Effects of Bilingualism on Verbal Learning and Memory in Hispanic Adults

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Abstract

The impact of bilingualism on qualitative aspects of verbal learning and memory was investigated. Equivalent list learning tests in English and Spanish were carefully constructed, and compared across two bilingual Hispanic groups of Mexican origin that differed in their level of English proficiency ("balanced" and "nonbalanced" bilinguals) and a group of monolingual English speaking subjects. Groups were matched for age, education and gender composition. Nonbalanced bilinguals assessed in English utilized semantic clustering to a lesser extent than balanced bilinguals, learned fewer words overall, and demonstrated lower retention scores compared to monolinguals. Comparisons of groups assessed in their dominant languages, however, revealed no significant differences on any of the learning and memory indices examined. In addition to comparisons with standard clinical memory indices, assessment issues concerning bilingual individuals are addressed.

The neuropsychological assessment of ethnic minority and linguistic minority individuals has received relatively limited attention in the literature. Only recently, for example, have the complexities of bilingualism been systematically reviewed and the implications for assessment of language functions addressed (Manuel-DuPont, Ardila, Rosselli, & Puente, 1992). Even more recent has been the publication of the first resource guide to the neuropsychological assessment of Spanish speakers, along with some preliminary norms (Ardila, Rosselli, & Puente, 1994). The need for additional Spanish language measures and for normative data on the cognitive, learning and memory processes of Spanish-speaking monolingual and bilingual individuals is increasingly evident. Recent statistics rank the U.S. fifth worldwide in the number of people who speak Spanish as the mother tongue (World Population Data Sheet, 1986-1990). Further, it is estimated that the U.S. Hispanic population will increase by 9 million or 60 percent between 1982 and 2000 and will double by 2030 (U.S. Bureau of the Census, 1986).

Interest in neuropsychological aspects of bilingualism has primarily focused on the cerebral organization of language in bilingual persons and on aphasia and differential language loss in bilingual individuals with neurological disorders (e.g., Albert & Obler, 1978; Genesee et al., 1978; Paradis, 1977;

Schwartz, Marin, & Saffran, 1979). Psycholinguists investigating bilingualism have generally been interested in the theoretical organization of the linguistic representational system(s) and the extent to which these systems are independent or interdependent (e.g., Durgunoglu & Roediger, 1987; Kolers, 1963; Paivio, Clark & Lambert, 1988). A related focus has been the investigation of the manner in which bilinguals organize and store verbal information. One mechanism for investigating these latter issues has been the presentation of free recall lists constructed in each of the bilingual's languages. Results from these investigations have suggested that recall patterns may vary as a function of the degree of bilingualism of a subject and the language of the list items (Champagnol, 1973; Lambert, Ignatow, & Krauthamer, 1968; Palmer, 1972). For example, Nott and Lambert (1965) reported that French/English bilinguals who were equally proficient in their two languages recalled on the average 3.4 more words per list (regardless of the language of the list) than those subjects who were dominant in French or English and tested in the dominant language. Categorical or semantic clustering of words during recall among subjects who are dominant in a language has been shown to be significantly greater in the stronger language than in the weaker one, even when category names are given to subjects prior to word presentation and

when the words from categories are grouped in presentation (Champagnol, 1973; Nott & Lambert, 1965).

The implications of these findings for the clinical assessment of verbal learning and memory functions in bilingual individuals remain unclear in part because differences exist between experimental and clinical assessment paradigms. For example, experimental word lists have typically been composed of 40 to 60 words presented once in the visual or auditory modality, followed by a recall trial. These lists are typically composed of high frequency words which may be too simple for an accurate assessment of learning and memory functions. To date, no detailed studies of memory functions in bilingual individuals have been published using process-oriented memory tasks of the type used in clinical assessment and no normative standards for such measures exist.

The purpose of the present study was twofold. First, the impact of bilingualism on verbal learning and memory was examined within a clinical assessment paradigm in balanced (equally proficient in two languages) and nonbalanced (dominant in one language) Hispanic bilingual individuals of Mexican origin in each of their two languages. Results were compared with those of a monolingual Caucasian English speaking group. Second, in order to

complete this investigation, it was necessary to develop two equivalent verbal learning lists, one in English and one in Spanish. These were designed to have clinical utility by constructing them to be similar to English language verbal learning lists in popular clinical use. It was hypothesized that balanced bilingual and monolingual individuals would demonstrate equivalent performance in the use of semantic clustering and recall of words when presented with an English language list. In contrast, it was predicted that nonbalanced bilinguals, assessed in English, would be less efficient in semantic clustering and, as a result, would recall fewer words than either the balanced bilingual or monolingual groups. Finally, it was anticipated that group differences in performance would not be evident when individuals were tested in their dominant languages.

