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AUTHOR Beanblossom, Gary F.
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ABSTRACT

This paper investigates the influences of traditional kinds of verbal and quantitative achievement and aptitude variables on high school foreign language achievement, as measured by Modern Language Association and University of Washington tests of language skills administered to entering college students. The report focuses on: (1) the sample and its properties, (2) Washington Pre-College (WPC) Test variables, (3) an ordinal measure of association, (4) partial gamma, (5) relationships between language skills, (6) language skills and WPC attainments, and (7) French, German, and Spanish tests. Several tables of statistical data illustrating the associations in gamma coefficients between WPC variables and language skills in French, German, and Spanish are included. (Author/RL)

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Some Correlates of High School Foreign Language Achievement

Gary F. Beamblossom

This paper investigates the influences of traditional kinds of verbal and quantitative achievement and aptitude variables on high school foreign language achievement, as measured by MLA and UW tests of language skills administered to entering UW students. Using an ordinal measure of association and controlling the effects of sex and semesters of high school study, the partial relationships range from low to moderate. French listening comprehension is very weakly associated with WPC variables relative to reading comprehension and grammar. Grammar skills seem to contain more of a motivational component than the other two skills and are more likely to be a function of logical and quantitative skills. The verbal aptitude measures play central roles in French reading and listening success. One of the more perplexing aspects of these data is the remarkably strong impact that natural science GPA has on German attainment, except with grammar where English Usage is a stronger correlate. Spanish achievement seems least influenced by WPC variables, and some of the more quantitative variables are just as influential as verbal variables.

Convincing evidence has frequently been cited supporting the dual impact on high school foreign language test achievement of semesters of language study and length of delay between the student's last contact with the language in high school and the administration of the placement examination when he enters college (Beamblossom, 1964; Flaugher and Spencer, 1967). This paper, by carefully controlling likely contaminating factors such as sex and semesters of high school study, will investigate the influences of traditional kinds of verbal and quantitative achievement and aptitude variables on high school foreign language achievement. This may provide some clues as to which factors

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are most prominently represented in the acquisition and development of foreign language skills during the high school years.

The Sample and Its Properties. The following set of conditions was laid down in defining the sample: (1) all students entered the University of Washington for the first time in Autumn Quarter 1968; (2) the entire sample took the Washington Pre-College (WPC) Test prior to entry; (3) all students were taking a language course in French, German, or Spanish during Autumn Quarter 1968; (4) all had taken MLA foreign language placement tests in one of the three languages measuring reading and listening comprehension and students in French and German took the UW grammar test developed by the respective language departments--the tests were used to place students at various course levels; (5) no students had any previous foreign language exposure at the college level.

The overwhelming majority of the sample, then, had graduated from high school in June 1968 and had commenced college studies the following fall. It should be pointed out that the foreign language graduation requirement of the College of Arts and Sciences was still intact, hence the substantial number of students enrolled in language courses. Subdividing the sample by language and course level yielded the following numbers:

Course	French	German	Spanish
101	8	91	1
102	133	108	131
103	107	103	54
201	111	60	75
202	86	18	84
203(222)	48	1	31
Totals	493	381	376

There is no need to look beyond WPC Test results in order to arrive at the conclusion that this group is a highly elite segment of the college-bound population. Among a recent survey of high school seniors who had formulated plans to attend college, large differences in WPC achievements were found between

students planning to attend community colleges, four-year state or private colleges, and state universities (Beanblossom, 1969). Comparisons on selected variables showing standardized test score means for each group (the mean for the entire college-bound population is 50 with a standard deviation of 10) follow:

WPC Variables	Comm Coll Plans	St or Pr Coll Plans	State Univ Plans	UW For Lang Sample
HS English GPA	2.35	2.85	3.09	3.28
HS Mathematics GPA	2.07	2.50	2.84	3.00
Vocabulary	46.3	51.9	55.2	56.7
Reading Comprehension	46.5	51.4	55.1	58.5
Math Achievement	45.1	50.3	55.1	57.0

These data are evidence of the unrepresentativeness of the UW foreign language sample when compared with all high school seniors who intend to continue their education. The superiority of this group is not as manifest however when compared with high school students who undertake extensive foreign language preparation, since the latter presumably have aimed their educational sights in the direction of the universities and the better four-year state and private colleges. It is quite likely that the sample furnishes adequate variability of high school foreign language preparation, and hence language test achievement, but somewhat restricted variability on many of the WPC variables, particularly the high school GPA variables.

The WPC Variables. The WPC battery of scores used below includes high school GPA's in five subject areas (English, foreign language, social studies, mathematics, natural science) and four test scores (English Usage, Vocabulary, Reading Comprehension, Math Achievement), an amalgamation of verbal and quantitative aptitude and achievement measures. A brief description of the tests follows (WPC, 1967-68, pp. 13-14):

English Usage--a 50-minute test in use of grammar, punctuation, word choice, capitalization.

