

Bilingual Aphasic Adults: Measures of Word Retrieval

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The bilingual patient presents a treatment planning challenge for the aphasia clinician. In deciding which language to remediate first, the clinician may consider factors such as the patient's primary language or the language used more frequently prior to onset of aphasia.

To date, little is certain regarding the differential recovery of languages by the bilingual aphasic patient, although several patterns of restitution have been identified (Paradis, 1982). Parallel restitution refers to the recovery of both languages at the same rate and to the same extent; differential recovery occurs when one language reappears after progress is documented in the other. In selective recovery, only one language is regained.

Previous investigations of recovery from aphasia in bilinguals have revealed several problem areas. Some investigators have used for data, histories in which complete details were not available (Albert and Obler, 1978) or reviews of previously-reported cases (Lebrun, 1976) rather than first-hand observations of language recovery. Some investigations have been accounts of experiences of one or two patients, and conflicting results have been reported (April and Tse, 1978; Watanori and Sasanuma, 1977; Paradis, 1982).

One way to systematically study the recovery of languages by bilingual aphasic patients is to compare retrieval of words in both languages. A word retrieval deficit long has been recognized as a frequent and persistent aspect of aphasia and has been defined as inability to name objects or pictures on command (Head, 1926; Wepman and Jones, 1951; Goodglass and Kaplan, 1983). Latency is considered to be an important factor (Newcomb, Oldfield and Wingfield, 1965; Mills, Knox, Juola and Salmon, 1979; Marshall, Neuberger and Sakellaris, 1982). One purpose of the present study was to investigate recovery of languages by bilingual aphasic patients by comparing the number of errors and the latency of responses to English words with the number of errors and the latency of responses to Spanish words. Comparisons of word retrieval measures for Spanish and English words between aphasic subjects and neurologically normal adults have not been made. Another purpose of the present investigation was to make that comparison. It was hoped that the results of this study could be used to aid the aphasia clinician in determining which language to use for remediation.

For the purposes of this study, the following definitions were used: Bilingual Aphasia Subject: An adult whose primary language was Spanish, who spoke both Spanish and English before the age of 10 years and who was using both languages immediately prior to sustaining a left hemisphere thrombo-embolic cerebral vascular accident. Prior to becoming aphasic, the individual may have been able to read and write in both languages, or in one language but not in the other. Bilingual Neurologically Normal Control Subject: An adult whose primary language was Spanish, who spoke Spanish and English before the age of 10 years and who was using both languages at the time of participation in the study. The subject may have learned to read and write

in both languages, or in one but not in the other. Latency Measure: The time in milliseconds between the presentation of a stimulus picture and the verbal production of an accurate, intelligible response (Marshall et al., 1982).

METHOD

Ten bilingual male aphasic patients were subjects. They ranged in age from 44-75 years. Time postonset of aphasia was 2-24 weeks. Severity of aphasia was based on a sample of conversational speech in Spanish and in English. Two bilingual aphasia clinicians, using the Aphasia Severity Rating Scale from the Boston Diagnostic Aphasia Examination (Goodglass and Kaplan, 1983), assigned ratings ranging from 1-4 for both languages. Ten neurologically normal bilingual controls also served as subjects. These subjects ranged in age from 25-74 years.

Black-and-white line drawings of common objects were shown to 15 neurologically normal bilingual adults who were asked to name the pictures in Spanish and English. Twenty drawings that were given identical labels by all 15 participants were considered to be low uncertainty items. These were reproduced on 2" x 2" slides.

Lafayette logic circuitry was used to control stimulus presentations and latency measure functions. Depressing a start pushbutton on a stopclock latch caused a tachistoscope shutter to open, a slide to appear on a screen, and, simultaneously, started two clock counters. A subject's first verbal response as detected by a voice-activated relay caused the first clock counter to stop. Depressing a hand-held pushbutton caused the tachistoscope shutter to close and the second clock counter to stop. Thus, if a subject produced a false start or a self-correction during the task, a latency measure for subsequent verbal responses could be obtained.

Each subject was seated at a table in front of the viewing screen. A microphone connected to the voice-activated relay was placed on the table. In a practice session, subjects were instructed to name five practice slides. If a subject did not perform the task by producing intelligible words, he was excused.

The slides were presented singly and subjects were instructed to name each one as rapidly as possible with the best single word they could recall. Responses and latency measures were recorded for each word. Order of presentation of the languages was counterbalanced; one-half the subjects first named the slides in English, and the remaining subjects first named the slides in Spanish.

The experimental procedures were carried out in two sessions. In the first session, subjects named the 20 slides in one language. After an interval of 30 minutes - 2 days, subjects named the same slides in the other language. All sessions were tape recorded for subsequent analysis.

The number of errors was tabulated for English and Spanish words for each subject in each of the two groups (aphasic, control). Latency measures for correct responses were tabulated for both languages for each subject in each group. The Mann-Whitney U Test was employed to test for differences between languages and between groups for both error and latency measures. This nonparametric procedure was chosen because of the small sample sizes and markedly different variance between the subject groups. The median was used because a few extreme outliers in the aphasia group biased the mean. Alpha was set at $p < .05$ and two-tailed test tables were used as references (Roscoe, 1969).

