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ABSTRACT

The verbal organizing abilities of the bilingual, multilingual, and monolingual, as measured by four subscales of the Goyer Organization of Ideas Test (GOIT), were investigated. A total of 163 subjects from 5 universities having high populations of multilingual students were administered the GOIT. Bilinguals were not as effective on the sequential tasks as monolinguals. Other results supported the view that bilinguals may be better equipped to organize, retrieve, and restructure verbal information because of their analytically oriented cognitive style. Females were more effective than males on component relationship organizing tasks. Multilingual females were the most effective across all measures. Speakers of Romance languages were markedly superior to either monolinguals or speakers of second languages of a non-Romance type. It may be that certain languages, because of their structure, have the potential to facilitate certain verbal processing tasks. (Author/RW)

VERBAL ORGANIZING ABILITY: DIFFERENCE AMONG MONOLINGUALS, BILINGUALS, AND MULTILINGUALS.

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ABSTRACT

VERBAL ORGANIZING ABILITY: DIFFERENCES AMONG MONOLINGUALS, BILINGUALS, AND MULTILINGUALS.

Previous research suggests that bilingual individuals may process information differently than monolingual individuals. This study sought to assess the verbal organizing abilities of the bilingual, multilingual, and monolingual, as measured by the four subscales of the Goyer Organization of Ideas Test (GOIT). Four hypotheses were advanced to test Ss on four subscales of the GOIT. It was hypothesized that bilinguals, compared to monolinguals, would be (1) superior on component skills, (2) inferior on sequential skills, (3) superior on material-to-purpose skills, (4) and inferior on conjunctive skills. Subjects, were solicited from five different universities having high populations of multilingual students. While none of the hypotheses were supported in their predicted directions, a significant effect for (H_2) was observed in a direction reverse to the a priori prediction, demonstrating a superiority for multilinguals on this measure.

The results of this investigation are in the direction of several studies which suggest the bilingual may be better equipped to organize, retrieve, and restructure verbal information because of their analytically oriented cognitive style. An effect was observed, consistent with the literature, that females are more effective than males on component relationship organizing tasks. Moreover, multilingual females were demonstrated to be most effective across all measures. A final effect was observed for the type of second language

spoken across all dependent measures. Speakers of the Romance languages were markedly superior to either monolinguals, or speakers of second languages of a non-Romance type. While the present sample and other methodological considerations limit the generalizability of these findings, the results suggest the need for additional research to document the effect of additional languages upon an individual's ability to organize and process information. Additionally, it is suggested that future research of this type should control for sexual differentiation (in cognitive task ability), since failure to do so will mask actual differences due to the number of languages spoken.

VERBAL ORGANIZING ABILITY: DIFFERENCE AMONG MONOLINGUALS, BILINGUALS, AND MULTILINGUALS.

There can be little argument that many urban areas in the United Stated today are becoming more multi-cultural, and, as a result, multi-lingual communities. To most people, the foreign national living in the U.S. is bilingual because he or she speaks two languages. There is a great deal of evidence that suggest that the bilingual individual may process information differently than his or her monolingual counterpart. Such differences may well result in differential cognitive abilities between the monolingual and bilingual student.

Lambert (1972, p. 111) noted that numerous studies since the 1920's had attempted to discover intellectual differences between bilingual and monolingual individuals. Collectively these studies found distinct differences in verbal abilities. Lambert (1972, p. 116) stated:

> The weight of the evidence so far presented seems to support the contention that there is no significant difference between monolinguals and bilinguals on nonverbal intelligence, but that bilinguals are likely to be handicapped on verbal intelligence measures.

Myers and Goldstein (1979) corroborate these findings in their study of cognitive development in economically low class bilingual and monolingual children. The results demonstrated no significant differences on nonverbal intelligence measures, but the scores of bilinguals on verbal measures were consistently lower than those of monolinguals.

In the present investigation "verbal" simply means symbolic, and "nonverbal" means non-symbolic. Such definitions are of little consequence unless the underlying processes involved are understood.

That is, verbal and nonverbal cognitive abilities can only be understood in terms of cerebral hemispheric functions, verbal or symbolic abilities are described as being associated with the left hemisphere in which functions are seen as processing information in propositional, analytic and serial ways. The abilities in the right hemisphere are viewed as processing information in appositional, holistic, and synthetic ways, hence nonsymbolic or nonverbal forms of information (see Bradshaw and Nettleson, 1981 for a complete review). It appears that as hemispheric functioning is differential, so are the abilities that result when employing either the right, left, or both hemispheres in the processing of information. The left hemisphere is known to be associated with tasks that involve rote memorization perceptual speed, manual dexterity, speech, and linguistic proficiency. The right hemisphere seems to be more adept at abilities requiring the restructuring of information, inference, and spatial relationships. (Maccoby & Jacklin, 1975).

