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ACADEMIC AND NON-ACADEMIC ACCOMPLISHMENT IN A REPRESENTATIVE SAMPLE TAKEN FROM A POPULATION OF 612,000

John L. Holland
James M. Richards, Jr.

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Summary

In a sample of 18, 378 college applicants, the student scores on the ACT test battery, the student scores for the non-academic achievement scales of the Student Profile Section of the ACT battery, and the student high school grades were intercorrelated. The correlations between these measures of academic and non-academic accomplishments are generally negligible. The results can be attributed neither to student exaggeration of their accomplishments nor to combining students with different interests. The results strongly suggest that academic and non-academic accomplishment are relatively independent dimensions of talent. The implications of the findings for the selection of talented persons and the conservation of talent are discussed.

Academic and Non-academic Accomplishment in a Representative Sample taken from a Population of 612,000

John L. Holland and James M. Richards, Jr.

There are at least four valuable purposes served by determining a high school student's potentials for a broad range of achievements in college and adult life. First of all, we could facilitate that student's choice of a college and career. Then we could enhance the college's ability to educate him more comprehensively. Moreover, we would be able to determine the student potentials for valuable accomplishments in later life which go unrealized during the college years. And finally, we would perceive which socio-educational influences foster them. Conventional techniques for assessing student potential for achievement in college--namely, high school grades and tests of academic potential--unfortunately measure only one of many dimensions of talent (Holland & Richards, 1965). We need a better record of the student's competencies and achievements during high school years if we are to find students who will be outstanding outside the classroom and in later life. The Student Profile Section was added to the ACT battery in the fall of 1965 to fill this need in part.

The Student Profile Section is a short biographical inventory containing the kind of information often requested in college application blanks. However, it collects and reports this information in a more systematic fashion than similar institutional forms. Specifically, it

gives the student the opportunity to tell prospective colleges about his aspirations, goals, anticipated personnel needs (such as housing and financial aid), and non-classroom achievements.

The present study is concerned only with that part of the Student Profile Section devoted to non-academic achievements. In a large representative sample of students tested by the American College Testing Program in 1964-65, the following questions about non-classroom achievements are examined: the statistical characteristics of the non-classroom achievement scales; the possible influence of faking on the non-academic achievement scales; the relationship of non-classroom achievement to ACT test scores and to high school grades; and the possibility that intended major field affects that relationship.

Method

The Sample. The subjects were a three-percent representative sample of the population of approximately 612,000 students tested by ACT on national test dates between November 1, 1964, and October 31, 1965. This representative sample was drawn by taking every 33rd, 67th, and 100th student on the master tape for each national test date. By this procedure, a sample of 18,378 students was obtained, of whom 10,073 were men and 8,305 were women.[1]

Non-Academic Achievement Scales. A checklist of extracurricular

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[1]Since very few students (less than 1%) repeat the ACT test, it is unlikely that there are students who appear in the sample more than once.

accomplishment was developed to obtain scores in the following areas: leadership, music, drama and speech, art, writing, and science. Each scale consisted of eight items ranging from common and less important accomplishments to rarer and more important accomplishments. For example, science items included such accomplishments as "performed an independent scientific experiment" or "won a prize or award of any kind for scientific work or study." In general, the accomplishments involve public action or recognition, so that in principle the accomplishments could be verified. The score on each scale is simply the number of accomplishments the student marks "Yes, applies to me." Students with high scores on one or more of these simple scales presumably have attained a high level of accomplishment, which requires complex skills, long-term persistence, or originality.

ACT Tests. The ACT test battery yields subtest scores in the following: English, Mathematics, Social Studies, and Natural Science. Each score is converted to a common scale with a mean of approximately 20 and a standard deviation of approximately 5 for college-bound high school seniors. The reliabilities of the ACT tests (American College Testing Program, 1965); the high correlations between the ACT battery and other similar measures (Eells, 1962); and the similar relationship of the ACT battery to college grades compared with other such measures (Munday, 1965) all indicate that the ACT battery is a typical measure of academic potential. Therefore, we would not expect markedly different results in the present study if we had used some other measure of

college potential, such as the SAT, the SCAT, or the College Qualification Test.

High School Grades. As a regular part of the ACT procedure, persons taking the ACT battery are asked to report their most recent high school grades in each of four areas: English, mathematics, social studies, and natural science. Scores are assigned to the grades so that A = 4, B = 3, C = 2, D = 1, and F = 0. Research by Davidsen (1963) indicates that such self-reported grades correspond closely to high school transcripts. A reanalysis of Davidsen's data by the present writers yielded a correlation of .92 between student-reported and school-reported grades.

