

THE SENSITIVE PERIOD FOR THE ACQUISITION OF SYNTAX IN A SECOND LANGUAGE¹

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This research tested the hypothesis that learners whose exposure to a second language begins before the age of 15 years achieve higher syntactic proficiency in the target language than adult learners. Sixty-seven immigrants who had come to the United States at various ages and who had resided in this country for various periods of time were tested for syntactic proficiency in English and were also administered a questionnaire to gather information concerning practice and instructional variables. Age at arrival was found to be a strong predictor of syntactic proficiency while other independent variables had very little effect. The results were interpreted as providing support for the hypothesis of an age related limitation on the ability to acquire full command of syntax in a second language.

The notion of a sensitive period for the acquisition of a second language has been debated in the field of L2 acquisition for some time. This notion derives from Lenneberg's hypothesis (1967) concerning the existence of a critical period for the acquisition of a first language extending from about two years of age to the close of puberty (Lenneberg proposed 14 years as the critical turning point). The term "critical period" refers to the notion that the age limitation is absolute in the case of first language acquisition. Theoretically, past the critical period, if no language has been acquired, there can be no learning of human language possible except for the learning of communication strategies dependent upon alternate cognitive mechanisms.

The term "sensitive period," on the other hand, refers to the fact that the age limitation on L2 acquisition is not absolute in the same sense as above. It is indeed possible to acquire a second language after the sensitive period, but it would theoretically not be possible to do so to the extent of attaining native-like proficiency and thus being able to "pass for native." In other words, the term "critical period" is employed here in the case of first language acquisition because it is held that absolutely no linguistic proficiency

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in L1 is possible past the critical point (despite possible development of non-linguistic systems of communication), while the term "sensitive period" is used in the case of second language acquisition because the limitation is on the ability to acquire *complete* native-like proficiency in L2.

Lenneberg, in advancing the critical period hypothesis, pointed out that "many animals traverse periods of peculiar sensitivities, response-propensities, or learning potentials. Insofar as we have made such a claim for language acquisition, we have postulated nothing that would be extraordinary in the realm of animal behavior" (Lenneberg 1967, p. 175).

Lenneberg presented three important arguments implicating puberty as the close of the critical period. The first is based upon studies in neurology which indicate that various maturational growth curves plateau during the early teens. The second argument concerns findings in aphasia which seem to show that the chances for recovery of lost language functions are very different for children and adults. The third argument is related to the language development of Down's Syndrome children which appears to follow a normal but slowed-down course until it is "frozen" at puberty. Literature concerning "wolf children," on the other hand, was held by Lenneberg to allow only the conclusion that "life in dark closets, wolves' dens, forests, or sadistic parents' backyards is not conducive to good health and normal development" (1967, p. 142).

Lenneberg's critical period hypothesis concerns first language acquisition specifically. However, he did address himself to the issue of second language acquisition, as shown in the following passage:

Our ability to learn foreign languages tends to confuse the picture. Most individuals of average intelligence are able to learn a second language after the beginning of their second decade, although the incidence of "language learning blocks" rapidly increases after puberty. Moreover, a person can learn to communicate in a foreign language at the age of forty. This does not trouble our basic hypothesis on age limitations because we may assume that the cerebral organization for language learning as such has taken place during childhood, and since natural languages tend to resemble one another in many fundamental aspects, the matrix for language skills is present. (Lenneberg 1967, p. 176).

Studies on accent by Oyama (1976) and Seliger et al. (1975) which investigated the relation of age of acquisition with the attainment of native-like pronunciation have adduced supporting evidence for the notion of a sensitive period for the acquisition of a second phonological system. The results in both cases showed that age of acquisition is a strong predictor of

accent, while various motivational and practice factors (including length of stay in the United States) have little effect.

The study reported here investigated the existence of a sensitive period for the acquisition of syntax in a second language. The hypothesis tested was that full, native-like acquisition of syntax in a nonnative language can be achieved only if learning begins before the age of fifteen years. It should be noted that native proficiency (meaning the ability to produce and comprehend speech in a manner which is indistinguishable from that of a native speaker) is not the necessary product of any second language acquisition experience prior to puberty, but rather is a possible outcome under optimal sociolinguistic conditions. Adult second language acquisition, on the other hand, would be expected never to result in total native fluency.

Method

Sixty-seven immigrants who had come to the United States and started learning English at various ages and who had lived in this country for various periods of time were tested for syntactic proficiency in English and were administered a questionnaire to gather information concerning linguistic, educational, and professional variables. All participants were required to have resided in this country for a minimum of five years. This was to ensure that participants had had ample time to acquire their second language. Most subjects either held professional positions or were continuing their education. Such selectivity was necessary in order to best answer the question at hand, namely, Can native-like command of syntax in a second language be acquired regardless of age? This goal was met by drawing upon highly educated, upwardly mobile subjects who could be assumed to have been exposed to near optimal sociolinguistic conditions. Additionally, this selectivity reduced the complexities introduced by dialectical variations in the language, since the subjects had been exposed to the educated, middle-class, "standard" version of the language upon which the language measures were based.

