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Null subjects: A problem for parameter-setting models of language acquisition*

VIRGINIA VALIAN

Hunter College

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Abstract

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Some languages, like English, require overt surface subjects, while others, like Italian and Spanish, allow "null" subjects. How does the young child determine whether or not her language allows null subjects? Modern parameter-setting theory has proposed a solution, in which the child begins acquisition with the null subject parameter set for either the English-like value or the Italian-like value. Incoming data, or the absence thereof, force a resetting of the parameter if the original value was incorrect. This paper argues that the single-value solution cannot work, no matter which value is chosen as the initial one, because of inherent limitations in the child's parser, and because of the presence of misleading input. An alternative dual-value solution is proposed, in which the child begins acquisition with both values available, and uses theory-confirmation procedures to decide which value is best supported by the available data.

Introduction

Parameter-setting theories of language acquisition are attractive because they directly address a deep and basic puzzle of acquisition: children learn language rapidly—any language—yet languages seem to vary enormously from each other. The variation is taken care of by the theory of language, and the rapid learning by the theory of acquisition. As a theory of language, parameter-setting regularizes and systematizes the variety of languages. The major

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dimensions on which languages can vary are specified as parameters. Each parameter typically takes one of two values. Any individual language is characterized by the set of values it takes across the spectrum of parameters. Further, some properties of languages which had been thought to be orthogonal properties are now seen to be entailed by a particular setting of a parameter.

The null subject parameter, a widely studied parameter both in language and in language acquisition, serves as a good illustration. Every language can be specified as either requiring subjects, as English does, or as allowing null subjects in certain circumstances, as Italian and Spanish do. Thus, English does not allow forms like (1), while Italian does, as seen in (2), an actual child utterance.

(1) Am a good kid.
(2) Sono bravo tato.

The null subject in Italian and Spanish and similar Romance languages (referred to as little *pro*) is interpreted as a special kind of pronominal element which is not pronounced; *pro* differs from normal personal pronouns in being unpronounced. In English, either a lexical Noun Phrase or a pronounced pronoun must be the surface subject of tensed clauses (with the exception of imperatives). In Italian and other null subject languages, in contrast, the subject of a tensed clause can be a lexical Noun Phrase, a pronounced pronoun, and either an unpronounced pronominal, namely, *pro*, or some other empty category. The null subject parameter is concerned, then, with the subjects of tensed clauses, not with the subjects of infinitival clauses.

In English, certain properties are entailed by the necessity for surface subjects (see Riemsdijk & Williams, 1986: pp. 298–303, for a candidate list of properties). One such is expletive pronouns. Expletive pronouns in English are the words "it" and "there", when they have no referential import but are present only to occupy the subject slot. For example, in (3), the "it" and "there" do no work other than to put a surface subject in each of the tensed clauses. Languages like Italian do not have expletive pronouns.

(3) It seems that there was a large demonstration in Yerevan.

The explanatory power of parameters, as a description of language, is to state what the linguistically important dimensions of language are, to reduce the apparent variation in languages, and to demonstrate how a particular parametric setting entrains a host of consequences.[1] Parameter-setting as a

[1]Many different parameters have been hypothesized. See Roeper and Williams (1987) for a recent collection of articles on candidate parameters. Two examples can be mentioned here. One is the head direction →

theory of language has its difficulties, however, prime among them the fact that languages do not fit as neatly into the categories as they should. There is more variation than the parameters allow. For the purposes of this paper, however, I am going to assume the essential correctness of a parameter-setting theory of *language*.

The focus of this paper is on a parameter-setting theory of *language acquisition*, as applied to the null subject parameter. As a theory of acquisition, parameter-setting portrays the child as a device which, given normal input, automatically and deterministically sets the correct value of each parameter. In our null subject case, the child determines whether her language requires overt, pronounced, surface subjects in tensed clauses, or allows null surface subjects. I will assume the essential correctness of parameter-setting's statement of the endpoint of acquisition. The child has to adopt either the English-like value, or the Italian-like value. (For convenience, the Chinese-like option is ignored in this paper.)

