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ABSTRACT

Properties of maintenance and loss of Spanish/English bilingualism were investigated in 308 high school students of Mexican background. Key variables investigated included: (1) actual and self-reported proficiencies in Spanish and English; (2) self-reported language choice behavior in various settings; and (3) language attitude. The biggest difference in Spanish proficiency was found between the student born in the United States of parents born in Mexico, and the student whose parents were born in the United States. Maintenance of Spanish proficiency was associated mainly with adult language practice in the home, and was not predicted by the subjects' choice of language outside the home or by language attitude. In turn, adult language choice was found to be affected by the demographic fact of immigration, the adult's ability to use English in the home, and increasing distance in the familial social ties to Mexico. Outside the home, language choice showed rapid and constant shift toward English, unrelated to Spanish proficiency but predicted by the subjects' language attitudes. Language attitude also appeared to contaminate self-reported proficiency in both Spanish and English. Finally, testing suggests that attrition of Spanish is best characterized as difficulty of retrieval rather than total loss. (Author/MSE)

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SOME PROPERTIES OF BILINGUAL MAINTENANCE AND LOSS IN MEXICAN BACKGROUND HIGH SCHOOL STUDENTS

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Some Properties of Bilingual Maintenance and Loss in Mexican Background High School Students

ABSTRACT

Properties of the maintenance and loss of Spanish/English bilingualism were investigated in 308 high school students of Mexican background. Ss were classified by their depth of familial establishment in the United States. The key variables investigated were their actual and self-reported proficiencies in Spanish and English, self-reported language choice behavior in various settings, and their language attitude. The largest difference in Spanish proficiency was found between the cohort who were born in the United States but whose parents were born in Mexico and the cohort whose parents were born in the United States, with maintenance of Spanish evident up to this group. Maintenance of Spanish proficiency was principally associated with adult language practice in the home, and was not predicted by the Ss' language choice outside the home or their language attitude. In turn, adult language choice was found to be affected by the demographic fact of immigration, the adult's ability to use English in the home, and increasing distance in the familial social network ties to Mexico. Outside of the home domain, language choice was found to show rapid and constant shift towards English. This shift in language choice was unrelated to Spanish proficiency, but instead was predicted by the S's language attitude. Language attitude also appeared to contaminate self-reported proficiency in both Spanish and English. Finally, a response latency task for vocabulary production recognition in Spanish suggested that attrition of Spanish is best characterized as difficulty in retrieval rather than total loss.

Observers of bilingualism among immigrant groups in the United States have typically noted its unstable and transitional nature (e.g., Fishman, Nahirny, Hofman & Hayden, 1966; Grosjean, 1982). They note that once English is learned by immigrants, most successfully and efficiently by children, there is rapid loss of the minority language by the group. This shift into monolingual English is said to occur rapidly and attains completion within three generations. Demographers such as Lopez (1978) and Veltman (1983) have documented language shift among various Spanish-speaking groups in the United States. Veltman in particular analyzed nationally representative data found in the 1976 Survey of Income and Education collected by the National Center for Education Statistics, and the High School and Beyond data set gathered by the National Opinion Research Center. Most of these analyses looked at reported *usage* of Spanish, but the High School and Beyond survey asked respondents to report their own *proficiency* in Spanish as well. Veltman found that parental birthplace and parental language practice were the best predictors of the maintenance or loss of language skills. Relevant to this study, he found that among the Spanish language subgroups, those of Mexican background showed the highest amount of Spanish maintenance.

This study attempted to further explore properties of language shift in the Mexican-background population. While the strengths of the demographic studies lie in their ability to construct population estimates of the parameters of interest through sophisticated sampling, they do not profess to provide insights into the linguistic and social mechanisms underlying the pattern of data. This study is principally an attempt to provide more detailed basic descriptive data on language proficiency, language behavior, and language attitudes as a function of the immigration background on a small sample (from the

demographer's perspective) of high school students in a rural community in Northern California.

Although this study was exploratory in its orientation, a number of fundamental questions were considered important in addition to detailing and replicating the claims of demographers. First, we felt it important to address the empirical distinction between the various ways in which bilingual ability might be measured. As mentioned previously, most demographers have chosen self-reported measures of language usage or choice. This variable should not be confused with proficiency, however. A bilingual individual may be highly proficient in Spanish, but may not use the language for any number of reasons, be they situational or attitudinal. In addition to the distinction between language proficiency and language choice behavior, we believed in the possibility that self-reported language proficiency may not be entirely accurate. Thus, a comparison was planned between self-reported language proficiency and actual measured language proficiency.

Second, we were eager to explore the consequences on bilingualism of the language attitudes of individuals. Studies of second language acquisition have suggested a sizable role for attitudinal orientation (Gardner, 1985). These findings have been extended to account for second language attrition as well (Gardner, Lalonde & MacPherson, 1985). Several attempts to explore attitudinal orientations towards the native language have also been reported (Hofman, 1977; Hofman & Cais, 1984), and uncovered different attitudinal orientations underlying maintenance of the native language. We believed that the effect of attitude may be differentially apparent depending on whether one was investigating language choice or language proficiency.

The high school population was chosen for a number of strategic reasons. It is an

age period when sufficient opportunity for the development of both languages has occurred (except for those most recent arrivals), such that the level of bilingualism attained can be considered to have attained some state of stability. There is mounting evidence of on-going interaction between the two languages in younger bilinguals (e.g., Merino, 1983 who assessed bilingual proficiency in kindergarten through fourth graders; Brewer-Bomar, 1981, who studied lexical and syntactical interference in four-year-olds; and Kaufman and Aronoff, in press, who studied the verbal system in a two-year old), but by adolescence, it is assumed that this process would have stabilized. At this period, furthermore, most subjects still live at home, and they are subject to the influences of the home language environment, a variable that has been determined to be important in Veltman's analysis.

Method

Subjects

The subjects in this study were students at a single, four-year, high school. The school has a student population of approximately 2,300, among which 65% (about 1500) are of Mexican descent. Located in a predominantly agricultural community on the central coast of California, it is the only high school in a community of approximately 30,000 inhabitants. Fifty one percent of this community's population are of Mexican descent. Having arrived from other areas of California, other states in the U.S. and directly from different states of Mexico (principally from Michoacan), the vast majority of the present Mexican-descent population have settled in this area in the last 20 years (Donato, 1988).

Subjects for this study included all of the Mexican-descent students enrolled in courses of either Spanish as a Foreign Language (SFL) or Spanish for Spanish-speakers (SS). Both SFL and SS courses are elective possibilities, meaning enrollment in them is

completely voluntary. The commitment by these Mexican-descent adolescents toward learning, improving or maintaining their Spanish ability on their own initiative reflects an overall positive attitude towards bilingualism which appears to be characteristic of the community.

To ascertain the representativeness of this sample population, one hundred students from each grade level were randomly selected from the total population of Mexican-descent students and screened to determine whether or not they had been enrolled in either type of Spanish class at any time during their high school career. The percentage of students enrolled in either SFL or SS sometime during their high school career are as follows: 48% of the Freshmen, 58% of the Sophomores, 72% of the Juniors, and 67% of the Seniors. Considering this information, it appears that the present study sample represents approximately two-thirds of the Mexican-descent students in attendance at this high school. Although the representativeness of this sample is necessarily a subjective judgement, we believe in the validity of the opinions explicitly stated by the high school counselor, principal and vice principal that these students comprise the "middle-range" distribution of school achievement, with those students uninterested in taking a Spanish course having either little or no Spanish ability or extensive fluency.

The demographics of this community and the high school, particularly the fact that so many Mexican-descent students are enrolled in a course to improve their Spanish, make it an ideal location for the study of Spanish maintenance and language attitudes among Mexican-descent adolescents.

Participation in the study was initially invited with a letter of introduction from the researcher. These letters were distributed to students in their Spanish classes.

Questionnaire data were originally obtained from a total of 415 Ss. Twenty-six Ss were eliminated because neither they nor any of their ancestry were born in Mexico; another 51 Ss were eliminated due to incomplete data on other measurements, an additional 6 Ss were eliminated because they had "far out" values on either the English or the Spanish Standardized Proficiency measure when examining for outliers (Tukey, 1977), and 24 more were eliminated for either providing incomplete or inconsistent answers on questions that intersected with their Depth classification (see definitions below). This left a remainder of 308 Ss with relatively clean and complete data for final analysis in this paper.

The immigration background characteristics of the Ss are presented below when the structure for categorizing them by their Depth cohort is detailed. Collapsing across these categories, Ss had a mean age of 16 years 4 months (SD = 1 year 1 month). There were 105 freshmen, 106 sophomores, 75 juniors, and 22 seniors, consisting of 149 males and 159 females. With respect to class type, 100 Ss were enrolled in Spanish as a foreign language, and 208 in Spanish for Spanish speakers.

Instruments.

The measurement strategy was to make direct assessments of language proficiency in Spanish and English in one class session, and to obtain self-reported information on language proficiency, language choice behavior, language attitudes, and background information in a second session. An individually-administered session to assess the productive and receptive efficiency of Spanish vocabulary through a response latency task was also conducted for a small subset of the sample.

Language Proficiency Measures.

Proficiency in Spanish and English were measured directly through group-

administered tests of several different kinds: a test of productive vocabulary, a test of the ability to detect grammatical errors, and a cloze test for global proficiency. Each subject received only one type of test, and this in both languages. Descriptions of each test follow.

Productive Vocabulary. Ss (N=102) received a booklet with 6 themes (plants and vegetables, animals, kitchen, school, parts of the body, and clothing) in alternating languages, with each theme marked at the top of a separate page, and they were instructed in the target language to write down as many instances of exemplars from the categories as possible in that language. They were told not to worry about spelling. In counting the number of words provided, a response was considered valid as long as it fit within the general classification category, regardless of spelling, or whether it strictly followed the rules of taxonomy. Ss provided a mean of 99.54 (SD=32.04) English words and a mean of 68.00 (SD=26.94) Spanish words. The three possible pairs of correlations between the English categories were r=.53, .67, and .50, and for the Spanish categories, r=.61, .69, and .76. The overall correlation between the summed English and Spanish scores was r=.16. The intralanguage correlations suggest an adequate reliability for the measure, and the low interlanguage correlations suggest the ability to distinguish between proficiencies in the two languages.

Grammatical Knowledge. Ss (N=123) received a booklet with 48 items in each language. For each item, they were instructed to put a check mark if it was correct, and if it contained a mistake, to "circle the mistake, then correct it by writing the correct word near the circle you have drawn". Each language set contained 16 fillers and 32 target items that were systematically constructed to draw upon specific grammatical rules that were either unique to the language (e.g., the distinction between por and para and the

subjunctive in Spanish) or shared commonalities with the other language (e.g., tense agreement, number agreement). A score of 0 was given if no indication or the wrong parameter was selected for correction on a target item; a score of 1 was given if there was indication that the S indicated the appropriate error, even if the final product was not perfectly grammatical. The fillers were scored as 0 if they were indicated as incorrect, and 1 if they were indicated as correct. The mean totals obtained were as follows: Spanish target items, M=24.28 (out of 32 items, SD=8.87); Spanish filler items, M=12.86 (out of 16 items, SD=3.47); English target items, M=26.73 (SD=6.63); English filler items, M=13.48 (SD=2.30). Reliability was estimated using Cronbach's alpha on the target items only, and the following coefficients were obtained: for Spanish, .96, and for English, .94.

