
The Second-Language Learner in the Context of the Study of Language Acquisition

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How can the study of second language learners illuminate the fundamental issues of development? That is the central concern of this conference, one whose many-faceted responses will be slowly revealed through the papers presented. I would like to address specifically the problem of grammar in the acquisition of a second language after the primary language has been established. The problem can be put into the perspective presented by Lila Gleitman in the 10th Anniversary special issue of the journal *Cognition* (Gleitman, 1981). Essentially, Gleitman argues for the informative value of three different kinds of variations in investigating the differential roles of maturation and environment in determining language acquisition. First, there are variations in the quality of the language sample available to the child. These include the traditional variables used in the investigation of motherese. Second, there are variations in the interpretive information from the learner's perspective (for example, how does a blind child interpret the verb *see*?) And third, there are variations in the learner's endowment, specifically the ability to represent language. Although everyone would have their own pet variations to add to this list (my own being cross-linguistic variations, more to be said on this later), the framework is very useful in discussing where the study of second language acquisition fits in with respect to major issues in language acquisition.

With regard to the first point, there are probably more variations in linguistic environments for second language (L2) acquisition than for first language (L1) acquisition. Most L2 studies are concerned with "naturalistic" situations, that is, cases where the learners are not formally tutored in the second language. These studies bear the closest resemblance to the L1 input situation, although the source of input can vary from adults to peers. Then, there are cases where

children and adults learn a second language through formally tutored classes. Such variations in the types of linguistic input to L2 learners can provide a rich source of data for assessing the role of the input. It is interesting that most L2 studies have been concerned with naturalistic acquisition, because tutored settings provide actually an ideal situation in which input data can be recorded accurately and experimentally manipulated.

Gleitman's second point, variations in interpretive information, can be well addressed by the study of L2 acquisition. A fact too obvious to dwell on at any length is that L2 learners are more cognitively advanced than the L1 learner, so that the usual confoundings of language and cognitive development can be separated out. By looking at the correlations between variations in the course of acquisition of L1 and L2 learners on the one hand and variations in their differences in interpretive capacities on the other, we can hypothesize what factors observed in L1 learners are "artifacts" of cognitive development. Likewise, similarities between L1 and L2 acquisition despite the vast cognitive differences would be strong evidence for language-specific processes. Leaving aside the problem of language transfer for the moment, one might even argue that L2 learners can reveal more about linguistic biases inherent in language acquisition than L1 learners (Gass & Ard, 1980). This brings us to the third point raised by Gleitman, on variations of the endowment of the learner.

Perhaps, as Gleitman puts it, "the early 'conceptual language' stage is not traversed during learning by these older children for they are capable of the mature representations of linguistic data" (p. 111). In addition to whether the first hypotheses by the L2 learner are represented linguistically rather than conceptually, there is much to be learned from language transfer. In the 1950s and 1960s, during the heyday of contrastive linguistics, language transfer was seen as evidence for the S-R view of language acquisition (see Hakuta & Cancino, 1977, for a historical review). However, more recently, transfer is seen as evidence for the learner's working hypotheses concerning the nature of the target language. By studying what types of linguistic rules transfer from the native language to the second language, we can garner a glimpse of the entrenchment of the native language in the child. The existence of transfer attests to the psychological reality of the linguistic rules in question. Another issue raised with regard to endowment in second language learners is that of the critical period. Does the capacity to represent language disappear with age (Lenneberg, 1967; Penfield & Roberts, 1959)? We can look at L2 learners varying in the age at which they begin acquisition.

First I would like to state the conclusions that can be drawn from the literature, and then provide the relevant evidence. Generally, it is not true that a second language learner, regardless of his-her age of learning, will perfectly mimic the developmental patterns displayed by a child learning the native language. In fact, more similarities are to be found between an adult and a 5-year-old second language learner than between a 5-year-old and a first language learner. However, there are also a large number of parallels between L1 and L2

acquisition that can be observed. Specifically, first, there are certain striking facts about L2 acquisition that can be best understood when cognitive-developmental factors are taken into account. That is to say, some of the differences between L1 and L2 acquisition are due to the fact that second language learners are cognitively more mature than their L1 counterparts. Second, there are also striking similarities between L1 and L2 learners. They reveal variation that can be attributed to the bureaucratic structure of the beast that all language learners, whether L1 or L2, must master. Regardless of the learner's endowment, certain structures are more difficult than others. This may be due to general cognitive factors, such as processing constraints imposed by configurational structure or memory, or it may be due to more abstract, language-specific factors. Third, the extent to which a human becomes entrenched in the native language can be seen in the effects of transfer from the native language to the second language. There is good evidence for the native language of the learner biasing L2 acquisition in different sorts of ways. And finally, there is good evidence to suggest that some time after puberty is a period when the capacity to acquire a second language deteriorates.

In support of these conclusions, I do not intend to review all of the available evidence. Rather, the discussion is intended to expose the newcomer to second language acquisition to the kinds of data that can be expected from such research. More extensive reviews of the literature can be found in McLaughlin (1976), Hakuta and Cancino (1977), Hatch (1978), Schumann and Stenson (1975), Oller and Richards (1973). The first section addresses the question of the effects of cognitive maturity. The second section reviews the effects of linguistic structure from the viewpoint of similarities between first and second language acquisition. The third section reviews evidence for transfer from the native language. The fourth section looks at the question of age effects. The fifth section proposes a framework for research from the viewpoint of language universals.

EFFECTS OF COGNITIVE MATURITY

A well-documented period in first language acquisition is the so-called two-word stage or Stage I speech in Brown's (1973) outline. It appears that a relatively small number of semantic relations characterize a large proportion of the two-word utterances that can be found in children during this period of development. Frequently found are relations such as agent-action, agent-object, attributive-entirety, and so forth. Brown pointed to the correspondence between the semantic roles expressed during this period and the sensorimotor schemes outlined independently by Piaget, the conclusion being that early Stage I speech is constrained by the cognitive capacities of the child. Conspicuously missing are semantic relations such as if-then conditionals, sophisticated temporal and aspectual relations, and logical connectives. The obvious needed to be done. Lightbown (1977) looked at the acquisition of French by two 6-year-old children whose

native language was English. She submitted the children's language in their initial stages of learning to the same kinds of analyses conducted for L1 learners. Essentially, Lightbown found that these children expressed all kinds of semantic relations from the very beginning. There was not the kind of orderly progression found with first language learners. She found relations expressed such as manner, intensifiers, and conjunctions. In short, L2 children, even when relatively young, do not seem to go through identical stages of development as L1 children.