Control subjects were fifteen native-born Americans of similar background. Insofar as little variance was to be expected among the controls, their main purpose was to provide evidence concerning the reliability and validity of the linguistic measures.

As part of a larger study, a number of measures of syntactic proficiency were employed. The most interesting measure turned out to be the syntactic ratings which were assigned by two trained judges to written transcripts of tape-recorded oral interviews. These interviews were patterned after the

Foreign Service Institute's language proficiency interview test. The rating system was adapted to meet the needs of a situation involving the assessment of written rather than oral materials (see Appendix). The interviews themselves lasted from fifteen to thirty-five minutes. Five-minute samples (or three pages of single-spaced typewritten transcript, whichever came first) were selected from toward the end of the conversations. Only minimal punctuation was provided, mispronunciations of correct structures were not indicated, and references which might have given away the national background of subjects were deleted.

Evaluation was performed using a scale of 0 to 5 (with a possible + value for any level except the 5 level, for a total of 11 possible ratings). The judges were two ESL teachers with master's degrees in TESOL and at least five years' experience. They were trained over a two-week period. They were then given all the transcripts to take home and rate over the following three weeks.

The independent variables employed in this research were the following: (a) age at the beginning of second language acquisition, which was the age of the participants upon arrival in the United States, (b) years in the United States, which represented a practice variable, (c) informal exposure to English, a more refined practice variable which was calculated by weighting the number of years spent in the United States with the subjects' self-reported patterns of language use, (d) formal instruction in English, which was calculated in hours of instruction in English as a second or foreign language received by participants. Information concerning these variables was gathered by means of a questionnaire. All subjects were seen individually.

Results

Interrater reliability on the syntactic ratings proved adequately high. The Pearson product-moment correlation coefficient between the judgments of the two raters for the 82 transcripts (67 nonnatives and 15 controls) was .78 ($p < .001$). Only 12 of the 82 pairs of ratings differed by more than one step. This left 70 pairs (85.4%) either in "perfect agreement" (identical ratings by both judges) or in "tolerable disagreement" (ratings differing by just one step).

In assigning final ratings to the subjects where the two judges differed, one-step differences were resolved in favor of the higher level (e.g., 4+ and 5 = 5). Two-step differences were resolved in favor of the middle level (e.g., 4 and 5 = 4+) and three-step differences, which only occurred twice, in favor of the first level down from the higher rating (e.g., 3+ and 2 = 3). Under this system,

all 15 native controls received ratings of 5 (one rater had assigned all 15 natives ratings of 5 and the other assigned 9 ratings of 5 and six of 4+).

The sample consisted of highly educated individuals who were either still pursuing their studies at the time of testing or were engaged in careers in the professions, government, and business. Fifty-one of the total sample of 82 had earned at least a master's degree. The sample consisted of 36 males and 46 females. The number of years spent in the United States (for the nonnative group) ranged from 6 to 61 years (mean = 19.5, SD = 10.7). The age at which second language acquisition began ranged from 5 to 50 years (mean = 18, SD = 11.1). The Formal Instruction Score, calculated in terms of hours of English language instruction, ranged from 0 to 9000 hours (mean = 780, SD = 1565). The subjects' native languages included Spanish (24 cases), Polish (17 cases), Chinese (9 cases) as well as French, Haitian Creole, Czech, Arabic, Turkish, Rumanian, Hebrew, Bengali, Russian, Italian, and Serbo-Croatian (each with 3 or fewer cases).

There were 33 subjects who had come to the United States before the age of 15 years (pre-puberty group) and 34 subjects who had arrived after (post-puberty group). The age of 15 (rather than 14 years, as proposed by Lenneberg) was picked on the basis of a personal experience of the researcher who, during his childhood, had witnessed the very rapid acquisition of French to full native fluency within a few months by a friend of his in Paris, France. The learner was slightly over fourteen years old upon arrival. The researcher, who had done all of his schooling up to that point in French, had been quite struck by the ease with which his friend, an otherwise very mediocre student, had acquired native-like Parisian French.

The mean age upon arrival was 8.6 years for the pre-puberty group (SD = 2.7) and 27.1 years for the second group (SD = 8.2). The post-puberty group had received considerably more formal instruction (apparently to little avail, as seen below): The mean number of hours of instruction for the post-puberty group was 1201, compared with 345 for the pre-puberty group ($t = -2.31$, $p = 0.025$). Both groups had lived in the United States for comparable periods of time; the mean number of years was 20.4 for the pre-puberty group and 18.7 years for the post-puberty group ($t = 0.65$, $p < .500$). However, the pre-puberty group scored higher on the informal exposure variable; the mean number of hours of informal exposure was 84,452 for the pre-puberty group and 58,479 for the post-puberty group. This finding is discussed below in light of subsequent results.

