DOCUMENT RESUME

ED 434 930 TM 030 182

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TITLE	Variation in the Prediction of College Grades across Gender within Ethnic Groups at Different Selectivity Levels.
PUB DATE	1999-04-00
NOTE	30p.; Paper presented at the Annual Meeting of the American Educational Research Association (Montreal, Quebec, Canada, April 19-23, 1999).
PUB TYPE	Reports - Research (143) -- Speeches/Meeting Papers (150)
EDRS PRICE	MF01/PC02 Plus Postage.
DESCRIPTORS	College Entrance Examinations; *College Freshmen; *Ethnic Groups; *Grades (Scholastic); High Schools; Higher Education; *Prediction; *Selective Admission; *Sex Differences
IDENTIFIERS	*Scholastic Assessment Tests

ABSTRACT

Correlation of the Scholastic Assessment Test I: Reasoning Test (SAT I) scores and high school grade point average (HSGPA) with freshman grade point average (FGPA) were studied in a sample of 23 colleges. The SAT I predicts FGPA about equally well across different ethnic groups. Correlation of the SAT I and the composite of SAT I scores and HSGPA with FGPA were generally higher for women than for men, although this pattern was reversed at the most highly selective colleges. Adjusting for differences in course grading policies increased correlation by about 0.05. When a single prediction equation was used for all students, men tended to get lower grades than predicted, and women got higher grades than predicted. Adjustments for course difficulty reduced underprediction, and there was no underprediction for women who intended to major in mathematics or scientific fields. African American and Hispanic/Latino men received lower grades than predicted, but women in these groups performed as predicted by the composite. (Contains 4 tables, 6 figures, and 17 references.) (Author/SLD)

Variation in the Prediction of College Grades Across Gender Within Ethnic Groups at Different Selectivity Levels

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Paper presented at the Annual Meeting of the
American Educational Research Association, Montreal, April, 1999

Abstract

Correlations of SAT I: Reasoning Test scores (SAT I) and high school grade point average (HSGPA) with freshman grade point average (FGPA) were sudied in a sample of 23 colleges. The SAT I predicts FGPA about equally well across different ethnic groups. Correlations of the SAT I and the composite of SAT I scores and high school grade point average with FGPA were generally higher for women than for men, although this pattern was reversed at the most highly selective colleges. Adjusting for differences in course grading policies increased correlations by about .05. When a single prediction equation was used for all students, men tended to get lower grades than predicted and women got higher grades than predicted. Adjustments for course difficulty reduced underprediction, and there was no underprediction for women who intended to major in mathematics or scientific fields. African American and Hispanic/Hispanic/Latino men received lower grades than predicted, but women in these groups performed as predicted by the composite

Colleges use SAT I: Reasoning Test (SAT I) scores as a supplement to other information, notably the high school grade point average (HSGPA), to make selection decisions. We examined the utility of SAT I and HSGPA both individually and combined as predictors of college grades. We recognize that freshman grades are only one indicator of success in college and that much can be gained from considering a broader perspective (Willingham, 1985); nevertheless, the freshman GPA (FGPA) is an important indicator because it reflects a cumulative judgment of the quality of college-level academic performance made by a number of faculty members in several different disciplines. Although the four-year average might be a preferable criterion, research reviews suggest that there is little or no difference in the size of validity coefficients based on FGPA and those based on the cumulative four-year average (Wilson, 1983; Burton & Ramist, in press).

Because students select colleges and colleges select students, the range of SAT scores and HSGPAs found among the enrolled students at a particular college can be much narrower than the range found in the potential applicant population. This restriction in range tends to reduce correlations with FGPA that can be computed only for enrolled students; the real question of interest is how well do the scores predict for potential applicants, not for enrolled students. Therefore, correlations were adjusted to estimate what they would have been if the range of SAT I scores and HSGPAs was the same for a given college as for the full national cohort of college-bound seniors taking the SAT I.

An additional question of interest was the extent to which the SAT I yielded over- or underpredictions, that is, whether predictions based on the total group were either too high or too low for specific subgroups. Overprediction occurs when a subgroup does not perform as well as predicted; their predicted performance is above, or over, their actual performance. A common finding is that college grades of women are underpredicted and grades of ethnic minorities are overpredicted (Breland, 1979; Linn, 1978; Ramist, Lewis, & McCamley-Jenkins, 1994; Sawyer, 1986). These studies all examined gender and ethnic groups separately rather than examining gender effects within ethnic groups. This leaves open the question of whether FGPA for women from minority groups is over- or underpredicted. A study of African American and Hispanic/Latino women in three colleges suggested that their scores were slightly underpredicted by SAT scores when the predictions were based on males from the same ethnic group (Pennock-Roman, 1994). However, Pennock-Roman did not evaluate over/underprediction within gender/ethnic groups when the original predictions were based on the regression for all students.

Method

Sample

Data for the 1995 entering class was provided by 23 colleges. The colleges in the sample represented a combination of public and private institutions (13 public and 10 private), including one junior college. One college had only female students. Each of the six College Board geographical regions was represented, but the sample should not be considered as a nationally representative sample in a strict sampling sense. In particular, most of the colleges were well above average in selectivity and had relatively high SAT I scores in their freshman classes. Seven colleges had average Verbal + Math SAT I scores above 1250, and only two colleges had average scores below 1000. In the sample, average scores on the recentered SAT Program scale were 566 Verbal and 581 Math compared to 504 and 506 for all college-bound seniors in 1995 (College Board/Educational Testing Service, 1995).