It has been observed (Hakuta, 1975; Tiphine, personal communication) that L2 children use sentence coordination from quite early on in their development. In L1 children, this structure is relatively late in emerging (Brown, 1973; Hakuta, de Villiers, & Tager-Flusberg, 1982; Tager-Flusbert, de Villiers, & Hakuta, 1982), especially when used in the contexts corresponding to logical connectives (Beilin, 1976). An illustration of the early use of conjunctions appears in Table 3.1. The data are from a five-year-old Japanese girl, named Uguisu, learning English (Hakuta, 1975). Table 3.1 is frequency distribution of various conjunctions observed in her speech over time. The monthly samples were made equivalent in length at 200 utterances each. As can be seen, Uguisu used conjunctions from quite early on, in the case of *and* and *because*, from the very first sample. The usage was in most instances appropriate from the target language point of view.

Aside from the structure of their native language, second language learners most likely know certain facts about the functions of language, such as that it is used for conversations, that conversations involve turn taking, and so forth

TABLE 3.1
Distribution of Coordinating Conjunctions in
Uguisu's Speech Samples. Each Monthly
Sampling Period Contains 200 Utterances.

<i>Month</i>	<i>and</i>	<i>but</i>	<i>because</i>	<i>so</i>	<i>if</i>
1*	3	—	2	—	—
2	8	—	3	—	—
3	5	1	4	—	—
4	5	4	11	8	—
5	20	4	—	4	11
6	4	1	10	2	3
7	5	6	5	4	1
8	7	2	8	4	5
9	7	5	12	—	3
10	6	4	2	3	2

Note: *represents the first month when Uguisu started producing high frequency of utterances, which was 6 months after her initial exposure to English.

(Source: Hakuta, 1975)

(Keller-Cohen, 1979). This knowledge about the global properties of language, along with a more developed memory span for remembering whole sentences, has been hypothesized to account for the large number of prefabricated patterns observed commonly in second language learners (Hakuta, 1974b; Huang, 1971; Wong-Fillmore, 1976). Prefabricated patterns (or formulaic utterances, as Wong-Fillmore calls them) are characterized by lack of internal structure. It appears that second language learners memorize entire utterances without knowledge of underlying structure. This is not unheard of in L1 acquisition (Clark, 1974), but its preponderance in L2 acquisition is striking.

Huang (1971) studied a 5-year-old Taiwanese boy, Paul, learning English. He reports an excellent observation of Paul's first utterance in English:

On February 3, only two days after the beginning of Paul's nursery school experience, the investigator heard him (Paul) muttering: *Get out of here*. On the way home from school the next morning, he asked me about the meaning of that utterance. When the investigator, instead of telling him the meaning, asked him to relate what had happened, he said that a boy who wanted to get away had said it. The Taiwanese translation he rendered means *Don't be-stay here*, which is very close to *Get out of here* in meaning. An incident in the nursery school the next day proved Paul's capacity not only to understand this utterance but to use it appropriately as well.

(Paul was on a tricycle while Michele holding on to the handle bar, kept on bothering him. Obviously, he wanted her to leave him alone.)

Paul: Get out of here.

(Michele walked away, somewhat embarrassed.) (pp. 12-13)

Wong-Fillmore (1976), in her study of five Spanish-speaking children learning English, reported that over half of the children's utterances contained prefabricated forms. She argued that through the gradual analysis of such forms, later linguistic structure developed: "All of the constituents of the formula become freed from the original construction, [and] what the learner has left is an abstract structure consisting of a pattern or rule by which he can construct like utterances" (p. 645).

It is not clear, however, whether such abstract structure can emerge through brute force. That is the traditional problem associated with the emergence of grammar. Nevertheless, what is clear is that second language learners have been observed to begin with whole sentences, and that if the same form is followed over time, the emergence of structure can be observed. A striking example of this can be illustrated in Uguisu's use of embedded "how" questions (Hakuta, 1976). During the third month of observation, Uguisu made the following utterances:

- I know how to do it.
- I know how to do read it this.

- I know how to read it this.
- I know how to make.
- I know how to draw it cat.
- I know how to draw (it) butterfly.
- I know how to draw it boy.

These can be characterized by a prefabricated pattern, *I know how to + VP*. This apparently correct form changed over time into forms such as the following, which were observed in her 15th month.

- First I gotta write it and show you how do you spell 'Debra'.
- I know how do you spell Vino.
- We only know how do you make it like that.
- I know how do you write this.

Figure 3.1 plots the proportion of forms using "how to" over the total number of how-questions, showing that the decline in performance is a gradual one. I have argued elsewhere that this change is in fact reflective of her other uses of indirect wh- questions, where forms were first used with subject-aux inversion (Hakuta, 1976). At any rate, prefabricated patterns are quite predominant in early second

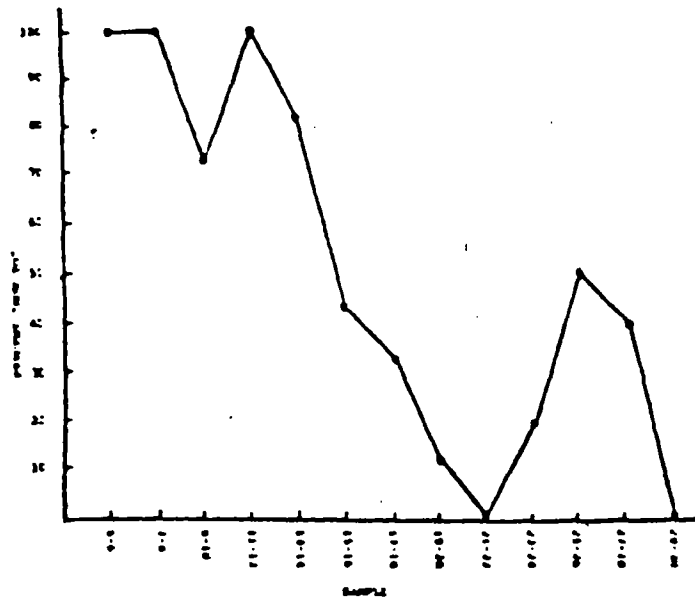


Fig. 3.1. Proportion of correct how-embeddings (how to) over total how-embeddings. Biweekly samples are paired. Source: Hakuta, 1976.