The population distribution curve for the dependent variable, Syntactic Rating, exhibited a bimodal aspect for the entire nonnative sample. However,

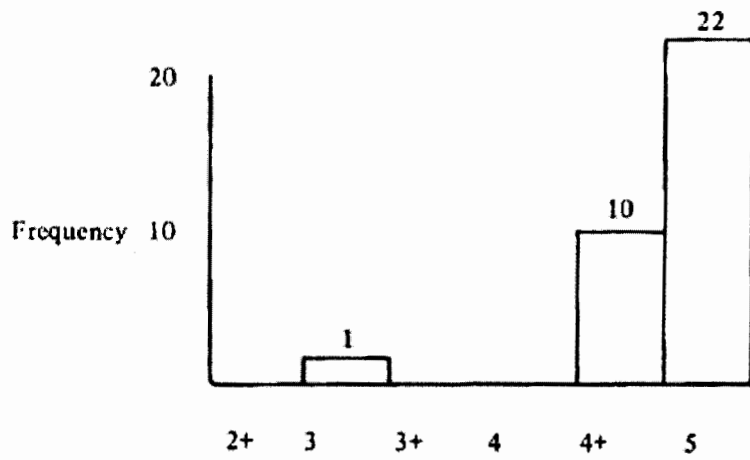
when the population curves for subjects having arrived before and after the age of 15 years were examined separately, the following results emerged. The curve for the pre-puberty group was strongly skewed to the right (mean = 4.8, mode = 5) and showed very little scatter (32 of 33 cases scored at the 4+ or the 5 level). The curve for the post-puberty group, on the other hand, exhibited a strikingly "normal" distribution centered about the 3+ level (mean = 3.6, SD = .6).

This difference, which is illustrated in Figure 1, is quite revealing. The population curve for the post-puberty group, with its normal characteristics, suggests the usual scatter of abilities which is often found in psychological and social research. The population curve for the pre-puberty group, however, strongly suggests that some special factor is at work and is the cause of such a skewed population distribution. Thus, even at a purely descriptive level, the distributional characteristics of the two nonnative groups are clearly consonant with the notion of a sensitive period for the acquisition of syntax in a second language.

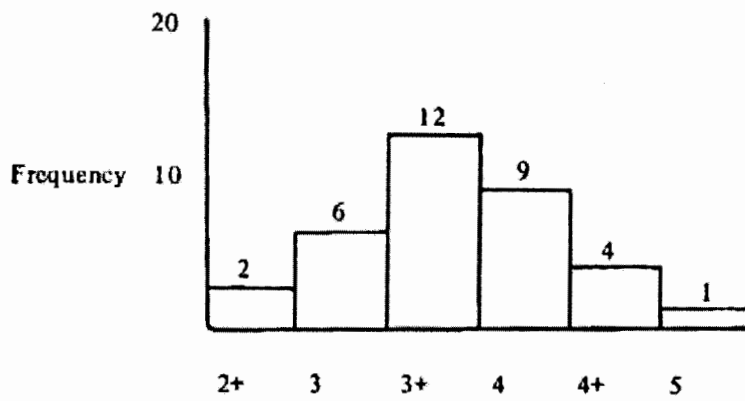
In order to test the hypothesis of a sensitive period for second language syntax, analyses of variance (2 x 2 factorial designs, unweighted means method) and correlational analyses were used. All calculations were carried out on an IBM 360 using the DATATEXT and SPSS statistical programs.

In dichotomizing continuous variables for the purposes of the ANOVAs, the median of each variable was selected as the cut-off point between "high" and "low" categories. The two-way analyses of variance, involving Age at L2 (age at the beginning of second language acquisition) as the first factor and taking each one of the remaining three independent variables (Years in the United States, Informal Exposure, and Formal Instruction) in turn as the second factor showed strong main effects for Age at L2 and no main effects for the other independent variables. Furthermore, there were no significant interaction effects. The *F* value for Age at L2 in Table 3 is lower because of the unequal cell frequencies resulting from the previously noted difference in the amount of Formal Instruction received by pre- and post-puberty learners. The DATATEXT statistical program which was used employs an unweighted means procedure allowing for unequal cell frequencies up to a ratio of 4 to 1. (See Tables 1, 2, and 3.)