There is evidence from the neurosciences that hemispheric specialization (lateralization) may play a much greater and important role in the acquisition and processing of language information than previously thought. Vaid and Genesee (1980) reviewed the "state of the art" neuro-physiological research on bilinguals with at least two important results. First, they articulated five major hypotheses advanced by various researchers regarding bilingualism and the acquisition of language:

(1) the stage hypothesis, or gradual lateralization of an additional language over time.

(2) the second language effect hypothesis which suggests that once a language has been acquired, there is greater right hemispheric involvement in the second.

(3) the age acquisition hypothesis, i.e. whether the language was learned before or after puberty which determines hemispheric involvement.

(4) The context of acquisition hypothesis, whether the additional language was learned in different environments or the same one.

(5) the language specific hypothesis which suggests that some languages due to their structure require a greater participation of the right hemisphere.

Secondly, they also formulated a model based upon an integration of known information about language acquisition and dependency of the language to hemispheric specialization. The model suggests that, for the, bilingual, the right hemisphere will become more involved the earlier the age of second language acquisition, the more formal the exposure, and the earlier the level of language development.

If, as suggested by Vaid and Genesee, some bilingual individuals are using the right cerebral hemispheric processing mechanism and monolinguals are using the left, differences in cognitive abilities would most likely result. Confirming the nature of these differences would be of value to educators who teach both bilingual and monolingual students. Confirming such differences will also help answer the question: would monolinguals who are thought to be left dominant do better on verbal tasks than bilinguals who may be right dominant?

Much of the research in bilingualism and associated abilities is actually dealing with the processes that underlie encoding and decoding. The two processes are necessary integral parts of verbal organizing ability of cognitive skills (see Kolers et al., 1980, p. 292).

Vaid and Genesee (1980, p. 420) also in seeming support of this notion suggest that not only are languages not necessarily superimposed upon one another in the same place in the brain, but different

languages, because of storage and retrieval facilities (i.e. in left and, or right hemispheres) may organize information differently. If information is organized differently for the bilingual as compared to the monolingual, then retrieval of experience within one language context to another may be exceedingly more complex for the bilingual. This may be due to varying types of interference which may seem to handicap the bilingual individual in certain verbal abilities.

A number of studies which compared differential information processing and lending support to hemispheric specialization differences in the bilingual versus the monolingual subject merit review to help further document the significance of hemispheric specialization in the encoding and decoding of messages. Rogers et al. (1977) suggested that the Hopi (American Indian) language creates an involvement with the Hopi perceptual field, while English directs the user away from the immediate context, resulting in more extensive use of the right hemisphere by the Hopi. Electroencephalographic readings supported this hypothesis during a protocol where Ss listened to folk tales in Hopi and in English. Sussman (1982) studied the bilingual in hopes of determining whether bilateral control for language existed (i.e. one language one-hemisphere, two languages-two hemispheres). Results indicated that the monolinguals were dominant in the left hemisphere, and bilinguals revealed the following: early bilinguals who acquired their first and second languages before the age of 6 were left dominant for both languages; late bilinguals (second language acquired after the age of 6) were left dominant only for the first language, with an apparent symmetrical (bilateral) involvement for the second language. In a study of the effects of bilingualism on verbal comprehension, Yela (1975)

investigated the types of cognitive strategies employed by bilingual versus monolingual Ss in solving verbal problems. Results indicated no differences in problems on solving grammar problems, but verbal problems involving syntax demonstrated significant differences, with the monolingual Ss using simple and direct strategies, and bilinguals using more intricate strategies in their solutions. This, of course, suggests that information may be organized and retrieval is possibly more complex in tasks related to placement or sequencing (syntax) for the bilingual.

Collectively these studies suggest that problems for the bilingual seem to be related to verbal encoding, rather than decoding functions. That is, the bilingual seems to be able to decode information, organize it, and re-organize it at least as well as the monolingual. It is when data must be encoded, particularly in tasks that involve the left cerebral hemisphere, that the bilingual may experience some difficulty. Durga (1978) studied the effects of interlingual interference to determine the extent of one language system competing with another in processing. Results showed the bilingual to be significantly inferior to the monolingual suggesting that a different hierarchical organization for semantic memory was an important factor in determining interlingual interference. Similarly Magiste (1979) in a developmental study, demonstrated that decoding in two languages, expressed in terms of reaction time, develops faster than encoding for multilinguals.