For reasons which will shortly be explained, most parameter-setting theories of language acquisition assume that the child begins the acquisition process with each parameter already set. The child then either remains with that value, or is forced, by the contradictory evidence provided by her environment, to switch to the other value. I will call this the single-value solution. Rapid, deterministic, purely deductive acquisition can thereby be guaranteed.

The child either begins with the correct value, and never receives any evidence that would force a switch to the other value, or the child begins with the incorrect value but is guaranteed to be presented with evidence that will force a switch to the correct value. The beauty of the parameter-setting model of acquisition is that it guarantees the correct outcome with a minimum of labor on the child's part. The initial setting, plus the input the child will automatically receive, *must* yield acquisition.

The gist of my argument is that, for the null subject parameter, this simple learning mechanism, involving switch setting and resetting, cannot work. No matter which single value the child is assigned initially, the correct outcome cannot be guaranteed. My conclusion is that, for the null subject parameter, both values of the parameter must be supplied to the child initially, and a more complicated learning mechanism, involving some method for testing which value is correct, must be invoked. There are two essential parts to my argument: one concerns the child's parser, the other concerns the child's input.

parameter: a language's phrases will either begin or end with the head of the phrase. English, for example, is a head-first language: the Verb (head) of a Verb Phrase, and the Preposition (head) of a Prepositional Phrase, are the initial constituents of their phrases. Certain other languages are head-final: the Verb is the final constituent of a Verb Phrase. Another example is whether *wh*-words are syntactically moved. In English, *wh*-questions are formed with the *wh*-word at the beginning of the sentence (*where are the crayons?*), while in Chinese, the *wh*-word remains in its underlying object position.

The single-value solution within parameter-setting

The subset problem

Is there a good reason, other than speed of learning, to suppose that there is an initial setting for a parameter? The answer is yes, and can be appreciated by a closer look at the null subject parameter. Let's say no value were established initially. How would the child learning English determine that surface subjects were required? The fact that every utterance she heard contained a subject wouldn't be evidence enough, because, logically, it would confirm both values of the parameter. The null subject value states that sentences in the language *can* have null subjects. No matter how many subjects the child hears, that does not logically rule out the possibility that there is an additional set of sentences, to which she has not yet been exposed, that do not have surface subjects. Since the child is only exposed to sentences of the language (so-called positive evidence), and is given no information about what strings are not sentences of the language (so-called negative evidence), she cannot draw any conclusions about absent strings. This is the subset problem (for recent treatments, see Dell, 1981; Berwick, 1982): if the sentences of one language are a subset of the sentences of another language, evidence confirming the subset also confirms the superset. Since the child is only exposed to positive evidence, and is not exposed to appropriate negative evidence (Brown & Hanlon, 1970), she is in a logical bind. She cannot reject the language which is too large.

The way around this problem is to start the child off with a single value — the value that could be contradicted by positive evidence (i.e., sentences of the language). (See Baker, 1981, for further discussion of positive evidence.) In the null subject case, that means starting the child off with the English-like value. The child with an English-style target will stay with that value, because she will never receive any contradictory input (strings without subjects). The child with an Italian-style target will have to switch to the other value, because she *will* receive contradictory input, in the form of sentences without surface subjects.

The English-like value: Parser limitations and misleading input

Thus, there is good motivation for the solution of starting the child off with the English-like value of the null subject parameter. Nevertheless, it won't work. It won't work (a) because the child's parser is fed by its current grammar, which determines the interpretations the child can give the input, and (b) because some of the child's English input includes strings lacking surface subjects.

Parser limitations

We begin with a child with an English-like grammar, exposed to an Italian-like target language. She hears strings without subjects (like (2)) and attempts to parse them. But her parser is fed by her English-like grammar, which says that sentences must have overt subjects. Her parser therefore does not label the string as a sentence, even though it is indeed a sentence. She cannot label the string as a sentence, because her parser reserves the label "Sentence" for strings with overt surface subjects. Instead she labels the string as a Verb Phrase, and retains her original English-like grammar.

The child cannot appreciate that the incoming data contradict her initial value, because she only has the initial value with which to interpret her data. The child has *data*, but not *evidence*. Evidence is data under an interpretation. Only interpreted data confirm or disconfirm a principle. Thus, the child's data are not evidence against her initial value until she supplies the appropriate interpretation for the data, and the incorrect initial value blocks the correct interpretation. Access to the correct value depends on the child's registering strings like (2) as contrary to the initial setting. But she cannot do that, since only the initial setting feeds her parser.

