: the result of an event of creation is encoded as a direct object, while a pre-existing participant is encoded as an INSTRUMENT[3]. The contrast, however, is not necessarily reflected in argument structure, as demonstrated by *bake*-type verbs, where both the newly created entity and the pre-existing entity are mapped as objects:

(4.26) a. Mrs Dursley baked a chocolate cake for Dudley.
b. Mrs Dursley baked an old potato for Harry.

The distinction is further blurred by the fact that some argument expressions may appear in either complement frame (as in *play lego* and *play with lego*). In this case the interpretation of the utterance is determined by syntactic structure rather than by the denotation of the complement expression in isolation and it is unlikely that the correct conceptual structure could be construed relying on situational cues alone.

[3]The generalisation is not entirely accurate as in English musical instruments are also encoded as direct objects even though they are not themselves created by the playing act.

For this particular verb, it seems plausible that the categorisation of argument types presents difficulties.

The hypothesis that the child's object and oblique NP arguments form a semantic category, however, cannot be maintained when we consider other frequently occurring predicates. In some cases the class of arguments that appear as NPs is simply too diverse to be reasonably considered a semantic category. The fact that errors in the selection of prepositions, when expressed, are negligibly rare demonstrates that it is not the case that the child is unable to distinguish thematic roles. The verb *write*, for instance, occurs with three types of oblique complements or adjuncts which may be mapped as object NPs by the child (11 out of 14 INSTRUMENTS as in (4.27a,b); 20 out of 29 GOALS as in (4.27c,d); and all 9 locative adjuncts as in (4.27e) where the magazine is to support the piece of paper the child is writing on):

(4.27) a. write pencil. (2;0)
b. I gonna write two pens. (2;6)
c. write paper. (2;1)
d. I'm writing tape. (2;2)
e. I writing magazine. (2;2)

A second kind of evidence against the hypothesis that mapping is *solely* determined by semantic factors is provided by utterance pairs where the same argument surfaces as an object in one utterance and as an appropriately marked oblique complement in the other. These examples suggest that even if children do grammaticise certain semantic categories, their rules are at best probabilistic. In the Hungarian data five of the eight utterance types in (4.23) also occur with target-like case marking. Some examples from the English data are given below. Each of the utterance sets occurs within a single episode:

(4.28) a. go to zoo tomorrow. (2;1)
b. go zoo tomorrow. (2;1)

(4.29) a. [the barrels] fell off the train. (2;2)

b. barrels fell the train. (2;2)

c. barrels fell the down the train. (2;2)

(4.30) a. put it in hair please. [the barrette] (2;1)

b. put my hair. [the barrette] (2;1)

(4.31) a. no play the blocks now. (2;4)

b. no play with the blocks. (2;4)

(4.32) a. I gonna write two pens. (2;6)

b. don't write with two pens. (2;6)

4.3.3 Frequency effects

A second possible factor motivating the mapping of oblique arguments onto the object function may be a simple effect of frequency. It may be the case that the statistically preponderant pattern in the input/intake prevails in the child's creative mapping choices. Immediate effects of this kind, where a pattern stored in short term memory is extended to a following utterance (termed "discourse analogy" by MacWhinney (1985)), have previously been noted in the literature. A candidate example from the data is shown below, where the structure of the erroneous utterance *get some store* matches the structure of the target-like verb phrase *get some gum* uttered three times in the child's previous turn:

(4.33) PETER: I'm get some gum. I'm gon get some gum. I'm gon get some gum, Daddy.

FATHER: I don't think we have any more gum, sweetie.

PETER: right there, Daddy. get some store, Daddy. (2;4)

This hypothesis predicts that at the beginning of the oblique NP stage target-like transitive frames with predicates subcategorising for oblique arguments dominate the child's frame types and that over time a correlation can be observed between the frequency of transitive frames and the frequency of oblique NPs. The frequencies are shown in Table 4.7 on page 133. Those verbs are included in the

table which occur at least once with a PP complement or a PP target complement which is realised as an NP, both transitive and intransitive. The first data column shows the summed number of target-like object NP and oblique PP complements. The second data column gives the percentage of object NPs. The third and fourth data columns show the same information cumulatively for verb types. As expected, with the exception of Stage 1, object complements are highly frequent with these verbs (15% at Stage 1, 86–66% at subsequent stages). We also find a high proportion of transitive verb types within the set of verbs that occur with oblique arguments (28% at Stage 1, 42–68% at subsequent stages).

Frame frequencies also seem to account for the relatively low probability of accusative-marked oblique arguments in Hungarian child language. As shown in Table 4.8 on the next page, although target-like objects occur with a large number of verb types (around 40% for Zoli and 30% for Balázs), their token frequencies tend to be lower than the token frequencies of oblique-marked arguments. This is not unexpected since objects are licensed to be dropped in Hungarian.

An explanation based on frequency effects alone, however, immediately raises a number of problems. First, if the transitive frame needs to be statistically dominant for overgeneralisation, why do oblique NPs occur at all with intransitive verbs and why are they frequent with transitive verbs at the first stage of Peter's data, where the number of PPs exceeds by far the number of objects? Second, no correlation can be observed between the frequency of oblique NPs and the frequency of transitive frames: over 90% of Peter's oblique arguments are mapped appropriately at the end of the studied period, even though the proportion of transitive frames remains high.

One explanation to consider is that it is not overall frame frequencies that influence the child's mapping choices but the frequencies of argument mapping patterns of individual verbs as observed by the learner. To investigate this hypothesis, the verbs most frequently occurring with oblique arguments in the English corpus, *go*, *play* and *write*, will now be examined individually. Figure 4.1 on page 135 compares learning curves for the three verbs. Actual numbers will be given in the paragraphs below. Two curves are plotted for each verb: preposition omission

Stage	PPs and Object NPs			
	Tokens		Verb Types	
	Obj+PP	% Obj	*Obj+PP*	% Obj
1	*54*	15	*7*	28
2a	*93*	77	*12*	42
2b	*168*	86	*17*	53
3a	*262*	76	*23*	61
3b	*306*	79	*28*	68
4	*397*	66	*42*	62
Total	*1280*		*42*	
Mean		66		

Table 4.7: Proportion of object NPs to target-like object NP and oblique PP arguments with oblique verbs; and cumulative proportion of transitive-oblique verb types to all oblique verb types.