language speech, but it is clear that gradually they are analyzed into more flexible form. Although prefabricated patterns may be a good place to start, and may provide the linguistic data upon which the language acquisition mechanism might work, the problem of what the analytic process consists of is a mystery, just as it is in first language acquisition.

Perhaps a longer processing span would imply that the second language learner would not show effects of length (such as would be reflected in M. L. U. upper bounds). One indication of this can be found in Uguisu's use of the English possessive inflection 's. Cazden (1968) reported differential use of the possessive in Adam, Eve, and Sarah, depending on whether they were used in noun-noun contexts (e.g., Mom's pie) or in elliptic contexts (e.g., Mom's). For all three children, there was a large difference in the percentage to which the morpheme was supplied in obligatory context, with greater proportion being supplied in elliptic contexts than in noun-noun. Uguisu, on the other hand, performed equally in both contexts (see Hakuta, 1976). Because the elliptic context requires only one noun, while the noun-noun context two, it is possible that this difference reflects the larger processing space available to second language learners. In turn, this provides an explanation for the otherwise perplexing differential use in L1 children. First language learners, having a more limited processing span, may omit the morpheme when they have to process two nouns for the non-elliptic form, but in the elliptic form may find it possible to "fit in" the morpheme because there is only one noun to process. The phenomenon found in first language learners, then, may be a simple performance factor.

Finally, with regard to the manifestations of cognitive maturity, it is worth pointing to vocabulary development as an under-investigated issue. All indications are that lexical development in second language learners is extremely rapid. Gillis (1975), in her study of 3 seven-year-old Japanese children learning English, reported PPVT (Peabody Picture Vocabulary Test) increases in mental score equivalents of 6 months to 1 year in a period of just 1 month. Snow and Hoefnagel-Hohle (1978) report that age is positively correlated with vocabulary development in American children learning Dutch, suggesting that older learners, with more cognitive capacity, pick up vocabulary faster. What is needed is a study of the organization of the lexicon in bilingual children, a promising area for future investigation.

EFFECTS OF LINGUISTIC STRUCTURE: L1 AND L2 SIMILARITIES

An active research tradition in applied linguistics is one commonly called "error analysis" (Corder, 1971; Nemser, 1971; Oller & Richards, 1973; Schumann & Stenson, 1975; Selinker, 1972; Svartvik, 1973). Typically, error analysis looks at the kinds of systematic deviations from the target language grammar observed

in language learners, and the errors are classified with respect to their hypothesized source. Usual categories for classification are *transfer*, *simplification*, and *overgeneralization*. Transfer errors refer to those errors whose source is clearly identifiable as the native language grammar. For example, a native speaker of Spanish saying "He no have happiness" is considered to have constructed an English utterance based on his native language. Simplification usually refers to errors of omission, particularly inflections and auxiliary verbs. The utterance "Reagan always sleep" is considered an example of omission, where the third person singular indicative marker is missing. Overgeneralization errors are most striking, and usually involve the learner "ironing out" irregularities common to language. For example, "Cooney fighted poorly" shows overgeneralization of the regular past tense marker *-ed* to irregular instances. Simplification and overgeneralization are errors well known to the student of language acquisition.

Studies employing error analysis typically show a relatively small number of transfer errors, with simplification being the most frequent (Cohen, 1975; Dulay & Burt, 1973; Duskova, 1969; Politzer & Ramirez, 1973; Selinker, Swain, & Dumas, 1975). For example, Dulay and Burt (1974a) looked at the errors produced by 179 Spanish-speaking children learning English. Out of 513 errors that they considered, 5% were classified as interference, whereas 87% were either simplification or overgeneralization errors. However, the classificatory system differs somewhat from study to study, and it is difficult to know how to interpret the results (Hakuta & Cancino, 1977). It is not a simple matter to classify errors. Japanese does not have articles, so should the omission of errors by a Japanese child learning English be considered an interference error or a simplification error? Also, it is not clear that the different types of errors are comparable, since their opportunities for occurrence are uncontrolled for. These studies in error analysis, however, do suggest commonalities between first and second language learners even when error proportion are left aside. Similar kinds of errors can be found in both kind of learners and across second language learners of different language backgrounds.

With regard to specific structures, there is some indication of similarities. Ervin-Tripp (1974) reports a study in which she looked at the comprehension of French passives in American children learning French. She found systematic misinterpretation of passives similar to those reported for French L1 children by Sinclair-de Zwart (1973). Interestingly enough, the children who misinterpreted the passives were at the same time correctly interpreting passives in English. Gass and Ard (1980) report a study of English relative clause comprehension by adult second language learners from different native language backgrounds. Their results (though not their interpretation of the data) are similar to those obtained for the same structures in English L1 children (for reviews of the English L1 literature, see de Villiers, Tager-Flusbert, Hakuta, & Cohen, 1979; Hakuta, 1981). Finally, D'Anglejan and Tucker (1975) administered to adult L2 learners English complementizer structures similar to those used by Carol Chomsky (1969) for older L1 children, and obtained similar results. The tenta-

tive generalization emerging from these three studies seems to be that at least when comprehension procedures are employed to investigate particular syntactic structures, L2 learners perform similarly to L1 learners.