Note that the limitations imposed by the grammar are an unintended by-product of the single-value solution. The intent behind the single-value solution is for the child to gain access to the other value via the presentation of contradictory evidence. But there is a condition on access, namely recognition of a string as contradictory input. Access cannot be achieved, because the data do not arrive already interpreted. For discussion of this and related issues, see Valian (1989a).

Further, from a logical point of view, it doesn't matter how many subjectless strings the child hears. They will not *force* a switch to the other value; they cannot *guarantee* change. But that was the intended purpose of the solution to start the child off with the English-like value: to guarantee the correct conclusion, without any involved ratiocination on the child's part.

Misleading input

The fact that the English child is exposed to strings without subjects rules out one way of patching up the single-value solution. We might have been tempted to add an additional assumption, that the child will label all incoming input (or at least everything containing a Verb) as a full grammatical sentence, regardless of what the parser would do on its own. Then when the child heard (2), she would have to call it a sentence, and would be forced to recognize that her grammar was inadequate, because her parser (parasitic on her grammar) would only label it a Verb Phrase, or would block altogether. That would then force the child to switch to the other value.

But such a labeling assumption would wreak havoc with the acquisition of English. English speakers' spoken and written productions include strings without subjects. Such productions include fully grammatical strings like imperatives, as in (4), and also strings which are acceptable, even if not strictly well formed syntactically, such as (5) and (6). Expletives are frequently omitted, as in (5), an example from the *New York Times*, but other pronouns are as well, as seen in (6).

(4) Wash the dishes.
(5) Seems like she always has something twin-related perking.
(6) Want lunch now?

Thus, we cannot have a labeling assumption. It would not only force the child with an English-like target to label (4), (5), and (6) as sentences, but to switch as a consequence to the other, Italian-like, value of the parameter. The assumption would guarantee that Italian was acquired, but only Italian.

There are, then, two reasons why the child's acquisition of the null subject parameter cannot be guaranteed by starting the child off with the value that requires surface subjects. The first is that the child with that value is unable to appreciate the significance of Italian sentences without subjects. Exactly the value the child's parser needs to correctly interpret such strings is unavailable. The second reason is that we cannot force the child to label strings without subjects as sentences, because we would then force children with an English target to take English to be Italian.

Sources of English strings without subjects

Closer analysis of the status of (5) and (6) is necessary in order to determine what sort of challenge such strings pose for the child, and how the child could cope with the challenge. What is the subject in (5) and (6)? If the subject were the unpronounced pronominal that exists in Italian and Spanish, then English would be a null subject language. That cannot be, given the statement of the null subject parameter.

There are two alternatives. One is that the subject is a lexical or pronominal Noun Phrase which does not get pronounced, for pragmatic or discourse reasons which are reasonably orderly and systematic. That makes (5) and (6) ungrammatical (because the omission is not a syntactic process), but fully acceptable and comprehensible. The second possibility is that the Noun Phrase is deleted (or, perhaps, not inserted, in the case of (5)) via a syntactic process. That makes (5) and (6) not just acceptable, but fully grammatical.

The distinction between grammaticality and acceptability is a familiar one, first made by Chomsky (1965), and reflects the fact that speakers can produce and comprehend strings, or fail to produce or comprehend them, for reasons

outside the syntactic structure of those strings. A string may be fully grammatical, but not spoken or understood, as in (7), or not grammatical, but spoken and understood, as could be the case in (5) and (6). See Langendoen and Bever (1973), and Bever, Carroll, and Hurtig (1967) for other examples.

(7) Buffalo buffalo Buffalo buffalo buffalo buffalo Buffalo buffalo[2]

Two factors suggest that (5) and (6) are acceptable but not grammatical: recoverability of deletion, and structure dependence. The "deleted" subject in (6) cannot be unequivocally recovered without contextual information, and recovery of deletion is a criterion for syntactic deletion. In (6), without any context, we probably assume that the subject is "you", but a chef in the kitchen of an executive dining room could be speaking to a server and, giving a nod to the assembled executives, ask about them, "Want lunch now?" In context it is clear who the subject is, and the identification is orderly. But recoverability of syntactic deletion has to hold independent of context. The subject of (4), for example, is recoverable: it has to be "you" if the sentence is an imperative.