Stage	Accusative Objects and Oblique Complements							
	Zoli				Balázs			
	Tokens		V Types		Tokens		V types	
	Acc+Obl	%Acc	*Acc+Obl*	%Acc	*Acc+Obl*	%Acc	*Acc+Obl*	%Acc
1	*29*	41	*8*	37	*17*	23	*7*	28
2	*65*	52	*19*	42	*11*	27	*12*	33
3	*54*	48	*27*	41	*22*	68	*17*	35
4	*125*	64	*36*	44	*31*	32	*22*	32
Total	*273*		*36*		*81*		*22*	
Mean		51				37		

Table 4.8: Proportion of accusative marked object NPs to target-like object and oblique arguments with oblique verbs; and cumulative proportion of transitive-oblique verb types to all oblique verb types.

rate, which is calculated across all oblique argument types regardless of thematic role for each individual stage; and an indication of transitivity, which is calculated cumulatively at Stage_n as the proportion of target-like transitive utterances to all utterances with expressed object or oblique arguments occurring up to and including Stage_n. (The phrase *home* is counted as the object of *go*):

(4.34)
$$\text{Transit: } \frac{\sum_{i=1}^{n} NP_i}{\sum_{i=1}^{n} NP_i + {*NP_i} + PP_i}$$

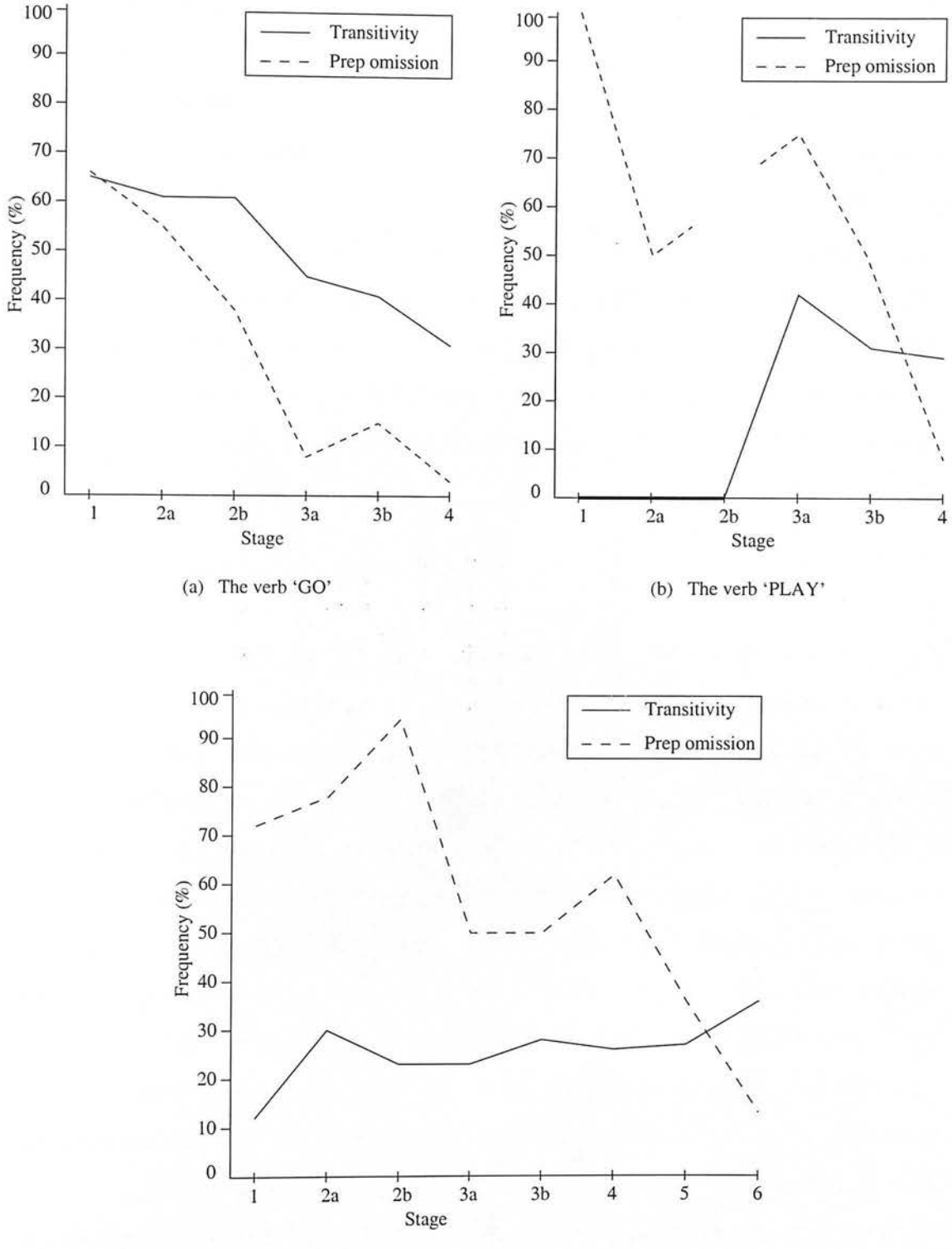
$$\text{Prep Om: } \frac{{*NP_n}}{{*NP_n} + PP_n}$$

The rationale for the method of calculating the transitivity curve is the assumption that previous usage of argument frames gradually strengthens the grammar's confidence level for those frames, as was discussed in the previous chapter.

Initially, the likelihood of preposition omission is fairly high (50% or more) with all three verbs. At later stages, however, the preposition omission curves differ greatly. While the oblique arguments of *go* are mapped as NPs in only 8% of utterances at Stage 3a, preposition omission with *play* and *write* remains at a high level. The arguments of *play* appear to be appropriately categorised by the end of the studied period (8% error rate) but oblique NPs with *write* continue to occur (62%). To follow the development of this verb, the graph shows data from the next two files in the CHILDES corpus, recorded one and two months after Stage 4. Over this period preposition omission rate suddenly decreases and at the latter session Peter consistently maps the oblique arguments of *write* as PPs.