Pearson product-moment correlation coefficients were also computed. The results, presented in Table 4, show a strong negative relationship between Age at L2 and Syntactic Rating ($r = -.74$, $p < .001$) and little relationship between the dependent variable and the practice and instructional variables. The correlation between Informal Exposure and Syntactic Rating did reach



Bar chart for pre-puberty learners ($n = 33$)



Bar chart for post-puberty learners ($n = 34$)

Figure 1. Bar charts showing population frequencies for pre- and post-puberty learners on syntactic rating

Table 1
Two-way analysis of variance: influence of age at arrival and of years in the U.S. on syntactic rating

	Years in the U.S.		
	Fewer than 18	More than 18	
Age at arrival			
Under 15 years (pre-puberty)	M = 4.8 SD = 0.2 n = 16	M = 4.7 SD = 0.5 n = 17	
Over 15 years (post-puberty)	M = 3.7 SD = 0.5 n = 18	M = 3.6 SD = 0.6 n = 16	
Source of variation	df	Mean square	F
Age at arrival	1	21.99	88.76 ^a
Years in the U.S.	1	0.30	1.18
Interaction	1	0.01	0.04
Within groups	63	0.25	

^a $p < .001$

Table 2
Two-way analysis of variance: influence of age at arrival and of informal exposure on syntactic rating

	Hours of informal exposure		
	Fewer than 57,489	More than 57,489	
Age at arrival			
Under 15 years (pre-puberty)	M = 4.9 SD = 0.2 n = 14	M = 4.7 SD = 0.5 n = 19	
Over 15 years (post-puberty)	M = 3.6 SD = 0.6 n = 20	M = 3.7 SD = 0.6 n = 14	
Source of variation	df	Mean square	F
Age at arrival	1	21.37	83.41 ^a
Informal exposure	1	0.02	0.07
Interaction	1	0.12	0.48
Within groups	63	0.26	

^a p < .001

Table 3
Two-way analysis of variance: influence of age at arrival and of formal instruction on syntactic rating

	Hours of formal instruction		
	Fewer than 150	More than 150	
Age at arrival			
Under 15 years (pre-puberty)	M = 4.8 SD = 0.2 n = 25	M = 4.7 SD = 0.7 n = 8	
Over 15 years (post-puberty)	M = 3.6 SD = 0.7 n = 9	M = 3.6 SD = 0.6 n = 25	
Source of variation	df	Mean square	F
Age at arrival	1	15.82	61.69 ^a
Formal instruction	1	0.02	0.08
Interaction	1	0.10	0.41
Within groups	63	0.26	

^a $p < .001$

significance at the .05 level ($r = .22$, $p = .03$), but such a low correlation "explains" less than 5% of the variance. Moreover, this relationship disappeared when the effect of Age at L2 was removed (1st-order partial $r = .06$, $p = .31$).

Second-order partials, which are presented in Table 5, showed no significant change in the strong negative relationship between Age at L2 and Syntactic Rating when all possible three-way combinations of independent variables were tested. They also showed little or no relationship between the dependent measure and the practice and instructional variables.

Thus, all of the results discussed above seem to be strongly consistent with the notion of an age limitation on the acquisition of syntax in a second language. Descriptive statistics reveal strikingly dissimilar population distribution characteristics for the pre- and post-puberty groups on syntactic proficiency; analyses of variance show strong main effects on syntactic proficiency for age at which learning begins and no significant effects for instructional and practice variables; correlational analyses further reinforce this picture.

In the light of these results, the difference noted earlier between the pre- and post-puberty groups on the variable of informal exposure (with the former group spending a considerably greater proportion of time exposed to English despite a similar mean number of years of residence in the United States) can be interpreted as follows. Since the pre-puberty group spoke better English, its members tended to immerse themselves in English language environments more often. At the same time, the fact that the post-puberty learners had received almost four times as much formal instruction might indicate that they recognized their linguistic shortcomings and sought to correct them.

For the purposes of replicating Oyama's study (1976) on the sensitive period for the acquisition of a nonnative phonological system, the two judges involved in this research had also been asked to rate on a scale of 0 to 5 thirty-second taped passages from all 82 interviews after they had finished rating the written transcripts. The results strongly upheld Oyama's. Interrater reliability was high ($r = .84$, $p < .001$). F tests revealed strong main effects for age upon arrival ($F = 118.5$, $p < .001$) and no significant main or interaction effects involving the other independent variables. The Pearson product-moment correlation between accent rating and age upon arrival showed a strong negative relationship ($r = -.76$, $p < .001$), and this relationship did not weaken with second-order partials controlling for all possible three-way combinations of independent variables.