Vocabulary--a 25-minute test of 100 antonym items.

Reading Comprehension—a 25-minute test of 40 questions on reading paragraphs for stated or implied meanings.

Math Achievement—a 60-minute test of 45 items of general mathematics, algebra, and geometry.

High school courses contained in the foreign language and mathematics categories are self-explanatory. English includes all courses in English composition and literature, journalism, radio-TV, drama, public speaking, and debate. Social studies includes cousos in history, geography, world problems, government and civics, sociology, psychology, economics, anthropology, philosophy, social problems, and human relations. Natural science includes courses in biology, chemistry, physics, physiology, anatomy, forestry, botany, geology, and photography.

An Ordinal Measure of Association. Because of the highly selective character of the sample, i.e., the highly skewed WPC variables (the modal GPA is 4.0 for two of the five high school GPA variables), an ordinal measure of association, gamma, was adopted instead of the correlation coefficient. Gamma can also detect conditional relationships more readily than conventional correlation measures and is not hamstrung by distributional assumptions of linearity and bivariate normality, since it merely involves making comparisons between ordered categories.

Costner (1965) has defined gamma as "the difference between the conditional probabilities that a pair of units (e.g., individuals) randomly drawn from the cross-classification fall in the same order on both variables or fall in opposite orders." Suppose two variables, X and Y, are each divided into three ordered categories, an upper, a middle, and a lower category. The cross-classification can be represented as follows:

		Variable X		
		Upper	Middle	Lower
Variable Y	Upper	a_1	a_2	a_3
	Middle	b_1	b_2	b_3
	Lower	c_1	c_2	c_3

n

There are n(n-1)/2 possible pairs in the cross-classification. We wish to compare the number of pairs that furnish evidence for a positive relationship (i.e., concordant pairs) with the number of pairs that furnish evidence for a negative relationship (i.e., discordant pairs). The comparisons of individuals falling in cell a_1 (upper, upper) with those falling in cell b_2 (middle, middle) involve concordant pairs and provide evidence for a positive association--similarly, when a_1 is compared with b_3, c_2, and c_3. The comparison of c_1 with b_2 illustrates a discordant pair since c_1's are higher than b_2's on variable X and lower on variable Y. There are other pairs for which ties exist on the X variable (a_3 and b_3), the Y variable (a_1 and a_2), or both variables (a_1 and a_1). Ties are discarded in computing gamma. The formula for gamma becomes:

$$\text{Gamma} = \frac{C - D}{C + D}$$

where C = number of concordant pairs
D = number of discordant pairs

In the above cross-classification:

$$C = a_1(b_2 + b_3 + c_2 + c_3) + a_2(b_3 + c_3) + b_1(c_2 + c_3) + b_2(c_3)$$

$$D = c_1(b_2 + b_3 + a_2 + a_3) + c_2(b_3 + a_3) + b_1(a_2 + a_3) + b_2(a_3)$$

In other words, gamma tells us how much more probable it is to get like than unlike orders in the two classifications, when two individuals are chosen at random from the population.

Some important properties of gamma (Goodman and Kruskal, 1954, p. 749) follow:

1. Gamma is indeterminate if the population is concentrated in a single row or column of the cross-classification table.
2. Gamma is +1 if the population is concentrated in an upper-left to lower-right diagonal of the cross-classification table. Gamma is -1 if the population is concentrated in a lower-left to upper-right diagonal of

the table.

3. Gamma is 0 in the case of independence, but the converse need not hold except in the 2x2 case.

Partial Gamma. Davis (1967) augmented the original contributions of Goodman and Kruskal by suggesting a partial coefficient for gamma, that is, an ordinal measure of relationship given certain control conditions. The control variable(s) may be either nominal or ordinal. The number of concordant and discordant pairs is computed as usual, but separately for each control category. The concordant and discordant pairs are then summed across control categories and become the C's and D's that are inserted into the partial gamma formula. Hence the partial coefficient turns out to be a kind of weighted average of the gammas computed for each control condition. Davis' partial measure is used in this study to "purify" the relationships between language test scores and WPC variables; more specifically, an effort is made to isolate from the relationships certain potentially contaminating variables such as sex and the number of semesters of high school foreign language study.