The transitivity curves of the three verbs also show different patterns. For *go*, the complement phrase *home* is most frequent at the first stage (65%) and its proportion gradually decreases thereafter in parallel with the preposition omission curve[4]. Target-like object complements are less frequent with *play* and *write* and their frequency of occurrence does not appear to be a good predictor of preposition omission rate.

[4]Note that the association between the two curves is not a valid correlation in the statistical sense, since the two measures are not independent.



(a) The verb 'GO'

(b) The verb 'PLAY'

(c) The verb 'WRITE'

Figure 4.1: Association between frequency of transitive use and preposition omission with the verbs *go, play* and *write*

THE VERB *go*

As we have seen previously (Table 4.5 on page 125), the GOAL arguments of the verb *go* tend to be mapped as bare NPs at the first three stages and as prepositional complements at subsequent stages. I have suggested that this pattern is compatible with the hypothesis that the error originates in the miscategorisation of the argument *home* as an object NP, which is later reanalysed as an adverb. This explanation can now be revised. There are two kinds of evidence that can trigger reanalysis. One is sentences where the word *home* is embedded in a PP, as in (4.35), indicating that the distributional properties of the phrase [Det *home*] are different from the distributional properties of [*home*]. Evidence for the child's awareness of the distinction appears at the last stage, where the [Det *home*] phrase first occurs embedded in a GOAL denoting PP:

(4.35) I wanna go to your home. (2;6)

The other kind of evidence may come from the observation that verbs of motion may be followed by more than one class of GOAL expressions. One class, including the words *home, there, here*, may or may not be embedded in a prepositional phrase while another class is predominantly mapped as a PP. 'Predominantly' in this context means that the proportion of non-PP mappings to PP mappings of class B expressions is negligible compared to the corresponding proportion observed with class A expressions. Both ways of arriving at the re-categorisation of the argument *home*, however, hinge on the assumption that the child notes nominal GOAL arguments being projected in PPs. The reanalysis is therefore more likely to be the result rather than the cause of the confirmation of the [*go* PP_{GOAL}] mapping pattern in the lexicon. Let us now consider frequency. An exhaustive count of complement types with the verb *go* is given in Table 4.9 on page 138. The last column of the table shows the cumulative type frequency of non-adverb GOAL complements regardless of phrase type. As we can see, not only the token frequency but also the type frequency of GOAL arguments sharply increases over time. The greatest increase in type frequency occurs at Stage 3a, where 14 new GOAL arguments appear relative to the previous stage. By this time a total of

27 noun types have occurred as destinations, indicating that the argument slot is sufficiently generalised. It is also at this stage that preposition omission rate suddenly drops from 37% to 8%.

If we maintain that the word *home* is initially categorised as an NP, the early acquisition of the phrase *go home* may in this case result in the creation of a default [V NP] argument frame in the lexical entry of the verb. As the child later acquires PP complements and their probability increases relative to the probability of the presumed transitive frame, the default frame will be abandoned and *home* will be marked as an exception and eventually re-categorised as an adverb. If this is correct, the correlation between the frequency of the complement *home* and the frequency of NP GOAL complements shown in Figure 4.1 on page 135 is expected.

THE VERB *play*

The argument frames of the verb *play* pose a slightly different learning problem in that both the transitive and the prepositional frames may occur with an unlimited number of argument lexeme types and it is the conceptual structure of the utterance rather than the word class of the complement that determines mapping pattern selection.

The actual token and type frequencies of Peter's argument frames are given in Table 4.10 on the following page. Interestingly, the child's first word combinations with the verb *play* fit the [V NP] frame even though the internal arguments denote toys (*toys* and *pencils*). At the next stage the word *toys* is mapped as an object NP on one occasion and as a PP on another occasion. At Stage 3a game and music arguments suddenly appear with high token and type frequencies and the proportion of oblique NPs is well above the overall rate of preposition omission at this stage. In the next sample new noun types appear in both the game/music and the toy categories, the token frequency of target-like object arguments is significantly reduced and we find a decrease in error rate. At the last stage toy denoting nouns previously mapped as objects are projected in PPs while game/music arguments continue to be expressed in transitive frames. It is safe to assume that the mapping options are fully specified at this stage. The single error occurs with the complement *my football*, where the noun is ambiguous between game and toy

Stage	Number of Complements/Adjuncts							Lex Types
	home	*NP	PP	Adv	VP	None	Tot	GOAL
1	11	4	2	22	0	5	44	3
2a	14	5	4	57	0	11	91	7
2b	12	3	5	30	1	8	59	13
3a	2	2	23	40	14	2	83	27
3b	3	2	11	26	10	7	59	30
4	0	1	29	8	3	13	54	38

Table 4.9: Number of occurrences of complement frames with the verb *go* and cumulative number of non-adverb GOAL lexeme types

Stage	Number of Complements/Adjuncts							Lex Types		
	Obj	INSTR		COMIT		0	Tot			
	NP	*NP	PP	*NP	PP			Obj	INSTR	COMIT
1	0	2	0	0	0	0	2	-	1	-
2a	0	1	1	0	0	0	2	-	2	-
2b	0	0	0	0	0	0	0	-	2	-
3a	17	15	4	0	1	5	42	7	11	1
3b	3	10	8	0	2	0	23	9	14	2
4	3	1	9	0	2	1	16	11	17	3

Table 4.10: Number of occurrences of complement frames with the verb *play* and cumulative number of lexeme types occurring as objects, INSTRUMENTs and comitative adjuncts

(disambiguated by the presence of the determiner) and which in fact follows a false start, as in (4.36):

(4.36) I play foot // my football. (2;6)

THE VERB *write*

The verb *write* occurs with four types of oblique roles: INSTRUMENTS, GOALS, LOCATIONS and comitative adjuncts. As shown in Table 4.11 on the next page, preposition omission occurs with all four types. The object argument is unexpressed in all of the erroneous utterances.

Similarly to the pattern observed with the verb *play*, the occurrence of oblique NPs at the initial stage cannot be attributed to frequency-based psycholinguistic factors, since target-like object arguments are infrequent. At later stages, although there is no sudden rise in the relative token frequency of objects, their type frequency increases at a significantly greater rate than that of any of the oblique arguments. We can also see that this increase continues throughout the studied period, yet the error rate in oblique argument mapping is reduced to an insignificant level by the final stage.