The development of the verbal learning lists is discussed and group comparisons are made on three indices of performance. In addition, performance of subjects in all three groups on the English and Spanish lists is compared with that of subjects examined with a popular clinical measure of learning and memory.

Method

Subjects

Volunteers consisted of two groups of Hispanic bilingual speakers (n = 44) and one group of Caucasian monolingual English-speaking adults (n = 22). All subjects were carefully screened via structured interview for any history of neurologic or psychiatric disorder, head trauma, learning disability, or substance abuse. Participants were between the ages of 21 and 50 and had completed at least 6 but not more than 16 years of education. The groups were selected to be similar in terms of mean age and education, and gender distribution.

Bilingualism is a multifaceted construct in which level or degree of competence may differ across modality of communication (e.g., oral versus written) as well as domain of communication (e.g., home versus work). Evaluation of oral language proficiency was considered most germane to the current investigation. Bilingual individuals were identified as either "balanced" (equally proficient in the oral production of the English and Spanish languages) or "nonbalanced" (dominant in Spanish), using performance criteria from the Oral Language subtests of both the English and Spanish versions of the Woodcock Language Proficiency Battery (WLPB;

Woodcock, 1980; 1981). The balanced bilingual group was comprised of 11 third generation, 3 second generation, and 5 first generation Mexican-Americans, and 3 individuals born in Mexico. Generation was determined according to the country of birth of an individual and that of the parents and grandparents. For example, first generation Mexican-Americans were defined as those individuals who were born in the U.S. and whose parents and grandparents were born in Mexico. All of the nonbalanced bilinguals were born in Mexico and later immigrated to the U.S. Seventy-five percent of the balanced bilinguals reported learning both languages in early childhood, at a mean age of three. Eighty-six percent of the nonbalanced bilinguals began learning English in adolescence or adulthood, at a mean age of 23. It is important to note that the nonbalanced individuals in this study subjectively appeared to have sufficient command of the English language for conversational purposes. Monolingual English-speaking subjects were all U.S. born Caucasian adults who, according to self-report, did not possess any degree of proficiency in speaking or understanding a second language. Monolingual subjects with more than three years of educational instruction at any level in any foreign language were excluded from participation. All subjects were living in the U.S. at the time of testing.

Raven's Coloured Progressive Matrices (CPM; Raven, 1956) was administered as a screening instrument to rule out gross intellectual impairment which could affect performance on other measures. While the effectiveness of so-called "culture-reduced tests" is debated, published reliability studies indicate consistent and high reliability estimates for the CPM across ethnic groups, ranging from .76 to .90 (Birkmeyer, 1965; Carlson & Jensen, 1981; Jensen, 1974; Valencia, 1979; Valencia, 1984). In addition, no major differences in performance between Hispanic and non-Hispanic school students have been found in recent studies of the CPM (Raven, Court, & Raven, 1986). Finally, well documented shortcomings of the Spanish version of the WAIS (EIWA), make this instrument unsuitable for the present purposes. No attempt was made to use the CPM as a strict measure of general intelligence nor to utilize IQ scores apart from general screening purposes. Any subject who obtained a raw score equivalent to an IQ score below 80 on the CPM (Raven, 1956) was excluded from participation in order to conservatively screen out gross intellectual impairment.

Method

Two verbal learning lists, one in English and one in Spanish (see Appendix), were developed in accordance with procedures described in the

development of the California Verbal Learning Test (CVLT; Delis, Kramer, Kaplan, & Ober, 1987), a commonly used measure of verbal learning and memory. This approach to the construction of the CVLT was designed to provide qualitative and quantitative indices of learning and memory which can be used to better understand the processes underlying normal and abnormal memory function.