Ever since Brown's (1973) report on the order of acquisition of "grammatical morphemes" appeared, researchers in second language acquisition have concerned themselves with whether the same order can be observed in second language learners (Cancino, 1976; Dulay & Burt, 1973, 1974b; Gillis, 1975; Hakuta, 1974a, 1976; Bailey, Madden, & Krashen, 1974; Larsen-Freeman, 1976; Rosansky, 1976). The answer is relatively straightforward: it is not. However, there has emerged a striking similarity in order of acquisition across second language learners, regardless of their native language. To be sure, there are influences of the native language (to be discussed in the next section), but the differences seem to be overshadowed by the similarities. This is taken as evidence that the native language exerts minimal influence on the order of acquisition of grammatical morphemes (see Hakuta & Cancino, 1977). The inference from here to the conclusion that first and second language acquisitions are similar is a somewhat difficult one, although it is one commonly made. On the one hand, there is no reason to expect, even if the two processes were the same, that the linguistic product would be the same. On the other hand, without some explanation for the differences, one is left skeptical. Compounding this problem is the commonly held misconception that "cognition equals semantics." For example, Dulay and Burt (1974b), in explaining the difference found in the order in first and second language learners, state: "It seems intuitive that children who are acquiring their first language have to deal with both semantic and syntactic information. However, six, seven, and eight-year old children learning a second language need not struggle with semantic concepts they already acquired, such as concepts of immediate past, possession, or progressive action" (p. 74).

The problem with this reasoning, as Schlesinger (1974) points out, is that cognition does not equal the semantics of a language. If they were the same, there would have to be no distinction between the two. The best demonstration of this complex relationship is through the fact that the cognitive categories from which languages draw are not uniform across language. For example, although many languages observe the distinction between alienable and inalienable possessions, English does not. Gender is another cognitive category that is expressed to widely varying degrees in different languages. Although cognitive development may be a pacesetter for cognitive categories available to the learner, the semantics of each particular language (one aspect of the formal complexity of the language) is often specific to that language (Slobin, 1973). As I argue later, the semantic distinction drawn in English between definite and indefinite articles presents precisely such a stumbling block for learners from languages that do not draw upon this distinction.

One explanation for the morpheme ordering has been provided by Larsen-Freeman (1976), who suggests frequency (although frequency itself should be explained). Larsen-Freeman correlated the L2 orderings with the frequencies

reported by Brown for the mothers of Adam, Eve, and Sarah. Although Brown found no correlation between maternal frequency and the order of acquisition for the children, Larsen-Freeman found rank order correlations of roughly .80 (depending on the study). Should we accept this conclusion, that L2 learners are sensitive to frequency whereas L1 learners are not, at least for closed class items, what are we to conclude about the similarities and differences? Gleitman (1981) suggests that L1 children can be influenced by differential use of closed class items in maternal input. Perhaps this would force a reexamination of the issue of frequency in L1 acquisition as well, as a "modified frequency" hypothesis.

EFFECTS OF LINGUISTIC STRUCTURE: NATIVE LANGUAGE TRANSFER

Just as language contact in society was seen as a reliable indicator of the dynamic interaction between cultures by the great sociolinguist Weinreich (1953), the interplay of the two linguistic systems in the individual can be seen as reliable indicators of interplay between mental structures. This effect is best seen in language transfer. What better indicator is there for the psychological reality of a linguistic structure than the fact that it can transfer to another language in the course of L2 acquisition?

A constant thorn in the side of those who want to argue for the similarity in the order of acquisition of grammatical morphemes is the English article system. As mentioned above, children learning English with Japanese (Hakuta, 1976) and Korean (Fathman, 1975; Kang, 1982) as their native language (neither of which has an article system) had difficulty in learning the English article system. This compares, for example, to Frauenfelder's (1974) study of English-speaking children in a French immersion program in Canada, in which he found that although the children made many errors in gender on articles, they never confused the definite-indefinite contrast. Notice how this exemplifies the distinction between semantic development and cognitive development. It certainly cannot be that the Japanese and Korean children were unable to conceptualize the difference between definite and indefinite reference. Rather, it was that the distinction was not marked in the semantic system of their native language. It appears that the semantic structure of the native language guides the formulation of specific hypotheses about the target language, not the cognitive system.

Negation has been investigated by a number of researchers in both children and adults (Adams, 1974; Butterworth, 1972; Cazden, Cancino, Rosansky, & Schumann, 1975; Wong-Fillmore, 1976). The general finding seems to be that native speakers of Spanish have a characteristic stage of preverbal *no*, such as *Carolina no go to play*. This structure is seen as deriving from the Spanish structure, where in fact a morpheme of very similar sound as the English form is used. Both children and adults use such structures in their early stages of acquir-

ing English. Recently, Herlinda Cancino and I completed a large study of 59 adult speakers of Spanish, all of whom had arrived in the United States after adolescence. One of the structures we investigated was negation. In an imitation task, we asked subjects to repeat sentences where the third person singular negative auxiliary was required (e.g., "The man does not like cheese"). Responses were scored as follows: 1 point for *no* + *Verb* responses; 2 points for *not* + *Verb* responses; 3 points for *don't* + *Verb* responses; and 4 points for *doesn't* + *Verb* responses. They corresponded to the rough order of development in the case studies. Figure 3.2 shows the scatterplot of the mean response score against an independent measure of grammatical ability based on ratings and a vocabulary test. The systematicity in their development is remarkable, despite the large range of variation with respect to the subjects' length of residence in the United States and educational status. These findings seem to support the conclusion that the first hypothesis the second language learner entertains is that "this language is mine unless proven otherwise."