Relationships between Language Skills. Gammas were computed for all combinations of reading, listening, and grammar tests in French and German, in addition to Spanish reading and listening. The reading and listening tests are Modern Language Association (MLA) Tests, Form B. The vast majority were administered Level L (the lower level) during the summer of 1968 prior to entering the UW. A few students, having had three or more years of high school language study, participated in the WPC spring testing program for high school seniors (since discontinued) and were administered Level M (the advanced level). Converted scores were used, obviating the need for distinctions in the data analysis. The grammar tests in French and German were designed and developed by their

respoctive departments at the University of Washington. There are two forms of the German test, LC and MC--these two forms also have a set of converted scores. There is only one form for French grammar, a 116-item test which assumed its present format in 1967.

Scores for the eight groups were trichotomized into an upper, middle, and lower third as follows:

Language Test	Lower	Middle	Upper
French Reading	0-153	154-166	167+
French Listening	0-154	155-162	163+
French Grammar	0-67	68-77	78+
German Reading	0-149	150-158	159+
German Listening	0-148	149-155	156+
German Grammar	0-40	41-52	53+
Spanish Reading	0-155	156-169	170+
Spanish Listening	0-150	151-164	165+

The tables below cross-classify the three skills in French. The numbers represent column percentages (not frequencies). The total number of French students is 493.

		Listening		
		Upper	Middle	Lower
Reading	Upp	71	23	05
	Mid	26	48	31
	Low	03	29	64

Gamma = .79

		Listening		
		Upper	Middle	Lower
Grammar	Upp	61	28	09
	Mid	35	39	34
	Low	04	33	57

Gamma = .68

		Grammar		
		Upper	Middle	Lower
Reading	Upp	66	28	05
	Mid	30	40	35
	Low	04	32	60

Gamma = .73

It is instantly apparent that empirically the three skills are very similar; it is highly unusual to score low on one skill and high on another, in fact even a shift from an adjacent category is uncustomary. Controlling for semesters of high school study (using two categories, 0-4 semesters and 5+ semesters) succeeded in reducing the associations, but only modestly. They were, respectively, .71, .65, and .59. Sex as a control variable had virtually no effect in altering the original relationships between language skills for any of the three languages.

The statistical associations in German are slightly lower than with French, but are nevertheless substantial. Column percentages are shown below (n=381):

Reading	Listening: Upper	Middle	Lower
Upp	72	23	08
Mid	21	48	31
Low	07	29	61

Gamma = .75

Grammar	Listening: Upper	Middle	Lower
Upp	65	23	10
Mid	25	45	37
Low	10	32	53

Gamma = .64

Reading	Grammar: Upper	Middle	Lower
Upp	71	26	09
Mid	22	43	32
Low	07	31	59

Gamma = .70

The reading-listening associations for both French and German are higher than the reading-grammar associations, a confirmation of earlier findings (Beanblossom and Lunneborg, 1966; Smith and Berger, 1968, p. 72). As with French, the degree of association is only slightly lessened when semesters of high school study is controlled.

In Spanish the reading-listening associations are the highest for any language (n=376):

Reading	Listening: Upper	Middle	Lower
Upp	72	27	0
Mid	25	50	22
Low	03	23	78

Gamma = .87

The correlation coefficients for the above comparisons are a bit lower than the gammas in magnitude, but still rather sizeable, ranging from .57 between German Listening and German Grammar to .80 between the Spanish tests.

These results suggest the futility and redundancy of assigning precise mathematical weights to different language skills for purposes of placement. Forcing students to suffer unnecessarily through long sessions of testing, when approximately the same results can be garnered from a single 30-minute test, makes no sense. If one test were to be used for placement, the reading test would probably be the best bet since it correlates somewhat higher with listening and grammar than do the latter two with one another.

Language Skills and WPC Attainments. Despite the contiguity of language skills, they do reveal some divergencies when associated with achievement and aptitude variables.

As with language test scores, WPC variables were trichotomized into upper, middle, and lower thirds. The categories were drawn up on the total sample of 1,250.[1]

WPC Variable	Lower	Middle	Upper
HS English GPA	0.0-3.0	3.1-3.5	3.6+
HS foreign language GPA	0.0-2.9	3.0-3.5	3.6+
HS social studies GPA	0.0-3.0	3.1-3.6	3.7+
English Usage	0-52	53-59	60+
Vocabulary	0-52	53-60	61+
Reading Comprehension	0-53	54-62	63+
HS mathematics GPA	0.0-2.7	2.8-3.3	3.4+
HS natural science GPA	0.0-3.0	3.1-3.5	3.6+
Math Achievement	0-52	53-61	62+

Since the major aim of this part of the study is to identify the antecedent verbal and quantitative skills that seem to be associated with language success, rather than make predictions of language achievement from combinations of WPC variables, primacy was given to generating relationships relatively free from spurious and contaminating kinds of effects. Gammas were computed between each of the eight language test skills and the nine WPC variables, controlling for sex and semesters of high school study simultaneously. In carrying out this procedure four control conditions were defined: (a) males with 0-4 semesters of high school study in the language, (b) males with five or more semesters, (c) females with 0-4 semesters, (d) females with five or more semesters. Gammas were computed separately for each grouping and are displayed in Table 1. Partial gammas were then computed and are shown in Table 2. These associations, then, measure the relationships between WPC variables and language skills once

[1] GPA's are measured on a regular four-point scale; test scores are standardized on a sample of college-bound high school seniors, i.e., students taking the WPC Test, with a mean of 50 and a standard deviation of 10.

the effects of sex and semesters of high school study have been removed.