In summary, the examination of the three verbs confirms the results of the overall frequency analysis: the statistical dominance of the target-like transitive frame at the early stages is not a necessary condition for the overapplication of the transitive mapping pattern; and recovery from the error is not dependent on a reduction in the frequency of object NPs. The first observation suggests that there must be some principle of the grammar that licenses oblique NPs as a default, which may then be reinforced by the occurrence of transitive frames in the input. The second problem points to the conclusion that there must be a learning process involved that leads to the correct specification of subcategorisation frames without a decrease in the relative frequency of transitive frames.

Stage	Number of Complements/Adjuncts											Lex Types				
	Obj	Instr		Comit		Goal		Loc		Othr	Tot					
	NP	*NP	PP	*NP	PP	*NP	PP	*NP	PP			Obj	Instr	Comit	Goal	Loc
1	1	2	0	0	0	3	2	0	0	1	9	1	2	-	2	-
2a	6	2	0	1	0	4	2	0	0	20	35	6	3	1	2	-
2b	3	1	0	0	0	9	1	7	0	13	34	7	3	1	2	1
3a	1	0	0	0	0	0	1	1	0	3	6	7	3	1	3	1
3b	3	0	0	0	0	1	1	0	0	3	8	10	3	1	3	1
4	5	6	3	0	1	3	2	1	0	23	44	13	4	2	5	1
5	5	2	0	0	1	2	6	0	0	35	51	14	5	3	7	1
6	21	2	4	0	0	0	9	0	0	16	52	18	5	3	9	1

Table 4.11: Number of occurrences of complement frames with the verb *write* and cumulative frequency of lexeme types occurring as objects, INSTRUMENTs, comitative adjuncts, GOALs and locative adjuncts. 'Other' category includes adverbs, particles and utterances with no complements or modifiers.

4.3.4 *The grammar of oblique NPs*

THE ECONOMY PRINCIPLE

A plausible factor encouraging the mapping of internal arguments onto the object function in preference to prepositional marking is an economy principle of some kind. The object construction may require less processing effort, since direct θ-role assignment by the verb in Pesetsky's (1995) terms involves a simpler derivation than the projection of a preposition whose θ-selection properties must match those of the verb. The reason for the reduced probability of accusative-marked oblique arguments in Hungarian may then lie in the fact that in that language mapping arguments onto the object function is not derivationally simpler than mapping arguments as oblique complements, as both types of argument receive inherent case. In the previous chapter I argued, however, that economy principles do not override factors of competence. That is, simplicity is not a sufficient condition for oblique arguments to be mapped as objects — the simpler mapping pattern must be a grammatical option which is assigned an above-zero probability by the learner's linguistic system.

LEXICAL ALTERNATIONS

The fact that arguments embedded in highly similar conceptual structures may be mapped by the child's grammar in different ways suggests that the mapping of arguments onto object versus oblique functions are treated as underspecified alternative linking patterns. The phenomenon of 'preposition omission' appears to resemble lexical alternation errors even though the child's alternations may have no semantically related adult analogues. We have also seen that the mapping patterns may be semantically underspecified to such an extent that it seems as though the child's grammar allows *any* oblique argument to be mapped onto the object function. The question is what principle of the learner's competence may have this effect if it is not the case that the child encodes semantic distinctions by applying alternative linking rules and the child's semantic representations are accurate.

Let us consider a generalised version of the linking theory view of lexical alternations advocated by Pustejovsky (1995) in his analysis of polysemy in general

and by Pinker (1989) and Pesetsky (1995) in their analysis of the dative and locative alternations in particular. As was discussed in Chapter 1, Pinker and Pesetsky propose that the availability of the two mapping options of the dative and locative constructions directly follow from the semantic specifications of the predicate. Pesetsky describes this property as the predicate's ability to θ-select THEME and GOAL arguments either directly or mediated by an overt or zero preposition. He further suggests that the lexico-semantic licensing conditions of the mediating prepositions are part of UG, just as Pinker's linking rules, and what the child has to learn is the semantics of individual predicates.

In Chapter 1 I argued that reducing the availability of mapping options to differences in lexical meaning components does not solve the logical problem of language acquisition, since there remains the problem of constraining an overgeneral hypothesis meaning. Now a second objection can be raised: the fact that argument structure errors are ubiquitous in child language and are not necessarily accompanied by semantic confusion on the one hand, and the observation that lexical alternation is a highly common and varied phenomenon in language on the other hand make the suggestion implausible that the semantic licensing conditions of each use of each mediating preposition are built into the grammar. The following sentence pairs illustrate just a few of the less commonly discussed alternations where a θ-role may be assigned both directly and through a preposition with some predicates but not with others:

(4.37) a. Ron hit the dashboard with the magic wand.
b. Ron hit the magic wand against the dashboard.
c. Ron swiped the dashboard with the magic wand.
d. *Ron swiped the magic wand against the dashboard.

(4.38) a. Peter fought with the pirates.
b. Peter fought the pirates.
c. Peter argued with the pirates.
d. *Peter argued the pirates.

(4.39) a. The party roamed in the woods/sailed around the lake.

b. The party roamed the woods/sailed the lake.

c. The boat floated in the lake.

d. *The boat floated the lake.

(4.40) a. Owl wiped the egg shells off the brontosaurus/from his eyes.

b. Owl wiped the brontosaurus/his eyes.

c. Owl took the egg shells off the brontosaurus.

d. !Owl took the brontosaurus.

(4.41) a. Oz made a brain for the Scarecrow.

b. Oz made the Scarecrow a brain.

c. Oz fabricated a brain for the Scarecrow.

d. *Oz fabricated the Scarecrow a brain.