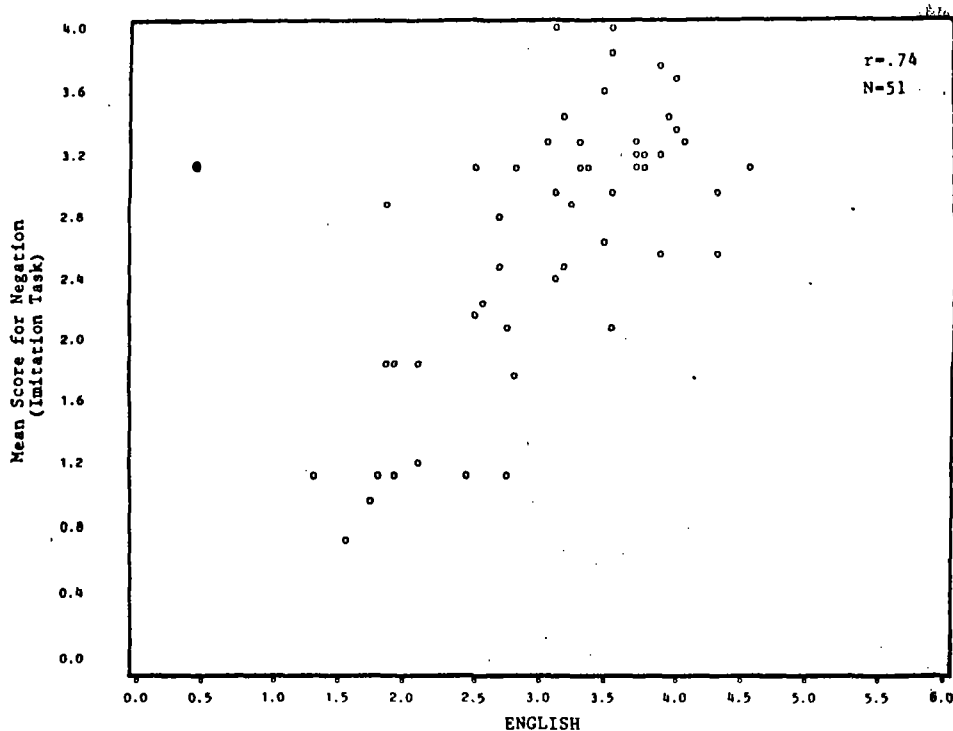


Fig. 3.2. Relationship between mean negation score on imitation task and global measure of English fluency in adult Puerto Ricans learning English.

Lest we mistakenly conclude that all language transfer occurs during the initial phases of L2 acquisition, two specific examples indicating otherwise will be mentioned. The first case involves Uguisu's use of English reflexives (reported in Hakuta, 1976). Some time between the 5th and 6th month after she started speaking English, Uguisu began using reflexives in utterances such as *You have to do self, because remember I do self?* (meaning *You have to do it by yourself, because remember I did it by myself?*) Although such use of the reflexive has not been reported (to my knowledge) for L1 learners, it is certainly something that might be expected. Around the 10th month, she began placing a pronoun in front of *self*, but in addition, she began using the English preposition *with*, resulting in utterances such as *They have to do it with theirselves*, and *I can make toast with myself*. In Japanese, the instrumental preposition is used with reflexive pronouns, and Uguisu apparently came to put the two together, resulting in the transfer error. What a clever child. In her native language knowledge, reflexivity was paired with the instrumental case, presumably at the semantic level.

The other case involves a Spanish-speaking five-year-old girl, named Marta (Cancino, 1976). Marta began using the possessive in contexts determined to require 's using the Spanish-derived form and word order *de*, as in *book de Marta*. Notice that the order, possessed-possessor, reverses the usual English order. Then, she reversed the nouns, but omitted the 's, as in *Marta book*. Now, her forms were just like one would find in an L1 learner. Four samples later, she picked up on the English preposition *of*, as in *frog of Freddie*, and for two samples she used both this form and the earlier form in apparently free variation. Shortly following this period, she gradually began supplying the 's in obligatory contexts. Essentially, there were two levels at which language transfer occurred, one at a gross level of actually using the native language form, then a more sophisticated transfer once the relevant English form was acquired.

Another error of potential interest in inferring the organization of the native language occurs when the native language and the target language differ with respect to the form class representing specific concepts. One example of this can be seen in Uguisu's use of the word *mistake* in English (Hakuta, 1976). In Japanese, it is a verb, whereas in English, it is commonly a noun. Uguisu, until the last few samples, used *mistake* as a verb, resulting in utterances such as *Not there, I mustake; Don't give me more because you're mustaking; I just mustake, and I just skipped*. Such errors give an indication that Uguisu was transferring at the unit of the form class, and that individual lexical items in her native language were tagged with the particular privileges of occurrence that define membership in form classes (Maratsos & Chalkley, 1980).

Finally, it should be pointed out that transfer does not manifest itself only as errors. Schachter (1974) showed that in written English compositions by native speakers of different languages, the native language made an important difference in the frequency with which they used relative clause structures. English

is a "right-branching" language, that is, the relative clause comes to the right of the head noun, such as in

the bottle [that fell on the floor].

The direction of branching, left or right, has been considered an important variable in the study of language typology (Lehmann, 1973). It turns out that in Schachter's study, subjects who came from right-branching languages (Arabic, Spanish) used more relative clauses than those from left-branching languages (Japanese and Chinese). It is important that there were no differences between these two groups in terms of error rates, that is, the degree to which they correctly used relative clause structure when it was in fact used. Thus, the data can be interpreted as avoidance of the structure, rather than inability. In a comparison of Uguisu and Marta's speech samples, Hakuta (1976) found, albeit tentatively because of the difficulty in comparability that Marta, whose native language is Spanish, used more relative clauses than Uguisu, extending Schachter's important finding to children. Thus, it is important in considering transfer to look at the overall *pattern* of development.

EFFECTS OF AGE

I finally turn now to a discussion of whether there is a critical period for second language acquisition. It is assumed that this question bears on the more general issue of concern, that of capacity for language. Much speculation has been made about the age at puberty (roughly 13 to 14) as the pivotal point beyond which second language acquisition becomes difficult (Lenneberg, 1967). Hence, it is not surprising that most studies have attempted to span that age period.

Williams (1974) looked at a very specific aspect of speech perception in investigating the problem. She chose the Voice Onset Time (VOT) parameter differentiating /pa/ from /ba/. In Spanish, the boundary falls at the 0 msec. VOT, whereas for English, the boundary is at +25 msec. Capitalizing on this contrast, Williams tested Puerto Rican subjects who varied along two background variables: age of arrival in the United States (from 8 years old to 16 years old) and length of exposure to English (from 0 years to 3 ½ years). She used both discrimination and labeling paradigms to determine the boundary in the English /pa/ and /ba/. Williams found main effects for both length of exposure and for age of arrival, with closer approximation to the English + 25 msec. boundary associated with longer exposure and with younger age of arrival. She also was able to obtain production of the sounds from the same subjects, and showed through spectrographic analysis a close correspondence to the perception results.