Cloze Test. The cloze test consisted of a story about a bull named Fernando. The same story was used in both languages, although the nature of the items varied naturally due to differences in the languages. A total of 126 Ss were given this measure. The Spanish version started with 17 items that were multiple choice, followed by 27 more items that contained blanks that had to be filled. The English version had 17 multiple choice and 25 blanks. All items were scored 0 for incorrect, 1 for correct. The Spanish mean total was 32.19 (SD=8.11), the English mean total was 36.44 (SD=6.18). Cronbach's alpha coefficients were .93 for Spanish, .88 for English.

Standardized Language Proficiency. In order to create a single measure of language proficiency that would enable use of the total sample across the different test measures for comparison with the language choice and attitudes results, an index of language proficiency was constructed by standardizing each S's score within his/her test group and adding 10 to eliminate negative numbers. Aside from the practical argument of enabling pooling of

groups, this practice would be justifiable if it can be assumed that (1) the same source of variation accounts for the measured variation in each of the three tests; and (2) there are no overall group differences between the three test groups.

The first assumption cannot be tested directly by correlating across the measures, because the tests were administered in a between-subjects design. However, there are two common yardsticks available in our data that can be correlated with each of the measures. One is for Spanish only, and consists of the vocabulary production and recognition response latencies (this task is described in a later section). Although the numbers are limited, there were 15 Ss who took the cloze test and the response latency measure, and 6 Ss who took the written vocabulary production measure and the response latency measure. The correlation between production time and the Spanish cloze was $r=-.59$, and between recognition time and Spanish cloze was $r=-.57$. For vocabulary production, the correlations were $r=-.66$ and $r=-.76$. The other common yardstick, included in the questionnaire to be described further below, was self-reported proficiency in the two languages. On a 7-point response scale ranging from "not at all" to "perfect", three questions were asked of the Ss about their proficiency in Spanish and English: "How well do you speak and understand Spanish/English?", "How well do you read in Spanish/English?" and "How well do you write in Spanish/English?" The responses within each language for these questions were highly correlated, and were averaged. The correlations between these self-reported measures of Spanish and English proficiency and actual proficiency in the three measures were as follows: Spanish self-report and vocabulary production, $r=.51$; English self-report and vocabulary production, $r=.26$; Spanish self-report and grammatical knowledge, $r=.67$; English self-report and grammatical knowledge, $r=.63$; Spanish self-report and cloze, $r=.68$;

English self-report and cloze, r=.59. Although the English self-report and vocabulary production is notably low, the correlations overall appear stable. Thus, we concluded that there was no overwhelming reason to reject the first assumption, especially since the types of linguistic skills we were measuring are very similar to the types of abilities measured in commercially produced global measures of language proficiency (such as the Language Assessment Scales) that attempt to maximize on test reliability.

The second assumption was verified by comparing the mean self-reported evaluations in Spanish and English proficiency across the three test groups. They were not significantly different from each other.

The two assumptions appearing to have been met by the data, we proceed to use the Standardized Proficiency Measure for Spanish and English as our single measure of proficiency. All of the attempts to replicate the major findings of this study within subgroups of those who took the different proficiency measures have yielded the same pattern of results, though naturally with attenuated statistical robustness because of the reduced sample sizes.

Questionnaire Data

The questionnaire sought to obtain (1) background information about the Ss, (2) their self-reported language proficiency, (3) language choice behavior in a variety of settings, and (4) language attitude towards Spanish. There were 86 items in all (not all of which will be analyzed in this report, since some exploratory items were included). The instrument was constructed in English. Pilot testing with a similar subject population in another school district showed that "walking through" the questionnaire item-by-item with concurrent Spanish translation was adequate for those students who were less proficient in

English. We did not address the question of whether the students might have responded differently due to different demand characteristics if the languages were reversed.

Basic Background.

The basic background information part included questions about the birthplace of the Ss, date of immigration if they were not born in the United States, the birthplaces of their parents and grandparents, their sibling structure, age when they first started speaking English, and extent of contact with Mexico.

Based on this information, to classify Ss with respect to their length of residence and generational depth in the United States, a variable was created in which the following definitions were utilized:

Depth 1: Born in Mexico, arrived in the USA > 10 years old.

Depth 2: Born in Mexico, arrived in the USA between the ages of 6 and 10 years old inclusively;

Depth 3: Born in Mexico, arrived in the USA when 5 years old or younger;

Depth 4: Born in the USA, both parents born in Mexico;

Depth 5: Born in the USA, at least one parent born in the USA;

Depth 6: Born in the USA, at least one parent and associated grandparents born in the USA.

The distribution of number of subjects in each Depth grouping was as follows: Depth 1, N=20; Depth 2, N=31, Depth 3, N=60; Depth 4, N=123; Depth 5, N=55; Depth 6, N=19.

Language Choice Behavior.

The questions about language choice behavior were initially roughly conceptualized around domains of language use (Fishman, 1966). Questions were formed to elicit judgments about language used in various domains, in which six response categories were provided: "only Spanish", "mostly Spanish", "both languages equally", "mostly English", "only English", and "not applicable". The last response was coded as missing data, and the first five responses were treated as interval data and given scores from 1 for "only Spanish" to 5 for "only English". The domains sampled were: (1) ADULTS: language use among and with the adults of the household (4 items, averaged); (2) SIBS: language use with siblings (2 items, averaged); (3) SCHOOL: language used in school for academic subjects (3 items, averaged); (4) PEERS: language used with friends (3 items, averaged); (5) MEDIA: language used in the media that they watch/listen (2 items, averaged), and (6) ALONE: language used in private, such as when they are angry or when they dream (3 items, averaged), and (7) CHURCH: language used at church (1 item).

The interrelationship between these domains of language uses was explored in a principal components factor analysis with varimax rotation, the results of which were unambiguous, and appear in Table 1. Two factors emerged in this analysis, with the first factor loading on SCHOOL, ALONE, MEDIA, PEERS, and SIBS, and the second factor loading on ADULTS and CHURCH. One variable, SIBS, loads least among the variables on Factor 1, and has the third highest loading on Factor 2, suggesting it to be an intermediate domain between the home and the outside worlds.

TABLE 1 ABOUT HERE

Language Attitudes.

A variety of statements on attitudes towards Spanish and English was elicited. Originally, the statements were to be constructed on the basis of the categories developed by Hofman and Cais (1984), in which they identified language use for sentimental, communicative, and instrumental reasons (see D'Andrea, 1989 for further discussion). However, through discussions with colleagues and among ourselves, the list grew to be a more heterogeneous set of statements about bilingualism that stemmed from our experience in this area. There were a total of 21 items. Roughly, we hypothesized that there would be a factor that would be related to a positive orientation towards maintenance of Spanish, another factor that would value English, and another that would be oriented toward the pragmatic uses of language. Each of the statements was rated on agreement on a 7-point Likert scale that ranged from "strongly disagree" to "strongly agree".

TABLES 2 AND 3 ABOUT HERE

This set of variables was reduced through factor analysis, using the principal components estimation with varimax rotation. The results appear in Table 2, and the actual statements associated with the factors are listed in Table 3. Three factors emerged, the first of which is clearly related to the maintenance of Spanish. The second factor has five statements roughly associated with it: agreement with the statements that "Two Spanish-speaking people who also know English should speak English together when they are in public", "Two Spanish-speaking people who also know English should always speak English even whey they're alone", and "In the USA it's all right for people of Mexican descent to

not know Spanish well because English is this country's main language", and disagreement with the statement that "It's possible to speak Spanish better without losing the ability to use English" and "It's possible to learn English without forgetting Spanish". We have labelled this factor a subtractive orientation towards bilingualism. The third factor, though somewhat scattered as third factors are likely to be in these kinds of analyses, seems to be associated with items that tap the pragmatic values underlying language.

Rather than creating a factor score for the products of this inductive exercise, the items that loaded well on each of the factors were added to form a score for the maintenance, subtractive, and pragmatic orientations. We felt justified in doing so because we were only interested in allowing the analysis to guide our creation of measurement rather than enslaving us to the mathematical constraints of factor scores.

Results

The results will be reported in the form of summary statements of the conclusions, followed by the supporting analyses.

The largest difference in English proficiency is found between Depths 1 and 2, and after which between-cohort differences are vastly diminished; the largest difference in Spanish proficiency is found between Depths 4 and 5, with no loss in Depths 1 thru 4.

The main results are displayed in Figure 1. The means for both English and Spanish vary significantly by Depth (for English, F (5,302) = 21.71, p <.001, accounting for .264 of the variance, and for Spanish, F (5,302) = 43.510, p<.001, accounting for .419 of the variance). Comparison of specific means using Tukey's HSD at p<.05 revealed several

differences. For English, Depth 1 is significantly different from all other Depths, and Depth 2 is not significantly different from Depth 3, but is different from Depths 4, 5, and 6. None of the other differences are significant. The magnitude of the differences shows that the major part of the variance is accounted for by the low performance of Depth 1, who are in the process of learning English. For Spanish, Depths 5 and 6 are significantly different from Depths 1 thru 4, but none of the other means are different from each other. Thus, Spanish language proficiency remains robust even through the cohort who were born in the United States but whose parents were born in Mexico (Depth 4).

INSERT FIGURE 1 ABOUT HERE

For the immigrant and first generation Ss (Depths 1-4), Spanish proficiency is related to the age at which they started speaking English.

Although there are no differences in Spanish proficiency means across Depth groups 1 thru 4 as revealed in the group mean comparisons, even within these groups, there is a significant effect on Spanish for the reported age at which the S started speaking English (controlling for Depth, $b=.049$, $t=2.775$, $p=.006$). The magnitude of this effect accounts for .076 of the variance. The shape of this function is shown in Figure 2, where it is evident that before age 10, there is a linear drop in Spanish proficiency with decreasing age at which English was reportedly started. This effect can be understood in a number of alternative ways. It could be that Ss who were exposed to English from early on did so at

the expense of the development of Spanish proficiency. It might also be the case that those who developed English earlier were less likely to end up in bilingual education programs that provided for continued development of formal school skills in Spanish. Unfortunately, the data that we have do not allow further clarification of this question, since we did not gather systematic data on previous program status. This information, even if it were available, would be difficult to interpret given the tremendous heterogeneity of programs that are called "bilingual" (see, e.g., Hakuta, 1986). However, although the magnitude of the effect seems to be small, it is an effect worthy of future investigation in greater detail.

FIGURE 2 ABOUT HERE

Maintenance of proficiency in Spanish is principally associated with adult language practice in the home, rather than the S's language attitude or language choice outside the home.