Variables

Colleges were asked to provide the freshman grade point average (FGPA) for all students in the 1995 entering classes. In addition, they were asked to provide grades in individual courses, but only seven colleges sent this course-level information. SAT I scores were extracted from SAT Program files at ETS. Demographic information was obtained from the Student Descriptive Questionnaire (SDQ) which about 95% of the students voluntarily complete when they register to take tests in the SAT program. The self-reported HSGPA was also obtained from the SDQ. This HSGPA contains 12 categories from F through A+. This HSGPA was coded such that an F = 0, D- = .7, D = 1.0, D+ = 1.3...A+ = 4.3. FGPA was similarly coded from 0 to 4.3, though 4.0 was the top score for many colleges that did not use A+ grades. Previous research suggests that using the self-reported HSGPA from the SDQ results in multiple correlations (combining SAT scores and HSGPA to predict FGPA) that are about .03 to .04 points smaller than multiple correlations that use the actual school-reported HSGPA (Freeberg, Rock, & Pollack, 1989).

Procedures

Correlations of predictors with FGPA were corrected for range restriction with the Pearson-Lawley multivariate correction (Gulliksen, 1950, pp. 165-166). This adjustment requires the national standard deviations for the predictors as well as their intercorrelations. For the old (unrecentered) SAT Program scale, these SDs were as follows: SAT I-V, 112; SAT I-M, 124; HSGPA, 0.66. For the recentered scale the SDs were: SAT I-V, 110; SAT I-M, 111. Correlations were the same for old and recentered scales and were as follows: SAT I-V with SAT-M, .71; SAT I-V with HSGPA, .48; SAT I-M with HSGPA, .53.

All correlations with FGPA were computed within colleges, weighted by the number of students at that college, and averaged across colleges. Similarly, multiple correlations that used more than one predictor were computed within college and then the weighted average taken across colleges. If any predictor in the multiple correlations had a negative weight, the multiple correlation was recomputed with that variable removed.

Over/underprediction was analyzed by making predictions based on all students in a college and then, for each gender within ethnic subgroup, computing the difference between the predicted and actual FGPA (predicted GPA minus actual GPA). The result is in grade point units, with positive values indicating overprediction and negative values indicating underprediction. Two colleges were excluded from the averages—one had only female students and the other used a 0-15 scale for FGPA rather than the 0-4 (or 0-4.3) scale used at the other colleges.

Results and Discussion

Correlations for Colleges in Three Selectivity Ranges

Correlations for colleges in three selectivity ranges are shown in Table 1. These correlations are adjusted for restriction in range. Such adjustments are especially useful when comparisons are being made across categories in which there is more range restriction in one category than another; specifically, there is greater restriction in the most highly-selective category.

Consistent with previous findings (Ramist, Lewis, and McCamley-Jenkins, 1994), correlations tended to be higher for the most selective institutions. In addition, the SAT I increment, that is the extent to which SAT I scores improve predictions over HSGPA alone, tended to be greatest for the most selective colleges. The SAT I increment was .04 in the lowest category, .06 in the middle category, and .09 in the highest category.

The pattern of higher correlations in the most selective colleges was not replicated in all gender/ethnic groups. Note, for example, that the V + M correlation for the most selective colleges was no higher than for the least selective colleges for African American, Asian American, and Hispanic/Latino females and for African American males as well. In the relatively large White sample, the correlation in the most selective colleges was much higher for males (.23 and .20 higher compared to the low and middle groups respectively) but only marginally higher for females (.01 and .05 respectively). As indicated in Figure 1, correlations for the combined ethnic groups suggest that the SAT I (V + M) is a better predictor for women than for men at the less selective colleges, but that it predicts FGPA equally well for men and women at the most selective colleges. These data are consistent with the argument that behaviors unrelated to the developed abilities measured by the SAT, such as failing to attend class or complete assignments on time, may be more common in males and therefore make male grades more difficult to predict. (Stricker, Rock, & Burton, 1991). Because males at the most highly selective colleges may be as likely as females to attend class and complete assignments, tested abilities should be equally valid for men and women at these highly selective institutions.

For the V + M + H composite, the same pattern seen for SAT I scores alone was repeated—grades of females were predicted more accurately in the less selective colleges, but grades of males were predicted more accurately at the most selective colleges. This pattern was especially evident in the White sample. In the least selective colleges, the correlation was higher for females by .08, but in the most selective colleges, the correlation was .05 higher for males. The previous Ramist et al. (1994) study found a similar pattern with higher correlations for women at the less selective schools in their sample, and a very small male advantage at the most selective schools; they did not provide information on gender within ethnic within selectivity categories. The same pattern could also be observed in the colleges studied by Pennock-Roman (1994). The two colleges in her sample that would be classified in the most selective group in our sample both showed higher correlations for White males than for White females. In the two less selective colleges, the pattern was reversed.

Over- and Underpredictions

Table 2 presents the over- and underpredictions of FGPA. Consistent with previous findings (e.g., Ramist et al. 1994; Pennock-Roman, 1994), there was a modest underprediction of women's grades and the complimentary overprediction of men's grades. As indicated in Figure 2, for the three ethnic minority groups studied, there was virtually no over- or underprediction of women's grades from the combination of SAT I scores and HSGPA. There was moderate to substantial overprediction of men's grades. For all of the three minority groups, but especially for the African American and Hispanic/Latino groups, there was overprediction of grades for men, i.e., men did not perform as well in college as would be expected from their high school grades and SAT scores. Note that in these groups the overprediction was as great for HSGPA by itself as for the SAT by itself. In the most highly selective colleges, the underprediction of women's grades from the SAT and HSGPA composite was slightly less, ranging from -.04 to -.05.

Correlations within Parental Education and Income Categories

Socioeconomic categories, such as the highest educational degree earned by either parent, interact with ethnic categories in a way that makes it difficult to attribute results to ethnic as opposed to socioeconomic categories. In an attempt to disentangle these effects, we ran correlations for the ethnic/gender groups separately in three parental education categories. The parent education categories were derived from responses on the Student Descriptive Questionnaire. Students responded for both mother's and father's education level, and we used whichever parent had the highest level. We used three categories: high school diploma or less, bachelors degree, and graduate degree. Students with parents who had some graduate work but no graduate degree were included in the bachelors degree category; students whose parents had some college but no degree were not included in the analysis.