Table 4
Correlation coefficients between syntactic rating and independent variables

	Age at arrival	Years in the U.S.	Informal exposure	Formal instruction
Syntactic rating	-0.74 ^a	-0.01	0.22 ^b	-0.19

^a $p < .001$

^b $p < .05$

Table 5
Second-order partial correlation coefficients between syntactic rating and independent variables

	A	B	C
Column A: Second-order partial correlation coefficient of Syntactic Rating and Age at Arrival with effects of Informal Exposure and Formal Instruction removed			
Column B: Second-order partial correlation coefficient of Syntactic Rating and Informal Exposure with effects of Age at Arrival and Formal Instruction removed			
Column C: Second-order partial correlation coefficient of Syntactic Rating and Formal Instruction with effects of Age at Arrival and Informal Exposure removed			
Syntactic rating	-0.72 ^a	0.04	-0.15

^a $p < .001$

Discussion

The sample investigated in this study was composed of people who were in an optimal position to acquire the new language. All had resided in this country for at least six years (and some for as many as thirty-five or more years). All were highly educated and were either continuing their studies or employed in professional positions. Under these circumstances, all could be surmised to have been highly motivated to acquire English, and yet the only factor which was highly associated with the level of syntactic proficiency attained by learners was the age at which acquisition of English began. Practice and instructional variables showed little or no association with the dependent variable. The results, then, appeared to strongly support the hypothesis of an age related limitation on the ability to acquire full command of a second language.

As Krashen et al. (1979) point out, there have been relatively few studies investigating child-adult differences in eventual attainment in a second language. These studies have also generally dealt with accent. Nevertheless, such investigations (e.g., Oyama 1976, Seliger et al. 1975) have consistently shown age at the beginning of L2 to be the independent variable most highly associated with eventual achievement. One accent study (Linda and Jay 1973) did show older groups outperforming younger ones. This research, however, involved some 200 or so minutes of tape-recorded German phoneme instruction and could not be held to bear in any way upon the issue of eventual attainment under "natural acquisition" conditions.

More recently, Neufeld (1979, 1980) demonstrated that phonological competence considerably outstrips phonological performance. Seven highly proficient nonnatives and three native controls were tape-recorded reading a corpus in French. The participants were allowed to re-record the passage as often as they liked. Under these conditions, five of the seven nonnatives were consistently identified as Francophones by French-speaking judges. These same participants were also consistently identified as Francophones (along with the three native controls) by fifty-four English speaking students of French who had all learned French as adults and who all exhibited clear traces of foreign accent in their speech. However, unlike the French judges, the English ones experienced difficulty in distinguishing between French Canadian and Continental French speakers.

Based upon the above results, Neufeld suggested that adult language learners who exhibit clear deficits in their phonological production (i.e., accent) nevertheless do not appear to suffer from any psycholinguistic

disability with respect to phonological competence. It would seem that this conclusion is not entirely warranted, as the English judges were unable to distinguish between regional accent variations, an ability which is certainly a standard property of any native speaker's competence. The fact that five nonnatives could be consistently misidentified by native judges poses more of a problem for our position on the sensitive period. However, several factors suggest themselves to account for this occurrence.

First, as has already been mentioned, the participants were allowed to re-record the passage as many times as they wished. This passage was also of relatively short duration (78 words, about 1 to 1½ minutes). Furthermore, while Ottawa, the site of the study, does border on the Province of Quebec, it is nevertheless a predominantly English speaking city. Thus, there may have been greater laxity on the part of judges in assessing accents than might have been exhibited by judges in a Continental French-speaking country. Indeed, this writer on his journeys to French-speaking Canada has often been struck by the broad range of accents as well as by the numerous "anglicisms" heard in the language (word-for-word renditions of English expressions and idioms which are not used in Continental Francophone countries). Last, the sensitive period hypothesis does not postulate that extremely advanced levels of proficiency are unattainable for adult second language learners. What is proposed is that completely native-like proficiency is unattainable. The task at hand, then, may not have been sufficient to distinguish extremely high nonnative proficiency from absolute native-like proficiency. It should also be noted that while Neufeld (1979) does state that the nonnatives had acquired French "as adults," the exact ages are not given. Since some studies have taken ages as young as 10 or 12 years as the critical turning point, this omission is of importance.

To return to the main theme of the Neufeld studies, it would seem that what is demonstrated is not so much that adults can acquire complete native-like phonological competence, but that phonological competence outstrips phonological performance. Scovel (1977) takes a similar but broader position by claiming that an age limitation can only be applied to accent because it has a neuromuscular reality which is lacking in the case of syntax and vocabulary. Scovel refers to this as the "Conrad Phenomenon," in honor of the Polish-born novelist who became one of the greatest literary figures of the English language despite being practically unintelligible in his spoken production. Thus, Scovel compared judging abilities among three groups of native speakers of American English: (a) adults, (b) children, and (c) aphasics. He found that children reached the adult level (95% or better correct identifica-

tions) at about age 9 and that aphasics showed only a mild deficit. These results were obtained when judging a small tape-recorded oral corpus from each of ten native and ten highly proficient nonnative speakers. However, judgments by the adults of one-paragraph free compositions by the subjects were essentially at random level.