Two variables important to consider in word-list construction are the rank order of words as exemplars of given categories (e.g., Battig & Montague, 1969) and frequency of occurrence of the words in written language (e.g., Carroll, Davies, & Richman, 1971; Thorndike & Lorge, 1944). It has previously been demonstrated that easily categorized and high frequency words are recalled in greater proportion, and categorical or semantic clustering is usually greater for higher frequency words (Baddeley, 1976; Bousfield & Cohen, 1955; Mandler, 1967). Failure to control for these factors could result in inappropriate basal or ceiling effects on performance.

The Spanish and English lists were equated in terms of category typicality using ratings in both languages published by Schwanenflugel and Rey (1986). Words with the highest average typicality ratings in a given category were excluded. An attempt was made to equate the verbal learning

lists on word frequency in addition to category rank. This task proved somewhat problematic due to the existence of only two rather dated sources for frequency of occurrence ratings of Spanish words (Eaton, 1967; Juilland & Chang-Rodriguez, 1964). The original source for the frequency ratings published in Eaton (1967) dates to 1927 (Buchanan, 1927). The Juilland and Chang-Rodriguez (1964) frequency ratings were compiled from a restricted review of literary works published between 1920 and 1940. As an example of the dated nature of these sources, "avion" (airplane) is not listed in either source. This word would likely receive high ratings in terms of both category rank and word frequency if a current source to establish these ratings were available. Because both available sources were determined to be of limited value, word familiarity ratings were compiled as an alternative (Schwanenflugel & Rey, 1986). It has previously been demonstrated that printed word frequency and experiential familiarity are highly correlated (Gernsbacher, 1984). As with category typicality, words with the highest ratings of familiarity were excluded. A total of eight distinct categories were represented on the two lists; each category was comprised of four words, for a total of 16 words per list. Shared categories across the two lists were avoided to minimize priming effects which could affect learning and recall.

Procedure

Test instructions were presented in Spanish to nonbalanced bilinguals and in English to monolinguals. Balanced bilinguals were given instructions in their self-reported preferred language of communication. For each word list, subjects received five learning trials, in which the 16 words were presented in the same order on each trial, immediately followed by a free recall trial. Following the five learning trials, subjects were presented with a brief nonverbal interference task (e.g., Symbol Digit Modalities Test; Smith, 1968; 1973) followed by a delayed recall trial, approximately three minutes later. The lists were presented in counterbalanced order across all subjects. Monolinguals were presented with both lists to control for the potential effects of practice and fatigue.

The following performance indices (see Delis et al., 1987) were calculated for each list: 1) a total recall score, expressed as the sum of the correct words recalled on all five learning trials, 2) a percent retention score, expressed as the number of correct words recalled on the short delay trial divided by the number correctly recalled on the fifth learning trial and multiplied by 100, and 3) a total category clustering ratio calculated by dividing the observed instances of semantic clustering, summed across the five

learning trials, by the expected chance clustering frequencies, also summed across the five trials. Category clustering ratios were of particular interest in that semantic clustering is generally considered a more effective learning strategy and is believed to result in more effective encoding into long-term memory (Craik, 1981; Delis, Freeland, Kramer, & Kaplan, 1988; Klatzky, 1980).

Results

Table 1 presents mean subject characteristics for the three subject groups. ANOVA results indicated there were no significant differences in age or education among the groups. However, results revealed significant differences among the groups on CPM scores, $F(2,63) = 4.86$, $p = .01$. Post-hoc analyses using the Scheffe' procedure indicated the nonbalanced bilinguals performed significantly worse on the CPM compared with monolinguals, although as the means illustrate, the 2.3 point difference is likely not clinically significant.

Insert Table 1 about here

Clustering ratios and performances on total recall and percent retention among the three groups under the English and Spanish list conditions were analyzed using 3 x 2 (group x list) repeated measures MANOVAs. The mean semantic clustering ratios, total recall scores, and percent retention scores for the two lists are displayed by group in Table 2.

Insert Table 2 about here

With regard to semantic clustering ratios, there was a significant group by list interaction effect, F (2,63) = 6.73, p = .002 and a main effect for group, F(2,63) = 4.45, p = .02. The nonbalanced bilinguals clustered words significantly less (M = 1.3) than the balanced bilinguals (M = 1.8), F(1, 63) = 4.27, p = .04, but essentially clustered words to the same extent as the monolinguals (M = 1.4).