As shown in Figure 3, across ethnic groups college grades tend to be more predictable for students whose parents have more education. Within each parental education category, grades were most predictable for Asian American males, but within-category trends were less clear for the other groups. For example, within the college degree category, V+ M + H correlations were just as high for African American males as for White males, but correlations for African American females appeared to be relatively low. In the high school diploma category, V + M + H correlations were as high for African American females as for White females. As indicated in Figure 4, analyses run within family income categories revealed the same trends with some within-category variation but a tendency for correlations to be highest in the highest income category.

Adjustment for Course Difficulty

Because grading standards differ across courses, students in leniently-graded courses may receive higher grades, on average, than students with the same academic background who take strictly-graded courses. For some students, the FGPA may consist primarily of leniently-graded courses while for other students the FGPA may consist primarily of strictly-graded courses. Given that students with the highest scores on admissions tests often select the scientific and quantitative courses that are graded most strictly, the correlation between admission test scores and FGPA can be attenuated (Goldman & Widawski, 1976; Elliott & Strenta, 1988; Ramist, Lewis, & McCamley-Jenkins, 1994).

For the current sample, we were able to make adjustments in the seven colleges that provided grades in individual courses. A number of different adjustment methods have been proposed and evaluated (Stricker, Rock, Burton, Muraki, & Jirele, 1994). We used three adjustment methods: a within-course predicted FGPA, a course- grade residual analysis, and an analysis within intended college major.

The within-course predicted FGPA followed the procedure outlined by Ramist, Lewis, and McCamley-Jenkins (1994). In this adjustment method, admissions scores are used to make linear regression grade predictions in each course containing at least seven freshmen. For each student, the predicted grade for each course taken is averaged over all of the courses taken by that student to form a predicted FGPA for that student. The predicted FGPA is then correlated with the actual FGPA. We performed the within-course predictions separately for each predictor (V, M, and H) as well as for the combinations of these predictors (V + M and V + M + H). If any equation contained negative regression weights, we removed the variable with the negative weight and recomputed the correlation using the remaining predictors. For courses with just a few students, the weight for a single predictor could be negative; in these cases we substituted the mean grade in the course for the regression estimate. Because regression estimates based on optimal weighting of multiple predictors in relatively small samples may inflate correlations by capitalizing on chance, we also computed the V + M + H correlation based on uniform weights, that is the simple sum of V + M + (200 x H). We used the same uniform weight equation whether the course was predominantly verbal (such as English) or primarily quantitative (such as calculus), thus producing a very conservative estimate.

As shown in Figure 5, the correction for course difficulty increased the V + M + H correlation by about .06 (from .43 to .49) with an additional increase to .65 when also adjusted for range restriction. These corrections for grading differences are somewhat smaller than those found by Ramist, Lewis, and McCamley-Jenkins (1994), but are consistent with those computed by Stricker et al. (1994). Figure 5 also shows that the conservative uniform weight correlations were nearly as high as those with the optimal regression weights.

For the course-grade residual analysis, we used the overall V+M+H prediction equation for a college to predict the FGPA for all of the students in a given course. The course residual was the difference between the predicted FGPA of the students in that course and the actual mean grade of the students in that course. Thus, each course had a residual value associated with it, with positive residuals indicating a course with higher grades than would be expected from the admissions scores of the students in that course, that is, a course with lenient grading; negative residuals indicated strict grading. For a given student, these residuals were averaged over all of the courses taken by that student. This mean residual was then used as an additional predictor (along with V, M, and H) in predicting the FGPA for a student. Results of this procedure were nearly identical to those for the predicted FGPA procedure (mean correlation over colleges of .50 for mean grade-residual analysis compared to .49 for the predicted FGPA procedure).

The third procedure did not directly adjust for differences in course grading; it merely grouped students into more homogeneous categories based on their intended college majors as indicated by their responses to the Student Descriptive Questionnaire. This method has obvious drawbacks in that students frequently change their intended majors before or after enrolling in college, and even students with different majors can have a similar mix of courses during the freshman year. Nevertheless, this approach has the distinct advantage of not requiring colleges to supply any course-level information, so it could be used for all 23 of the colleges in the sample. We grouped all majors into two categories—"math/science" included majors in the physical and biological sciences, engineering, and mathematics; all other majors were put in the "other" category. As indicated in Figure 6, correlations were uniformly higher in the math/science group. Note that because these correlations were adjusted for range restriction the higher correlations in the math/science category cannot be attributed merely to greater variability of scores in that category. The means, standard deviations, and standardized differences (*d*) in Table 3 indicate that the difference in FGPA between the math/science and other groups is considerably smaller than the difference in any of the admissions measures, suggesting that grading standards were indeed more rigorous for students whose intended major was in a math/science field.

Over/underprediction adjusted for course difficutly. Because members of different gender and ethnic subgroups may differentially sort themselves into courses with relatively strict or lenient grading standards, adjusting for course diffiuculty can also have an impact on the the extent to which grades are over- or underpredicted. For each subgroup, we used the FGPA predicted in the course grade residual analysis (V + M + H + Residual) that accounts for course difficulty differences, and then found the difference between the predicted and actual FGPA. The correction reduced the underprediction of women's grades from –0.07 to –0.05; for women in the two colleges in the highly selective category that provided course grades, underprediction was reduced from –0.04 to –0.03

For the full sample of colleges, not just those that supplied course grades, over/underprediction results by intended major are presented in Table 4. Grade predictions were made without regard to intended major, but differences between predicted and actual grades were computed within major (math/science or other). Results were consistent with the notion that grading standards are more strict in math/science fields. In every gender/ethnic category, grades for students with intended majors in math/science were not as high as predicted from the V + M + H equation for the entire college. The generalization that grades of women are underpredicted was not true for these math/science students, though the overprediction for men was notably larger than the overprediction for women.