Scovel concluded that perception of foreign accents is an integral part of native linguistic competence and that this ability is acquired during a critical period terminating around the age of ten. Furthermore, this ability was seen as a highly robust psychological phenomenon in that it is not compromised under highly adverse circumstances (aphasia). With respect to the "Conrad Phenomenon," Scovel found confirmation for the notion that there is no age limitation on vocabulary and syntax acquisition from the fact that the judges were unable to distinguish nonnatives on the basis of their one-paragraph compositions. However, since these subjects had been selected on the basis of their high English proficiency (all had used English for at least 12 years) it is not surprising that they were able to perform this relatively minor task. Furthermore, as "avoidance" studies have shown (e.g., Kleinman 1977), adult learners are quite adept at avoiding the use of constructions with which they do not feel at ease; such avoidance behavior could only be surmised to be greater under conditions of composition writing.

It is also not entirely clear that Conrad could be considered fully native-like, as indicated in the following passage by Kurt Vonnegut (1980):

The writing style which is most natural for you is bound to echo the speech you heard when a child. English was the novelist Joseph Conrad's third language, and much that seems piquant in his use of English was no doubt colored by his first language, which was Polish.

Thus, it could be held that results of the Scovel study demonstrate that accent is more easily perceived and judged than syntax, but not that native-like syntactic proficiency is attainable by adults in a second language. Indeed, in our own study, it took two weeks to train the judges to rate typewritten transcripts, and yet a slightly higher interrater reliability coefficient was attained after an accent rating training session of only a few minutes ($r = 0.84$ for accent ratings, compared with 0.78 for syntactic ratings).

It is interesting to note that the "Conrad Phenomenon" (taken here to mean that there may be great disparity between various aspects of linguistic competence and performance) was also encountered in this research. A measure of syntactic proficiency which has not been discussed in this article was the Linguistic Intuitions Test, or LIT (see Patkowski 1980a or 1980b).

This measure, developed by the researcher, was a multiple-choice test designed to probe the syntactic competence of subjects, rather than their performance which the rating system was felt to be measuring. The results, with respect to the main hypotheses, exactly paralleled those reported herein for Syntactic Rating, but always to a lesser degree.

For example, two-way ANOVAs taking Age at L2 as the first factor and Years in the U.S. as the second factor produced an F value of 88.76 ($p < .001$) when using Syntactic Rating as the dependent variable (Table 1); when using LIT Score as the criterion measure, the F value was 25.03 ($p < .001$). Similarly, whereas Age at L2 correlated with Syntactic Rating at $r = -0.74$ (Table 4), when LIT Score was used as the dependent variable the r value fell to -0.50 ($p < .001$). The correlation between Syntactic Rating and LIT Score was $.56$ ($p < .001$).

To return to the "Conrad Phenomenon," the subject with the lowest Syntactic Rating (2+) out of the entire sample was a Polish gentleman who had started acquiring English at the age of 50 years and who worked in the book publishing and distribution business. This subject's spoken output was very difficult to comprehend and his tape proved excruciating to transcribe. Of course, since the judges were working from written material, the subject's poor phonological performance did not affect the rating. On the LIT, however, the subject scored at the native level, making only one mistake (on the item which had also proved the most difficult for the native controls). Thus, there is little doubt that there can be great disparity among various aspects of linguistic proficiency in individual cases. At the same time, however, our study did uncover a correlation of $.80$ ($p < .001$) between Accent and Syntactic Rating, indicating that the two are not so far apart for the general population.

At this point, it would be useful to reiterate that the sensitive period notion holds only that absolute, native-like proficiency in all aspects of language (including vocabulary and syntax) is impossible to attain for the adult learner; it does not hold that extremely high, quasi-native levels cannot be attained in one or more areas. Furthermore, it must be insisted that what is referred to is the eventual level of proficiency attained after a sufficient period of exposure to and immersion in the target language under optimal sociolinguistic and affective conditions.

Indeed, studies which have not focused on eventual achievement have in fact shown child-adult differences favoring adults. Thus, Snow and Hoefnagel-Hohle (1978) tested (and rejected) the prediction that second language acquisition would be relatively quick and successful if it occurred before

puberty by following during a period of one year a group of English speakers who were learning Dutch in a natural setting. The results, on a battery of tests, showed that the general order from proficient to poor on most tasks was: (1) 12- to 15-year-olds, (2) either adults or 8- to 10-year-olds, (3) 6- to 7-year-olds, (4) 3- to 5-year-olds. The authors then noted that "the adults, despite their initial rapid acquisition, fell increasingly behind because their subsequent improvement was very slow. The teenagers had almost achieved native performance very rapidly" (Snow and Hoefnagel-Hohle 1978, p. 1122).

As Krashen et al. (1979) noted, this study involved a very short exposure time and thus concerned learning rates, not eventual attainment. This writer would like to suggest that the above results are quite compatible with the hypothesis of an age limitation. The optimal age for acquiring a second language, at least with respect to ease and rapidity, would logically be the age at which the learner has attained a high level of cognitive development while he or she still retains use of the genetically based language acquisition system. This optimal age, then, would have to be somewhere prior to the critical turning point, in the low teens (say 12 to 15 years). In fact, most studies comparing acquisition rates between children (e.g., Fathman 1975, Ervin-Tripp 1974) have shown older children outperforming their younger counterparts.