What kinds of general statements can be made about these data? From Table 1 it is obvious that gammas are highly variable across control categories. For example, French Reading and high school foreign language GPA show a reasonably high association (+.43) for males with 0-4 semesters of French, but a very slight negative association (-.01) for males with five or more semesters. Many other illustrations of such instability could be cited. In some cases differences may be attributed to small n's, e.g., German females with five or more semesters. But for the most part, n's are large enough to warrant placing some trust in the reliability of the coefficients. There are at least a couple of postulations as to the sources of these highly variable results: (1) the third and fourth years of high school language study demand a somewhat different constellation of abilities than the first two years; (2) a self-selection principle may exist whereby students opting for more than four semesters of a language are considerably different in terms of interests, abilities, motivations, etc., than others, and these differences become reflected in the statistical associations.

WPC variables are more likely to be important in differentiating language achievement among males with limited foreign language experience than among males with more than two years of language study—the latter tends to be a highly selective group. This tendency is not visible, however, among females. Among students with four or fewer semesters of language study male performances are more highly predictable from WPC variables than female performances; the reverse is true among students with more than four semesters.

The relationships, though statistically significant in many instances, range from low to moderate. None of the partial gammas (shown in Table 2) exceeds .42. This indicates that language achievement in high school is more

than just a composite of other types of achievement and aptitude. Semesters of high school language study and length of delay between instruction and testing time appear far more crucial in affecting test achievement than other types of measurable IQ and achievement skills.

The French Tests. Chart 1 depicts, by means of bar charts, the magnitudes of the partial associations reported in Table 2 for the three French skills. The major findings are:

1. MLA Listening Comprehension is very weakly associated with WPC variables relative to MLA Reading Comprehension and UW Grammar; six of the nine associations are below .20 and none is above .30.
2. Grammar skills are more likely to be associated with high grade achievement in high school than reading or listening, suggesting that grammar success may contain more of a motivational component than the other two skills. It is also more highly related to Math Achievement scores indicating that, relative to reading and listening, grammar is more readily enhanced through logical and quantitative skills.
3. French Reading success is more a function of verbal aptitudes usually thought to accompany language success, i.e., usage, vocabulary, and reading comprehension.
4. Among WPC achievement variables, foreign language GPA, as might be expected, is the strongest correlate of language test skills. The verbal aptitude measures play central roles in reading and listening success; however, grammar achievement would seem at least equally influenced by the math and science variables.
5. High school social studies GPA, which historically has probably been the best single predictor of college GPA among the entire array of WPC

predictors, is a virtual nonentity in French language attainment.

The German Tests. Performances on the three German tests are manifestly more a function of WPC variables than the French tests; this is particularly so with respect to listening skills. One of the more interesting, albeit perplexing, aspects of the German data is the remarkably strong impact that natural science GPA has on German attainment. This is especially significant when one remembers that sex and semesters of high school study have been controlled--with a single exception in grammar, data in Table 1 disclose the tenacity of these relationships across control categories. A fuller appreciation of the relationship between natural science GPA and German Reading can be glimpsed from the following cross-classification (numbers represent column percentages; n=378):

		German Reading (MLA)		
		Upper	Middle	Lower
HS Nat Sci GPA	Upp	47	28	25
	Mid	30	27	13
	Low	23	45	62

The best single predictor of German Reading is natural science GPA (+.42) even surpassing foreign language GPA, English Usage, and Vocabulary.

Along with English Usage, high school natural science GPA also heads the list of German Listening correlates (+.35).

What is it about achievement in chemistry, physics, and kindred subjects that is so closely intertwined with German MLA achievement? Is there something about the logic or syntax of the Germanic languages that makes it easier to grasp for students with natural socience abilities? Or perhaps it is more a matter of interest--students who are more interested in the natural sciences (and hence do better) are more likely to develop an interest in German (and hence do better). It is obvious that these data can only pose these questions, not answer them.