Analyses of total recall scores indicated there was a significant group by list interaction effect, F (2,63) = 145.47, p < .001. Main effects were obtained for group, F (2,63) = 21.08, p = <.001 and list F (1,63) = 68.66, p < .001. The nonbalanced bilingual group recalled significantly fewer words (M = 44.7) from the English list compared to the balanced bilingual (M =

54.3), $\underline{F}(1, 63) = 14.00$, $\underline{p} < .001$, and monolingual ($\underline{M}$ 56.2), $\underline{F}(1, 63) = 11.81$ $\underline{p} < .001$ groups.

With regard to percent retention scores, there was a significant group by list interaction effect $\underline{F}$ (2, 63) = 21.45, $\underline{p} < .001$. In addition, significant main effects were obtained for group, $\underline{F}$ (2, 63) = 4.53, $\underline{p} = .015$ and list, $\underline{F}$ (1, 63) = 8.37, $\underline{p} = .005$. The nonbalanced bilingual group retained a lower percentage of words ($\underline{M} = 85.1$) on the English list compared to the monolingual group ($\underline{M} = 96.5$), $\underline{F}(1, 63) = 11.81$, $\underline{p} = .001$.

Univariate analysis of variance indicated that the three groups did not significantly differ with respect to semantic clustering, total recall, or percent retention when tested in the dominant language. Spanish was chosen arbitrarily as the dominant language for the balanced bilingual group for the purpose of this analysis. Balanced bilingual individuals performed equally well on the two lists with regard to all three indices of performance.

Total recall scores and semantic clustering ratios of male and female monolingual and balanced bilingual individuals were compared with similar scores reported by Kramer, Delis, and Daniel (1988) in a monolingual study of sex differences in verbal learning using the CVLT (See Table 3).

Insert Table 3 about here

With regard to total recall, mean scores for monolingual males and females under the English condition were very similar to the mean recall scores reported by Kramer et al. (1988) for the CVLT. Females assessed with the CVLT demonstrated significantly better recall performance compared to males in their sample. Superior verbal learning was similarly evident for females assessed with the English list in the present study $\underline{F}(1, 20) = 9.74$, $\underline{p} = .005$. However, the balanced bilingual group failed to demonstrate this gender effect, as balanced bilingual females and males performed at similar levels on both the English and Spanish lists.

Semantic clustering ratios were somewhat lower for male and female monolinguals on the English list in the present study compared to the ratios reported by Kramer et al. (1988) on the CVLT. In comparing the performance of balanced bilingual males on either the English or Spanish list to the performance of males from the Kramer study, it is evident that the males utilized semantic clustering to a similar extent. However, balanced bilingual females in the present sample clustered less than the Kramer et al.

(1988) female sample on both lists. In contrast to the findings of Kramer et al. (1988), there were no significant differences in semantic clustering on either list between females and males who were balanced bilinguals.

Discussion

Results of this study suggest that degree of bilingualism, as measured in the present study, represents a significant variable in the learning and retention of verbal information presented in a list format similar to the CVLT. Nonbalanced Mexican origin bilingual speakers, examined in English (the nondominant language), recalled fewer words than either of the other groups, in spite of clustering as well as monolinguals. In addition, the nonbalanced group retained fewer words compared to monolinguals. In contrast, the performances of balanced bilingual and monolingual persons tested in English were equivalent on all three indices of verbal learning and recall. Not surprisingly, performance differences among the three groups were not evident when individuals were assessed using verbal learning lists constructed in their dominant languages. Furthermore, balanced bilingual individuals, regardless of which list was presented, recalled and retained an equivalent number of words in either language and were equally skilled at using the organizational strategy of semantic clustering in both languages.

These results illustrate the similarity in verbal learning and memory functions cross-culturally among individuals from two ethnic/linguistic groups who possess similar years of education and who are of approximately the same age. However, it is clear that access to a specific learning strategy and use of the strategy to facilitate recall may not be evident in nonfluent English speakers until such individuals are provided with the opportunity to perform in their dominant language. It is important to emphasize that the nonbalanced individuals in this study possessed sufficient command of the English language for conversational purposes.

Semantic clustering ratios of balanced bilingual males and females on the English and Spanish lists were very similar to that of the males in the Kramer et al. (1988) sample assessed with the CVLT. However, clustering ratios for male and female monolinguals were somewhat lower than those reported by Kramer and colleagues. This may be related to different list compositions and/or to a lack of cohesiveness in one of the English list categories in the present study. For example, two words intended to represent the category "weapons" may have been more representative of the category "tools," which was not used in the list. This may have adversely affected the use of clustering in the monolingual group. The bilingual group, in contrast,

may not have been as affected by this, perhaps due to a more extensive semantic network resulting from the representation of two languages.