The results of all of the course-adjustment procedures underscore the importance of taking grading differences into account whenever possible for predictions of FGPA. When adjustments cannot be made, it should at least be acknowledged that the resulting correlations are underestimates of the ability of the admissions measures to predict college grades.

Conclusions

The SAT I appears to predict about equally well across ethnic groups. At most colleges, grades of females are more predictable than grades of males, but at the most highly selective colleges, the grades of males and females are predicted equally well. Males generally perform slightly worse in their freshman year than predicted from test scores and high school grades; women perform slightly better than predicted. Within African American and Hispanic/Latino groups, men perform worse than predicted and women perform about as predicted.

Across ethnic groups, grades are more predictable for higher SES students that for lower SES students. This is true for both parent education and income definitions of SES.

Accounting for differences in course grading practices produces a noticeable improvement in predictions of FGPA. Even as simple a procedure as running correlations separately for students who indicate that they would like to be math/science majors has an impact on the size of validity coefficients. Validity coefficients would have been even larger had we adjusted for unreliability in the FGPA criterion as was done by Ramist et al. (1994). However, we had no way of adequately estimating the reliability of the FGPA for all of the schools in our sample. If grade reliability were about the same in our sample as in the Ramist et al. sample (a reasonable but unverifiable assumption), about .05 should be added to the adjusted correlations. Thus, for example, correcting for the unreliability of the FGPA would raise the correlation for the V+M+H composite in math/science students from .66 to .71.

Many issues remain to be explored in future analyses of the data base created for this study. Additional data will be needed to explore longer-term validity issues.

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Table 1

Adjusted Correlation of Recentered Scores with Freshman Grade Point Average for Colleges in 3 Score Categories

			Correlation with Freshman Grade Point Average									
			Gender Total		African American		Asian American		Hispanic/ Latino		White	
Score	Score Category (V+M)	Total	M	F	M	F	M	F	M	F	M	F
Number of students	<1050	4,490	2,001	2,489	269	320	76	68	170	268	1,398	1,733
	1050-1250	37,033	17,589	19,444	697	1,305	3,560	3,550	1,220	1,556	11,448	12,063
	>1250	6,516	3,335	3,181	182	201	442	469	127	110	2,403	2,174
SAT-V	<1050	.46	.43	.50	.48	.49	.42	.58	.48	.49	.42	.49
	1050-1250	.46	.44	.49	.32	.48	.50	.50	.39	.48	.42	.47
	>1250	.55	.56	.55	.43	.46	.54	.55	.46	.33	.55	.50
	Total	.47	.46	.50	.37	.48	.50	.50	.39	.46	.44	.48
SAT-M	<1050	.46	.41	.53	.52	.21	.38	.66	.52	.51	.39	.52
	1050-1250	.47	.47	.51	.40	.52	.57	.54	.40	.50	.44	.48
	>1250	.57	.59	.57	.46	.52	.58	.56	.56	.29	.59	.53
	Total	.48	.49	.52	.44	.52	.57	.55	.40	.48	.46	.49
HSGPA (H)	<1050	.58	.54	.60	.47	.53	.38	.66	.47	.53	.55	.61
	1050-1250	.53	.52	.52	.45	.47	.55	.52	.48	.47	.51	.51
	>1250	.60	.60	.58	.49	.51	.54	.49	.62	.38	.61	.58
	Total	.54	.53	.53	.46	.49	.55	.52	.49	.48	.53	.53
V+M	<1050	.50	.46	.56	.55	.55	.47	.68	.55	.55	.44	.55
	1050-1250	.50	.50	.55	.42	.55	.59	.57	.43	.55	.47	.51
	>1250	.61	.63	.61	.53	.54	.61	.61	.59	.41	.67	.56
	Total	.52	.51	.56	.47	.55	.59	.58	.44	.53	.49	.53
V+M+H	<1050	.62	.58	.66	.59	.62	.55	.77	.59	.62	.58	.66
	1050-1250	.59	.58	.61	.52	.60	.66	.63	.54	.60	.56	.59
	>1250	.69	.70	.68	.61	.61	.67	.67	.72	.66	.70	.65
	TOTAL	.61	.60	.62	.55	.61	.66	.64	.55	.61	.58	.60

Table 2

Over (+) and Underprediction (-) of FGPA

Score	Gender Total		African American		Asian American		Hispanic/ Latino		White	
	M	F	M	F	M	F	M	F	M	F
Number of students	22,327	24,589	1,121	1,770	3,675	3,994	1,480	1,903	14,887	15,713
SAT I-V	+.08	-.07	+.26	+.06	+.01	-.07	+.20	+.09	+.07	-.11
SAT I-M	+.13	-.12	+.26	-.02	+.14	-.03	+.22	+.02	+.11	-.17
HSGPA	+.04	-.04	+.22	+.12	+.04	-.01	+.20	+.15	+.01	-.09
V+M	+.11	-.10	+.22	-.03	+.09	-.06	+.19	+.01	+.11	-.14
V+M+H	+.08	-.07	+.14	-.01	+.07	-.03	+.15	+.02	+.07	-.09

Table 3

Means and Standard Deviations of Scores and GPA's by Intended Major

	Intended Major				
	Math/Science		**Other**		*d*
	M	**SD**	**M**	**SD**	
SAT I-V	578	84	560	84	0.21
SAT I-M	628	76	564	83	0.81
HSGPA	3.70	0.43	3.54	0.46	0.36
FGPA	3.01	0.79	2.96	0.74	0.07

Note.—The standardized difference between the Math/Science and Other categories, *d*, is the mean difference divided by the square root of the unweighted average of the squared standard deviations.