RESULTS AND DISCUSSION

In Table 1 is the summary of hypotheses tested with the Mann-Whitney U Test. On four tests, significant levels were reached; on the remaining four tests, significant levels were not demonstrated.

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 Table 1. Summary of hypotheses tested with the Mann-Whitney U Test.

<u>Null Hypotheses</u>	<u>Mann-Whitney Value</u>
A=B	44
C=D	42
E=F	42
G=H	N/A
A=C	17*
B=D	11*
E=G	0*
F=H	10*
I=J	32
K=L	28

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 *Note: The critical Mann-Whitney value at $p < .05$ (two-tailed) ≤ 23 .

There were no significant differences between languages for either number of errors or response latencies for the aphasic or the control group. Statistically, the aphasic group was inferior to the control group on both measures for both languages. Table 2 shows median latency and median number of errors for the two groups.

No significant differences between medians were found between languages on either measure for either group. The analysis for this finding was accomplished by subtracting the latency for each Spanish word from the latency for each English word for all 20 items. The median of these difference scores was recorded for each subject as his "language superiority measure." Aphasic subjects were then compared to controls on the basis of these median differences using the Mann-Whitney. A positive English-Spanish score indicated a superiority of Spanish over English (a shorter Spanish word-retrieval latency). A negative English-Spanish score indicated a superiority of English over Spanish. The analysis was extended to naming errors using the same methodology. These results are shown in Table 3.

It was not surprising that the control group retrieved words with fewer errors and shorter response latencies than the aphasia group did. Similar results have been reported by others (Mills et al., 1979; Marshall et al., 1982). Another expected finding was that in the control group there was no significant difference between the languages. Neurologically normal bilingual subjects made only two errors in Spanish and no errors in English. Response latencies were short for both languages.

Table 2. Median latency of response in seconds and median number of errors for English and Spanish words for aphasia and control groups.

LATENCY

Language		Groups	
		Aphasia	Control
	<u>English</u>	2.995 (A)	1.840 (C)
	<u>Spanish</u>	2.682 (B)	1.928 (D)

H : A=B (\bar{U} = 44, p = NS)

H : A=C (\bar{U} = 17, p < .05)

H : C=D (\bar{U} = 42, p = NS)

H : B=D (\bar{U} = 11, p < .05)

ERRORS

	<u>English</u>	4.0 (E)	0 (G)
	<u>Spanish</u>	4.5 (F)	0 (H)

H : E=F (\bar{U} = 42, p = NS)

H : E=G (\bar{U} = 0, p < .05)

H : G=H (N/A)

H : F=H (\bar{U} = 10, p < .05)

Table 3. Median differences in responses for English minus Spanish words for aphasia and control groups.

Group		Median Differences	
		Latency	Errors
	<u>Aphasia</u>	+ 0.485 (I)	0 (K)
	<u>Control</u>	- 0.107 (J)	0 (L)

H : I=J (\bar{U} = 32, p = NS)

H : K=L (\bar{U} = 28, p = NS)

In the aphasia group no significant differences were found in either error rate or response latency between English and Spanish words. These findings are compatible with those of Porch and de Berkeley-Wykes (1985). These investigators found that, for their bilingual aphasic subjects, there was no significant difference between English and Spanish on the performance of the verbal subtests of the Porch Index of Communicative Ability (Porch, 1967).

The absence of statistical significance does not imply, necessarily, the absence of clinical significance. The findings for individual subjects in this investigation have implications for the treatment of bilingual aphasic patients. Of the 10 patients studied, three scored no errors in word retrieval, demonstrating parallel recovery. For these patients, it would be appropriate for the aphasia clinician to begin remediation in either one or both languages. On the other hand, seven patients scored errors; some scoring more in Spanish, some scoring more in English and all demonstrating differential recovery. Further studies are needed in order to determine, for these patients, whether remediation in the "stronger" language (that language in which fewer errors are scored during a word retrieval task) or remediation in the "weaker" language (that language in which a greater number of errors are scored during a word retrieval task) will be the better facilitator of recovery from aphasia for both languages. It is reasonable to assume that the outcome of a word retrieval task can aid the clinician in the selection of the appropriate language to use to facilitate recovery from aphasia.