Figure 3 suggests that the language choice of adults in the household is a prime suspect in the loss of Spanish skills that occurs between Depths 4 and 5, since it is at this same juncture that adults in the household shift their preference dramatically towards English. One-way analysis of variance of Depth on Adults is highly significant, F (5,302) = 108.104, $p<.001$, accounting for .642 of the variance. Comparison of specific means using Tukey's HSD at $p=.05$ reveals that Depth 4 adults use significantly more English than Depths 1 thru 3, and that Depths 5 and 6 adults in turn use significantly more English than Depth 4 adults. The larger shift occurs at the juncture between Depths 4 and 5, and

parallels the findings from the Spanish language proficiency measure.

INSERT FIGURE 3 ABOUT HERE

Furthermore, when multiple regression analyses are conducted in predicting Spanish proficiency on the basis of the different language choice and language attitude variables (the model being SPANISH PROFICIENCY = CONSTANT + ADULTS + SIBS + PEERS + MAINTAIN + SUBTRACT + PRAGMAT) as shown in Table 4, the coefficients implicate adult language usage, particularly at Depths 4, 5, and 6. This increasing contribution of the adult language choice in the higher depths is pictured in Figure 4, where Spanish proficiency is plotted as a function of adult language choice and Depth grouping, using a distance-weighted least squared method for non-linear smoothing (Wilkinson, 1988). Additional inspection of the figure shows that in the depth levels where adult language choice does have an effect on Spanish, the slope is steeper between the values on the adult variable of 3 and 5 (responses "both Spanish and English" to "English only" than it is between 1 and 3 ("Spanish only" to "both Spanish and English").

INSERT FIGURE 4 AND TABLE 4 ABOUT HERE

Adult language choice is affected by demographic variables associated with immigration.

The fact that adult language choice at home is closely related to the demographic facts of their immigration depth was shown above. To explore further the possible

determinants of adult language choice, exploratory regression analyses were conducted predicting adult language choice on the reported mother's level of education (0=never went to school, 1=elementary school, 2=junior high school, 3=high school, 4=college/university, 5=graduate school) and frequency of visits to Mexico (0=never, 1=once every 2 or 3 years, 2=every year or more). Mother's education is a common proxy for socioeconomic status but for our purposes, it is better understood as a reflection of the extent to which the mother may be proficient in English, especially for mothers who were received all or part of their formal education in the United States (starting at Depth 4, i.e., those who were born in Mexico, but who may still have received some formal schooling in the United States). Frequency of visits to Mexico can indicate the extent to which the family maintains its social network with relatives and friends in Mexico.

Separate multiple regressions for each depth were performed estimating the beta coefficients using mother's education and frequency of visits to Mexico as predictors. The results are summarized in Table 5. It is not surprising to find non-significant effects at Depths 1 and 2, considering that at these depths, the adults are speaking almost exclusively Spanish (witness the small values for the constant at these Depths), and also considering the size of the samples. However, already by Depth 3, significant effects in the direction of English can be found for mother's education as well as an opposite effect for frequency of visits to Mexico. The effects become more statistically stable at Depth 4, somewhat less so at Depth 5. It is notable also that the magnitude of the effect for mother's education increases from $\underline{b}$=.289 at Depth 4 to $\underline{b}$=.531 at Depth 5. The Depth 6 results are once again quite unreliable.

INSERT TABLE 5 ABOUT HERE

From this pattern of results, one concludes that at least 3 factors influence adult language choice at home: demographic fact of immigration, whether the adult possesses the proficiency to use English in the home, and increasing distance in the social network from Mexico.

Within Depth cohorts, English proficiency is not related to adult language practice in the home, but rather with peer language use and with a pragmatic orientation towards language.

In contrast to the finding discussed above that Spanish proficiency is primarily associated with adult language practice in the home, English proficiency within depth cohorts is associated with peer language usage. This is supported by multiple regression analyses predicting English standardized proficiency on the choice and attitude variables, conducted separately for the different depth cohorts. The results are in Table 6. As can be seen, the contribution of adult language practice is significant in none of the depth cohorts, while peer language use is implicated in Depths 1 and 3. Further, the pragmatic orientation towards language is associated with variance in English at Depths 3 and 4, but the maintenance orientation is not.

INSERT TABLE 6 HERE

Somewhat surprisingly, the one significant effect for the subtractive orientation that appears at Depth 4 is in the opposite direction of what might be expected. Those who tend to believe that Spanish must be lost in order for English to be learned are on average doing worse on their English proficiency measure. Just what this effect might mean is unclear, but the effect appears to have some consistency in that the direction and magnitude of the beta coefficients is in the same direction and of similar magnitude except in Depth 1. It is possible that those students with this rather negative orientation towards language have a more generalized attitude that seeps into all aspects of their academic achievement.

Outside of the home domain, S's language choice shows consistent shift towards English across Depths.

Although the pattern of adult language choice and the Spanish language proficiency of our Ss both covaried by depth, showing the greatest disjuncture between Depths 4 and 5, the pattern of language choice by Ss in other domains shows a different pattern. Figure 5 shows choice patterns for language used with siblings, peers, at school for academic purposes, and for private use (see definitions in the methods section above) as a function of Depth. Main effects for Depth are highly significant in all cases: for siblings, F (5,298) = 33.966, for peers, F (5,302) = 32.770, for school, F (5,302) = 37.594, and for alone, F (5,301) = 25.579. Unlike the sharp break witnessed for adult language and Spanish proficiency, most of the group means were significantly different from each other when subjected to Tukey's HSD comparison. Indeed, only the following differences between means were not significant at $p<.05$: for siblings, Depths 1 vs. 2, Depths 3 vs. 4, Depths

5 vs. 6; for peers, Depths 2 vs. 3, Depths 5 vs. 6; for school, Depths 2 vs. 3, Depths 5 vs. 6; for alone, Depths 2 vs. 3, Depths 5 vs. 6. Thus, it is safe to conclude that each depth cohort experiences progressive shifts towards English in every domain except for adult language use.

INSERT FIGURE 5 ABOUT HERE

One way of investigating progressive shifts in language choice within given Depth cohorts is through questions that asked Ss to report about past and predicted future language behavior. We asked the following: "As a child I first learned to speak in ..." (CHILD), "In elementary school I usually spoke in..." (ELEM), "In junior high school I usually spoke in..." (JUNIORHI), and the estimate of the present which has to do with language used with peers (PEERS). About the future, 3 questions were asked, which were averaged into a single response about future choice (FUTCHOIX): "As an adult, my parents expect me to use...", "As an adult, I expect to use...", and "My children will speak...". The means for this set of temporally related items as a function of Depth is shown in Figure 6. As can be seen, there is progressive shift towards English taking place within Depth cohorts.

INSERT FIGURE 6 ABOUT HERE

It is notable that the responses to the future choice questions show a remarkable optimism towards the maintenance of bilingualism in the future, hovering about the level that states equal amounts of Spanish and English. Further, this level does not vary by

Depth. An analysis of variance indicates no main effect for Depth on future choice, F (5,284) = .210, n.s..

Although language attitude does not seem to be related to Spanish proficiency, it is related to language choice.

The results of earlier analyses showed that although adult language choice was a key determinant of Spanish proficiency, attitude had no substantial effect. However, analyses to determine predictors of language choice show attitudinal variables play a role. Language choice variables were regressed on the attitudinal cluster (maintenance, subtractive, and pragmatic orientations), as well as proficiencies in the two languages. The results are displayed in Table 7. With just one exception (the pragmatic orientation predicting school language use), all of the variables are significant, with the maintenance orientation having the greatest contribution among the attitudinal cluster.

In order to estimate the magnitude of the unique contribution of the attitudinal cluster independent of depth and the language proficiency variables, the difference in R^2 between equations that did and did not contain the attitudinal cluster was calculated. The estimated changes in R^2 were as follows: for peers, .072, for siblings, .056, for school, .032, and for alone, .056. Thus, when correlated effects of language proficiency are removed, the contributing effect of the attitudinal cluster is small but nevertheless different from zero.

INSERT TABLE 7 ABOUT HERE

When it comes to stating the desired future choice of language, attitude appears to exert greater influence. Regression of this variable on the attitudinal cluster and the proficiencies in English and Spanish, as shown in Table 7, indicates that the maintenance and subtractive orientations are significant. Analysis of the change in R^2 shows a substantial increase when the attitudinal cluster is added, by .206. The fact that prediction of future language behavior is more consistent with attitude than report on current behavior is not surprising when one considers that situational variables probably account for much of current language choice, leaving less room for the influence of individual attitudes, while conjecturing about future behavior can be more affected by the hope that one would be in situations that would be consistent with one's attitude.

Language attitude contaminates self-rated language proficiency.

As noted earlier in the discussion of the proficiency measurement, self-rated proficiency in Spanish and English was correlated with actual proficiency measurements, but not very highly. Overall, the correlation between self-reported proficiency and the standardized proficiency measures was .61 for Spanish and .46 for English. Some of the discrepancy can be accounted for by the language attitude cluster. For example, the following models were estimated for Spanish and English using multiple regression: SELF-REPORTED PROFICIENCY = CONSTANT + ACTUAL PROFICIENCY MEASURE + ATTITUDINAL CLUSTER. The results are reported in Table 8. For Spanish, maintenance and subtractive orientations contribute to the prediction of self-reported proficiency in expected directions, i.e., with maintenance orientation leading to higher self-

reported proficiency than the actual measurement would predict, and the subtractive orientation working in the opposite direction. The results for English are less pertinent to this discussion, but nevertheless interesting because all of the attitudinal variables are predictive of self-report, but the subtractive orientation is not in the predicted direction. It may be that this attitudinal orientation is associated with a general depreciation of one's sense of self worth.

INSERT TABLE 8 ABOUT HERE

It is noteworthy that comparison of the magnitude of the contributions of actual proficiency scores with those of the attitudinal measures (as can be done by comparing the standardized beta coefficients) shows the attitudinal cluster to be of equal magnitude as the actual proficiency. Thus, it might even be said that self-reported language ability is as much a measure of attitude as it is of proficiency.

Attrition of Spanish is best characterized as difficulty in retrieval rather than total loss.

As mentioned in the methods section briefly, an individually-administered response latency task for vocabulary production and recognition in Spanish was administered to a small subset of Ss. The purpose of this small pilot study was to examine the nature of the attrition of Spanish. It was reasoned that less frequent words would be more difficult to retrieve than more frequent words, and that this would interact with whether a word had to be retrieved from memory in a production task, or could be recognized if it is provided

for the S. Thirty-six Ss participated in this study.

Method

The task consisted of a word production and a word recognition component. In both tasks, words were chosen to vary in frequency, from low, medium, and high. Frequency as used here is a relative concept, and was determined in advance of this experiment through extensive pilot work with Hispanic middle school students from the same school district, who provided word members of 16 different categories. The words they provided were tabulated and ranked by frequency of mention, and then all words were given back to the same group of students to receive a rating for their frequency of use. Students were also asked to indicate words that were not known to them. Then, objects for words with high agreement on frequency and which were not indicated as unknown to most students, and which we further judged to be of high picturability, were drawn by a professional illustrator. These pictures were then presented to another group of high school students of similar background, who were asked to name the pictures. Only those pictures that were unambiguously named by 90% of these students were subsequently chosen for inclusion in the production study. Thus, we tried to maximize the possibility that most of the words would be within the repertory of most of the Ss.