One exception, however, is Ramsey and Wright's large scale study (1974) of immigrants to Toronto. This research involved 1200 nonnative and 3800 native students in grades 5, 7, and 9. Scores on standard language tests were expressed as unit normal deviates from the grade means. The results showed the early age groups (those who had arrived up to the age of 6 years) performing at grade means. Past age 7, there was a sharp drop in achievement. Unfortunately, the researchers did not control for length of stay or for background sociocultural variables. Furthermore, only eight subjects had arrived after the age of 15 years.

A reanalysis of the Ramsey and Wright data by Cummins (1980) seemed to show that the results could be largely accounted for by length of residence (which was extrapolated for each age group based upon grade level). Nevertheless, a sensitive period within the sensitive period persisted. That is, subjects who had arrived until the age of six still outperformed those arriving later, up to the age of fifteen. An interpretation of these findings is given below.

As Lamendella (1977) points out, the term "first language acquisition" is misleading, because children who grow up manifest a single schedule of

developmental stages in both languages (Tremaine 1975), and the argument can be made that a child growing up bilingually is not so much acquiring a first and second language as acquiring a single "code" with different "speech registers" (Swain 1977). Thus, Lamendella proposes that the term "primary language acquisition" be applied to the normal language learning process which occurs typically at ages 18 months to 5 or 6 years, no matter whether one or more languages are involved. This position provided the rationale in our research for selecting only subjects who had begun acquiring English as a second language after the age of 5 years, since only then could this be considered as nonprimary (or secondary) language acquisition. The results uncovered by Ramsey and Wright, then, could be taken as confirmation of the notion that extremely early "second language acquisition" is in fact still "primary language acquisition." Since the research did not include adult subjects and did not focus on eventual achievement, no further conclusions can be drawn concerning the issue of age limitations.

In addition to those discussed above, some studies on child-adult differences have focused on children in formal foreign language learning situations in school settings. Such research (e.g., Burstall 1975, Stern 1976) has shown essentially no differences in second language attainment between younger and older children. According to Lamendella (1977), formal settings are conducive to an essentially rational, intellectual, and conscious learning process where little or no use is made of the language acquisition system. Thus, it is only under conditions of prolonged exposure to the target language in a "natural" setting that the intrinsically greater potential for effective second language acquisition of children can be detected. Studies of formal language learning situations therefore do not bear directly upon the hypothesis of an age limitation.

Conclusion

Appeal to innate mechanisms is widely regarded with great suspicion; yet the results of studies on the sensitive period run counter to competing theories of language acquisition. A strict behavioral approach (e.g., Skinner 1957) would lead to the prediction that, all other things being equal, a longer period of exposure (i.e., a longer conditioning process) would result in superior linguistic performance. This clearly does not appear to occur. The high strength of the age factor also seems to dispute a "social learning" approach (e.g., Gardner et al. 1976) or an "optimal distance" approach (e.g., Brown 1980). Such approaches hold that sociocultural factors affect the

attitudinal and motivational factors which determine success or failure, irrespective of age factors. This writer would not seek to deny the importance of such factors; indeed, the failure of large numbers of minority language children in the United States to acquire English both under conditions of "immersion" and of "bilingual education" must be ascribed to various sociocultural and attitudinal factors. Similarly, the fact that immersion of middle-class children in a second language seems to raise no linguistic or educational problems (e.g., Lambert and Tucker 1972) must also be ascribed to such variables. Nevertheless, this writer would hold that such factors operate within the constraints of a genetically based sensitive period. Thus, it is claimed that conditions of "optimal distance" would lead only children to native-like mastery of a second language. Adults exposed to the same conditions would have to be satisfied with attaining extremely high levels of proficiency falling just short of total native mastery. If, however, it is postulated (as Brown, 1980, seems to do) that adults are intrinsically incapable of achieving "optimal distance," then it is difficult to see how such an explanation more parsimoniously accounts for the data, especially given the evidence in the areas of neurology and childhood aphasiology concerning the structural differences between child and adult brains (Hecaen 1976).

Finally, those who posit that cognitive structures provide the sole basis for language acquisition (e.g., Sinclair 1975) are left with the task of explaining why, upon the onset of formal operations (the highest level of cognitive development) at about puberty, the capacity to master a second language appears to greatly subside. Indeed, it seems that a "rationalist position" (Chomsky 1979), holding that the mind possesses a genetically determined language acquisition system which functions during a critical period (Lenneberg 1967), is the most compatible with the evidence uncovered in this and similar research.