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Table 4

Over (+) and Underprediction (-) of FGPA for Students with Math/Science or Other Intended Majors

Score	Gender Total		African American		Asian American		Hispanic/ Latino		White	
	M	F	M	F	M	F	M	F	M	F
Math/Science Intended Major										
Number of Students	9519	7342	513	642	2072	1641	653	646	5846	4075
V + M	.13	-.04	.22	-.02	.07	-.01	.20	.08	.13	-.07
V + M + H	.12	.02	.17	.03	.08	.03	.20	.11	.13	.01
Other Intended Major										
Number of Students	12,644	17,138	626	1157	1653	2404	847	1277	9022	11,597
V + M	.11	-.13	.23	-.04	.10	-.09	.18	-.03	.09	-.16
V + M + H	.04	-.11	.12	-.03	.05	-.08	.13	-.03	.02	-.13

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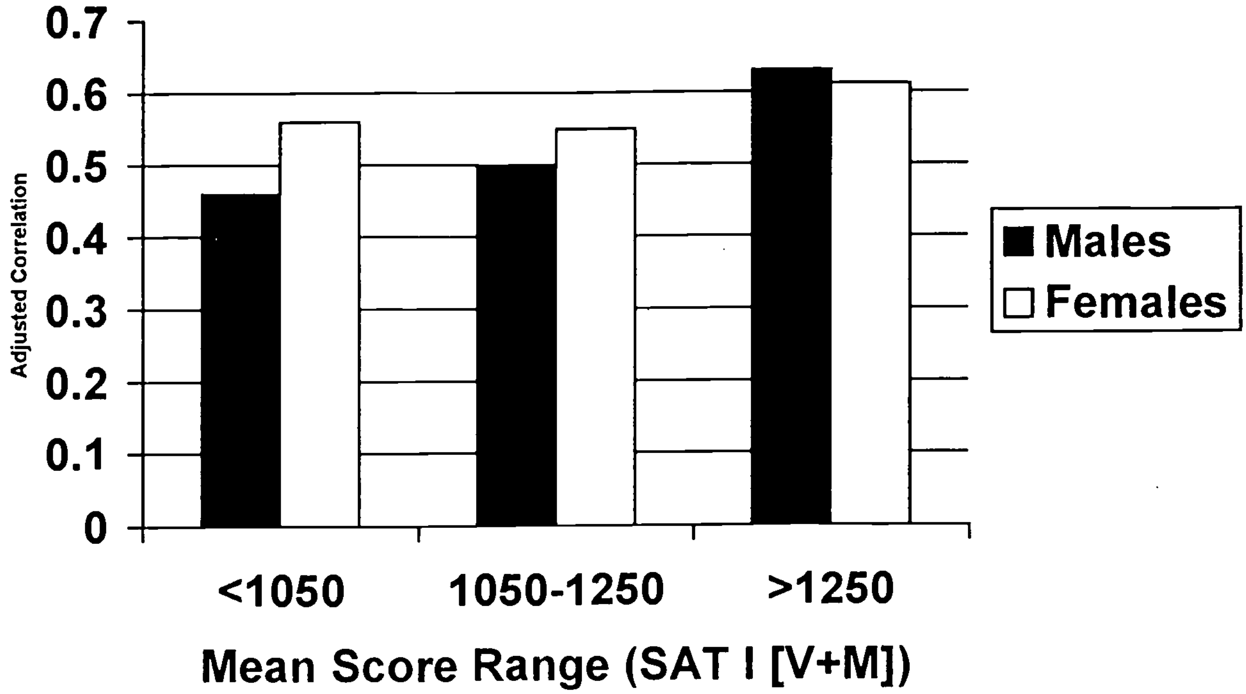

Figure 1. Adjusted correlations of SAT I (V+M) scores with FGPA for Males and Females in Colleges in Three Score Ranges.