In the word production task, pictures of low, medium, and high frequency words were presented in randomized order across subjects on a Macintosh screen. They were instructed to name the object as quickly as they could. Picture presentation was accompanied by a tone, and their response was tape recorded. Subsequently, latency between the tone and the response was measured visually by use of the MacRecorder that displays the tone onset and the response onset along a time/frequency spectrum. Erroneous responses were coded

as such. If the Ss indicated that they did not know the word, this was coded as missing data. There were 18 pictures each in the low, medium and high frequency category for a total of 54 items in the production task.

In the recognition task, a picture appeared on the screen that was accompanied by a word that either matched or did not match the picture. S was simply instructed to indicate with a yes or a no (sí or no in Spanish) their judgment of the match. There were 18 true and 18 false items in each of low, medium and high frequency picture/word groups, for a total of 108 items. Response latency was measured in the same way as in the production task, and errors were noted.

Results

The data from four Ss had to be eliminated because their Spanish proficiency was so low that they had no valid responses for the low frequency words. For the 32 remaining Ss, the mean response latencies for the production task were 1605.68 msecs for low frequency words, 1509.63 msecs for medium frequency words, and 1092.71 msecs for high frequency words. For the recognition task, the obtained mean response latencies on the target (non-filler) items was 678.14 msec for low, 648.20 msec for medium, and 579.20 msec for high frequency items. When analyzed in a 2-way repeated measures analysis of variance for main effects of modality (recognition vs. production) and frequency, all effects were highly significant. For the main effect for modality, F (1,31) = 85.47, $p < .001$, for the main effect for frequency, F (2,62) = 15.84, $p < .001$, and for the modality x frequency interaction, F (2,62) = 7.57, $p < .001$. The pattern of means appears in Figure 7.

INSERT FIGURE 7 ABOUT HERE

These results are consistent with the characterization of language attrition at the lexical level as retrieval difficulty, in that the effect of modality is differentially evident depending upon the frequency of words, and that the slope of the effect of frequency on recognition is relatively flat.

This conclusion is tempered by the fact that there were substantial error rates that tarnish the clean conclusions that might be drawn from the response latency data just presented. This was particularly true for the production data, and even if a modest criterion of 75 percent correct responses in both the recognition and production tasks were to be employed, only 14 Ss survived the elimination. However, it is noted that when the same analysis of variance procedure was repeated with this cleaner sample of Ss, the same pattern of significant results was obtained. For the main effect of modality, F (1,13) = 45.849, $p < .001$, for the main effect for frequency, F (2,26) = 24.236, $p < .001$, and for the modality x frequency interaction, F (2,26) = 13.962, $p < .001$.

The results can also be appreciated when broken down by Depth grouping, although the numbers are quite thin. Fortunately, there were 7 Ss from Depth 3, 9 Ss from Depth 4, and 10 Ss from, Depth 5. As seen in Figure 8, response latency varies as a function of Depth, and this is principally reflected in the difference in the production time.

INSERT FIGURE 8 ABOUT HERE

Discussion

The analysis revealed several facts about language proficiency, choice, and attitude in this bilingual population of high school students. It verifies in large part the existence

and the robustness of the phenomenon of language shift among immigrant populations in the United States, as described by demographers using survey data. Shift is occurring across depth cohorts, although in different degrees depending on whether shift is defined as a change in choice or as the loss in Spanish proficiency. Defined as proficiency loss, that loss is best described as occurring most sharply across generations, especially between the cohort whose parents were born in Mexico (Depth 4) and whose parents were born in the United States (Depth 5). Defined as a shift in choice, however, this process is observed to begin immediately and in a progressive manner both across and within depth cohorts.

Since this was not a longitudinal study, we could not address the question of whether lower performance in the Spanish proficiency measure was the result of individual subjects having lost proficiency in Spanish that they previously possessed, or whether it was due to incomplete acquisition of Spanish to begin with. This methodologically important point for the study of first language loss was raised by Jaspaert, Kroon and van Hout (1986). In the absence of longitudinal study, we must be satisfied with cross-sectional comparisons. As the comparisons across the depth cohorts reveals, it appears the Depth 4 cohort has not lost proficiency in comparison to Depths 1-3. However, as was revealed in Figure 2, even among the Depths 1-4 cohorts, Spanish proficiency was associated with the age at which the Ss reported themselves as starting to speak English. As we discussed in the results section, this decrement is probably attributable to both actual attrition and incomplete acquisition, but in either event, only about 7 percent of the variance is accounted for by this factor.

In the case of Depths 5 and 6, incomplete acquisition probably accounts for much of this picture, and is related to adult language choice, as will be discussed below. Nevertheless, the results of the pilot study with vocabulary production and recognition

latency are worth discussing here. In that experiment, we predicted that if retrieval difficulty characterized language attrition, that we would find stronger effects of word frequency in production than in recognition tasks. This was exactly what was found. It should be noted that in the experiment, we made efforts to make sure that the response latency measure was not confounded with knowledge of the words, and were mostly successful in doing so. Thus, we interpret the results to mean that once vocabulary is acquired, attrition can be effectively characterized by increasing difficulty in lexical access, although by no means does this rule out the possibility that actual loss of words from memory can occur.

As for social psychological and situational correlates of Spanish proficiency, we saw that Spanish proficiency is primarily determined by adult language practice in the home. It is worth emphasizing that Spanish proficiency was not affected by the subjects' language choice in other situations (which presumably reflects the extent to which they actively use the language), nor by their attitudinal orientation.

Since adult language practice is so important in the determination of Spanish proficiency, we explored factors that might account for this variable. It was shown to be affected by factors that might be considered primarily demographic: the depth cohort, the mother's level of formal education that presumably affected her ability to use English, and the family's maintenance of social network ties with Mexico. In many ways, these variables are inevitable facts associated with immigration, and testify to why language shift is such a robust phenomenon in the United States.

Attitudinal orientation, as we saw, did not predict proficiency in Spanish. However, attitudinal variables were effective in predicting the choice to use Spanish in contexts other

than home, including with peers and siblings. Thus, attitude plays a role in determining choice of language outside of one's parental home. When one projects the effect of attitude to what would happen when the individuals move out of the parental home and set up their own home and produce offspring, and we further consider the fact that adult household language practice determines Spanish proficiency, it is easy to see how this individual attitudinal orientation might transfer into variability in the probability of inter-generational transmission of Spanish.

A methodologically important point was raised by the discrepancy between self-reported proficiency and actual proficiency in both Spanish and English. In particular, it appears that attitudinal orientation contaminates self-reported proficiency (at least as globally measured in this study) to a substantial degree. Indeed, in the case of Spanish, the magnitude of the predictive power of the maintenance orientation threatened to match the magnitude of measured Spanish proficiency, such that a self-reported measure of proficiency would be almost as good a measure of attitude as it would be of language proficiency. Thus, it may be the case that survey studies that simply ask for self-reported proficiency can be conflating their dependent variable with attitudes. Since attitude was shown to be related to language choice as well, and since shift was more evident in choice than it was in actual proficiency, estimates of shift based on self-report may err in the direction of overstating the magnitude of the shift.

Several observations need to be made concerning the patterns found in English proficiency, even though this study did not seek to address the question of second language acquisition. First, it was clear that English is acquired relatively rapidly in this population. Put another way, this population is certainly not showing signs of resisting the learning of

English, despite the evident retentiveness of Spanish among Ss in Depths 1-4. The most striking pattern was the fact that Depth 1 cohort, who had been in the United States for a mean of 3.34 years, was markedly lower in English proficiency than the other cohorts. Depth 2 (mean length of residence in the United States was 9.28 years) also showed a significant though much smaller difference with Depths 4 thru 6, though not with Depth 3. Thus, the bulk of the variance in English proficiency arises from the cohort that had been here for a short period of time. Indeed, if English proficiency were plotted as a function of the length of residence in the United States, as seen in Figure 9, English proficiency reaches asymptotic performance at about 8 years. This corresponds quite well with the figures of 5-7 years required for attainment of the full range of second language acquisition as estimated by Cummins (1984) based on a heterogeneous L1 population in Canada.

INSERT FIGURE 9 ABOUT HERE

A second point regarding English acquisition worthy of note is its relationship with peer language choice, and its lack of relationship with adult language choice or peer language choice in any of the depth cohorts. A practical implication that may emerge from this finding is that it is certainly not necessary to advocate for parents to speak English at home in order to better the chances of their children learning English more effectively.

In conclusion, the exploratory nature of this research needs to be re-iterated. As was suggested in the introduction, very few studies have been conducted to investigate the processes involved in the phenomenon of language shift. This study therefore took a broad net and cast it in the general areas of language proficiency, language choice, and language

attitudes. Clearly, the results of this study indicate that these three areas involved in shift are complexly related but definitely need to be kept distinct.

At least four directions for future research emerge from the findings. First, the tentative model of the relationship between proficiency, choice and attitude proposed here needs to be tested more rigorously, employing better balanced samples for the depth cohorts and the better statistical models that this would enable. In so doing, it would also be important to realize that ethnographers of language such as Blom and Gumperz (1972) have long pointed out the inadequacies of self-reported measures of language choice. The lesson we learned about self-reported measure in language proficiency is just as likely to be true for language choice, and there is need to aggressively investigate this probable contaminant in our results.

A second direction for future research is to further explore the differential contributions of language attrition versus incomplete acquisition, especially in the Depth 5 group. The study of language attrition is promising in part because of the potential for studying parallels and differences with the more extensive research in the area of the loss of foreign language skills.

A third direction is in the area of the interaction between first and second language acquisition. The fact that age of initial learning of English was related to Spanish proficiency is possibly related to the interaction between the two languages that might occur in early language development. Several studies of second language acquisition in early childhood suggest attrition in the native language (e.g., Kaufman & Aronoff, in press, Brewer-Bomar, 1981). A systematic investigation into whether this phenomenon is age-related would begin to explain the pattern of results obtained in this study.

A final important direction is investigation of the extent to which the patterns found here are true to speech communities that are either less robust (such as in communities where the Spanish-speaking population is smaller or less recognized in the schools through the existence of bilingual programs), or to bilingual communities where the two languages do not share orthographies (such as Chinese and English). Variation in this basic pattern as a function of sociolinguistic settings would provide important opportunities to understand the cultural underpinnings of the robust pull towards monolingualism in the United States.

REFERENCES

Blom, J. & Gumperz, J. (1972). Social meaning in linguistic structures: Code switching in Norway. In J. Gumperz & D. Hymes (Eds.), *Directions in sociolinguistics* (Pp. 407-434). New York: Holt, Rinehart and Winston.

Brewer Bomar, K. (1981). *Second language lexical and syntactical interference on the first language of two four year old Spanish speakers.* Unpublished Doctoral Dissertation, University of Pittsburgh.

Cummins, J. (1984). *Bilingualism and special education: Issues in assessment and pedagogy.* San Diego: College-Hill Press.

D'Andrea, D. (1989). *The role of language attitudes in the maintenance of Spanish among Mexican-American adolescents.* Unpublished masters thesis, University of California, Santa Cruz.