The majority of research into the bilingual's alleged deficiency in verbal processing skills seems to be related to activities in the left cerebral hemisphere. Moreover, these deficits are somehow involved with encoding functions rather than functions used in decoding, possibly as a result of differential cerebral organization, interlingual interference,

or the types of activities executed by the left side of the brain. How information is stored and retrieved in terms of cerebral organization may well provide some answers as to why verbal deficiencies in the bilingual seem to exist. Such answers would give a clear picture of the kinds of processes with which bilinguals may be experiencing difficulty.

Not all studies, however, have demonstrated a deficiency in the bilingual. In fact, several investigations conclude that the bilingual may actually profit from a "verbal disadvantage." Cummins (1978) assessed the metalinguistic awareness of bilingual and monolingual children in evaluating language objectively and the evaluation of contradictory and tautological statements. Results indicated that the bilingual possessed a greater awareness of properties of language as well as a greater ability to evaluate contradictory statements. It was suggested that bilingualism could actually increase metalinguistic awareness and could promote an analytical orientation to linguistic input. Another study conducted by Ben-Zeev (1977) suggested that interlingual interference could force coping strategies to develop in a bilingual S, accelerating the development of more analytical cognitive development. Results indicated that while bilinguals suffered a vocabulary deficit, they demonstrated more advanced processing of verbal material, more discriminating perceptual distinctions, a greater ability to search structure in perception, and more capacity to reorganize their perceptions in response to feedback than monolingual Ss. Such results also seem to point to right hemispheric involvement. Lambert (1972) also found a superiority for the bilingual in both verbal and nonverbal tasks. He suggested that his results ran contrary to most others

possibly because of sampling and perhaps types of performances required. Lambert (1972, p. 139) summarized:

> . . .it is proposed that bilinguals, because of their training in two languages, have become more adept at concept formation and abstract thinking than the monolinguals, and that this accounts, in part, for their superiority on the symbolic re-organization type tests.

It is clear that whether the bilingual is cognitively favored or unfavored in terms of ability in processing information, such processing is apparently quite different than that of the monolingual. The evidence strongly points to differential hemispheric involvement between bilingual and monolingual individuals. These differences seem to manifest themselves in two different ways for the bilingual. On one hand, the bilingual exhibits an apparent deficiency in verbal performance tasks, particularly when encoding or sequencing is involved. On the other hand, the complexities in retrieving information, processing information, and restructuring information given different linguistic organization complexes may actually benefit the bilingual in terms of analytical-gestalt abilities. Therefore, the present investigation sought to assess the bilingual's verbal organizing ability.

Verbal organizing ability as conceived by Goyer (1955, 1966, 1969) refers to "that skill whereby an individual perceives verbal stimuli, analyzes and abstracts from those stimuli the cues consistent with his purposes in perceiving them, and synthesizes and generalizes the idea selected." The ability to organize information has been considered one of the primary objectives in the educational process (Bloom, 1954; Goyer, 1969). The obvious implication for the bilingual is that if differential processes and abilities exist, are educators, advertisers,

journalists, etc., helping the bilingual process information effectively? Consider a school system where information is presented to a majority of monolingual students by a monolingual teacher. Will the information be processed equally well by the bilingual? Likewise, information and style of presentation geared to the monolingual but presented to a bilingual schools population may create problems for both student and teacher alike. Martin and Obler (1978, p. 21) deal directly with this sort of issue. They stated:

> People who are strongly left lateralized for languages should do better in a class that is taught deductively. They may actually prefer to be given a number of items that exemplify a rule and then discover the rule themselves.

Since organization of information is probably the result of component skills located in both left and right cerebral hemispheres, assessing the nature of these skills should provide information as to whether or not bilinguals and monolinguals differ in their ability to organize verbal information. If differences should exist, the various component sub-skills in verbal organizing ability as measured by the GOIT may provide the qualitative information desired. If such qualitative differences exist between how verbal information is organized between bilingual and monolingual individuals, the ramifications would be extremely important, since organization of information is pervasive in all human activity.

METHODS

Verbal Organizing ability (VOA) was assessed by the Goyer Organization of Ideas Test (GOIT), form S (see Goyer, 1966, 1969, 1979). Various forms of the GOIT have been found to highly correlate with general intelligence, as measured by the Ohio State Psychological Examination. Moreover, and particularly relevant to this investigation, the GOIT has been consistent in finding effects for VOA with respect to learning message information, thus dealing with the fundamental processes of encoding and decoding (Thompson, 1960, 1967; Daniels, 1979; Petrie, 1964; Whitman and Timmis, 1975; Rankis, 1981).

Materials

A personal data form eliciting demographic and language proficiency was constructed. Demographics included: age, sex, right or left handedness, grade point average (GPA), racial/ethnic background, number of languages spoken, number of years second or multiple languages spoken, age of acquisition, and self rating scale for language proficiency.