Contrary to the French skills, German Reading is more highly associated

with the high school GPA variables than grammar. The WPC Test score variables show relatively stable associations across language skills. German Reading is most noticeably linked with natural science and foreign language grades, English Usage, Vocabulary, and Math Achievement. English Usage is the supreme correlate of grammar attainment; the motivational (i.e., high school GPA) variables are less prominently associated with German Grammar than with French Grammar.

As with reading, German Listening achievement is furthered by natural science grades, but also by English Usage, Vocabulary, and Reading Comprehension. Once more, social studies GPA proves to be a rather undistinguished predictor of language skill development.

German is uniquely a male-dominated language with a sex composition of 65 per cent male, compared to 47 per cent for Spanish, and just 37 per cent for French.

The Spanish Tests. From a composite perspective the two Spanish tests are less apt to be influenced by the types of abilities measured by WPC variables than the French and German tests. Also, there are very minute differences, on the whole, between the magnitudes of the WPC relationships when Spanish Reading is compared with Spanish Listening. The latter fact may be due to the extraordinarily high relationship noted earlier between Spanish Reading and Spanish Listening. Social studies GPA, on the other hand, correlates better with the Spanish tests than other language tests, though the relationships can only be considered moderate at best. Again, it is interesting to observe that some of the more quantitatively oriented variables, especially Math Achievement, are just as effective as predictors of Spanish achievement as the more verbally tenored tests.

Cautions. In interpreting these findings it would be wise to heed the frequently uttered admonition that from correlations thou shalt not impute

causes even when certain key variables have been controlled. Secondly, the relationships between WPC variables and language skills are simply not that high—probably in no instance does a single WPC variable account for much more than 20 per cent of the variance of any language skill. And third, the elitist and self-selective composition of the sample could alter some of the relationships in complex and capricious ways.

Table 1

Associations (gamma coefficients) between WPC variables and language skills in French, German, and Spanish subdivided by sex and semesters of high school study*

	WPC Variables															
	HS English GPA				HS For Lang GPA				HS Soc Stud GPA				English Usage				Vocabulary			
	Males		Females		Males		Females		Males		Females		Males		Females		Males		Females	
Language Test	0-4 Sem	5+ Sem	0-4 Sem	5+ Sem	0-4 Sem	5+ Sem	0-4 Sem	5+ Sem	0-4 Sem	5+ Sem	0-4 Sem	5+ Sem	0-4 Sem	5+ Sem	0-4 Sem	5+ Sem	0-4 Sem	5+ Sem	0-4 Sem	5+ Sem
MLA French Reading	+06	+04	+28	+35	+45	-01	+20	+43	+05	-17	+12	+26	+62	+35	+34	+33	+31	+28	+39	+36
MLA French Listening	+18	+03	+08	+24	+34	-03	-02	+35	+05	+10	-02	+09	+52	+30	+07	+10	+43	+06	+36	+21
UW French Grammar	+35	+28	+31	+33	+36	+39	+22	+56	+23	-03	+12	+38	+54	+15	+34	+28	+36	-02	+29	+22
MLA German Reading	+32	+01	+29	+28	+44	+35	+41	+34	+19	+11	+15	+45	+40	+23	+34	+68	+37	+22	+32	+64
MLA German Listening	+13	+25	+17	+30	+29	+21	+21	+42	+16	+15	-07	+45	+30	+38	+43	+47	+33	+22	+30	+58
UW German Grammar	+24	+09	+01	+08	+45	+19	+17	+32	+14	+01	-12	+04	+45	+44	+32	+21	+33	+25	+05	+61
MLA Spanish Reading	+06	+27	+40	+35	+14	+23	+33	+34	+23	-10	+33	+41	+33	+13	+41	+32	+36	+24	+29	+21
MLA Spanish Listening	+08	+43	+43	+26	+29	+50	+32	+38	+14	+20	+31	+35	+30	+27	+43	+30	+36	+26	+23	+21

	Reading Comp				HS Math GPA				HS Nat Sci GPA				Math Achievement			
	Males		Females		Males		Females		Males		Females		Males		Females	
Language Test	0-4 Sem	5+ Sem	0-4 Sem	5+ Sem	0-4 Sem	5+ Sem	0-4 Sem	5+ Sem	0-4 Sem	5+ Sem	0-4 Sem	5+ Sem	0-4 Sem	5+ Sem	0-4 Sem	5+ Sem
MLA French Reading	+18	+53	+31	+27	+36	-01	+10	+22	+31	+10	+07	+27	+48	+19	+26	+00
MLA French Listening	+44	+33	+28	+17	+29	+02	+06	+09	+40	+07	+09	+15	+39	+35	+26	+08
UW French Grammar	+33	+23	+30	+34	+39	+14	+07	+41	+16	+06	+15	+45	+32	+25	+20	+40
MLA German Reading	+20	+25	+34	+43	+29	+20	+12	+68	+48	+26	+38	+56	+35	+24	+29	+45
MLA German Listening	+28	+25	+36	+56	+32	+20	+01	+52	+39	+33	+23	+39	+32	+17	+18	+55
UW German Grammar	+30	+27	-03	+52	+28	+17	+25	+11	+39	+15	+20	-03	+40	+16	+21	+13
MLA Spanish Reading	+29	+15	+33	+34	+29	-05	+21	+26	+06	+21	+29	+13	+43	-18	+53	+17
MLA Spanish Listening	+18	+27	+32	+11	+27	+17	+18	+10	+27	+23	+22	+33	+46	+08	+38	+21