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REFERENCES

- Albert, M.L. and Obler, L. The Bilingual Brain, Neuropsychological and Neurolinguistic Aspects of Bilingualism. New York: Academic Press, Inc., 1978.
- April, R.S. and Tse, P.C. Crossed aphasia in a Chinese bilingual dextral. Archives of Neurology, 34, 766-770, 1978.
- Goodglass, H. and Kaplan, E. The Boston Diagnostic Aphasia Examination. Philadelphia, PA: Lea and Febiger, 1972.
- Head, H. Aphasia and Kindred Disorders of Speech. New York: Hafner Publishing Co., 1926.
- Lebrun, Y. Recovery in polyglot aphasics. Neurolinguistics, 4, 96-108, 1976.
- Marshall, R.C., Neuburger, S.I. and Sakellaris, P.C. Word retrieval latencies for aphasic syndromes. In R.H. Brookshire (Ed.), Clinical Aphasiology: Conference Proceedings, 1982. Minneapolis, MN: BRK Publishers, 1982.
- Mills, R.H., Knox, A.W., Juola, J.F. and Salmon, S.J. Cognitive loci of impairments in picture naming by aphasic subjects. Journal of Speech and Hearing Research, 22, 77-87, 1979.
- Newcomb, F.B., Oldfield, R.C. and Wingfield, A. Object naming by dysphasic subjects. Nature, 207, 1217-1218, 1965.
- Paradis, M. Alternate antagonism with paradoxical translation behavior in two bilingual aphasic patients. Brain and Language, 15(1), 55-69, 1982.
- Porch, B.E. Porch Index of Communicative Ability. Palo Alto, CA: Consulting Psychologists Press, 1967.
- Porch, B.E. and de Berkeley-Wykes, J. Bilingual aphasia and its implications for cerebral organization and recovery. In R.H. Brookshire (Ed.), Clinical Aphasiology: Conference Proceedings, 1985. Minneapolis, MN: BRK Publishers, 1985.

- Roscoe, J.T. Fundamental Research Statistics for the Behavioral Sciences.
New York: Holt, Rinehart and Winston, Inc., 1969.
- Watanori, T.S. and Sasanuma, S. The recovery processes of two English-Japanese bilingual aphasics. Brain and Language, 6(2), 127-140, 1980.
- Wepman, J. and Jones, L. Studies in Aphasia: An Approach to Testing.
Chicago, IL: University of Chicago Education Industry Service, 1961.

DISCUSSION

- Q: You said that your subjects spoke both languages prior to their incidence of aphasia. In the work I'm doing with Japanese aphasic patients, I'm trying to go much more deeply into how they were using the languages prior to onset of aphasia. Did you ask your subjects anything other than what language they spoke before becoming aphasic?
- A: Yes, we interviewed extensively, and, in fact, have correlated such variables as the language used immediately prior to CVA and age (before or after 6 years) of second language acquisition with measures of word retrieval.
- C: Some of the questions that I'm asking are: To what extent were the subjects using the two languages? At what linguistic level were they using both languages? I'm trying to determine, for example, if they were using one language at home and the other in their business; and, in written correspondence, if they used both languages equally, or one language more than the other.
- A: We obtained similar information during our interviews.
- Q: Were you convinced that you got good data from these interviews? I'm not; that's my problem.
- A: I understand your problem all too well. The literature is full of studies in which data were based on subjective reports which may or may not be valid. That is why we used the objective measures that a word retrieval task could yield.
- Q: I was curious about the nature of the errors. Were they "no response" errors or paraphasic errors? And, if they were paraphasias, did the subjects make the same verbal paraphasic errors in both languages?
- A: There were errors of omission (no response) as well as errors of commission (paraphasias). However, in this study, for a given subject, we did not note the same paraphasic errors across languages.
- Q: If a patient could not retrieve a word in English, did he try to retrieve it in Spanish? And, if he then used a Spanish word, was a following response made in Spanish? Or was the subject able to switch back to English again?
- A: Some patients attempted to retrieve a word in the "other" language, whether that language was English or Spanish. Some were able to switch successfully from one language to the other on their own, without help; others had to be re-instructed to name the words in the appropriate language. After this intervention by the examiner, some subjects switched languages appropriately; others did not.

- Q: You stated that there was differential recovery in a number of your patients. Was that recovery on the task that you used or recovery in general?
- A: I was referring to a subject's performance of the word retrieval task used in the study.
- Q: You used tachistoscopic presentations. Were you looking for hemispheric differences, that is, right-field versus left-field differences?
- A: No. We used the T-scope only as a method for presenting the stimulus materials.
- Q: How did you define "primary" or "first" language? I had a problem with that when I was in Texas.
- A: "Primary" language was defined as the first spoken language acquired by the subject.
- Q: This is a methodological question about the 30 minute - 2 day lag between the two conditions. In my experience, the bilingual patients tend to cue across languages. I wonder if you got an order effect, or if you had enough variation in that lag between the two presentations that you could make an analysis as to whether patients who had a short time did better than patients who had a longer lag. I wondered why there was that variation. Why didn't you do them all at 2 days or all at 30 minutes?
- A: In a pilot study, we gave subjects a shorter interval (15-20 minutes) between conditions (languages). We found that subjects seemed to have difficulty switching languages after that short amount of time. So, we tried a longer interval of 30 minutes, and, for most subjects, that seemed to control for the language switching difficulty. For most subjects the interval was 30 minutes - one hour. A few who could not stay to participate in the second condition returned within the next two days. We have not analyzed the data in terms of length of interval between the conditions.