Operational definitions

Bilingualism was operationally defined in this investigation as a subject who marked a "4" or "5" on the second language proficiency scale. Researchers interested in bilingualism have observed that self-rating scores for proficiency have been highly correlated to tests of language fluency (see DiVesta, 1974; Macnamara, 1967).

The GOIT

Form S (short form) of the Goyer Organization of Ideas Test is composed of four discrete skill categories. It is apparent from the literature in hemispheric specialization that each discrete skill category may well be associated with a specific cerebral hemisphere in terms of operations required to execute the specific skill performances. The categories are as follows (Goyer, 1969, p. 2):

I. Component (part-whole) relationships: including dependence-independence, significance-insignificance, coordination of ideas. (Right hemispheric involvement?)

II. Sequential relationships: including chronological, cause-to-effect, climax, topical, etc. (Left hemispheric involvement?)

II. Material-to-purpose (relevence) relationships: including recognition of central or unifying ideas, exclusion of ideas lacking consistency with total group. (Right hemispheric involvement?)

IV. Transitional (conjunctive) relationships: including use of relational words and phrases based on total pattern of communication. (Left hemispheric involvement?)

STATEMENT OF HYPOTHESES

Inasmuch as the assessment of VOA (as measured by the GOIT) has never before been tested on multilingual Ss who speak Indo-European languages, definite statements of prediction could not be made. Given the skill categories (subscales of the GOIT) in consideration of suspected differential hemispheric involvement reported in the literature reviewed above, the following hypotheses were advanced:

(H_1): Bilinguals will be superior to monolinguals on component skills

(H_2): Bilinguals will be inferior to monolinguals on sequential

skills.

(H_3): Bilinguals will be superior to monolinguals on material to purpose skills.

(H_4): Bilinguals will be inferior to monolinguals on conjunctive skills.

DATA PREPARATION

Materials

Ss were asked to complete a consent form, demographics form, and the GOIT, form S. Example questions of each GOIT subscale and a copy of the demographics form, may be found in appendix A & B respectively.

Subjects

Subjects were solicited from five different universities having high populations of multilingual students. Two of the universities were located in the Caribbean basin area.

Procedures

163 Ss volunteered to participate in this investigation across five universities. Administration of the GOIT and other forms was accomplished by the investigators in a similar way; the consent form was distributed, and a brief discussion of the project was given. The Ss were then asked to complete the demographics form (Appendix B). Upon completion, the Ss were asked to open the GOIT booklets and begin. Testing required about 45 minutes plus an additional five minutes for the other forms. Ss who had not not signed the consent form, or who

were under the age of 18 were immediately deleted from the analysis. Other deletions from the study were due to extreme amounts of missing data, those who self reported less than 4 for a second language, and clerical errors. After data collection, a total of (n=91) Ss were deemed usable in the investigation. Demographics are as follows:

Age	$\bar{X}$ = 27.3	STD ERR 1.02	S_j = 9.67
Sex	M (n=26)	28.6%	
	F (n=64)	70.3	
Handed	R (n=78)	85.7%	
	L (n=3)	3.3	
Ethnic	NAC (n=20)	22.%	(North American Caucasion)
	NHNA (n=1)	1.1%	(Non Hispanic Naturalized American)
	BA (n=3)	3.3%	(Black American)
	LA (n=3)	3.3%	(Latin American)
	HN (n=9)	9.9%	(Naturalized American of Hispanic Origin)
	CB (n=47)	51.6%	(Caribbean)
	Other (n=7)	7.7%	

Number of Languages Spoken

1	(n=43)	47.3%
2	(n=16)	17.6%
3	(n=20)	22.0%
4	(n=11)	12.1%

First Language

English	(n=70)	76.9%
Spanish	(n=16)	17.6%
Other	(n=4)	4.4%

Second Language

None	(n=47)	51.6%
English	(n=17)	18.7%
Spanish	(n=17)	18.7%
French	(n=4)	4.4%
FR Creole	(n=3)	3.3%
Other	(n=3)	3.3%

Age Second Language Acquired

Mdn=0.43, $\bar{X}$=5.0, STD ERR 0.75 (53.8% of sample was at 0) (Age range 0-40).

STATISTICAL DATA PREPARATION

It was the assumption of the investigators that the GOIT was composed of four discrete subscales. A correlation matrix was computed combining all independent and dependent measures. This was done to determine the degree of multiple colinearity among the independent variables, and also to determine the degree to which linear relationships were formed among independent variables and criterion measures. It was observed that besides several high intercorrelations among the independent variables, there was a statistically significant relationship between each of the scales of the GOIT (see table 1)

Table 1

	Component	Sequential	Material/Purpose	Conjunctive
Component	1.0	r = .41 (p = .000)	r = .35 (p = .001)	r = .28 (p = .01)
Sequential	.41 (p = .0001)	1.0	.46 (p = .000)	.41 (p = .000)
Mat/Purpose	.35 (p = .001)	.46 (p = .000)	1.0	.45 (p = .000)
Conjunctive	.28 (p = .01)	.41 (p = .000)	.45 (p = .000)	1.0

(n = 91, pairwise deletion for missing data on independent variables)
Correlation matrix for subscales on the GOIT, form S.