Donato, R. (1988). In Struggle: Mexican-Americans in the Pajaro Valley Schools, 1900-1979. Unpublished Doctoral dissertation, Stanford University, 1979).

Fishman, J. A. (1964). Language Maintenance and Language Shift as a Field of Inquiry.

Linguistics, 9, 32-70.

Fishman, J. A., Nahirny, Vladimir C., Hofman, John E., & Hayden, Robert G. (1966). *Language Loyalty in the United States.* The Hague: Mouton and Company.

Gardner, R. C. (1985). *Social psychology and second language learning: The role of attitudes and motivation.* London: Edward Arnold.

Gardner, R. C., Lalonde, R. N. & MacPherson, J. (1985). Social factors in second language attrition. *Language Learning, 5,* 519-540.

Grosjean, F. (1982). *Life with two languages.* Cambridge, Mass.: Harvard University Press.

Hakuta, K. (1986). *Mirror of language: The debate on bilingualism.* New York: Basic Books.

Hofman, John (1977). Language Attitudes in Rhodesia. In J. Fishman, R. Cooper & A. Conrad (Eds.), *The Spread of English* (pp. 277-301). Rowley, Mass. : Newbury House.

Hofman, J. & Cais, J. (1984). Children's attitudes to language maintenance and shift. *International Journal of the Sociology of Language, 50,* 147-153.

Jaspaert, K., Kroon, S. & van Hout, R. (1986). Points of reference in first language loss research. In B. Weltens, K. de Bot & T. van Els (Eds.), *Language attrition in progress.* Foris Publications.

Kaufman, D. & Aronoff, M. (in press). Morphological disintegration and reconstruction in first language attrition. In H. W. Seliger & R. Vago (Eds.), *First language attrition: Structural and theoretical perspectives.* New York and Cambridge: Cambridge University Press.

López, David E. (1978). Chicano language loyalty in an urban setting. *Sociology and Social Research, 62,* 267-78.

Merino, B. J. (1983). Language loss in bilingual Chicano children. *Journal of Applied Developmental Psychology, 4*, 277-294.

Tukey, J. W. (1977). *Exploratory data analysis.* Reading, Mass.: Addison-Wesley.

Veltman, Calvin. (1983). *Language Shift in the United States.* Berlin: Mouton Publishers.

Wilkinson, Leland. SYGRAPH. Evanston, Illinois: SYSTAT, INC. 1988.

Footnotes

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Table 1. Principal components factor analysis with varimax rotation for variables reporting on language use in different domains.

ROTATED LOADINGS

	Factor 1	Factor 2
SCHOOL	0.874	0.226
ALONE	0.805	0.380
MEDIA	0.801	0.248
PEERS	0.796	0.402
SIBS	0.622	0.568
ADULTS	0.258	0.888
CHURCH	0.328	0.835

VARIANCE EXPLAINED BY ROTATED COMPONENTS

1	2
3.250	2.229

PERCENT OF TOTAL VARIANCE EXPLAINED

1	2
46.423	31.836

Table 2. Principal components factor analysis with varimax rotation for statements used to obtain language attitudes. See Table 3 for statements corresponding to variable names.

ROTATED LOADINGS

	Factor 1	Factor 2	Factor 3
SENHIST	0.662	0.173	-0.098
S_IMPORT	0.659	-0.201	0.241
SENXPRES	0.654	0.105	-0.009
B_IMPORT	0.639	-0.127	0.173
SENGOOD	0.623	0.003	0.054
USEDAILY	0.571	-0.063	0.001
COMDAILY	0.569	-0.099	0.069
OKFORGET	0.393	-0.311	0.055
SHIPUBLC	0.085	0.708	0.043
SHIALONE	0.065	0.686	0.125
NOLOOSEN	-0.102	0.534	-0.244
SHIMAINL	-0.356	0.438	0.258
LEARNENG	-0.130	0.474	-0.145
ENUSEFUL	-0.038	0.037	0.718
E_IMPORT	0.153	-0.035	0.630
ENGODJOB	0.063	0.152	0.543
INSJOB	0.204	-0.139	0.464
COMFRIEN	-0.194	-0.144	0.443
COMRADIO	0.290	0.020	0.329
INSHISCH	0.372	-0.082	0.289
INSBEDUC	0.334	0.296	0.257

VARIANCE EXPLAINED BY ROTATED COMPONENTS

1	2	3
3.508	2.042	2.149

PERCENT OF TOTAL VARIANCE EXPLAINED

1	2	3
16.704	9.725	10.231

Table 3. Statements used to obtain language attitudes, sorted by factors obtained in principal components factor analysis. The key factors have been labelled

Maintenance Orientation

SENHIST	Knowing how to speak Spanish is important to understand a person's family history. (strongly disagree/ strongly agree)
S_IMPORT	How important is it for you to know Spanish well? (not at all / very much)
SENXPRES	A person who knows Spanish, in addition to English, has more chances to express his or her feelings. (strongly disagree/ strongly agree)
B_IMPORT	How important is it for you to know both English and Spanish well? (not at all / very much)
SENGOOD	Using Spanish allows a person to feel good about him or herself. (strongly disagree/ strongly agree)
USEDAILY	People who know Spanish should use it daily, especially at home. (strongly disagree/ strongly agree)
COMDAILY	A person often needs to use Spanish for daily communication. (strongly disagree/ strongly agree)
OKFORGET	It's O.K. if a person grows up speaking Spanish, and later forgets it. (strongly disagree/ strongly agree)

Subtractive Orientation

SHIPUBLC	Two Spanish-speaking peopl who also know English should speak English together when they are in public. (strongly disagree/ strongly agree)
SHIALONE	Two Spanish-speaking people who also know English should always speak English even when they're alone. (strongly disagree/ strongly agree)
NOLOOSEN	It's possible to speak Spanish better without losing the ability to use English. (strongly disagree/ strongly agree)
SHIMAINL	In the USA it's all right for people of Mexican descent to not know Spanish well because English is this country's main language. (strongly disagree/ strongly agree)
LEARNENG	It's possible to learn English well without forgetting Spanish. (strongly disagree/ strongly agree)

Pragmatic Orientation

ENUSEFUL	It is very useful to know English for everyday life. (strongly disagree/ strongly agree)
E_IMPORT	How important is it for you to know English well? (not at all / very much)
ENGODJOB	Knowing English is important for getting a good job. (strongly disagree/ strongly agree)
INSJOB	Knowing Spanish helps a person get a job and sometimes even higher pay. (strongly disagree/ strongly agree)
COMFRIEN	Using Spanish enables a person to meet and make friengs with other Spanish-speaking people. (strongly disagree/ strongly agree)

Table 4. Summary of results of multiple regression analysis predicting Spanish proficiency on the basis of language choice and language attitude variables, conducted for separate Depth cohorts.

	Dependent Variable: Spanish					
	Depth 1 (N=20)	Depth 2 (N=31)	Depth 3 (N=60)	Depth 4 (N=121)	Depth 5 (N=53)	Depth 6 (N=19)
PREDICTOR						
Coefficient						
Constant	10.934***	10.170***	10.480***	10.436***	10.814***	10.160**
Adults	-0.378**	0.243	0.005	-0.221*	-0.503**	-1.630**
Sibs	0.068	-0.259*	-0.189*	-0.084	-0.036	1.400*
Peers	-0.179	-0.003	-0.044	-0.030	-0.145	-0.021
Maintain	-0.016	0.365*	-0.047	-0.069	0.141	-0.210
Subtract	-0.092	-0.155	-0.038	-0.052	0.097	-0.485
Pragmat	0.110	-0.145	0.161	0.168	-0.026	0.296
Standard Error						
Constant	0.709	0.923	0.756	0.961	1.587	2.564
Adults	0.103	0.405	0.110	0.096	0.158	0.432
Sibs	0.082	0.118	0.092	0.101	0.269	0.524
Peers	0.120	0.132	0.112	0.101	0.205	0.347
Maintain	0.085	0.165	0.093	0.095	0.158	0.179
Subtract	0.061	0.095	0.067	0.069	0.138	0.244
Pragmat	0.079	0.156	0.095	0.120	0.203	0.254
Standardized Coefficient						
Constant	0.000	0.000	0.000	0.000	0.000	0.000
Adults	-0.785	0.116	0.007	-0.227	-0.531	-0.877
Sibs	0.259	-0.460	-0.365	-0.101	-0.023	0.728
Peers	-0.502	-0.005	-0.072	-0.033	-0.108	-0.014
Maintain	-0.036	0.600	-0.073	-0.077	0.131	-0.218
Subtract	-0.335	-0.348	-0.083	-0.070	0.081	-0.541
Pragmat	0.309	-0.249	0.230	-0.130	-0.015	0.214
Multiple R^2	.579*	.276	.195	.113*	.491***	.735**

* $p < .05$
** $p < .01$
*** $p < .001$

Table 5. Summary of results of multiple regression analysis predicting adult language choice on the basis of mother's education level and frequency of visits to Mexico, conducted for separate Depth cohorts.

	Dependent Variable: Adult Language Choice					
	Depth 1 (N=16)	Depth 2 (N=25)	Depth 3 (N=55)	Depth 4 (N=105)	Depth 5 (N=52)	Depth 6 (N=18)
PREDICTOR						
Coefficient						
Constant	1.041***	1.012***	1.137***	1.600***	2.402***	4.484***
Mother's Educ	0.248	0.063	0.279***	0.289***	0.531***	0.045
Visit Mexico	-0.124	-0.036	-0.209*	-0.310**	-0.354	-0.253
Standard Error						
Constant	0.233	0.061	0.152	0.170	0.433	0.772
Mother's Educ	0.124	0.039	0.065	0.061	0.138	0.250
Visit Mexico	0.163	0.052	0.106	0.112	0.210	0.285
Standardized Coefficient						
Constant	0.000	0.000	0.000	0.000	0.000	0.000
Mother's Educ	0.506	0.325	0.495	0.416	0.475	0.046
Visit Mexico	-0.192	-0.138	-0.228	-0.244	-0.207	-0.229
Multiple R^2	.238	.127	.302***	.213***	.258***	.050

* $p < .05$
** $p < .01$
*** $p < .001$

Table 6. Summary of results of multiple regression analysis predicting English proficiency on the basis of language choice and language attitude variables, conducted for separate Depth cohorts.