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APPENDIX

Language Proficiency Levels²

0. Unable to function in the language.
- | | |
|----------------------------------|--|
| Elementary Proficiency | 1. Can use stock expressions; almost no control of syntax; speaks largely by juxtaposition of words; vocabulary is adequate only for survival, basic courtesy needs; except for memorized expressions, speech is so fragmentary that little meaning is conveyed. |
| Limited Working Proficiency | 2. Has fair control of basic patterns; uses simple "kernel" sentences; very frequent errors of all types; vocabulary is adequate for simple social conversation and routine job needs; relatively simple meanings are accurately conveyed, but linguistic abilities are clearly strained in doing so. |
| Minimum Professional Proficiency | 3. Has good control of most basic syntactic patterns; reasonably complex sentences used; errors quite frequent; vocabulary is adequate for participation in all general conversation and for professional discussion in a special field; despite errors and possible circumlocutions, always accurately conveys meanings of relative complexity. |
| Full Professional Proficiency | 4. Has excellent control of the grammar; few errors are made and these reveal no overall pattern of deficiency; vocabulary is broad, precise and literate; occasional unidiomatic use of words or expressions; can convey complex messages in a fluent and literate fashion. |
| Native Proficiency | 5. Has native control of grammar; occasional slips do not have a "foreign" quality to them; vocabulary is equal |

² The Language Proficiency descriptions and the Numerical Rating Procedure are adapted from materials provided by the Foreign Service Institute's Testing and Publications Office. Special thanks are owed to Mrs. Marianne Adams. Assistance was also obtained from Mr. John Clark of the Educational Testing Service to whom gratitude is also expressed.

to that of an educated native; speech is as fluent as a native's.

All ratings, except the 5, may be modified by a plus (+), indicating that proficiency substantially exceeds the minimum requirements for the level involved but falls short of those for the next higher level.

Numerical Rating Procedure

Instructions: For all of the three areas (Grammar, Vocabulary, Communicative Ability), choose the Proficiency Descriptions—from 1 to 6—which best represent the interviewee's competence. Then, in the Weighting Table, find the number corresponding to each of the three descriptions and add all three numbers. Then, determine from the Conversion Table the rating level within which the total score falls. **THIS NUMERICAL PROCEDURE IS INTENDED ONLY TO SUPPLEMENT THE VERBAL DESCRIPTIONS AND SHOULD NOT BE USED BY ITSELF TO DETERMINE A RATING.**

Note that the numbers 1 through 6 are simply used to designate the different proficiency descriptions for each language area and do not have any direct relationship to the rating levels 1 through 5.

After some practice, you may in some cases want to give a score that is in-between two of the descriptions. For example, if you feel the interviewee's competence in Grammar is about midway between description 3 ("Frequent errors showing. . .") and description 4 ("Occasional errors showing. . ."), you might give a weighted score of 21 for Grammar, rather than 18 or 24.

Proficiency Descriptions

GRAMMAR

1. Grammar almost entirely inaccurate except in stock phrases.
2. Constant errors showing control of very few major patterns and frequently preventing communication.
3. Frequent errors showing some major patterns uncontrolled and causing occasional irritation and misunderstanding.
4. Occasional errors showing imperfect control of some patterns but no weakness that causes misunderstanding.

5. Few errors, with no pattern of failure.
6. No more than two nonnative-like errors during the interview.

VOCABULARY

1. Vocabulary inadequate for even the simplest conversation.
2. Vocabulary limited to basic personal and survival areas (time, food, family, etc.).
3. Choice of words sometimes inaccurate, limitations of vocabulary prevent discussion of some common professional and social topics.
4. Professional vocabulary adequate to discuss special interests; general vocabulary permits discussion of any non-technical subject with some circumlocution.
5. Professional vocabulary broad and precise; general vocabulary adequate to cope with complex practical problems and varied social situations.
6. Vocabulary apparently as accurate and extensive as that of an educated native speaker.

COMMUNICATIVE ABILITY

1. Speech is so fragmentary that little meaning is conveyed; appears to understand little or nothing.
2. Except for routine sentences, speech is very fragmentary; needs constant repetition for minimal comprehension.
3. Speech is hesitant, sentences are often left uncompleted; requires careful, somewhat simplified speech with much repetition and rephrasing.
4. Speech is occasionally hesitant, sentences may go uncompleted quite often; gropes for words; understands normal speech but may require rephrasing or repetition.
5. Speech is smooth and fluent but occasional unidiomatic utterances are perceptibly nonnative; understands everything in normal educated conversation.
6. Speech and understanding appear nativelike in all respects.

WEIGHTING TABLE

Proficiency Description →	1	2	3	4	5	6	—
Grammar	6	12	18	24	30	36	—
Vocabulary	3	8	12	16	20	24	—
Communicative Ability	6	12	18	23	29	35	—
						Total:	—

CONVERSION TABLE

Total score	Level	Total score	Level	Total score	Level
12-21	0+	39-48	2	69-78	3+
22-28	1	49-58	2+	79-88	4
29-38	1+	59-68	3	89-95	4+