While the major thrust of this study was how bilinguals and multilinguals differed from monolinguals on the four subscales of the GOIT (S), a number of other independent variables derived from the literature were introduced into the present investigation in order to increase explanatory power. They were: age, sex, handedness (right and left), ethnicity, number of languages spoken (at self reported level 4 or 5), primary language, the nature of the second language (i.e.,

Spanish, English, or none), and the age at which the second language was acquired.

In view of the high significant intercorrelations among the subscales of the GOIT, and high intercorrelations among combinations of some of the independent variables, multiple regression analysis could not be used to isolate the most important variables. Therefore, Canonical correlation analysis was employed to assess the relationship between the sets of independent and dependent variables. The canonical variate names were later employed in subsequent univariate analysis of variance (ANOVA).

RESULTS

One significant canonical correlation was obtained (see table 2).

Table 2

Eigvenvalue	Canonical Correlation (1st)	DF	Significance
.29335	.54161	24	.032

(Set 2)

SEX	HANDED	ETHNIC	Number lang. spoken	second language	first language
-.43840	.19435	.44164	-.87530	.20760	.53638

(Set 1)

COMPONENT SKILLS	SEQUENTIAL SKILLS	MATERIAL/PURPOSE	CONJUNCTIVE SKILLS
-.74806	.707395	.03798	-.55866

Canonical correlation analysis

The above independent variables were subsequently used in one-way, two-way, and three-way univariate analyses of variance.

The canonical correlation analysis produced one significant canonical correlation which explained 29% of the variance between the

two sets of variables (dependent and independent). The canonical variate loadings suggested that component and conjunctive subscales of the GOIT seem to be related more to each other than to either sequential or material to purpose skills. Moreover results suggested that:

(1) Multilingual females of foreign birth tended to score highly on component skills, followed by conjunctive skills.

(2) Multilingual females of foreign birth who score high on component and conjunctive skills tend to be much less effective on sequential and material to purpose skills.

While canonical correlation was not the initial thrust of this investigation, it served as a method to reduce the number of independent variables introduced to add explanatory power. Moreover it was desirable to discover the nature of the relationships among the independent and dependent variables, as well as accounting for the explained variation brought to the model by the independent variables deemed useful and appropriate in the study. It should be noted that age and age of second language acquisition were not included in the analysis due to extreme variability in range. Inclusion of such data may lead to spurious conclusions based on inflated within group variance estimates.

Univariate Analyses

(H_1): Bilinguals will be superior to monolinguals on component skills. One-way analysis of variance produced no significant differences between monolinguals, bilinguals, or multilinguals ($p=.11$). It is of interest to note, however, that while no statistically significant differences were observed, bilinguals had the lowest

numerical means, followed by monolinguals, trilinguals, and quadra linguals, respectively. Therefore (H_1) was not supported.

(H_2) Bilinguals will be inferior to monolinguals on sequential skills. A statistically significant difference was observed, although not in the expected direction. In this case, multilinguals were more effective than the monolinguals and bilinguals, respectively. ($F = 4.21$, $df = 3, 89$, $p = .008$).

(H_3) Bilinguals will be superior to monolinguals on material to purpose skills. No statistically significant difference was observed ($p=.12$). Again, the bilingual had the lowest numerical mean, followed by the monolingual, quadralingual, and trilingual, respectively. (H_3) was, therefore, not supported.

(H_4) Bilinguals will be inferior to monolinguals on conjunctive skills. Again no significant difference was observed ($p=.10$), and the hypothesis was not supported. As with Component and Material to Purpose skills, the numerical value of the means was lowest for the bilingual, followed by the monolingual, trilingual, and quadralingual, respectively.

As mentioned previously, a number of independent variables were introduced in order to provide explanatory power to the results. Canonical correlation was used to determine the independent variables carrying the greatest weights with respect to the dependent measures. These weights, were subsequently used in Univariate ANOVA. Since the data are available, a brief description of the univariate results for sex, ethnicity, type of second language, and first language, follows, with some interesting results.