	Males 0-4 Semesters	Males 5+ Semesters	Females 0-4 Semesters	Females 5+ Semesters
French	N = 96	N = 83	N = 142	N = 167
German	N = 149	N = 98	N = 84	N = 47
Spanish	N = 100	N = 73	N = 83	N = 113

*Decimal points omitted

Table 2

Partial gammas (controlling for sex and semesters of high school study) between WPC variables and language skills in French, German, and Spanish*

	WPC Variables								
Language Test	Eng GPA	ForLa GPA	SocSt GPA	Engl Usage	Vocab	Read Comp	Math GPA	NatSc GPA	Math Achie
MLA French Reading	+25	+31	+13	+38	+35	+30	+17	+20	+17
MLA French Listening	+16	+19	+05	+17	+27	+26	+10	+16	+21
UW French Grammar	+32	+40	+23	+32	+24	+31	+27	+27	+31
MLA German Reading	+24	+41	+18	+37	+34	+25	+26	+42	+32
MLA German Listening	+17	+26	+13	+35	+31	+30	+25	+35	+27
UW German Grammar	+15	+33	+06	+41	+27	+24	+24	+28	+30
MLA Spanish Reading	+27	+26	+26	+31	+27	+15	+21	+16	+26
MLA Spanish Listening	+28	+36	+26	+32	+27	+20	+17	+27	+30

N's for the respective languages are: French 488, German 378, Spanish 369

*Decimal points omitted

Chart 1

Partial gammas (controlling for sex and semesters of high school study) between WPC variables and French language skills