Oblique NP errors can be explained, however, if we allow the availability of the two types of θ-selection process to be a default property of the grammar and the lexical and/or thematic selectional principles of the two mapping patterns to be acquired. Let us assume that language has a flexible and general mechanism of mapping pattern selection that allows distinctions in the conceptualisations of lexical meaning to be reflected in syntactic structure. These distinctions may be represented in the grammar as sets of entailments in the sense of Dowty (1991), as structured conceptual primitives (Jackendoff 1990) or as qualia structures in event representations (Pustejovsky 1995). The mechanism of mapping pattern selection may be realised in the form of direct versus mediated θ-selection (Pesetsky 1995), or, perhaps, by a process of head selection in event structure in Pustejovsky's sense, where subevents may specify distinct argument structures, only one of which, that of the head, is mapped onto syntactic structure in any one derivation. The details of this mechanism will not be discussed here, while acknowledging that the problem is far from trivial.

Under the view proposed above children's oblique arguments may be mapped onto the object function not because the child's grammar associates certain semantic features with objects but because the general syntactic mechanism of mapping alternations is made available by UG and the precise conditions of the linking

options are at this stage undetermined. However, if mapping pattern alternations are unconstrained in the child's grammar, we expect NP and PP complements to occur essentially at random. This does not seem to be correct. Although there are a few examples of preposition insertion errors (shown in 4.6 on page 112), these are restricted to intransitive prepositional verbs. There are no occurrences of objects erroneously embedded in PPs. One explanation to consider is that the innate principle of object/prepositional complement alternation is unidirectional:

(4.42) Prepositional complements may alternatively be mapped as direct objects to encode distinctions in conceptual structure.

This formulation suggests that the prepositional mapping pattern is basic and the alternative option, when licensed, is marked. There seems to be no evidence for this claim, however. In certain alternation phenomena, such as the conative for instance, it is in fact the transitive structure that is intuitively basic or prototypical:

(4.43) a. Neville hit Malfoy.
b. Neville hit at Malfoy.

A more plausible explanation is provided by the economy principle mentioned earlier. Since the generation of the transitive construction requires less processing effort, it is a reasonable conjecture that this option will be overused as long as it is in free variation with the alternative according to the current state of the grammar.

If this is correct, however, it is no longer clear why oblique NPs should be less likely to occur with intransitive verbs than with transitive verbs. If the innate principle of mapping alternation is a predicate-general rule of permissible mapping patterns, the oblique arguments of all predicates should be affected as a default hypothesis. As oblique NPs do occasionally occur with intransitive verbs, we can assume that although the initial state of the grammar does not distinguish predicate types, the learning process does, ensuring relatively quick recovery from the error for predicates that do not appear with object arguments in the input. The next paragraphs look at the nature of this learning mechanism.

4.3.5 *The learning process*

Returning to the earlier discussion of frame frequency effects, obviously, the hypothetical causal correlation between the frequency of target-like transitive frames and the error rate can produce progression only if the target-like transitive frame is used less and less frequently relative to the target-like prepositional frame over time. This scenario is only plausible, without having to make unreasonable assumptions about the input, for predicates that may take a restricted number of NP complement types, which are acquired early, but are predominantly prepositional. In this case target-like performance may be achieved without sub-lexical featural analysis, by marking the few NP complement types as exceptional. As was discussed above, Peter's acquisition of the argument structure of the verb *go* fits well this pattern. To attain adult competence, however, the learner needs to establish which of the semantic differences between argument types are syntactically relevant.

If the analysis of early oblique NPs as an option in underspecified argument structure alternations is correct, the learning process can involve the mechanism of pairwise comparison detailed in the last section of the previous chapter. As a first step the child acquires a set of predicates which are specified in the lexicon as subcategorising for optional or obligatory oblique arguments. The lexical structures of these predicates may be acquired on the basis of syntactic evidence in the input or on the basis of situational cues, as proposed by Pinker (1989), for instance. The learner's grammar licenses alternations in mapping patterns. Economy principles dictate that the simpler mapping pattern is applied provided that this is not in conflict with other rules of the grammar. If, as I suggested, the grammar also specifies that alternative mapping patterns encode some (as yet unknown) differences in conceptual structure, the child should be predisposed to contrasting the set of properties that are associated with PPs with the set of properties that are associated with object NPs. It must be emphasised that, unlike in Pinker's theory, this stage of the learning process is not directed at refining semantic representations (they may not need refining) but at marking existing features of conceptual structure as cues to one or the other mapping pattern. For this reason, at this stage positive and negative syntactic information in the input is crucial. It seems to be

a reasonable conjecture that to what extent and in which environments simplicity considerations are overridden during the course of development will be determined by the amount of available evidence and the transparency of the feature contrasts. Assuming that lexical contrasts are identified more easily than extra- or sub-lexical contrasts as discussed in the previous chapter, intransitive predicates, which do not occur with object complements in the primary linguistic data, will be the first to be removed from the set of predicates that, as a default hypothesis, allow the argument structure alternation.

Where object arguments are observed in the input, for the successful marking of semantic features as relevant for mapping pattern selection the child must have experience of a sufficient number of argument types in both the [V PP] frame and the [V NP] frame. In this case, the large number of object arguments, which initially reinforce the child's default hypothesis, should subsequently assist the learning process, which is what we find comparing the learning curves of the verbs *play* and *write*.

The learning mechanism allows feature contrasts (i.e., PP-features vs. NP-features) to be established for the argument types of individual predicates or for generalised configurations of conceptual structure. The latter type of process may lead to argument structure errors which typically occur at later developmental stages, such as dative subjects in Hungarian and the overgeneralisation of lexical alternation of the kind discussed in Chapter 1. Thus, the overapplication of the locative alternation, for instance, may not be the consequence of underspecified semantic representations construed for individual predicates but the consequence of overgeneral mapping rules, such as a rule licensing the alternation for all verbs of non-possessional transfer. Recovery from the overgeneralisation can then involve further pairwise statistical learning from the occurrence or non-occurrence of expected argument structures. As we have seen, this allows not only the extraction of any semantic regularities characteristic of syntactic types but also the direct marking of individual predicates as not licensing one or the other argument mapping pattern.

5 Conclusion

The questions asked at the beginning of the study were, Why do certain errors occur while other apparently similar ones do not? And what learning mechanisms allow the learner to progress from a broader to a narrower grammar? The answer that emerges from the detailed examination of two wide-ranging and arguably independent characteristics of early child English is that the two puzzles share a common solution, statistical learning.