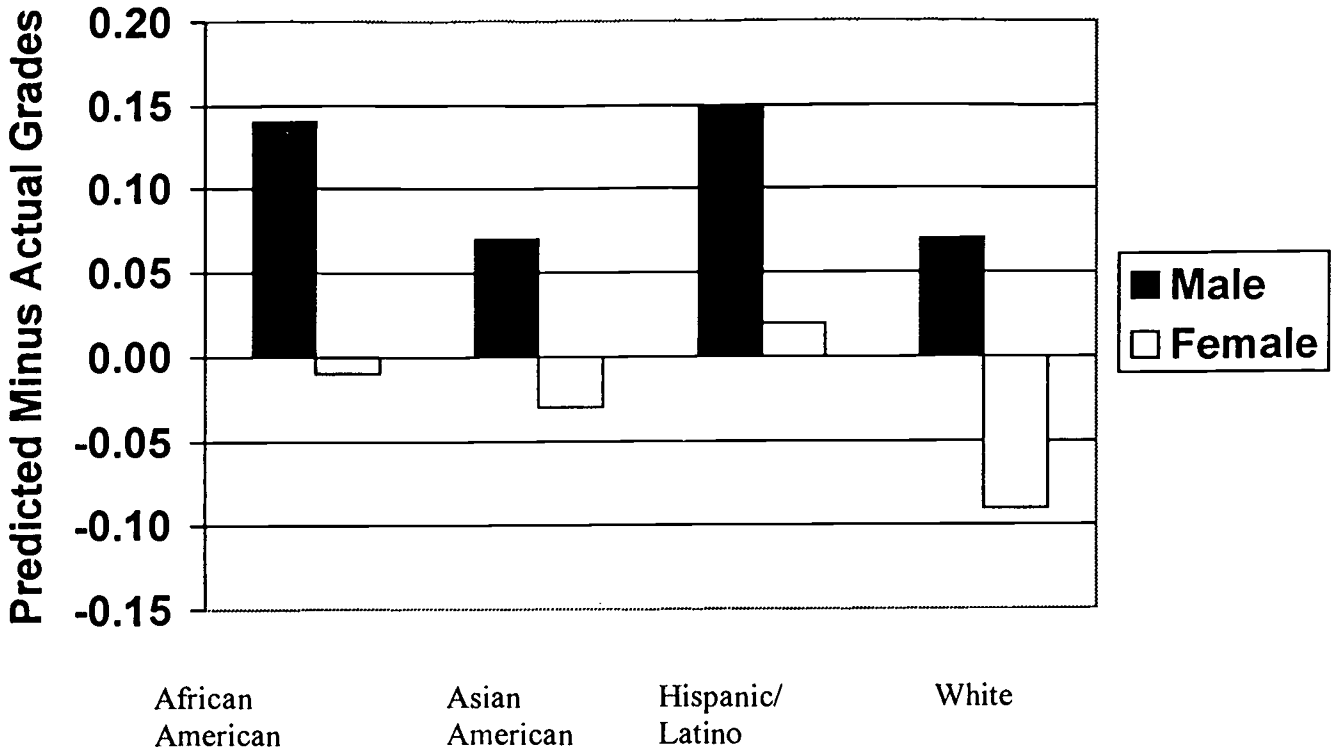

Figure 2. Over (+) and Underprediction (-) of FGPA from SAT I (V+M) and HSGPA Composite for Four Ethnic Groups

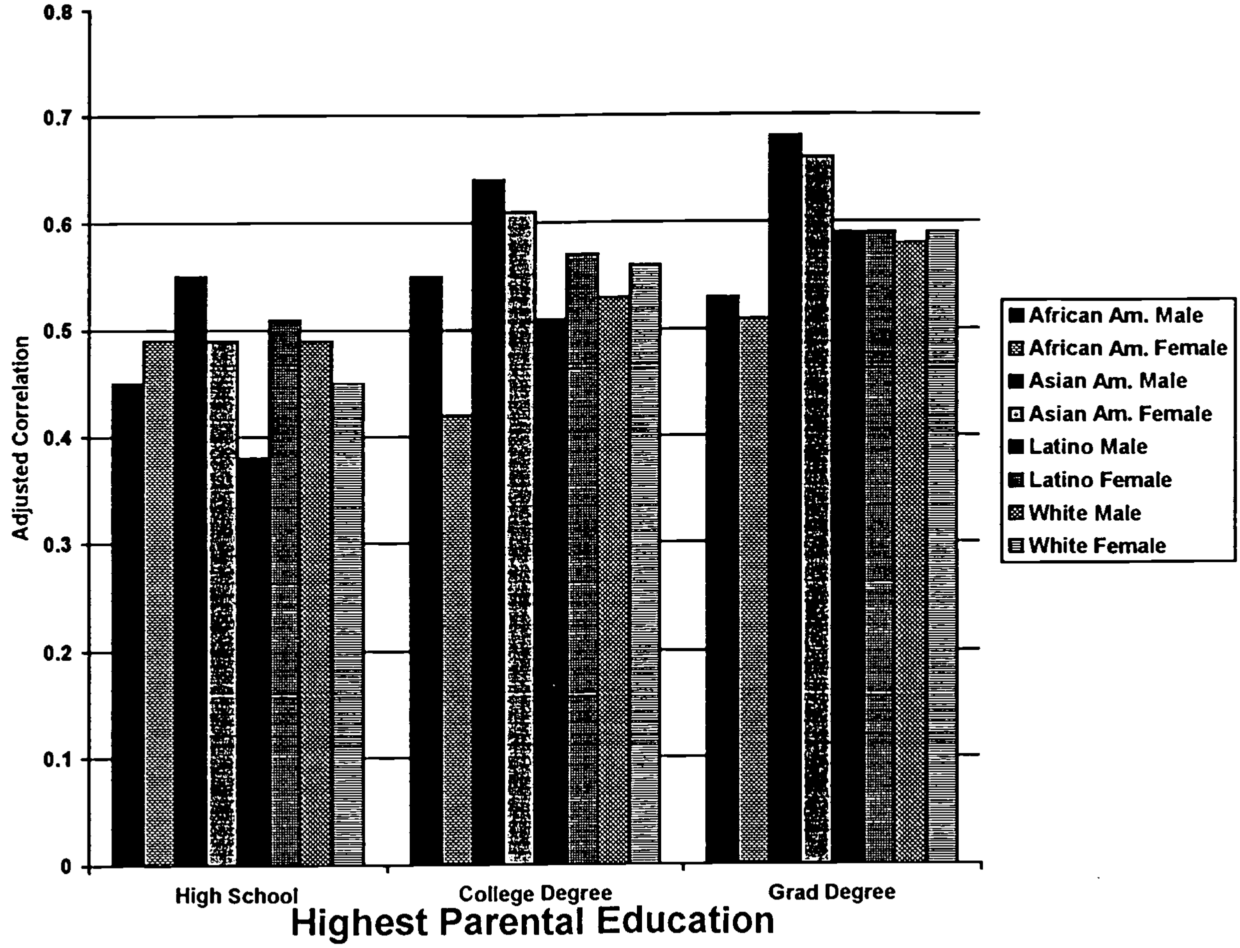

Figure 3. Adjusted Correlations of the V+M+H Composite with FGPA by Parental Education Level for Males and Females in Four Ethnic Groups.