The second factor is similar: structure-*in*dependent processes appear to account for the pattern of omissions, but structure-*de*pendent processes are necessary for syntactic omission. For example, the first word of an utterance is especially prone to omissions and reductions, not just of subjects, but of other constituents. Cases range from "Time is it?" (to mean "What time is it?"), to "Lousy car's in the garage again". (As these examples suggest, prosodic factors probably also play a role in the omission or reduction of utterance-initial elements.) The utterance-initial position is a structure-independent position, one that syntactic rules do not refer to.

That the phenomenon is *utterance*-initial rather than *sentence*-initial can be seen by comparing cases where utterance-initial and sentence-initial coincide, with cases where they do not coincide. Thus, while "Lousy car's in the garage again" is acceptable, "I told her lousy car's in the garage again" is not. The same holds for subjects: although they can acceptably be omitted from utterance-initial positions, they cannot be omitted from embedded sentence-initial positions: compare the acceptable "Wants lunch now" (with a nod in the direction of Jane) with the unacceptable "I think wants lunch now". The comparable sentence in Italian is perfectly grammatical.

[2]A paraphrase of (7) may be in order. (7) trades on the three-way ambiguity of "buffalo": there is the city of Buffalo (a Noun serving as an Adjective in our sentence), the animal buffalo (a Noun), and the action buffalo (a Verb meaning to bewilder or confuse). A paraphrase thus is: "NY State bison, that other NY State bison bewilder, themselves befuddle yet other NY State bison". The structure is identical to: "repeated words fiendish psycholinguists manipulate cause comprehension problems". My thanks to Ann Senghas for (7).

If the analysis I favor is correct, then the child's task in acquiring the correct value of the null subject parameter is to label input like (5) and (6) as not fully grammatical, but acceptable, semi-sentences. We would not want the child to label such strings as sentences, but we would want her to allow for the possibility that she will receive some input which is not fully grammatical. If the other analysis is correct, then the child's task is slightly different. The child's task is to accept (5) and (6) as fully grammatical sentences whose subjects were deleted, without taking them as fully grammatical sentences whose subjects are unpronounced pronominals. The child has to end up recognizing that the subjects of (5) and (6) are not null subjects, but subjects which have been deleted either via a discourse process, or an as yet unspecified syntactic process. Either way, the input presents a problem to the child, because it mimicks input from null subject languages. For ease of exposition, I will assume in what follows that the analysis I favor is correct, but similar arguments can be run assuming the other analysis.

The single-value solution to the problem of acquiring the null subject parameter requires the input to be both perfectly grammatical and perfectly transparent. That assumption cannot be met. On the analysis I favor, (5) and (6) are not perfectly grammatical, and (4) is not perfectly transparent. On the other analysis, (4)–(6) are not perfectly transparent.

Only further investigation will determine how general the null subject case is, but there is at least one reason to think that the input will frequently be difficult for the child to sort out. By definition, each value of a parameter represents a linguistically possible outcome. Otherwise the universal would be an absolute universal, rather than a relative universal taking the form of a parameter. Further, each parameter is independent of every other parameter. Otherwise the property being typologized would not be a separate parameter but would be entailed by some other parameter.

Accordingly, it is likely that variation in the expression and use of a parameter *within* a language will be affected by possible variation *across* languages. Speakers will "borrow" expressions from the other value. If there is any variation at all within the expression of a language, which is highly likely given that humans are variable, that variation is likely to reflect and be constrained by linguistically possible alternatives. (See Roeper & Weissenborn, in press, for a similar speculation.) In any event, it is an empirical question how potentially misleading the child's input is.

The Italian-like value: Misleading input and the subset problem

We have not yet examined the possibility of starting the child off with the Italian value, rather than the English value. That is because starting the child

off with the Italian value seems to present the child with the same problem as starting her off with both values. If the child begins with the Italian value, and is exposed to English, all her English evidence will simultaneously confirm both English and Italian. The evidence will not allow her to reject Italian, the larger language. But perhaps there is a way out of the logical difficulty initially described. If so, then either a single-value solution with Italian as the initial value, or a dual-value solution, would be feasible.