Oyama (1976) used a more global measure of rated degree of accentedness in the speech of adult Italian immigrants to the United States. Her subjects varied in age of arrival from 6 years old to 20 years old, and for her length of exposure

variable, she took the range far exceeding William's range: 5 years to 18 years. Oyama found that age of arrival was an important predictor of rated pronunciation, but length of exposure had no predictive power. The latter result does not conflict with Williams because of the differences in range. Oyama (1978) reported the results of a sentence comprehension task with the same subjects, and reported essentially the same results.

A recent study by Patkowski (1980) looked at syntactic ability in adults as rated by judges. Subjects came from a variety of language backgrounds. Age of arrival ranged from 6 years old to 61 years old, and although length of stay was not controlled strictly, all subjects had been in the United States for longer than 5 years. Patkowski reports that age of arrival was correlated $-.74$ with syntactic rating. Neither length of stay nor amount of formal instruction in English made a difference. Thus, in all three studies, there is substantial support for a negative relationship between age and degree of success in second language acquisition.

One study, in which the age of subjects ranged down from 3 years old up to 15 years old, reports a positive relationship with age (Snow & Hoefnagel-Hohle, 1978). Subjects were American children learning Dutch, and they were tested on a variety of measures including pronunciation, auditory discrimination, and morphology. The fact that they found that learning increased with age is interesting, especially in light of our earlier discussion of the advantages of having a more cognitively mature system to work with. Perhaps up until somewhere around a "critical" period, there is a positive relationship. On the other hand, it is entirely possible that the older children were performing better on the tasks because they are better test takers.

The evidence previously summarized looks fairly strong in support of a negative relationship of language learning ability with age, but that is only a beginning. It will be recalled that there were many pieces of evidence suggesting similarities between child and adult second language learning. What accounts for these similarities? Without specification of what capacity it is that deteriorates, statements regarding age effects are bound to be misleading and uninterpretable. In addition, there are many successful adult second language learners. Even in Patkowski's distribution, which was fortunately published, there were overlaps in the distributions. The critical period is hardly likely to be even an absolute boundary. Further linguistic studies that shed light on the nature of the acquisition process can help sharpen the problem.

LANGUAGE UNIVERSALS AS AN INTEGRATED PERSPECTIVE

How are we to understand the maze of data from second language acquisition, and its relationship to first language acquisition? In an earlier paper (Hakuta, 1982), I argued for the use of research in language universals and language typology as a framework.

Any particular human language can be specified by its location within an n -dimensional space that defines the limits of variation of all human languages. As a psycholinguist, I understand the study of language typology and language universals to be an attempt to determine what the relevant dimensions are, and to determine how many meaningful dimensions exist. I assume as a working hypothesis that the n -dimensional space bears some relevance to the facts of human language learning. Perhaps there is some isomorphism between the n -dimensional space defined by language typologists and the hypothesis space of the language learner.

On a conceptual level, the goal of language typologists can be seen as similar to the factor-analytic personality psychologist (e.g., Cattell, 1965), with languages being used instead of people as random variables. Unlike psychologists, however, linguists do not go around asking raters to rate a large number of languages along various linguistic dimensions. In addition, the types of data, or scales of measurement, used in language typology are different. The linguistic dimensions are most frequently considered to be categorical (Greenberg, 1978), whereas personality dimensions are interval scale data, and assumed to be continuous. But these differences constitute differences in statistical treatment. The working assumption seems to be that once enough typological dimensions have been formulated and investigated with respect to a large number of languages, these variables can be collapsed through statistical techniques to a smaller number of underlying dimensions, the essence of human language. As Greenberg recently put it, "A theoretical analysis of basic typological concepts helps us to broaden our conception of cross-linguistic generalizations, while its application provides a useful methodology for discovering such generalizations at the lower empirical levels and thus providing the materials for broader and deeper conclusions about the nature of human language" (p. 58).

Linguists have typically kept away from providing hypotheses as to the reasons for the existence of cross-linguistic generalizations (with notable exceptions such as Kuno 1974, and Givón, 1979. For example, Downing (1978), in formulating universal characteristics of relative clause structures, writes: "In their present form they may serve as a summary of observations on the nature of relative clauses across languages, with which the data of additional languages may be compared. As such generalizations are refined, they afford an increasingly solid empirical basis for the formulation of explanatory principles in functional and psychological terms" (p. 411). Along similar lines, Steele (1978) formulates constraints to account for word order variation, such as the following: "A variation on basic word order in which the object precedes and the subject follows the verb is to be avoided" (p. 604). Although such constraints serve to explain at one level the observed data on word order variation, she writes in a footnote that "I am not offering explanations for the constraints" (p. 604, footnote 15).

Given this tendency, the developed product of language-typological research will be essentially a set of factors with loadings on different linguistic variables

(e.g., direction of branching, order of verb and object, etc.). These n factors will constitute the n -dimensional space of human languages. My understanding of language typological research in its present state is that it is not yet at this stage, but it is perhaps not too early to discuss at the abstract level the psychological question, "In what ways is the n -dimensional space psychologically real, and how can we understand changes in the relationship under different psychological conditions of language acquisition?" I use the term *psychological correspondence* to refer to an empirical correspondence between the linguist's dimensions and psychological data obtained from studies of language learners.