Sex

One-way ANOVA demonstrated a significant effect for component relationships in favor of the female, $F(1, 89) = 5.20$, $p = .02$. No other significant differences were observed. Descriptive statistics for sex across the dependent measures are given in table 3.0

Table 3

	COMPONENT	SEQUENTIAL	MATERIAL/PURPOSE	CONJUNCTIVE
Male (n=26)	$\bar{X}$ =2.65 a* S_j =1.85	$\bar{X}$ = 3.81 a S_j = 2.23	$\bar{X}$ = 3.73 a S_j = 1.66	$\bar{X}$ =2.08 a S_j =1.20
Female	$\bar{X}$ =3.50 b* S_j =1.48	$\bar{X}$ = 4.26 a S_j = 2.16	$\bar{X}$ = 3.76 a S_j = 2.56	$\bar{X}$ =2.55 a S_j =1.73

Descriptive statistics for Sex. * Comparisons having different letters are significantly different.

Handedness

Was deleted from the analysis because only three left handed Ss were in the present sample.

Ethnicity

No significant differences due to ethnicity were observed for any of the dependent measures.

Primary Language Learned

A significant effect in favor of English (primary) speakers, $F(1, 84)$ 4.02, $p = .05$, was observed for sequential skills. No other differences were observed, although the means for primary English

speakers were numerically higher across all measures. Sex was combined with primary language (language type) in a two-way ANOVA. No interactions were observed, suggesting that effects are additive. A three-way ANOVA was executed combining language type, sex and number of languages spoken, significant main effects were observed for sequential and conjunctive skills. The results are presented in table 4 below.

Table 4

SEQUENTIAL SKILLS

Source	SS	DF	MS	F	SIG
MAIN EFFECTS	101.04	5	20.21	5.09	.000
SEX	0.117	1	0.117	0.029	.86
LANGUAGE TYPE	48.22	1	48.22	12.16	.001
NON LANG. SP	81.46	3	27.15	6.85	.000
EXPLAINED	101:04	5	20.21	5.09	.000
Residual	313.38	79	3.97		
Total	414.42	84	4.93		

n = 91

$m\overline{R^2}$ = .24

Conjunctive Skills

Source	SS	DF	MS	F	SIG
MAIN EFFECTS	33.34	5	6.67	3.00	.016
SEX	0.27	1	0.27	0.12	.73
LANGUAGE TYPE	8.54	1	8.54	3.84	.053
NON LANG. SP	25.19	3	8.40	3.78	.014
EXPLAINED	33.34	5	6.67	3.00	.016
Residual	175.55	79	2.22		
Total	208.89	84	2.49		

n = 91

$R^2_m = .16$

** Note to reader: The interaction term in both unvariate analyses were suppressed due to empty cells in the overall model.

After careful review of the data revealed by the three-ways, it was apparent that language type (primary language) and the number of languages spoken were the two most important variables, accounting for the major portion of between group variance. Additionally, sex is an important factor in component skills. A two-way ANOVA was executed considering only sex and the number of languages spoken. As previously noted, a sex effect (in favor of females), $F_{(1,77)} = 4.06$, $p = .048$, was observed for Component skills. A significant effect for the number of languages spoken (in favor of the multilingual), $F_{(2,77)} = 5.33$, $p = .007$, was observed for Sequential skills. No significant effects were observed for Material- to-purpose skills. However, a potential main effect for the number of languages spoken approached significance at $p = .07$. Sex and the number of languages spoken produced a significant interaction with no significant main effects for Conjunctive skills, $F_{(2,77)} = 3.35$, $p = .04$, corroborating the results of the canonical correlation. Results are summarized as follows:

1. Generally the female's effectiveness in component and conjunctive skills seems to be facilitated by additional languages spoken. Moreover, the multilingual female was the most effective on all criterion measures.
2. The bilingual male, with the exception of component skills, was at least numerically more effective than bilingual females and monolinguals of both sexes.
3. Additional languages for the male appear to render him less effective in conjunctive skills, and to some extent, component skills.

Means for each measure by sex and number of languages spoken are provided in figure 1 below.

Figure 1

		Monolingual	Bilingual	Multilingual
Component	Male	2.85	2.00	2.71
	Female	3.07	3.27	4.25
Sequential	Male	3.23	4.20	5.00
	Female	3.60	3.91	5.58
Material Purpose	Male	3.54	4.0	4.14
	Female	3.37	3.0	5.08
Conjunctive	Male	2.46	2.20	1.29
	Female	2.07	2.09	3.08

Type of Second Language Spoken

This variable, while contributing only moderate weight to the canonical correlation analysis, had a significant effect across all dependent measures in favor of Romance languages. The F statistic and descriptive statistics are given in table 5 below. Note the categories of Italian, French Creole, and "other" (i.e. Malaysian) were deleted from the present table due to insufficient cell size.