Similar problems with category cohesiveness may have existed on the Spanish list as well. For example, during the course of the investigation, it was discovered that various Spanish speakers attributed different meanings to two of the Spanish words. To illustrate, the word "banqueta" was intended to mean a footstool and was to be included as part of the "furniture" category. Nearly all of the individuals from Mexico, however, interpreted "banqueta" to mean "sidewalk." Many of the bilinguals raised in the southwestern United States, particularly New Mexico, associated this word with a piece of furniture. This finding underscores the difficulty in developing "generic" verbal learning lists in Spanish (or other languages) due to dialectical and regional differences in the meaning of words. These variations in meaning would clearly impact one's ability to use an organizational strategy such as semantic clustering. In the present study, clustering ratios for the bilingual individuals may have been artificially depressed as a result of these variations in meaning, although it should be emphasized that performances of bilingual males and females were very similar to that of the males in the study by Kramer et al. (1988) using the CVLT.

Significant differences in performance on the CPM between the nonbalanced bilingual and monolingual groups deserves comment. While mean years of education was similar among all three groups, there was a lower range in the nonbalanced group. In addition, subjects in the nonbalanced group were primarily educated in Mexico, unlike subjects who comprised the monolingual and balanced bilingual groups. There is considerable variability in educational services throughout Mexico, particularly in rural versus urban areas. Familiarity and experience with nonverbal reasoning tasks, such as the matrices test used in this study, may have differed among the groups and resulted in slightly diminished performance by the nonbalanced group.

Although balanced bilingual individuals performed equally well in the two languages, this does not imply that either language may be arbitrarily chosen for evaluation of learning and memory functions in the balanced bilingual. For example, each language may be differentially organized in the bilingual brain and thus may be differentially affected by neurological damage. In addition, linguistic skills and proficiency could differ in the two languages depending upon the domain in which a given language is utilized (e.g., home versus school) (See Albert & Obler, 1978; Manuel-Du Pont et al., 1992). For

example, we used a standardized measure, the WLPB, to assign individuals to the two bilingual groups. This measure has traditionally been used with school children for bilingual educational planning. Some of the test stimuli are intended to elicit responses which would likely have been learned in an academic setting (e.g., "volcano" or "Sphinx"). Some bilingual individuals who considered themselves fluent in both languages were assessed as English dominant using the WLPB and subsequently excluded from the study. These individuals had been educated primarily in the U.S. and apparently did not possess the relevant Spanish vocabulary to score in the balanced range on this particular proficiency test.

As Manuel-Du Pont et al. (1992) have suggested, bilingual individuals, (particularly those who appear to be balanced in proficiency) should be assessed in both languages as much as possible. Although it may be difficult to discriminate the effects on performance of reduced proficiency versus neurological impairment, it may nevertheless be possible to identify strengths and weaknesses in memory and other cognitive functions under a given language condition. Further studies of brain-injured bilingual individuals are needed to help clarify these issues.

The use of a verbal learning strategy, such as semantic clustering, and

its relationship to memory ability is clearly related to level of language proficiency and language of assessment. Bilingual individuals may possess unique features in terms of linguistic organization which could mediate expression of other cognitive abilities. General assumptions regarding cerebral asymmetries in the context of gender-related lateralization effects need to be further examined in bilingual populations. Regardless, exclusive use of English language verbal learning tests and norms may fail to adequately capture expressions of linguistic and memory functions in bilingual individuals. Verbal learning tests in Spanish, however, such as the one developed in this study, may be effective tools to begin meeting the challenge of neuropsychological assessment of the bilingual individual. Further, such measures may yield additional means to study cerebral organization of language and other cognitive functions in bilingual individuals.

References

Ardila, A., Rosselli, M., & Puente, A.E. (1994). Neuropsychological evaluation of the Spanish speaker. New York: Plenum Press.

Albert, M.L., & Obler, L.K. (1978). The bilingual brain. New York: Academic Press.

Baddeley, A.D. (1976). The psychology of memory. New York: Basic Books.

Battig, W.F., & Montague, W.E. (1969). Category norms for verbal items in 56 categories: A replication and extension of the Connecticut category norms. Journal of Experimental Psychology Monograph, 80, 1-46.