The observed patterns of erroneous implicit arguments and oblique NP complements in English child language share a number of features:

(5.1) The state of the grammar at the initial stage of the studied period:

a. The errors do not constitute violations of Universal Grammar, both implicit arguments and the mapping of canonical oblique θ-roles onto the object function result in permissible syntactic configurations.

b. The precise licensing conditions of implicit arguments and oblique NPs lie beyond the constraint system of UG. The child's utterances are ungrammatical in that they fail to conform to pragmatic, semantic and/or lexical conventions that determine the mapping process in the mature grammar.

c. The errors seem to indicate that it is these conventions of mapping rather than the child's semantic representations which are underdetermined.

d. For each of the two error types a related construction (object mapping and intransitive prepositional constructions) has been observed which appears virtually error-free in the child's output.

e. The study fails to confirm previous suggestions or to identify new explanations based on the properties of UG that could account for differences in these pairs of error patterns.

(5.2) The course of development:

a. The child's hypotheses are probabilistic in that the erroneous and the target-like constructions occur side by side and no criterion has been found that can unfailingly predict the selection of one or the other alternative in individual utterances.

b. There are, however, statistical differences between environments in the frequency of each type of error relative to the frequency of the target-like alternative.

c. These differences cannot fully be attributed to some *a priori* property of the child's grammar, although considerations of derivational simplicity have an observable effect.

d. Surface syntactic structures corresponding to the child's erroneous utterances (i.e., null-subject frames and transitive frames) occur with non-negligible token and type frequencies in the child's target-like output. Variations in these frequencies can to a significant extent predict statistical variations in error patterns, suggesting that those are a product of the learning process.

On the basis of the above findings I have suggested that the learning process may be defined as a simple statistical pairwise feature-comparison algorithm. The motivation behind revising hypothesis rules in the absence of an increase in parsing power is provided by the learner's predisposition to match "expected" form/meaning pairings against attested form/meaning objects given the constraint system of the innate language acquisition programme, including a predisposition to search for semantic/pragmatic contrasts in the face of formal contrasts.

I have further proposed that the negligibly low frequency of occurrence of certain error types (i.e., object omission and preposition omission with intransitive verbs) at the initial stage of the studied period is best analysed as an instance of

statistical variation of the kind mentioned above rather than as evidence for differential accessibility to aspects of UG. The approach outlined in the study therefore dispenses with problem-specific rules of limited applicability in favour of a generic language acquisition mechanism working towards a solution both to the theoretical problem of narrowing an overgeneral grammar and to the empirical puzzle of islands of error-prone versus error-free linguistic behaviour in early child language.

References

AKSU-KOC, A A, & D I SLOBIN. 1985. The acquisition of Turkish. In *The Crosslinguistic Study of Language Acquisition*, ed. by D I Slobin, volume 1: The Data. Hillsdale, NJ: Lawrence Erlbaum.

AOUN, J. 1986. *Generalised Binding*. Dordrecht: Foris.

BABARCZY, A. 1998. The transition to the functional stage in Hungarian language acquisition. In *Approches to Hungarian*, ed. by C de Groot & I Kenesei, volume 6. Szeged, Hungary: JATE.

BAKER, C L. 1979. Syntactic theory and the projection problem. *Linguistic Inquiry* 10.533–581.

——, & J MCCARTHY (eds.) 1981. *The Logical Problem of Language Acquisition*. Cambridge, MA: MIT Press.

BAKER, M. 1988. *Incorporation*. Chicago: University of Chicago Press.

BICKERTON, D. 1997. How to acquire language without positive evidence: What acquisitionists can learn from creoles. In (DeGraff 1997).

BLOOM, L. 1970. *Language Development: Form and Function in Emerging Grammars*. Cambridge, MA: MIT Press.

BLOOM, P. 1990. Subjectless sentences in child language. *Linguistic Inquiry* 21.491–504.

BORER, H, & K WEXLER. 1987. The maturation of syntax. In (Roeper & Williams 1987).

BOWERMAN, M. 1982. Reorganisational processes in lexical and syntactic development. In (Wanner & Gleitman 1982).

——. 1988. The "no-negative evidence" problem: How do children avoid constructing an overly general grammar? In *Explaining Language Universals*, ed. by J A Hawkins. Oxford: Basil Blackwell.

——. 1989. Learning a semantic system: What role do cognitive predispositions play? In *The Teachability of Language*, ed. by R L Schiefelbusch & M L Rice. Paul H Brooks Publishing Co.

——, & S Choi. 2001. Shaping meanings for language. In (Bowerman & Levinson 2001).

——, & S C Levinson (eds.) 2001. *Language Acquisition and Conceptual Development*. Cambridge: CUP.

Braine, M D S, & P J Brooks. 1995. Verb argument structure and the problem of avoiding an overgeneral grammar. In (Tomasello & Merriman 1995).

Budwig, N A. 1989. The linguistic marking of agentivity and control in child language. *Journal of Child Language* 16.263–84.

Cairns, P, R Shillcock, N Chater, & J Levy. 1997. Bootstrapping word boundaries: A bottom-up corpus-based approach to speech segmentation. *Cognitive Psychology* 33.111–153.

Chomsky, C. 1969. *The Acquisition of Syntax in Children from 5 to 10*. Cambridge, MA: MIT Press.

Chomsky, N. 1972. *Language and Mind*. ??: ??

——. 1977. *Essays on Form and Interpretation*. New York: North-Holland.

——. 1995. *The Minimalist Program*. Cambridge,MA: The MIT Press.

Clahsen, H (ed.) 1996. *Generative Perspectives on Language Acquisition*. Amsterdam: John Benjamins.

——, S Eisenbeiss, & M Penke. 1996. Lexical learning in syntactic development. In (Clahsen 1996).

Clark, E V. 1977. Universal categories: On the semantics of classifiers and children's early word meanings. In *Linguistic Studies Presented to Joseph Greenberg*, ed. by A Juilland. Saratoga, CA: Anma Libri.

——. 1987. The principle of contrast: A constraint on language acquisition. In (MacWhinney 1987b).

——. 2001. Emergent categories in first language acquisition. In (Bowerman & Levinson 2001).

——, & K L CARPENTER. 1989. The notion of source in language acquistion. *Language* 65.1–30.