	Dependent Variable: English					
	Depth 1 (N=20)	Depth 2 (N=31)	Depth 3 (N=60)	Depth 4 (N=121)	Depth 5 (N=53)	Depth 6 (N=19)
PREDICTOR						
Coefficient						
Constant	11.734**	10.210***	8.273***	7.503***	8.905***	9.885**
Adults	-0.371	-0.346	0.039	0.119	0.196	0.134
Sibs	-0.715	-0.108	-0.078	0.089	0.084	0.360
Peers	1.414*	0.267	0.323*	0.161	0.073	-0.186
Maintain	-0.144	0.121	-0.205	-0.003	0.073	-0.274
Subtract	0.056	-0.227	-0.071	-0.252*	-0.172	-0.253
Pragmat	-0.542	-0.114	0.358**	0.318**	0.006	0.200
Standard Error						
Constant	3.808	1.358	1.057	0.930	1.148	3.361
Adults	0.554	0.596	0.153	0.093	0.114	0.567
Sibs	0.442	0.174	0.128	0.098	0.195	0.687
Peers	0.644	0.194	0.156	0.098	0.148	0.455
Maintain	0.456	0.243	0.130	0.092	0.114	0.235
Subtract	0.328	0.139	0.094	0.067	0.099	0.320
Pragmat	0.425	0.230	0.133	0.117	0.147	0.333
Standardized Coefficient						
Constant	0.000	0.000	0.000	0.000	0.000	0.000
Adults	-0.175	-0.119	0.035	0.123	0.357	0.099
Sibs	-0.625	-0.139	-0.103	0.107	0.091	0.257
Peers	0.905	0.281	0.364	0.177	0.094	-0.167
Maintain	-0.074	0.145	-0.219	-0.003	0.118	-0.391
Subtract	0.046	-0.368	-0.105	-0.206	-0.248	-0.388
Pragmat	-0.346	-0.141	0.349	0.248	0.006	0.198
Multiple R^2	.370	.176	.270**	.156**	.209	.142

* $p < .05$
** $p < .01$
*** $p < .001$

Table 7. Summary of results of multiple regression analysis predicting S's language choice in different domains on the basis of language attitude variables and Spanish and English proficiency measures.

	Dependent Variable				
PREDICTOR	PEERS (N=308)	SIBS (N=304)	SCHOOL (N=308)	ALONE (N=307)	FUTURE (N=290)
Coefficient					
Constant	1.676*	3.734***	2.328***	1.853*	3.626***
Depth	0.220***	0.234***	0.194***	0.257***	-0.031
Maintain	-0.273***	-0.285***	-0.126**	-0.271***	-0.141***
Subtract	0.122**	0.086*	0.078**	0.087*	0.071***
Pragmat	0.161**	0.204**	0.077	0.136*	0.029
English	0.300***	0.211***	0.236***	0.303***	-0.005
Spanish	-0.175***	-0.313***	-0.129**	-0.184***	0.007
Standard Error					
Constant	0.762	0.844	0.608	0.797	0.323
Depth	0.046	0.051	0.036	0.048	0.019
Maintain	0.052	0.057	0.041	0.054	0.021
Subtract	0.041	0.045	0.032	0.042	0.017
Pragmat	0.066	0.073	0.053	0.069	0.027
English	0.055	0.061	0.044	0.058	0.023
Spanish	0.054	0.060	0.043	0.056	0.022
Standardized Coefficient					
Constant	0.000	0.000	0.000	0.000	0.000
Depth	0.276	0.267	0.318	0.307	-0.115
Maintain	-0.262	-0.248	-0.158	-0.248	-0.406
Subtract	0.128	0.082	0.107	0.087	0.225
Pragmat	0.108	0.126	0.067	0.087	0.060
English	0.266	0.171	0.273	0.256	-0.013
Spanish	-0.176	-0.285	-0.169	-0.176	0.021
Multiple R^2	.491***	.489***	.446***	.497***	.219***

* $p < .05$
** $p < .01$
*** $p < .001$

Table 8. Summary of results of multiple regression analysis predicting self-reported proficiency in Spanish and English on the basis of actual measured proficiency and language attitude variables.

	Dependent Variable		
	Self-Reported Spanish Ability (N=308)		Self-Reported English Ability (N=308)
PREDICTOR		**PREDICTOR**	
Coefficient		**Coefficient**	
Constant	-1.889**	Constant	1.863**
Spanish	0.530***	English	0.406***
Maintain	0.407***	Maintain	-0.157**
Subtract	-0.135**	Subtract	-0.121**
Pragmat	0.007	Pragmat	0.201**
Standard Error		**Standard Error**	
Constant	0.640	Constant	0.717
Spanish	0.052	English	0.053
Maintain	0.057	Maintain	0.052
Subtract	0.046	Subtract	0.044
Pragmat	0.075	Pragmat	0.072
Standardized Coefficient		**Standardized Coefficient**	
Constant	0.000	Constant	0.000
Spanish	0.457	English	0.396
Maintain	0.336	Maintain	-0.166
Subtract	-0.121	Subtract	-0.139
Pragmat	0.004	Pragmat	0.150
Multiple R^2	.490***		.254***

* $p < .05$
** $p < .01$
*** $p < .001$

Figure 1. Mean Standardized Spanish and English language proficiency measures for six Depth cohorts. (Depth 1: Born in Mexico, arrived in the USA > 10 years old; Depth 2: Born in Mexico, arrived in the USA between the ages of 6 and 10 years old inclusively; Depth 3: Born in Mexico, arrived in the USA when 5 years old or younger; Depth 4: Born in the USA, both parents born in Mexico; Depth 5: Born in the USA, at least one parent born in the USA; Depth 6: Born in the USA, at least one parent and associated grandparents born in the USA.)

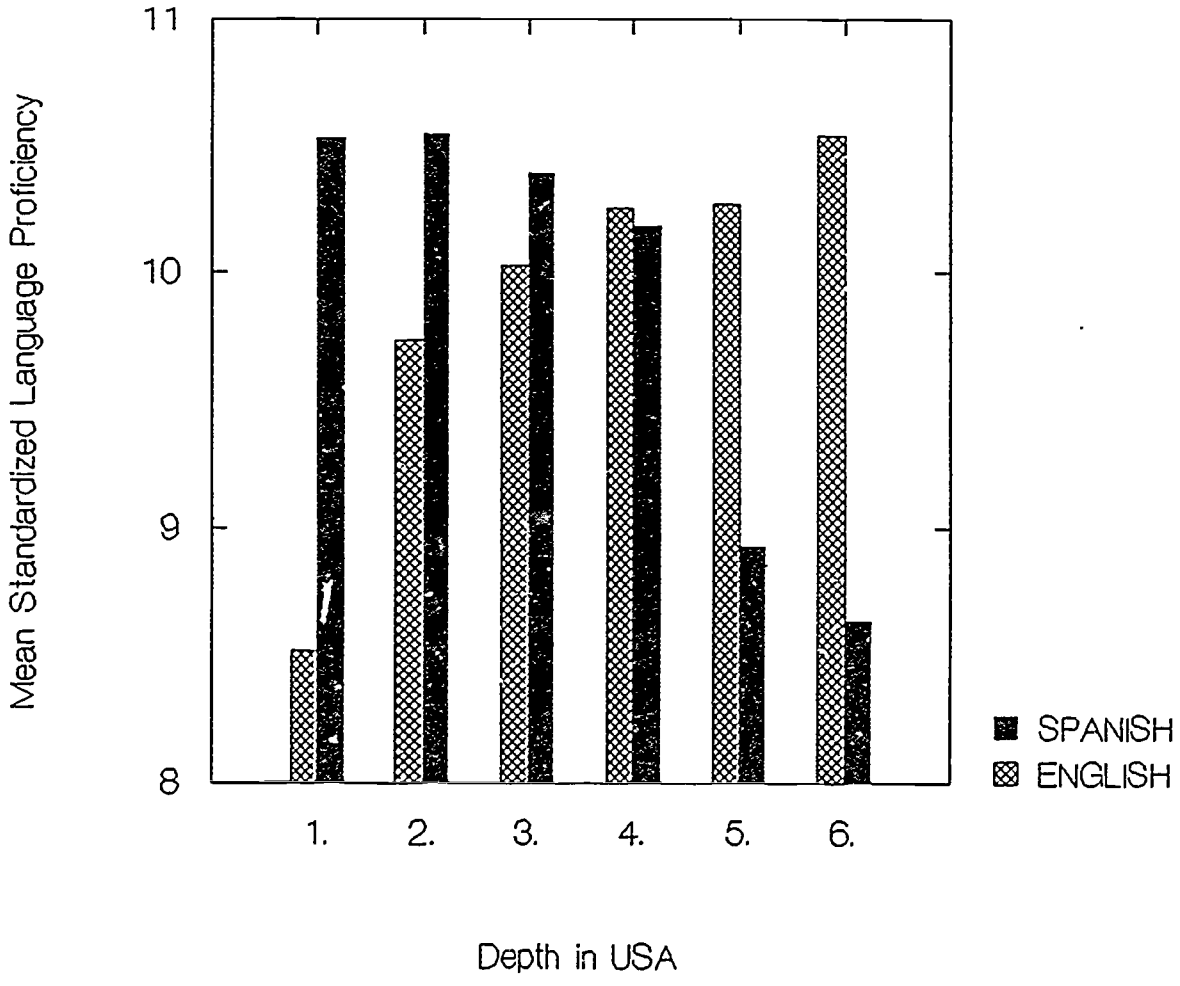

Figure 2. Standardized Spanish language proficiency score as a function of the age at which Ss reported themselves as starting to speak English. Only Depths 1-4 are included in this plot.

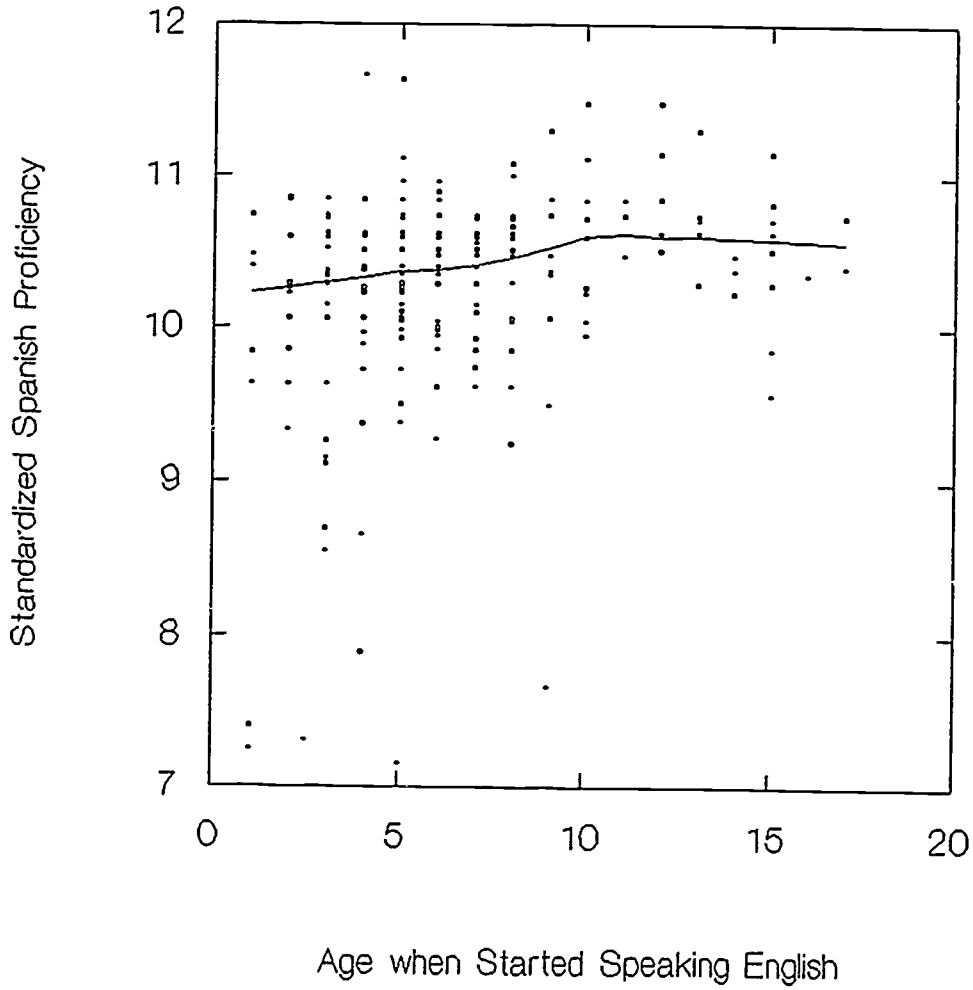

Figure 3. Adult language choice for six Depth cohorts.