Lasnik (1983) has considered how the child who begins with Italian but is exposed to English might reject the Italian alternative. He makes use of Chomsky's (1981) notion of indirect negative evidence. The idea is this: for the child to operate with a particular value of a parameter means that the child expects all the structures associated with that value to be present in the input to which the child is exposed.

In the case of the null subject parameter, it means that the child will expect to hear sentences *with* and sentences *without* surface subjects. When the input provides no sentences without subjects, that constitutes indirect negative evidence. Direct negative evidence would occur if the environment directly informed the child that there were no sentences without surface subjects, but direct negative evidence occurs rarely, if at all. Indirect negative evidence, however, in the form of the absence of sentences, could occur. Thus, the child with the Italian value and an English target would expect to hear sentences without subjects, would fail to hear any, and would change her grammar.

Indirect negative evidence provides an answer to the question of how the child is to reject the larger language, Italian. The child pays attention not just to what she hears, which confirms both languages equally, but to what she does not hear, which only confirms English.

Misleading input

There are, however, at least two problems with the solution indirect negative evidence provides. The first problem is that the solution will not work: the child with an English target hears strings without subjects. Thus, the child with an English target should conclude that English is Italian. For indirect negative evidence to work, the input cannot contain strings that are supposed to be absent, and in the case of the null subject parameter the input does contain such strings, such as (5) and (6).

The subset problem

But even if the input did not present misleading data, indirect negative evidence would not really solve the logical problem as it was initially posed. The child cannot validly *deduce* that her target is not Italian because she

hears no sentences without subjects. She can, taking all the evidence into account, conclude that her target is not Italian, but her conclusion is not fixed by a deterministic, automatic, purely deductive process.[3]

Indirect negative evidence is a notion outside parameter-setting, indeed, outside linguistic principles or language. Indirect negative evidence is an example of the kind of reasoning that parameter-setting was intended to eliminate as a feature of language acquisition. Pure parameter-setting as a model of acquisition cannot legitimately incorporate a notion like indirect negative evidence, because it requires the child to evaluate and weigh evidence. The reasoning of indirect negative evidence is the reasoning of hypothesis-testing and theory construction, not the automatic triggering of parameter-setting. To appeal to indirect negative evidence is already to subvert the picture of acquisition as deterministic and automatic.

Expletives

Are there any other ways to save the single-value solution for the null subject case? We have tried to set it for the English-like value, using positive evidence, and the Italian-like value, using indirect negative evidence, and found that in neither case could we guarantee acquisition of the null subject parameter. But the syntactic option of null subjects is not the only property distinguishing English-like languages from Italian-like languages. Perhaps a parameter-setting explanation could exploit a different feature which distinguishes the two languages, such as expletives. That feature could serve as a telltale, an infallible guide to the correct setting of a parameter. Hyams (1986) has proposed that all children begin acquisition with the Italian-like value of the null subject parameter. The child with an English target must reset the parameter to the value that requires overt surface subjects. The presence of expletives in English could be the telltale allowing the child to reset the parameter.

Expletives duplicate, however, the problem encountered earlier, with respect to the correct interpretation of strings without subjects. The expletive interpretation is linked to the non-null subject value of the parameter. The child's parser cannot supply the correct interpretation of expletives if it is fed

[3]There is a fully automatic and deterministic way to incorporate indirect negative evidence, but at the cost of psychological realism. One could have the child wait long enough, or encounter enough input, so that, for all parameters, there would be no question but that the sample was sufficient. The child's device could have the instruction: if, after ten years (or, if, after ten million utterances), no examples of x have been noted, conclude that there are no examples of x. That would imply, however, that the child would be in limbo for a long period of time, or a large number of utterances, for all parameter settings for which indirect negative evidence was required. In addition to being psychologically unrealistic, such implementations of indirect negative evidence would still not qualify as linguistic.

solely by the Italian-like value of the null subject parameter. The null subject value will supply, at best, a *referential* interpretation for the expletive pronouns the child hears. When the child hears an utterance like "it's raining", she will try to supply a referential interpretation to *it*. She might succeed in establishing reference (by taking *it* to refer to a cloud or the surroundings), or she might fail. But if the expletive interpretation is available only as an entrained consequence of the non-null setting of the parameter, the child will not be able to entertain it. Thus, even if the child fails in assigning a referential interpretation to expletive *it*, no other interpretation will be available.[4]

Acquisition data

Within the single-value solution there appears to be no way of guaranteeing the acquisition of the null subject parameter. Whichever single value the child begins with creates an insoluble problem. Yet, the child does appear to learn which value is the correct value, and very quickly.