For discussion's sake, consider the following variables along which languages are known to be distributed:

1. POSITION (postposition/preposition)
2. BRANCHING DIRECTION (left-branching/right-branching)
3. WORD ORDER VARIABILITY (rigid word order/free word order)
4. DUMMY SUBJECT (has no dummy subjects/has dummy subjects)
5. OBJECT-VERB ORDER (verb-object/object-verb)
6. AGREEMENT (has no subject-verb agreement/has agreement)
7. PASSIVIZATION (has no passives/has passives)

Table 3.2 presents raw data for 20 hypothetical languages (fabricated from my imagination with a little help from the intuition of several colleagues about some real languages) with values on each of the variables. A value of "0" is entered where the language exhibits properties of the first level of the variable, and "1" is entered where the second level is exhibited. The relationship between the variables across languages can be expressed in a correlation matrix, which appears in Table 3.2. A casual inspection of Table 3.3 reveals that there are many variables that are well correlated. For example, OBJECT-VERB AND BRANCHINGNESS are correlated -1.00 , a perfect negative relationship revealing that all OV languages are left-branching, and all VO languages are right-branching. AGREEMENT is correlated $.70$ with DUMMY SUBJECT, indicating that languages with subject-verb agreement also tend to have dummy subjects. An underlying structure of the intercorrelations between the variables can be revealed strikingly through factor analysis, the results of which appear in Table 3.4. Factor 1 is "saturated" with the variables of branchingness, object-verb, and position. This may be interpreted as follows: languages that are left-branching tend to be object-verb and have postpositions, whereas right-branching languages tend to be verb-object and have prepositions. Factor 2 is saturated with the variables dummy subject, agreement, and passive. The interpretation is that languages with dummy subjects also tend to have subject-verb agreement and passivization. When I fabricated the data for Table 3.1, I had in mind two clusters of variables that have been suggested in the literature, one related to the

TABLE 3.2
Distribution of 20 Fabricated Languages with Respect to Language Variables.

Language	Language Variables						
	Position	Branching	Word Order	Dummy Subject	Object Verb	Agreement	Passive
1	0	1	1	0	0	0	0
2	1	1	1	0	0	0	0
3	0	1	1	1	0	1	1
4	1	1	1	1	0	1	0
5	0	1	0	0	0	0	0
6	1	1	0	0	0	0	1
7	0	1	0	1	0	1	1
8	1	1	0	1	0	1	1
9	0	0	1	0	1	0	0
10	0	0	1	0	1	0	0
11	0	0	1	1	1	1	1
12	1	1	1	0	0	1	1
13	0	0	1	0	1	0	0
14	1	1	0	1	0	1	1
15	1	1	0	1	0	1	1
16	1	1	1	1	0	1	1
17	0	0	1	0	1	0	0
18	1	1	1	0	0	1	1
19	0	0	1	0	1	0	1
20	0	0	0	1	1	0	1

Variable labels: Position (0 = postposition; 1 = preposition)
 Branching (0 = left-branching; 1 = right-branching)
 Word Order (0 = rigid word order; 1 = free word order)
 Dummy Subject (0 = has no dummy subject; 1 = has dummy subject)
 Object-Verb (0 = verb-object order; 1 = object-verb order)
 Agreement (0 = has no subj-verb agrmnt; 1 = has subj-verb agrmnt)
 Passive (0 = has no passives; 1 = has passives)

TABLE 3.3
Correlation Matrix of Language Variables Across 20 Fabricated Languages.

	Position	Branch	Word Order	Dummy Subj.	Object Verb	Agreement	Passive
Position	1.00	0.66	-0.17	0.19	-0.66	0.50	.32
Branching	0.66	1.00	-0.31	0.24	-1.00	0.52	.25
Word order	-0.17	-0.31	1.00	-0.38	0.31	-0.10	-.38
Dummy subject	0.19	0.24	-0.38	1.00	-0.24	0.70	.53
Object verb	-0.66	-1.00	0.31	-0.24	1.00	-0.52	.61
Agreement	0.50	0.52	-0.10	0.70	-0.52	1.00	1.00
Passive	0.32	0.25	-0.38	0.53	-0.25	0.61	

TABLE 3.4
Factor Analysis Solution with
Varimax Rotation for 20
Fabricated Languages.

	<i>Factor 1</i>	<i>Factor 2</i>
Position	0.63	0.26
Branching	0.98	0.19
Word order	-0.21	-0.33
Dummy subject	0.07	0.84
Object verb	-0.98	-0.19
Agreement	0.38	0.74
Passive	0.15	0.70

order of elements in sentences (e.g., Greenberg, 1963; Lehmann, 1973) and the other related to the subject-topic typological dimension suggested by Li and Thompson (1976). The factor structures in Table 3.4 reflect these dimensions, although I should point out that, for purposes of the present paper, the actual variables that load on the factors are irrelevant. What's important is simply the fact that this is the kind of way in which the ultimate outcome of the current thrust of language typology might be represented. In subsequent discussion of the factor structure of languages, I simply label the factors Factor A and B, and the individual variables that load on the factors Variables 1, 2, and so forth, so that our discussion is uncluttered by the truth value of linguistic statements and concentrate on the logic of inquiry.

IN SEARCH OF PSYCHOLOGICAL CORRESPONDENCE.

As Stephen Jay Gould points out in his elegantly written book on intelligence testing (Gould, 1981), we human consumers of statistics have an inherent bias towards reifying factors derived through factor analysis. This is a higher order bias similar to the bias of inferring causality from correlation, against which we are warned repeatedly in elementary statistics classes. Language factors are no more than statements about the distribution of the world's languages. We should be wary of using observed language factors as explanations for psychological data. Rather, the question should be "What are the principles that determine the observed factor structure?"

The observation of the language learner can constrain the psychological plausibility of the n -dimensional space. We can look for the preservation or fragmentation of the factor structure in the language learner, under different circumstances, i.e., in L1 and L2 learners. If it can be observed in some circumstances, but not others, than we might be able to formulate hypotheses about its governing

principles. If we consider the n -dimensional space defined by language factors to be a good candidate as a psychologically real hypothesis about the target language on the part of the language learner, we expect there to be some correspondence between the language factor and data obtained from language learners. In this section, I sketch out some considerations that must go into the search for psychological correspondence.