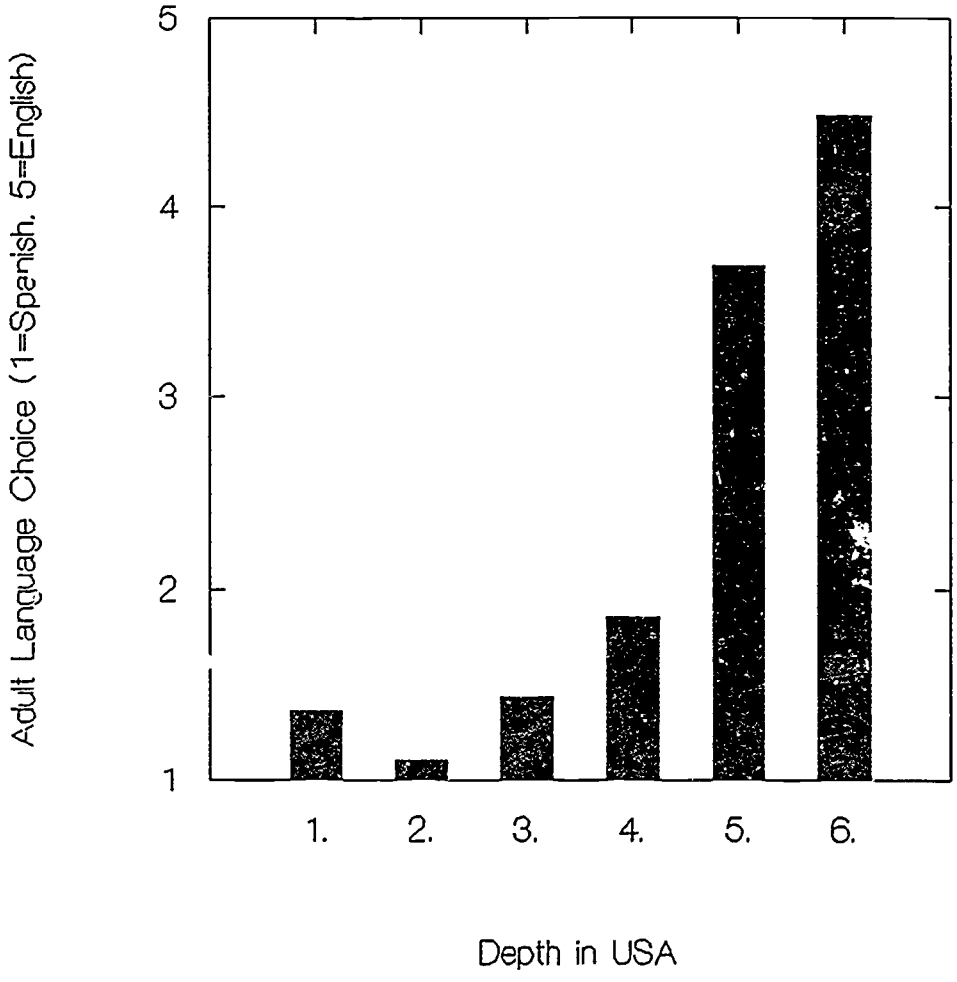

Figure 4. Standardized Spanish language proficiency as a function of adult language choice and Depth, showing a greater contribution of adult language choice in Depth cohorts 4 thru 6. Non-linear smoothing of dependent variable uses a distance-weighted least squares fit (Wilkinson, 1988).

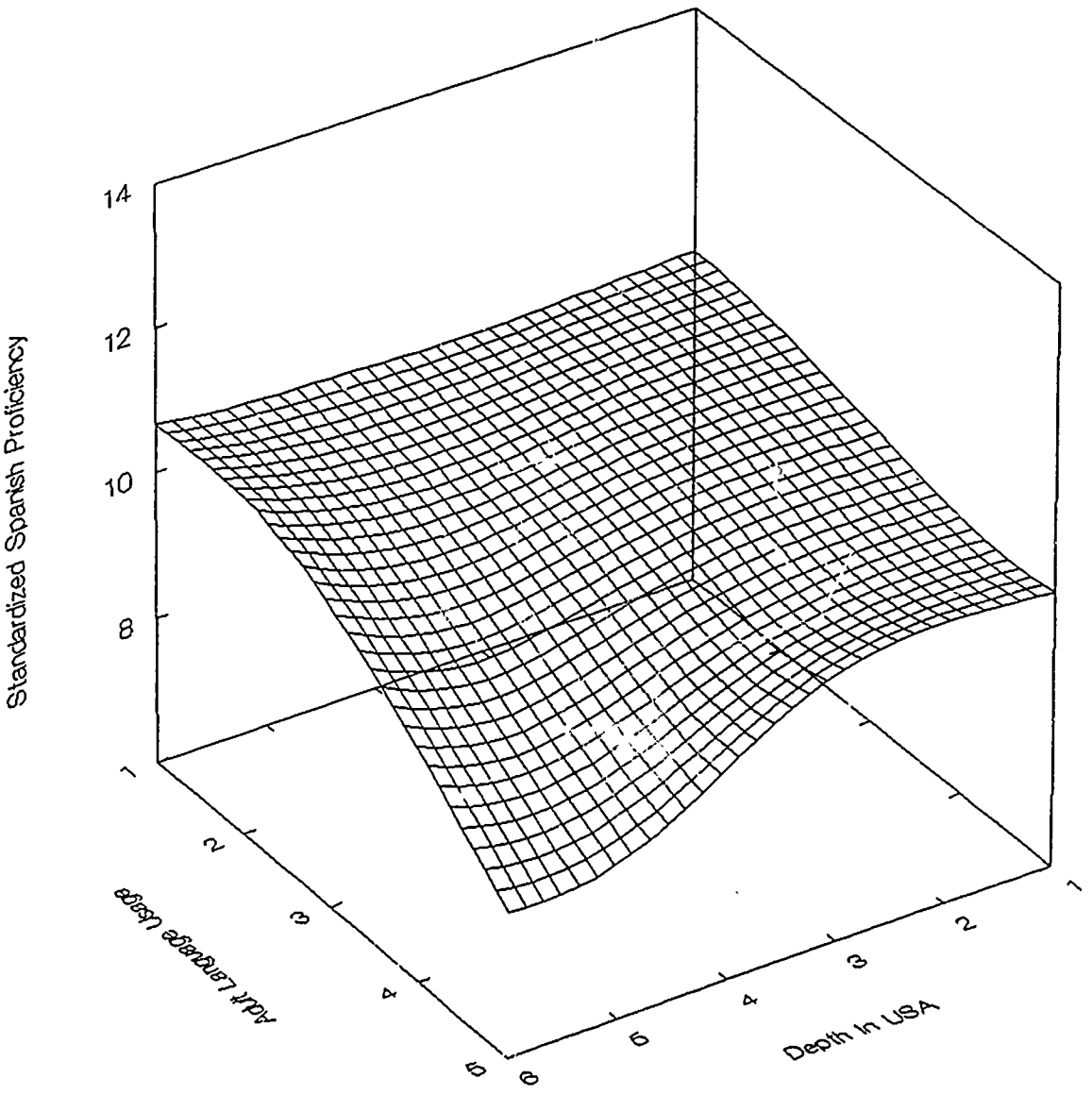

Figure 5. Language choice with siblings, with peers, for academic purposes at school, and when alone, by Depth cohorts.

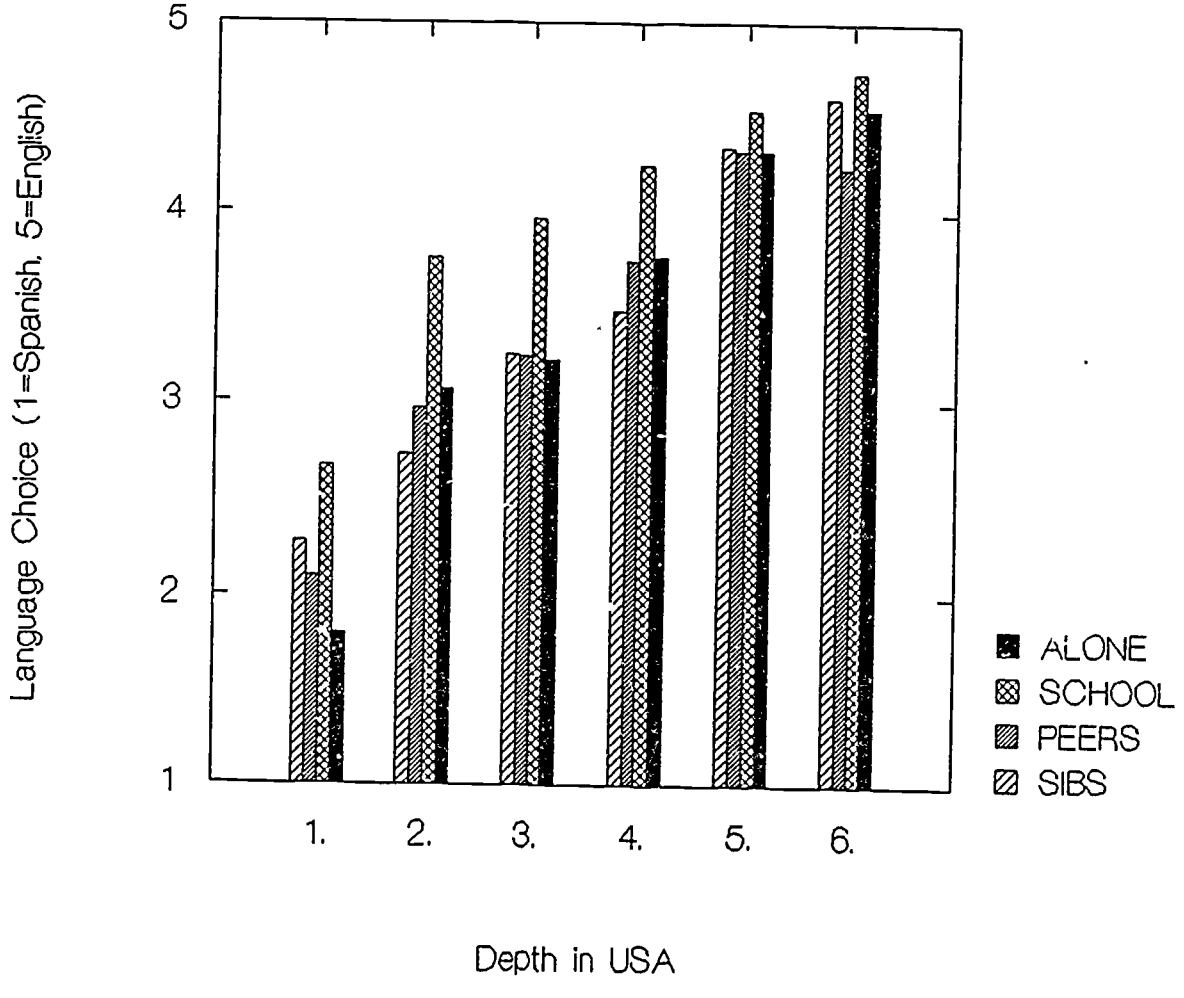

Figure 6. Language choice reported in previous points in life (in childhood, in elementary school, in junior high school), presently with peers, and prediction for the future, by Depth cohorts.