Table 5

COMPONENT $F(3, 84) = 6.54$, $p = .000$

Language Type	Mean	Standard deviation
None	3.02	1.64
English	2.71	1.49
Spanish	4.38	0.85
French	3.50	1.73

SEQUENTIAL $F(3, 84) = 5.84$, $p = .0012$

Language Type	Mean	Standard Deviation
None	3.57	2.07
English	3.47	2.29
Spanish	5.53	1.74
French	6.25	1.50

Material/Purpose $F(3, 84) = 3.53$, $p = .02$

Language Type	Mean	Standard Deviation
None	3.30	2.28
English	3.24	1.68
Spanish	5.12	2.57
French	5.00	1.63

CONJUNCTIVE $F(3, 84) = 4.39$, $p = .006$

Language Type	Mean	Standard Deviation
None	2.26	1.61
English	1.71	1.10
Spanish	3.29	1.49
French	3.75	1.89

F values and descriptive statistics for the dependent measures.

Another way to display graphically the results in these univariate analyses is by rank ordering the name of the language type in terms of each dependent measure as given below and listed from low to high:

COMPONENT (ranked from low to high)

1. English 2. None 3. French 4. Spanish.

SEQUENTIAL

1. English 2. None 3. French 4. Spanish.

MATERIAL/PURPOSE

1. English 2. None 3. French 4. Spanish.

CONJUNCTIVE

1. English 2. None 3. French 4. Spanish.

In the above analysis it is obvious that speakers of the Romance type languages by group appeared to be more effective numerically (and in some cases statistically) than either monolinguals or speakers of non-Romance type languages. It should not be surprising to the reader that Ss with English as a second language would be less effective on all dependent measures, since they would have to work harder than Ss whose primary language was English.

DISCUSSION

This investigation was exploratory in nature, seeking to discover if bilinguals and multilinguals organized verbal information differently than their monolingual counterparts. While none of the hypotheses were supported in their predicted directions, one significant effect was observed in a direction reverse of the a priori prediction. (H_2) hypothesized that bilinguals would not be as effective on the sequential tasks as monolinguals. This prediction arose from the notion that sequential processing tasks are executed by the left cerebral hemisphere. It has been suggested elsewhere that bilinguals and multilinguals would more likely be predominant in the right cerebral hemisphere. This is primarily due to the fact that bilinguals use, and perhaps are forced to use, more intricate and analytical strategies in processing tasks (Yale, 1975). Given the high intercorrelations on the subscales of the GOIT, interpretation of this results is somewhat tenuous. On the other hand, when one looks at the numerical direction of the means for each criterion measure, multilingual's typically had higher numerical values than either monolinguals or bilinguals, who were least effective with the exception of sequential skills. Myers and Goldstein (1979) suggested that their sample of English-Spanish bilinguals did poorly on verbal measures. At first glance, the direction of the results of this investigation may suggest a similar effect.

When one considers the obvious effect of sex found in the present investigation, however, a different picture is painted. It has been well documented that the female possesses a greater ability for verbal

tasks than males, without regard to ethnicity (Maccoby and Jacklin, 1975; Backman, 1972). With additional languages the female apparently becomes increasingly more effective in VOA than her male counterpart. Bilinguals, with the exception of males in component and conjunctive skills, and females in material to purpose skills, are at least as effective, if not more effective than monolinguals in VOA. When the data are considered as unisexual, the sex effect is masked, and bilinguals appear less effective than monolinguals. In fact, the results for the multilingual appear to be more in the direction of the findings of Cummins (1978), Ben-Zeev (1977), Lambert (1972) and Durga (1978), that bilinguals are better equipped to organize, retrieve, and restructure verbal information because of their analytical orientation. This investigation can only hold that multilingual Ss seem to be more effective on sequential processing tasks than monolinguals using the verbal organizing ability subscale provided by the GOIT. It may be that additional language acquisition may facilitate processing of VOA type information, particularly for the female. The literature is replete with information on sex differences in the processing of verbal information. This effect would seem to be in line with what has been previously observed (see Backman, 1972; Maccoby and Jacklin, 1975; Wechsler, 1958).

A final effect was observed for type of second language spoken across all dependent measures. All subscales demonstrated a fairly clear picture that speakers of the Romance languages were markedly superior to either monolinguals, or speakers of second languages of a non-Romance type. It is easily understood why speakers whose second

language was English were fairly consistently less effective than the other groups since the GOIT is in English.

The results are, however, most provocative and will require additional investigation. It may be that certain languages, because of their structure, have the potential to facilitate certain verbal processing tasks. This, of course is not a new idea in the field of psycholinguistics. Based upon the results presented here, a number of implications for future research arises, particularly with respect to the "type of second language spoken." In order to develop the efficacy of a second language type "difference" hypothesis, it is suggested that a sampling of tasks, across the cognitive domain be given to monolingual, bilingual and multilingual Ss. Examples of such a sampling might include a free recall protocol from which category clustering and serial position effects could be observed, in addition to cued recall, and inference making measures. Such measures might provide a clearer picture of verbal processing task differences between monolinguals, bilinguals, and multilinguals. It additionally appears imperative to control for sex in any future research of this type. Dismissal of sexual differentiation will only mask over all effects for bilingual subjects.