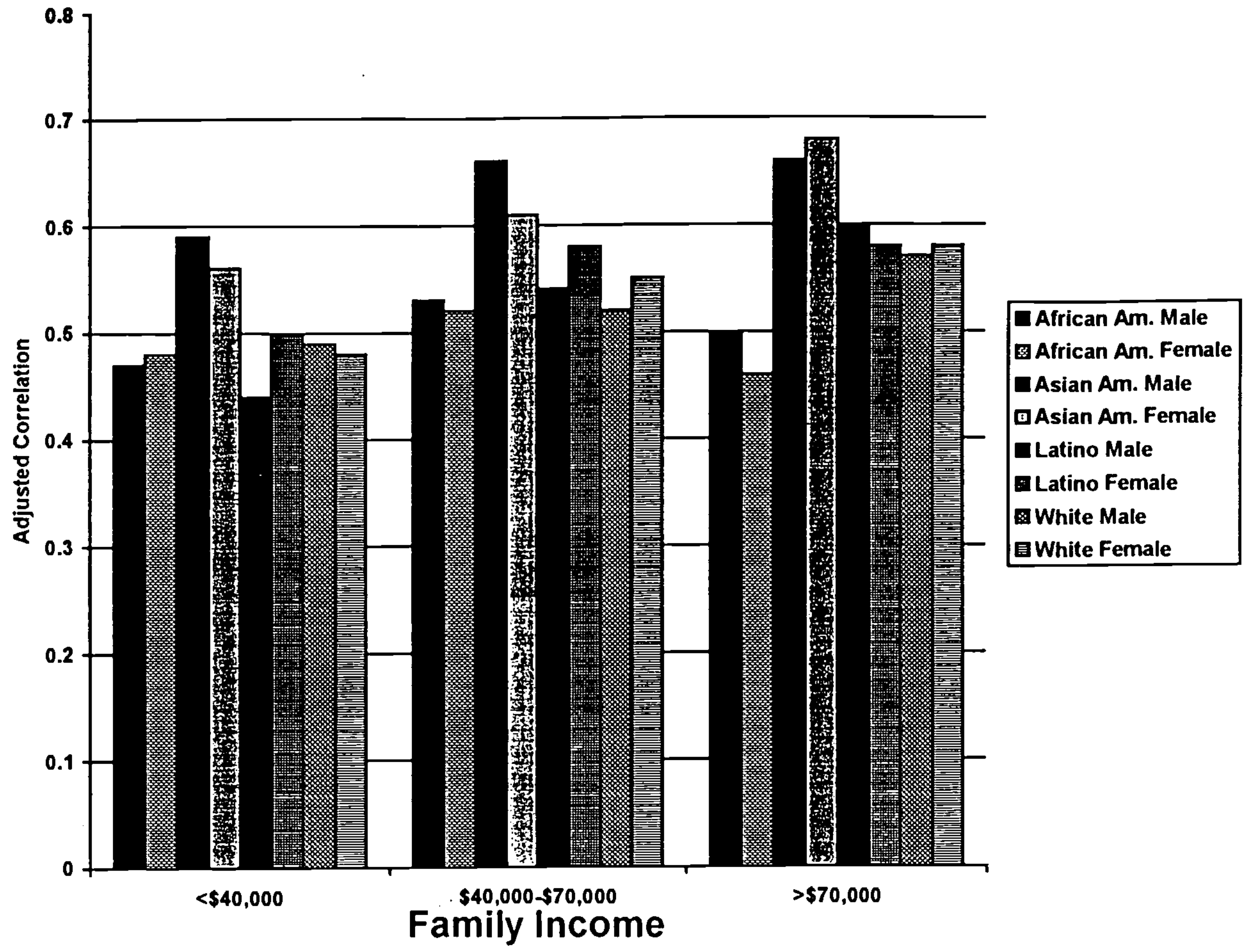

Figure 4. Adjusted Correlations of the V+M+H Composite with FGPA by Family Income Level for Males and Females in Four Ethnic Groups.