CULICOVER, P W. 1999. *Syntactic Nuts*. Oxford: OUP.

DEGRAFF, M (ed.) 1997. *Creolization, Language Change and Language Acquisition*. Cambridge, MA: MIT Press.

DEMUTH, K. 1989. Maturation and the acquisition of the sesotho passive. *Language* 65.56–80.

DOWTY, D. 1991. Thematic proto-roles and argument selection. *Language* 67.547–619.

DRESHER, E, & J KAYE. 1990. A computational learning model for metrical phonology. *Cognition* 34.137–195.

FELIX, S. 1992. Language acquisition as a maturational process. In (Weissenborn *et al.* 1992).

FILLMORE, C. 1986. Pragmatically controlled zero anaphora. Technical Report 12, Berkeley Linguistics Society.

FISHER, C, G HALL, S RAKOWITZ, & L GLEITMAN. 1994. When it is better to receive than to give: Syntactic and conceptual constraints on vocabulary growth. *Lingua* 92.333–375.

FRIEDEMANN, M, & L RIZZI (eds.) 2000. *The Acquisition of Syntax*. Harlow: Pearson Edication Limited.

GERKEN, L. 1991. The metrical basis for children's subjectless sentences. *Journal of Memory and Language* 30.431–451.

GIBSON, E, & K WEXLER. 1994. Triggers. *Linguistic Inquiry* 25.407–454.

GLEITMAN, L, & E WANNER. 1982. Language acquisition: The state of the art. In (Wanner & Gleitman 1982).

GOLDIN-MEADOW, S, & C MYLANDER. 1990. Beyond the input given: The child's role in the acquisition of language. *Language* 66.323–355.

GREENFIELD, P, & J H SMITH. 1976. *The Structure of Communication in Early Language Development*. New York: Academic Press.

GRIMSHAW, J. 1981. Form, function and the language acquisition device. In (Baker & McCarthy 1981).

——, & C ROSEN. 1990. Knowledge and obedience: The developmental status of the binding theory. *Linguistic Inquiry* 21.187–222.

GROPEN, J S, S PINKER, M HOLLANDER, & R GOLDBERG. 1991a. Affectedness and direct objects: The role of lexical semantics in the acquisition of verb argument structure. *Cognition* 41.153–195.

——, ——, ——, & ——. 1991b. Syntax and semantics in the acquisition of locative verbs. *Journal of Child Language* 115–151.

HAEGEMAN, L. 2000. Adult null subjects in non pro-drop languages. In (Friedemann & Rizzi 2000).

HAMANN, C, & K PLUNKETT. 1998. Subjectless sentences in child Danish. *Cognition* 69.35–72.

HAWKINS, J A. 1994. *A Performance Theory of Order and Constituency*. Cambridge: CUP.

HOEKSTRA, T, & B D SCHWARTZ (eds.) 1994. *Language Acquisition Studies in Generative Grammar*. Amsterdam: john Benjamins.

HUANG, C-T J. 1984. On the distribution and reference of empty pronouns. *Linguistic Enquiry* 15.531–574.

HYAMS, N. 1986. *Language Acquisition and the Theory of Parameters*. Dordrecht: Reidel.

——. 1987. The theory of parameters and syntactic development. In (Roeper & Williams 1987).

——. 1989. The null-subject parameter in language acquisition. In (Jaeggli & Safir 1989a).

——. 1994. V2, null arguments and COMP projections. In (Hoekstra & Schwartz 1994).

——, & K WEXLER. 1993. On the grammatical basis of null subjects in child language. *Linguistic Inquiry* 24.421–459.

JACKENDOFF, R S. 1990. *Semantic Structures*. Cambridge, MA: MIT Press.

JAEGGLI, O, & K SAFIR (eds.) 1989a. *The Null Subject Parameter*. Dordrecht: Kluwer.

——, & ——. 1989b. The null subject parameter and parametric theory. In (Jaeggli & Safir 1989a).

LASNIK, H. 1989. On certain substitutes for negative data. In *Learnability and Linguistic Theory*, ed. by R J Matthews & W Demopoulos. Dordrecht: Kluwer Academic Publishers.

LEVIN, B. 1993. *English Verb Classes and Alternations*. Chicago: University of Chicago Press.

LEVY, Y, I M SCHLESINGER, & M D S BRAINE (eds.) 1988. *Categories and Processes in Language Acquisition*. Hillsdale, NJ: Lawrence Erlbaum.

LIGHTFOOT, D. 1997. Catastrophic change and learning theory. *Lingua* 100.171–192.

LUST, B. 1986a. Introduction. In (Lust 1986b).

—— (ed.) 1986b. *Studies in the Acquisition of Anaphora*. Dordrecht: Reidel.

MACWHINNEY, B, 1974. *How Hungarian Children Learn to Speak*. University of California at Berkeley dissertation.

——. 1985. Hungarian language acquisition as an exemplification of a general model of grammatical development. In (Slobin 1985b).

——. 1987a. The Competition Model. In (MacWhinney 1987b).

—— (ed.) 1987b. *Mechanisms of Language Acquisition*. Hillsdale, NJ: Lawrence Erlbaum.

——. 1991. *The CHILDES Project: Tools for Analysing Talk*. Hillsdale, NJ: Lawrence Erlbaum.

MARATSOS, M P, & M CHALKLEY. 1981. The internal language of children's syntax: The ontogenesis and representation of syntactic categories. In *Children's Language*, ed. by K Nelson, volume 2. New York: Gardner Press.

MARCUS, G. 1993. Negative evidence in language acquisition. *Cognition* 46.53–85.

MARKMAN, E. 1989. *Categorization and Naming in Children*. Cambridge, MA: MIT Press.

——. 1990. Constraints children place on word meanings. *Cognitive Science* 14.57–77.

MATTHEI, E. 1981. Children's interpretations of sentences containing reciprocals. In *Language Acquisition and Linguistic Theory*, ed. by S L Tavakolian. Cambridge, MA: MIT Press.

MORGAN, J L, & K DEMUTH (eds.) 1996. *Signal to Syntax: Bootstrapping from Speech to Grammar in Early Acquisition*. Hillsdale, NJ: Lawrence Erlbaum.