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PERSONAL INFORMATION
(CONFIDENTIAL)
APPENDIX A

*****Please PRINT all information*****

PART I

NAME _____ STUDENT ID 1 _____

I AGREE THAT I AM VOLUNTARILY PARTICIPATING IN THIS STUDY (signature: _____

Age at last birthday _____. (circle one) Male/Female Right handed/left handed

Academic Major _____. (circle one) Fr Soph Jr Sr Grad: MA Ph.D.

Approximate overall grade point average _____.

PART II

RACIAL/ETHNIC BACKGROUND (circle the most specific category that you consider yourself to be

1. North American caucasion
2. Non-hispanic naturalized American: _____ country?
3. American Indian: _____ nation or tribe
4. Black American
5. Latin American: _____ country?
6. Naturalized American of Hispanic origin: _____ country?
7. Caribbean _____ country
7. OTHER: _____

PART III

I speak (1) _____ languages. Please list them in order of learning below:

st) a._____ b._____ c._____ d._____

For how many years have you consistently spoken your first language?_____

What (if any) is the second language that you speak fluently? (Fluently means that you are able to write, or speak a language easily and expressively in addition to being able to THINK in this language).

Language?_____

Age at which you began speaking your second language? If you speak no other languages besides English, Write "NA" in the blank below, and do NOT go to part IV.
AGE:_____

PART IV

USING THE FOLLOWING SCALE, CIRCLE THE APPROPRIATE CATEGORY FOR EACH LANGUAGE GIVEN BELOW.

1------Absolute beginner.
2------Can understand the language at an elementary level.
3------Can get by pretty well, but couldn't go to high school or college using it.
4------Read, write, speak it very well (fluently), could go to college using it.
5------NATIVE SPEAKER (only slight accent, if any).

LANGUAGES

GLISH 1 2 3 4 5
ANISH 1 2 3 4 5

OTHER 1 2 3 4 5 (list)_____
OTHER 1 2 3 4 5 (list)_____

APPENDIX B

Sample Question for COMPONENT SKILLS of the GOIT, For S (Goyer, 1968)

Consider the following partial outline:

(Specific Purpose) To persuade students to make better use of the library.

i. Many courses require research papers.

ii. A student can get a better knowledge of his courses by looking up more information than he can find in his text.

iii. The library can provide outside reading.

iv. Many people are "lost" in the library.

v. Experience in the use of the library will be useful in later life.

vi. One should know how the card catalogue is organized.

vii. One Should know how to use the reference room.

viii. Periodicals are past issues of magazines and newspapers.

In the outline above, Main Point iv:

(1) should be a part of the conclusion.

(2) is a specific detail.

(3) is irrelevant.

(4) should appear as a subpoint to main point vii.

(5) should appear as a subpoint to main point v.

Sample Question for SEQUENTIAL SKILLS of the GOIT, Form S (Goyer, 1968)

Consider the following phrases:

a. Knowledge of background and method.

b. Persistence in the face of discouragement.

c. Practice in analysis of problems.

d. Scientific discovery.

Which of the following choices suggests the proper arrangement of these items in order of increasing achievement?

(1) b a c d
(2) c b a d
(3) a b c d
(4) a c b d
(5) b c d a

Sample Question for MATERIAL-TO-PURPOSE SKILLS of the GOIT, Form S (Goyer, 1968)

The following points are to be covered in a message on the subject, "The Style of the Spoken Word."

A. Clearness is essential in oral style in order that everything the speaker says ;may be instantly intelligible to the hearer.

B. Accuracy is a necessary characteristic of oral style, in order that the speaker and audience may have the same mental picture of the thing discussed.

C. Vividness in style arises from the proper choice of words and from their unique employment in sentences.

D. Rhythm involves the principle of metrical regularity in the structure of phrases and sentences, and has an important emotional effect.

Which one of the following statements about this partial outline is most accurate?

(1) The main points are organized in a time-order sequence.

(2) The main points are organized in an order of increasing importance.

(3) The main points are organized arbitrarily, for convenience of discussion.

(4) The main points are organized in order from the general to the more specific.

(5) The main points are organized in order from the specific to the more general.

Sample Question for CONJUNCTIVE SKILLS of the GOIT, Form S (Goyer, 1968

Mark the most appropriate choice of connective word or phrase from the list below to make the proper transition at the blank space for each item.

(1) Moreover

(2) Nevertheless

(4) To repeat

(5) In contrast