The task for the learner can be defined as a process of determination of the factor score for the particular target language. Having determined the factor score, the learner can be guided in the search for the particular realizations of the individual variables that go with the factor. Consider the situation in Table 3.5. A language with a high positive score on Factor A will have a value of "1" on Variables 1-3, and a value of "0" on Variables 4 and 5, as in LANGUAGE X. A language with a high negative score on Factor A will have values of "0" on Variables 1-3, and values of "1" on Variables 4 and 5, a situation reflected in LANGUAGE Z. The two hypothetical languages are mirror images of each other with respect to Factor A. Although it would be highly interesting if all languages were of the types X and Z above, it would be difficult to test for psychological correspondence, since there would be no variance across languages. However, such a situation is unlikely and is certainly inconsistent with current knowledge about cross-linguistic variation. Then, variations across languages with respect to their language factor scores (i.e., the extent to which they reflect the ideal factor structure) can be used to test the psychological coherence of the factor. Take for example LANGUAGE Y in Table 3.5, conveniently created for our purposes. The values on the variables mostly reflect a high positive loading on Factor A, with the exception of Variable 3. The structure of Variable 3 for LANGUAGE Y in fact matches that for LANGUAGE Z, which is the ideal language with negative loading on Factor A. There are several predictions that can be made, and empirically tested, given such a situation. One would expect that the learner of LANGUAGE Y would have fewer cues than the learner of LANGUAGE X, due to the mismatch on Variable 3. If the determination of the factor score is a psychologically real process, then one can predict differences in

TABLE 3.5
Distribution of Values on Variables for Three
Hypothetical Languages.

	VAR1	VAR2	VAR3	VAR4	VAR5	VAR6
Loading on Factor A	+	+	+	-	-	0
Language X	1	1	1	0	0	1
Language Y	1	1	0	0	0	1
Language Z	0	0	0	1	1	1

the ease of acquisition of structures that reflect variables with the same values for both languages, assuming that other sources of differences, such as frequency, can be controlled. Thus, for Variables 1, 2, 4, and 5, the learner of LANGUAGE X is at an advantage over the learner of LANGUAGE Y. In Table 3.5, I have also inserted Variable 6, which has no loading on Factor A. This might be considered a control variable, for which no difference would be predicted between the two languages.

If we had LANGUAGE Z for comparison, we can make further predictions, since the values on Variable 3 are similar for both LANGUAGES Y and Z. Since the value for LANGUAGE Z is consonant with the factor structure, while it is not for LANGUAGE Y, we would predict that the structure for Variable 3 would be easier for the learner of LANGUAGE Z than for the learner of LANGUAGE Y. Furthermore, we can make predictions about the frequency and kinds of errors that might be expected in the course of learning. Learners of LANGUAGE X will be likely to make errors on structures reflecting Variable 3 that deviate toward the value of '1.' This can be compared to the likelihood of such errors for learners of LANGUAGE Z.

Whether the psychological correspondence can be determined or not is an empirical question. Ideally, one should be able to iterate the above process across each of the variables, finding strategically located languages. If we find that certain variables consistently do not affect the acquisition of its *related variables* (i.e., variables with which it is related through the factor structure), we can weed them out from our mapping of psychological correspondence. The end result would be psychologically real hypothesis space of language learners, which can be used in the further, and necessary, investigations into the nature of the task-specificity and species-specificity of language.

In the discussion above, I have simplistically reduced the study of language typology and universals to factor analysis, and glossed over many of the technical difficulties that the researcher would encounter in searching for psychological correspondence for language factors. I undertook this exercise because I wanted to emphasize the viewpoint toward first and second language acquisition that is implicit in an approach that incorporates language typology and universals, a viewpoint that I believe at present to be potentially the most productive. In sum, in this approach, we do not treat each linguistic variable as an isolated entity, but rather as one of a constellation of variables related to each other, concretized for the researcher through factor structures.

My current analogy can be found in a recent article in the *American Scientist* that reviewed some recent research in developmental biology (Tickle, 1981). In particular, the article was concerned with similarities and differences between the growth of limbs during ontogeny on the one hand, and the regeneration of severed limbs (in certain species) on the other. Essentially, the problems faced by the cells in these two processes are similar: how does a growing cell know what part of the limb it is ultimately to become? To make a long story short, there

are marked differences between the two, which can be characterized by the degree to which developing cells are sensitive to, and interact with, positional specifications of neighboring cells. In development, the positional specifications are developed in cell generation, whereas in limb regeneration, the positional specifications of the new growth interacts with the already established positional specifications of its neighbors. This is an interesting statement about the relationship between the two processes that could not have been possible without a system for specifying position (it turns out that position can be specified by three dimensions: anterior–posterior, dorsal–ventral, and proximal–distal, and some promising mechanisms for how this information is signaled have been proposed).

The relationship between first and second language acquisition and language typology might be regarded in a similar way. The n -dimensional space hypothesized by language typologists, whose psychological correspondence is verified, can become a tool similar to the positional specification of the developmental biologist concerned with limb growth. It defines the problem, and the problem for the language acquisition researcher then becomes to observe and explain the role that this n -dimensional space might play in the different conditions under which language is learned. Although we are still uncertain as to the nature of this n -dimensional space, I believe that it is not too early to begin speculating and formulating our research questions with respect to its manifestations under different psychological contexts.

CONCLUSIONS

Conclusions need not be stated since they were listed in the introductory remarks. I only hope that the evidence presented was tantalizing to the newcomer to second language acquisition. There has always been a kind of unstated snobbery among psychologists and linguists toward applied linguistics and its interest in the applied problem of second language acquisition. Some of it may be justified. Applied linguists are not trained in conducting sound research from an empirical perspective. However, much of the denigration of studying second language learners most likely comes from lack of knowledge and from artificial dean's boundaries in the academic world. Once we admit that second language acquisition can shed light on the nature of our capacity to learn language, the door swings wide open for adding numerous variations that can shed light on the beast. I have argued that the study of language typology and universals can be a working framework around which L1 and L2 acquisition can be unified. They are, after all, the same problem. And given the lack of progress we have made in the past few years toward understanding our ability to learn language, who can turn away such an interesting source of variation on the problem? John Macnamara (1976) was right when he said, "When an infant, a ten year old child, and an adult learn Russian, the most striking outcome is Russian" (p. 175).

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