Birkmeyer, F. (1965). The relationship between the Coloured Progressive Matrices and the Wechsler Intelligence Scale for Children. Psychology in the Schools, 2, 278-280.

Bousfield, W.A., & Cohen, B.H. (1955). The occurrence of clustering in the recall of randomly arranged words of different frequencies-of-usage. The Journal of General Psychology, 52, 83-95.

Buchanan, M.A. (1927). Graded Spanish word book. Toronto: University of Toronto Press.

Carlson, J.S., & Jensen, C.M. (1981). Reliability of the Raven Coloured Progressive Matrices Test: Age and ethnic group comparisons. Journal of Consulting and Clinical Psychology, 49, 320-322.

Carroll, J.B., Davies, P., & Richman, B. (1971). The American Heritage Word Frequency Book. New York: American Heritage Publishing Co.

Champagnol, R. (1973). Organisation se'mantique et linguistique dans le rappel libre bilingue. Anne'e Psychologique, 73, 115-134.

Craik, F.I.M. (1981). Encoding and retrieval effects in human memory: A partial review. In J. Long & A.D. Baddeley (Eds.), Attention and performance, IX. Hillsdale, N.J.: Erlbaum.

Delis, D., Freeland, J., Kramer, J., & Kaplan, E. (1988). Integrating clinical assessment with cognitive neuroscience: Construct validation of the California Verbal Learning Test. Journal of Consulting and Clinical Psychology, 56(1), 123-130.

Delis, D., Kramer, J.H., Kaplan, E., & Ober, B.A. (1987). The California Verbal Learning Test-Research edition. New York: Psychological Corporation.

Durgunoglu, A.Y., & Roediger, H.L. (1987). Test differences in accessing bilingual memory. Journal of Memory and Language, 26, 377-391.

Eaton, H.S. (1967). An English-French-German-Spanish word frequency dictionary. New York: Dover Pub.

Genesee, F., Hamers, J., Lambert, W.E., Mononen, L., Seitz, M., & Starck, R. (1978). Language processing in bilinguals. Brain and Language, 5, 1-12.

Gernsbacher, M.A. (1984). Resolving 20 years of inconsistent interactions between lexical familiarity and orthography, concreteness, and polysemy. Journal of Experimental Psychology: General, 113(2), 256-281.

Jensen, A.R. (1974). How biased are culture-loaded tests? Genetic Psychology Monographs, 90, 185-244.

Juilland, A., & Chang-Rodriguez, E. (1964). Frequency dictionary of Spanish words. The Hague: Mouton & Co.

Klatzky, R.L. (1980). Human memory: Structures and processes. San Francisco: W.H. Freeman and Company.

Kolers, P.A. (1963). Interlingual word associations. Journal of Verbal Learning and Verbal Behavior, 2, 291-300.

Kramer, J.H., Delis, D.C., Daniel, M. (1988). Sex differences in verbal learning. Journal of Clinical Psychology, 44(6), 907-915.

Lambert, W.E., Ignatow, M., & Krauthamer, M. (1968). Bilingual organization in free recall. Journal of Verbal Learning and Verbal Behavior, 7, 207-214.

Mandler, G. (1967). Organization and memory. In K.W. Spence & J.A. Spence (Eds.), The psychology of learning and motivation (Vol 1). New York: Academic Press.

Manuel-DuPont, S., Ardila, A., Rosselli, M., & Puente, A.E. (1992). Bilingualism. In A.E. Puente and R.J. McCaffrey (Eds.), Handbook of neuropsychological assessment: A biopsychosocial perspective. New York: Plenum.

Nott, C.R., & Lambert, W.E. (1965). Free recall of bilinguals. Journal of Verbal Learning and Verbal Behavior, 7, 1065-1071.

Paivio, A., Clark, J.M., & Lambert, W.E. (1988). Bilingual dual-coding theory and semantic repetition effects on recall. Journal of Experimental Psychology: Learning, Memory, and Cognition, 14(1), 163-172.

Palmer, M.B. (1972). Effects of categorization, degree of bilingualism, and language upon recall of select monolinguals and bilinguals. Journal of Educational Psychology, 63, 160-164.

Paradis, M. (1977). Bilingualism and aphasia. In Whitaker & Whitaker (Eds.), Studies in neurolinguistics Vol 3. New York: Academic Press.