NAIGLES, L. 1996. The use of multiple frames in verb learning via syntactic bootstrapping. *Cognition* 58.221–251.

——, & E KAKO. 1993. First contact: Biases in verb learning with and without syntactic information. *Child Development* 64.1665–1687.

NEWPORT, E, L GLEITMAN, & H GLEITMAN. 1977. Mother, i'd rather do it myself: Some effects and non-effects of maternal speech style. In *Talking to Children: Language Input and Acquisition*, ed. by C E Snow & C A Ferguson. Cambridge: CUP.

NEWPORT, E L. 1997. Reduced input in the acquisition of signed languages: Contributions to the study of creolization. In (DeGraff 1997).

OUHALLA, J. 1992. Functional categories, agrammatism and language acquisition. Arbeitspapier 9, Johann Wolfgang Goethe-Universitat, Frankfurt a.M.

PESETSKY, D. 1995. *Zero Syntax*. Cambridge, MA: MIT Press.

PIATTELLI-PALMARINI, M. 1989. Evolution, selection and cognition: from 'learning' to parameter setting in biology and in the study of language. *Cognition* 31.1–44.

PINKER, S. 1984. *Language Learnability and Language Development*. Cambridge, MA: Harvard University Press.

——. 1987. The bootstrapping problem in language acquisition. In (MacWhinney 1987b).

——. 1989. *Learnability and Cognition*. Cambridge, MA: MIT Press.

PUSTEJOVSKY, J. 1995. *The Generative Lexicon*. Cambridge, MA: MIT Press.

QUINE, W V O. 1960. *Word and Object*. Cambridge, MA: MIT Press.

RADFORD, A. 1990. *Syntactic Theory and the Acquisiton of English Syntax*. Oxford: Blackwell.

——. 1996. Towards a structure-building model of acquisition. In (Clahsen 1996).

——. 1997. *Syntactic Theory and the Structure of English*. Cambridge: CUP.

RANDALL, J H. 1992. The catapult hypothesis: An approach to learning. In (Weissenborn *et al.* 1992).

RASETTI, L. 2000. Null subjects and root infinitives in the child grammar of French. In (Friedemann & Rizzi 2000).

RISPOLI, M. 1995. Missing arguments and the acquisition of predicate meanings. In (Tomasello & Merriman 1995).

RIZZI, L. 1994. Early null subjects and root null subjects. In (Hoekstra & Schwartz 1994).

——. 2000. Remarks on early null subjects. In (Friedemann & Rizzi 2000).

ROEPER, T. 1986. How children acquire bound variables. In (Lust 1986b).

——, & E WILLIAMS (eds.) 1987. *Parameter Setting*. Dordrecht: Reidel.

RUBINO, R B, & J M PINE. 1998. Subject-verb agreement in Brazilian Portuguese: What low error rates hide. *Journal of Child Language* 25.35–59.

SAG, I A, & T WASOW. 1999. *Syntactic Theory*. Stanford: CSLI Publications.

SANO, T, & N HYAMS. 1994. Agreement, finiteness and the development of null arguments. In *NELS*, volume 24, 543–558.

SCHÜTZE, C T. 2001. Semantically empty lexical heads as last resorts. In *Semi-lexical Categories: On the Content of Function Words and the Function of Content Words*, ed. by N Corver & H van Riemsdijk. Berlin: Mouton de Gruyter.

SELKIRK, E. 1996. Prosodic structure of function words. In (Morgan & Demuth 1996).

SLOBIN, D I. 1985a. Crosslinguistic evidence for the language making capacity. In (Slobin 1985b).

—— (ed.) 1985b. *The Crosslinguistic Study of Language Acquisition*, volume 2. Hillsdale, NJ: Lawrence Erlbaum.

TOMASELLO, M. 1992. *First Verbs*. Cambridge: CUP.

——, & W E MERRIMAN (eds.) 1995. *Beyond Names for Things*. Hillsdale, NJ: Lawrence Erlbaum.

TREMBLAY, M. 1996. Empty prepositions and ug. In *The Proceedings of the Fourteenth West Coast Conference on Formal Linguistics*, ed. by J Camacho, L Choueiri, & M Watanabe, 557–570.

VALIAN, V. 1990. Null subjects: a problem for parameter-setting models of language acquisition. *Cognition* 35.105–122.

——. 1991. Syntactic subjects in the early speech of American and Italian children. *Cognition* 40.21–81.

——, J HOEFFNER, & S AUBRY. 1996. Young children's imitation of sentence subjects: Evidence of processing limitations. *Developmental Psychology* 32.153–164.

VAN VALIN, R D, & R J POLLA. 1997. *Syntax: Structure, Meaning and Function.* Cambridge: CUP.

WANG, Q, D LILLO-MARTIN, C T BEST, & A LEVITT. 1992. Null subjects and objects in the acquisition of Chinese. *Language Acquisition* 2.221–254.

WANNER, E, & L GLEITMAN (eds.) 1982. *Language Acquisition: The State of the Art.* Cambridge, MA: MIT Press.

WEISSENBORN, J, H GOODLUCK, & T ROEPER (eds.) 1992. *Theoretical Issues in Language Acquisition: Continuity and Change in Development.* Hillsdale, NJ: Lawrence Erlbaum.

WERNER, D, A WAGNER, R BURCHARDT, N SCHULZ, & J NAKATH. 2001. Person in the language of singletons, siblings and twins. In (Bowerman & Levinson 2001).

WEXLER, K. 1981. Some issues in the theory of learnability. In (Baker & McCarthy 1981).

——. 1994. Optional infinitives, head movement and the economy of derivations. In *Verb Movement*, ed. by D Lightfoot & Y Horstein. Cambridge: CUP.

——. 1998. Very early parameter setting and the unique checking constraint. *Lingua* 106.23–79.

——, & P W CULICOVER. 1980. *Formal Principles of Language Acquisition.* Cambridge, MA: MIT Press.

——, & R MANZINI. 1987. Parameters and learnability in Binding Theory. In (Roeper & Williams 1987).

WILLIAMS, E. 1987. Implicit arguments, the binding theory, and control. *Natural Language and Linguistic Theory* 5.151–180.