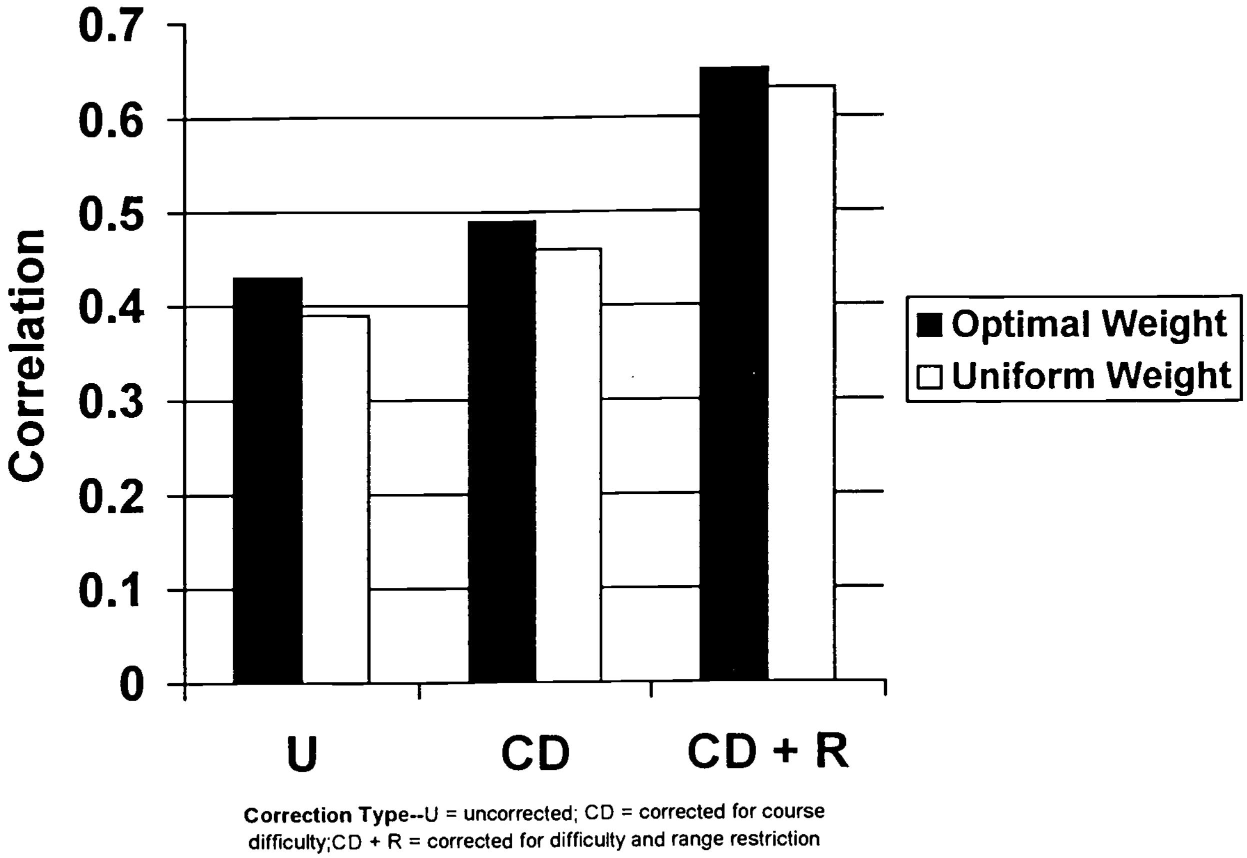

Figure 5. Effects of Correction for Course Difficulty and Range Restriction on Correlation of FGPA with V+M+H Composite (Optimal Weights and Uniform Weights).

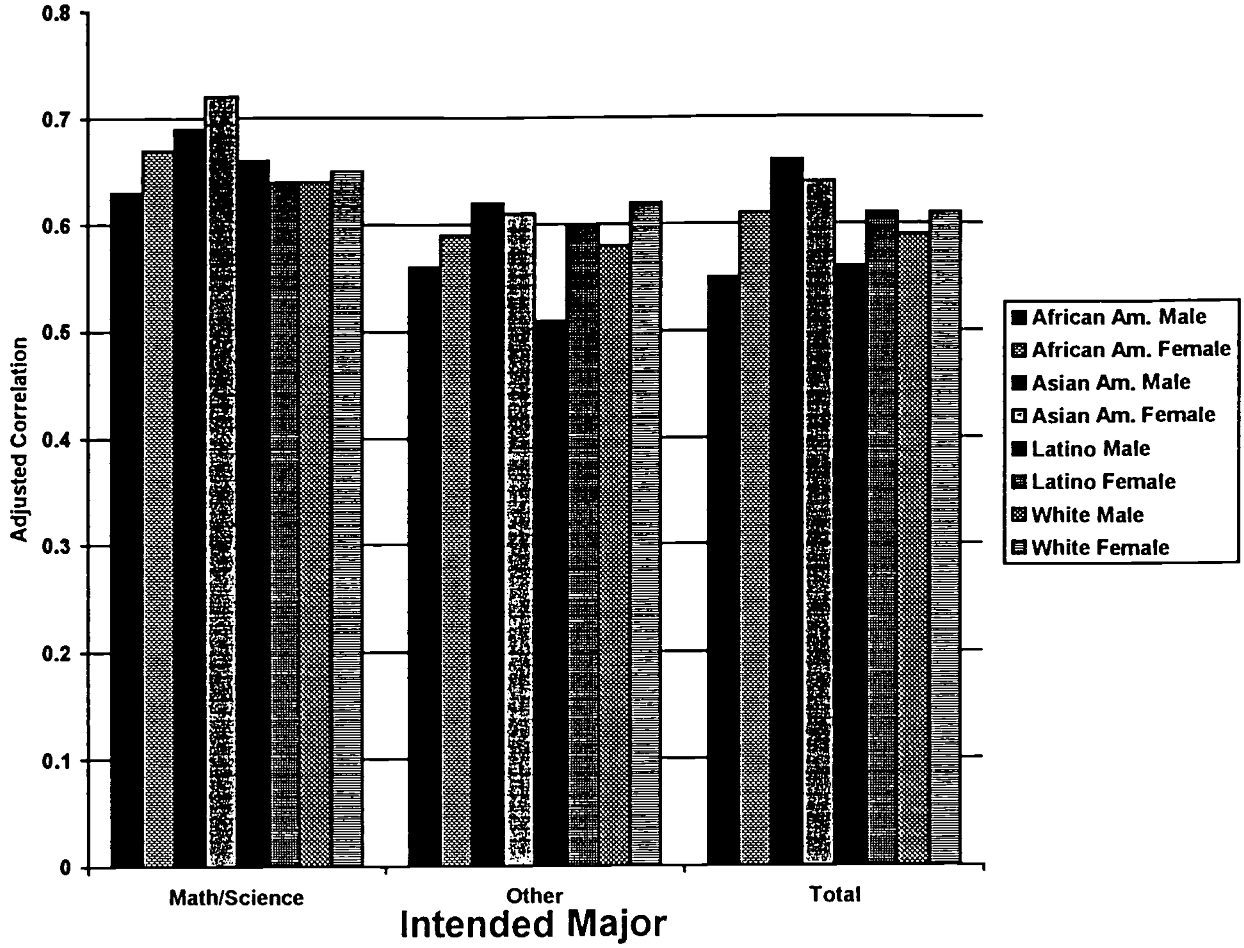

Figure 6. Adjusted Correlations of the V+M+H Composite with FGPA by Intended Major for Males and Females in Four Ethnic Groups.

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Educational Testing Service	1999, April

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