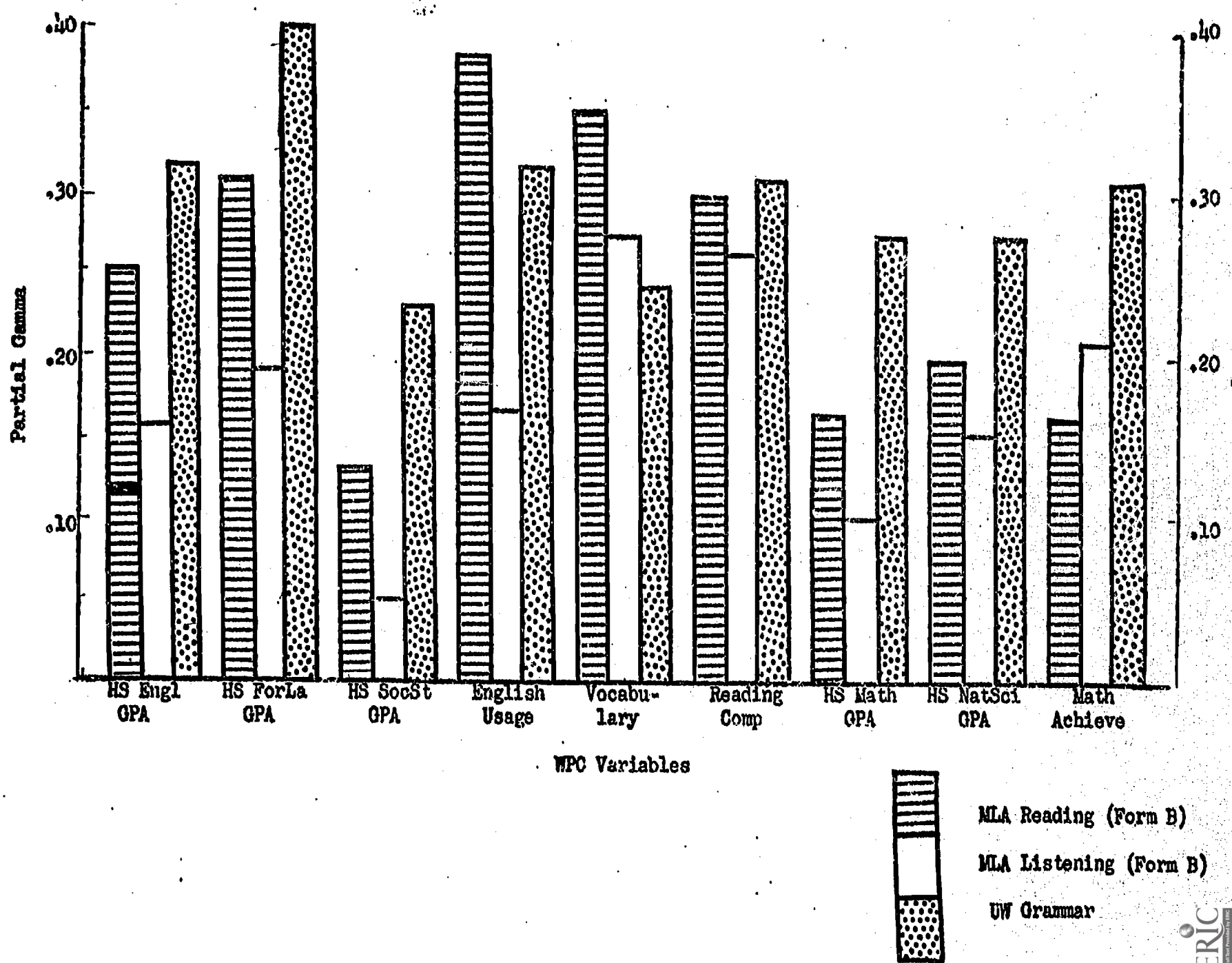


Chart 2

Partial gammas (controlling for sex and semesters of high school study) between WPC variables and German language skills