From the beginning of combinatorial speech, American and Italian children look very different in their production of subjects and other sentence elements. Valian (1989b, 1990) compared cross-sectional data from 21 American children with longitudinal data from 5 Italian children. Very young American children (n = 5, average age 2;0, average MLU (mean length of utterance) 1.8) produce many more subjects (69%) in non-imitative utterances containing verbs than Italian children of a comparable age do (30%). They also produce many more pronouns as subjects (75% vs. 35%), and produce more Modals. American children also increase their production of subjects. The second group of American subjects (n = 5, average age 2;5, average MLU 2.49) produced subjects 89% of the time, and the third group (n = 8, average age 2;5, average MLU 3.39) produced subjects 93% of the time. American children produce very few expletives, but that is so even when they are producing subjects 90% of the time. The children's use (or non-use) of expletives is not diagnostic.

Taken at face value, the data suggest that American children know, from the beginning of combinatorial speech, that subjects are required in English. Their competence is not deficient, but their performance is. (See Bloom, 1989, for the same conclusion, on different grounds.)

[4]Other developments in the child's grammar, such as an understanding of structures involving the verb "seem", could force recognition that the subject of "seem", when a *that*-complement follows, cannot be referential. That possibility, however, is beyond the scope of the present inquiry (see Valian, 1989a).

What correlates well with American children's use of subjects is how frequently they use verbs (Valian, 1989b, 1990): the more frequently children use verbs, the more frequently they provide subjects for those verbs. Even when the child's age and MLU are partialled out, verb usage and subject usage are highly correlated ($r = .78, p < .001$; there is no correlation between subject use and Modal use, once age and MLU are partialled out). The two measures are independent, in that children could use more verbs without simultaneously increasing the proportion of the time that they supply subjects for verbs, and vice versa. Yet in acquisition verb usage and subject usage are yoked for American children.

We can interpret the yoking of verb and subject usage as evidence that American children know that verbs require subjects. Since using a verb requires using a subject, the children restrict their usage of verbs until they can handle the increased processing load entailed by producing both a verb and a subject. An additional factor that may account for American children's less than perfect production of subjects is that they are sensitive to the fact that omission of subjects in utterance-initial position is acceptable.

Nevertheless, our data should be interpreted with caution. It is difficult to separate competence and performance factors. Our data may mean only that both American and Italian children are sensitive to frequency of usage and distributional regularities, and that they attempt to match in their output the patterns they hear in their input. The data cannot be taken as definitive evidence that both the American and Italian children acquire the correct value of the null subject parameter at the onset of syntax acquisition. It may well be that the children of neither language acquire the knowledge represented by the appropriate value of the null subject parameter until some time after their speech looks impeccable. Further observational and experimental data will be necessary to establish just when children correctly set the null subject parameter.

But, if there *is* a null subject parameter, and if children *do* acquire it, then the data suggest that the acquisition begins very early in development, minimally by matching the input patterns. There has to be a way for the child to learn the null subject parameter, other than the single-value solution.

A dual-value solution within hypothesis-testing

A dual-value solution and its mechanisms

Availability of both values to the parser

The solution I propose has two principal parts. The first part is the provision of both values of the null subject parameter to the child's parser, rather than either value alone. By supplying the parser with both values of the parameter at once, we solve the problem of the unavailability of the other interpretation. We answer the question of how the child knows that the Italian sentence could be a sentence, and how the child knows that the expletive subject could be an expletive, by making those interpretations available to the child's parser. Berwick and Weinberg (1984) have previously adopted a multi-value solution to account for how the child acquires a different parameter, that of head direction, but outside a hypothesis-testing model.