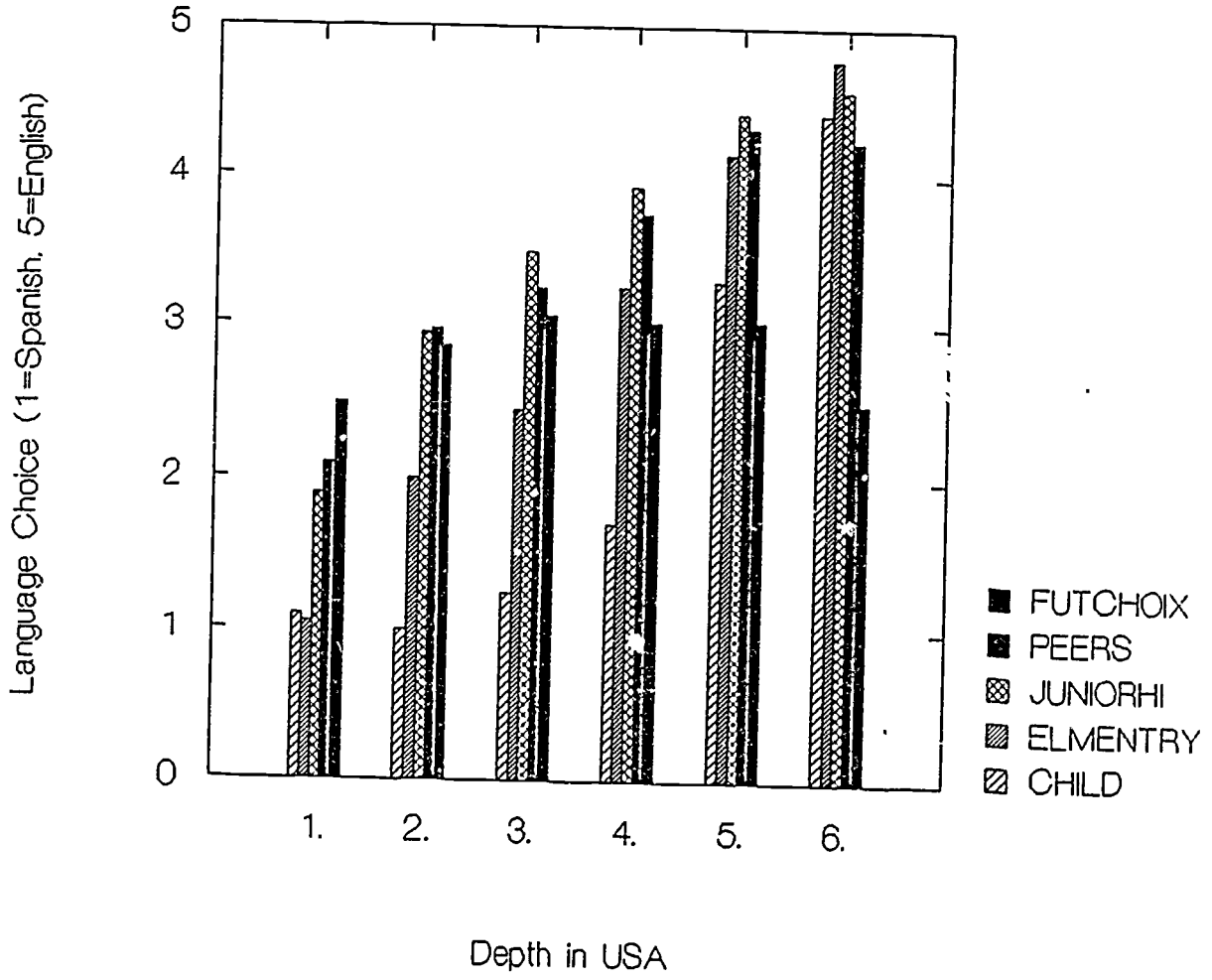

Figure 7. Interaction of modality x word frequency on response latency experiment.

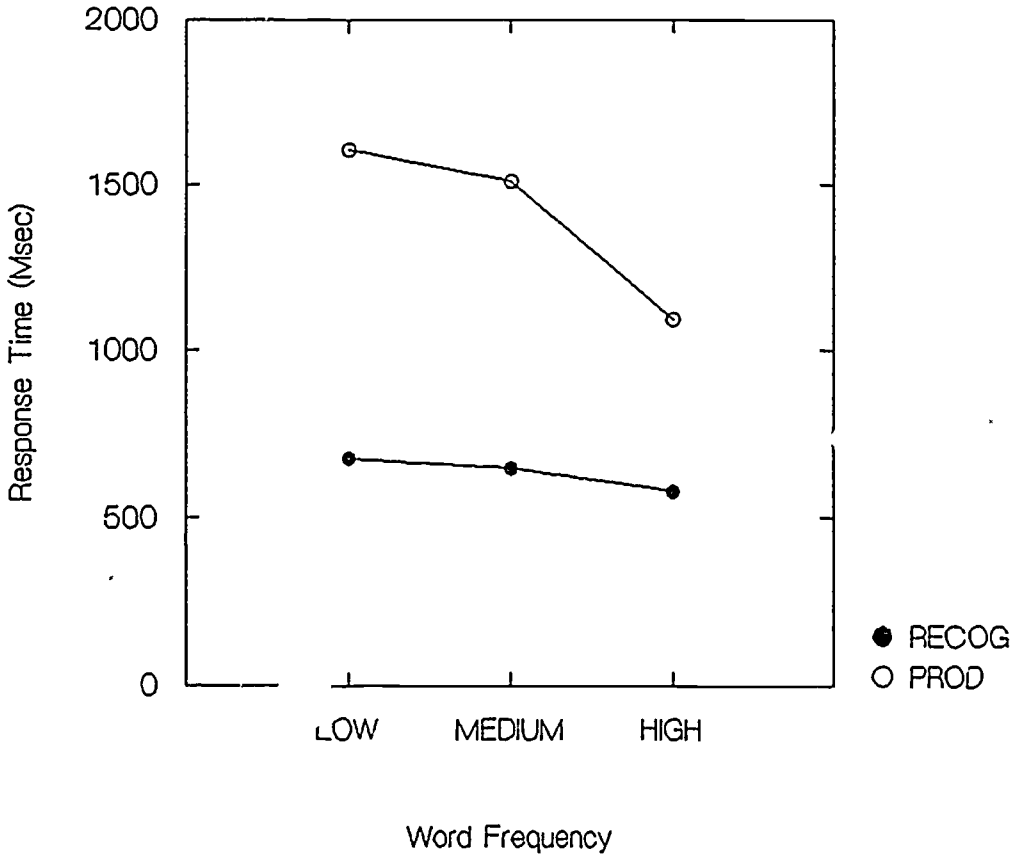

Figure 8. Production and recognition times for high, medium and low frequency Spanish words as a function of Depth (N's=7, 9, and 10 for Depths 3, 4, and 5 respectively).

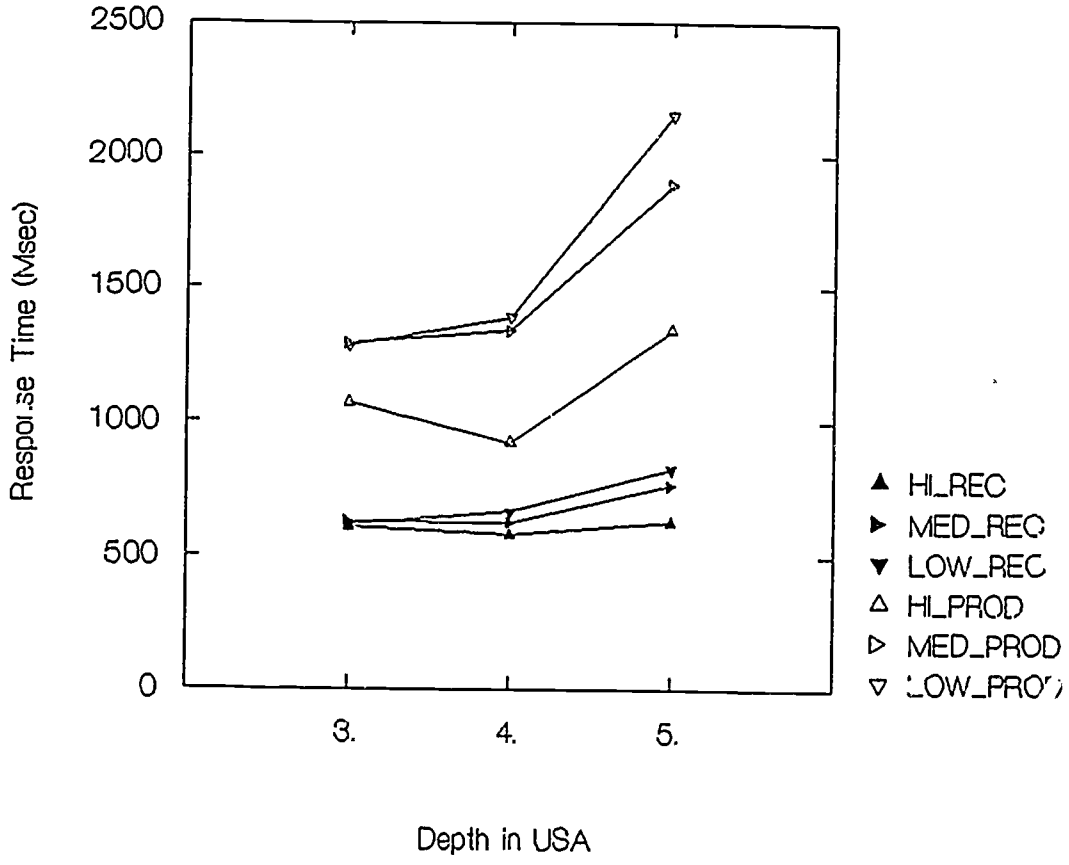

Figure 9. English proficiency plotted as a function of length of residence in the United States.