Raven, J.C. (1956). The Coloured Progressive Matrices. London: H.K. Lewis & Co..

Raven, J.C., Court, J.H., & Raven, J. (1986). A manual for Raven's progressive matrices and vocabulary tests (Research Supplement No. 3). San Antonio: The Psychological Corporation.

Schwanenflugel, P.J., & Rey, M. (1986). The relationship between category typicality and concept familiarity: Evidence from Spanish- and English-speaking monolinguals. Memory and Cognition, 14(2), 150-163.

Schwartz, M.F., Marin, O.S.M., & Saffran, E.M. (1979). Dissociations of language function in dementia: A case study. Brain and Language, 7, 277-306.

Smith, A. (1968). The Symbol Digit Modalities Test: A neuropsychologic test for economic screening of learning and other cerebral disorders. Learning Disorders, 3, 83-91.

Smith, A. (1973). Symbol Digit Modalilties Test Manual. Los Angeles: Western Psychological Services.

Thorndike, E.L., & Lorge, I. (1944). The teacher's word book of 30,000 words. New York: Teachers College.

United States Bureau of the Census (1986). Projections of the Hispanic population: 1983-2080. (U.S. Dept. of Commerce, Population Estimates and Projections, Series P-25, No. 995). Washington D.C.: U.S. Government Printing Office.

Valencia, R.R. (1979). Comparison of intellectual performance of Chicano and Anglo third-grade boys on the Raven's Coloured Progressive Matrices. Psychology in the Schools, 16, 448-453.

Valencia, R.R. (1984). Reliability of the Raven Coloured Progressive Matrices for Anglo and for Mexican-American children. Psychology in the Schools, 21, 49-52.

Woodcock, R.W. (1980). Woodcock Language Proficiency Battery, English Form. Hingham, Mass.: Teaching Resources Corp.

Woodcock, R.W. (1981). Woodcock Language Proficiency Battery, Spanish Form. Hingham, Mass.: Teaching Resources Corp.

World Population Data Sheet (1986-1990). Washington, D.C.: Population Reference Bureau.

Table 1

Sample Characteristics

	Monolingual English	Balanced Bilingual	Nonbalanced Bilingual
Total Number	22	22	22
Right Handed	20	18	22
Left Handed	2	4	0
Male	12	10	10
Female	10	12	12
Age			
M	32.1	35.0	29.8
SD	8.1	8.0	7.6
Education			
M	13.1	13.0	11.9
SD	1.5	1.6	3.3
Raven CPM			
M	33.1	31.1	30.8
SD	1.6	3.1	2.7

Table 2

Results

	Monolingual English	Balanced Bilingual	Nonbalanced Bilingual
Total Recall			
English			
M	56.2	54.3	44.7
SD	7.1	8.7	9.6
Spanish			
M	23.5	51.5	54.4
SD	7.5	7.7	8.0
Cluster Ratios			
English			
M	1.4	1.8	1.3
SD	.8	.9	.6
Spanish			
M	1.0	1.8	1.7
SD	.8	.7	.7
% Retention			
English			
M	96.5	90.1	85.1
SD	5.6	11.4	14.0
Spanish			
M	68.7	92.7	90.4
SD	21.7	9.1	13.4

Table 3

Comparison of Current Results With Kramer et al. (1988) Mean Verbal Learning Scores by Gender

	Monolingual English (Eng. List)	Balanced Bilingual (Eng. List)	Balanced Bilingual (Span. List)	Kramer et al. CVLT
Total Recall				
Males	52.6	53.2	50.5	53.8
Females	60.5	55.3	52.3	58.4
Cluster Ratio				
Males	1.4	1.8	1.8	1.9
Females	1.6	1.7	1.8	2.5

Appendix[1]

Spanish List	English List
Mecedora	Sword
Tren	Raspberry
Tambor	Vest
Codo	Arrow
Lampara	Coconut
Una	Underwear
Marimba	Grenade
Banqueta	Cabinet
Avion	Stockings
Maracas	Window
Bicicleta	Hatchet
Diente	Cherry
Camion	Closet
Silla	Slippers
Corneta	Door
Pelo	Raisen

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Footnotes

[1]A new version of the Spanish California Verbal Learning Test is being constructed to conform to the CVLT II, which is under development.