Procedures to evaluate data

The second part of the solution is the provision of hypothesis-testing procedures. In supplying the child with both values of the parameter, we solve one problem but create a new one – one which does not have a deterministic, purely deductive solution.[5] The child now has two interpretations which she must choose between. When she hears a string without a subject, for example, she has to decide whether it is a fully grammatical sentence of Italian, or an acceptable semi-sentence of English. It could be either. Similarly, when the child hears "it" in subject position, she must decide whether that "it" is expletive or referential. To make such a decision, the child has to evaluate and weigh evidence. The child has to look for a variety of clues in the language input she receives in order to decide where, on balance, the preponderance of evidence lies.

That sort of process, like indirect negative evidence, is typical of theory confirmation in science, and quite different from the automatic processes envisioned in parameter-setting. In opting for the solution of weighing and evaluating evidence, we do not provide a logical solution to the logical problem of how to avoid choosing the larger language. There is *no* logical solution to that problem, other than prohibiting the child from ever being in a position to choose the larger language, which is the single-value solution criticized above. Thus, the solution proposed here is a psychological, rather than a

[5] "Nondeterministic" should not be interpreted to mean nonmechanistic. Nondeterministic only means that a given outcome cannot be guaranteed. Probabilistic models, for example, are typically nondeterministic but mechanistic.

logical, solution. It is psychological in that it requires us to beef up the learning mechanism. That mechanism will search for clues which will allow it to distinguish English from Italian. (I confine myself here to English and Italian, but a successful model must account for *every* language the child acquires.)

Searching for clues: Distributional analysis and its limitations

A wealth of data suggest that children are adept at distributional analysis: they detect and analyze the patterns and regularities in their input. The data cited above on American and Italian children's production of subjects (Valian, 1989b, 1990) support that conclusion for subjects, as, more generally, do data on children's knowledge of syntactic categories, subcategories, and inflections (see, for example, Gathercole, 1985; Gordon, 1988; Maratsos, 1982; Slobin, 1982; Valian, 1986).[6]

Thus, if the difference between English and Italian in the status of subjects has distributional reflexes in the speech of English and Italian speakers, we may expect children to be able to detect and analyze those differences in order to infer the correct value of the null subject parameter. As we have seen, there is no all-or-nothing difference, because speakers of both languages produce strings without subjects. (Further, although expletives only exist in English, many expletive pronouns could be interpreted referentially.)

As we have also seen, however, there *is* a pattern to subject omissions in English: they are restricted to utterance-initial position. That restriction is not present in Italian speakers' speech, since null subjects are syntactically allowed in embedded as well as matrix tensed clauses in Italian. In English the phenomenon is a function of discourse and prosody, while in Italian it is a function of syntax.[7]

What will allow the child to draw the correct inference about English? She can begin by establishing the facts about subject absence in English, a procedure which would involve three components. (1) She needs to identify the utterance-initial position as a magnet for deletion and reduction effects. She receives ample evidence for that in the input she receives, since utterance-initial elements are frequently reduced or deleted. (2) However, since utter-

[6]The failure of taxonomic grammar testifies to the inadequacy of brute force distributional analysis, where no linguistic universals are assumed. The discussion in the text assumes that linguistic universals constrain the child's hypothesis space so that the child only entertains hypotheses couched in the theoretical vocabulary of linguistic universals, and only tests hypotheses allowed by the universals.

[7]To be precise, the *option* of null subjects in Italian is syntactic; the *exercise* of the option is determined by discourse and other factors.

ance-initial and sentence-initial positions so often coincide, the child will also have to determine that the magnet is *utterance*-initial position rather than *sentence*-initial position. A comparison between tensed matrix and tensed embedded clauses will yield that information. (3) The child needs to classify the utterance-initial position as a structure-independent position which is thereby subject to discourse and prosodic effects, rather than syntactic effects. Since syntactic rules are by definition structure-dependent, that classification should be automatic.

The first component in the above procedure is unproblematic, since the kind of observation the child needs to make is similar in kind to others she makes regarding verb endings, ordering of elements within a phrase, allowable substitutions, and so on. The third component is also unproblematic, as long as the child knows what a syntactic phenomenon is. The doubtful component is the comparison between matrix and embedded clauses. We have no evidence that children make such a comparison. However, American children around MLU 2.5 do begin producing embedded clauses, and those clauses always have subjects (Valian, 1989b, 1990). Thus, while unsubstantiated, the second component is plausible.