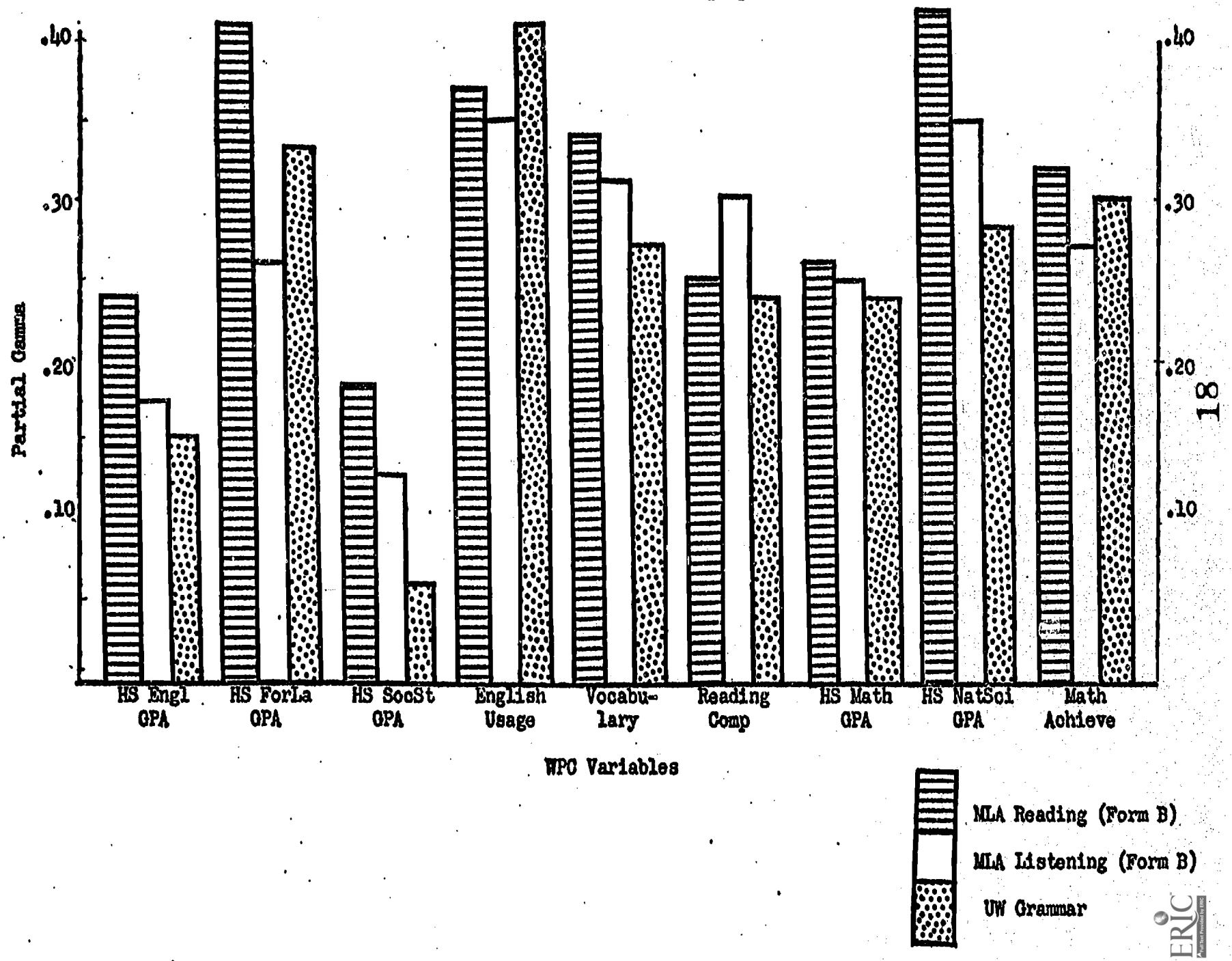
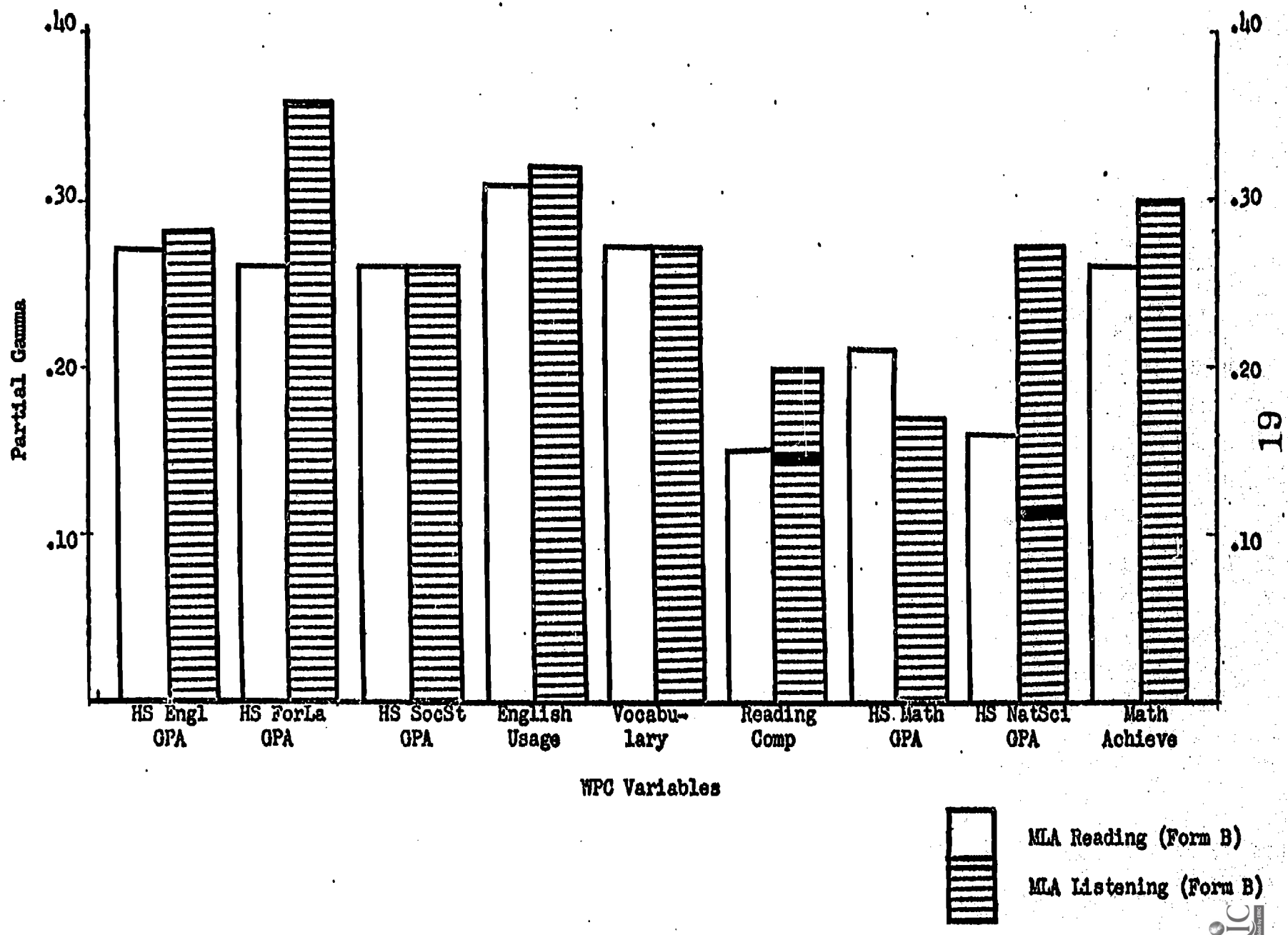


Chart 3

Partial gammas (controlling for sex and semesters of high school study) between WPC variables and Spanish language skills



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