The child's observations about the distribution of subjects gives her probable cause to regard English as syntactically requiring surface subjects. Her observations do not mandate such a conclusion, but they give more support to that conclusion than the conclusion that her language has null subjects. American children's production of expletives is so infrequent that it is impossible to know, at present, whether expletives play an important role in helping the child establish the nature of her language.

The child presented with Italian has equal probable cause to regard Italian as a null subject language. Like the American child, the Italian child will be attempting to determine whether strings without subjects are perfectly grammatical, or only acceptable. If they are only acceptable, then the distribution in speech should be skewed rather than general. But in Italian speech the phenomenon is perfectly general: all types of tensed clauses, embedded and matrix, have null subjects. That does not mean that subjects are absent with the same frequency in every syntactic context, but that null subjects appear in every syntactic context. Again, the child's conclusion is not mandated by the evidence. But the conclusion is the more highly supported of the two alternatives.

The comparison process within a dual-value solution requires that the child receive variegated input, and that she have a large enough sample of it to make a probable-cause decision. How variegated the child's input is with respect to the null subject parameter, and how large a sample of each variety there is, are important questions in further research on the comparison

model. The single-value solution in principle allows the child to set a parameter on the basis of a single datum (indeed, that is part of its appeal). But that would only be feasible if the input were uniform, so that the single datum accurately represented the entire body of input. Depending on how variegated the input is, the more of it the child needs to sample, on any theory.

Roeper and Weissenborn (in press) present an interesting alternative designed to do away with the comparison process. They propose as a general principle that "parametric decisions have no local exceptions in subordinate clauses". In other words, subordinate clauses don't lie. (This is an extension of ideas in Roeper, 1973, based on work by Emonds, 1970.) Exceptions to the correct setting of the parameter, such as the omission of subjects in tensed clauses, will only occur in matrix clauses, never in embedded clauses. They propose that the telltale (or "unique trigger", in their words) for the null subject parameter is the obligatory or optional presence of subjects in tensed embedded clauses. The child uses the telltale to set the parameter, and then generalizes that to matrix clauses unless special circumstances allow null subjects there.

But a comparison process within a dual-value solution still seems necessary. Without it, how can the child appreciate the significance of the fact that she hears no null subjects in embedded clauses? That absence could be an accident of sampling or the result of a low base frequency of null subject usage. The best way for the American child to appreciate the import of absence of null subjects in embedded clauses is by comparing matrix clauses, where subjects are occasionally absent, with embedded clauses, where they never are.

From the differential frequency in American and Italian children's usage of subjects, we know that American children do pay attention to matrix clauses. If American children were insensitive to the input frequency of subjects in matrix clauses, their subject usage would duplicate that of Italian children's, which it does not. That accordingly lends plausibility to the idea that American children compare matrix and subordinate clauses in working out the pattern of English.

As the foregoing discussion suggests, the acquisition of the null subject parameter poses a rich set of empirical and theoretical questions. We need to establish the facts of acquisition in different language communities, the facts about input, and the influence of different kinds of input. We need to determine whether children's omission of subjects represents competence limitations, performance limitations, or sensitivity to acceptability factors. Our theoretical proposals must take the facts of acquisition into account, must be realized in a logically coherent and psychologically plausible mechanism, and must make empirical predictions about acquisition.

Conclusion

Neither single-value solution to how the child acquires the null subject parameter will work. Providing the child with the English-like value alone puts unacceptable limitations on the power of her parser to interpret contradictory data, and is not proof against the misleading input the child is exposed to. Providing the child with the Italian-like value alone is also not proof against misleading data. There is no fully automatic and deductive solution to the problem of how the child acquires the appropriate value of the null subject parameter.

The alternative is a dual-value solution. The two basic features of the solution proposed here are likely to be correct. The provision of both values appears necessary because it solves the problem of where the different interpretations of the input can come from. The provision of hypothesis-testing procedures appears necessary because it gives the child a way of weighing and evaluating her mixed input. The particulars of the solution, such as the comparison of subject absence in different positions, may well be incorrect. At present, we know too little about the child's acquisition of the null subject parameter to do more than propose logically possible, plausible mechanisms.

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