Results

We first computed the means, standard deviations, and intercorrelations of the ACT tests, high school grades, and extracurricular achievement scales.[2] The reliability coefficients (Kuder-Richardson Formula 20) of the achievement scales were also computed. These analyses were performed separately for males and for females. The means, standard deviations, and intercorrelations for both sexes are shown in Table 1, and the estimated reliabilities in Table 2. For more information about the reliability of these scales, see the ACT Technical Report (American College Testing Program, 1965).

The skewed distributions on the achievement scales, revealed by

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[2]All computations for this study were carried out at Measurement Research Center, University of Iowa.

Table 1

Means, Standard Deviations, and Intercorrelations of
ACT Scores, High School Grades, and Non-academic Achievement Scales

Variable		1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. ACT English		--	61	68	65	41	31	36	30	10	09	04	-05	15	09
2. ACT Mathematics		62	--	61	62	37	47	36	37	07	02	-03	-08	07	13
3. ACT Social Studies		70	61	--	75	38	27	41	30	09	03	05	-02	15	11
4. ACT Natural Sci.		66	61	74	--	34	30	34	33	07	05	03	-01	10	17
5. HS English		40	37	39	37	--	44	56	48	17	04	09	-04	14	08
6. HS Mathematics		30	44	27	29	44	--	42	50	11	01	02	-04	05	12
7. HS Social Studies		34	34	39	34	55	43	--	48	18	-01	08	-04	12	11
8. HS Natural Science		29	32	28	29	46	46	49	--	13	02	05	-02	07	14
9. Leadership Ach.		05	07	04	05	16	11	14	14	--	23	42	23	38	32
10. Music Achievement		05	04	00	02	05	02	03	02	23	--	31	24	28	27
11. Drama & Speech Ach.		02	00	02	03	09	04	06	06	38	28	--	34	49	35
12. Art Achievement		00	00	02	04	-02	-03	-04	-02	18	12	26	--	43	35
13. Writing Ach.		17	11	17	15	18	08	13	13	36	19	41	31	--	40
14. Science Ach.		02	10	03	08	05	09	06	09	27	20	30	35	36	--
Men	Mean	18.02	21.32	20.96	21.30	2.45	2.29	2.66	2.37	2.25	1.34	1.12	.58	.76	1.10
	S.D.	4.97	6.38	6.28	6.09	.85	.99	.90	.92	1.96	1.89	1.55	1.36	1.33	1.62
Women	Mean	19.96	18.09	20.74	19.76	2.95	2.44	2.88	2.62	2.42	1.90	1.49	.69	1.16	.61
	S.D.	4.85	6.34	6.23	5.83	.80	.96	.87	.89	1.86	1.93	1.63	1.34	1.41	1.28

Note.--Correlations for men are shown above the diagonal and for women below. Decimal points are omitted.

Table 2

K-R 20 Reliabilities of Non-Academic Achievement Scales

Variable	Men	Women
Leadership Achievement	.70	.65
Music Achievement	.84	.77
Drama and Speech Achievement	.75	.69
Art Achievement	.87	.81
Writing Achievement	.81	.72
Science Achievement	.84	.84

the data in Table 1, occur because each scale contains accomplishments that high school students attain only infrequently. The correlations between the non-academic achievement scales, ACT tests, and high school grades support earlier findings that academic and non-academic achievements are essentially independent of one another (Holland & Astin, 1962; Nichols & Holland, 1963; Holland & Nichols, 1964; Holland & Richards, 1965; Richards, Holland, & Lutz, 1966). In addition, the present study uses the largest and most diverse student sample ever obtained to examine the relationships in question--a situation that is optimum for the production of high positive or negative relationships, if such relationships exist.

The non-academic accomplishment scales have moderate reliability, generally somewhat lower than the reliabilities of the regular ACT tests. The regular ACT tests, however, are several times longer than the achievement scales. Relative to their length, therefore, the reliabilities of these new dimensions, which have a relatively brief history of development, are comparable to those of conventional tests.

Because the non-academic achievement scales rest on a student's

self-report, his good memory and honesty are important. In particular, we should check the effect of a student exaggerating his achievements. Thus a special scale, the Infrequency Scale, was developed. The rationale for this scale is that a student who is exaggerating his achievements is likely to claim rare accomplishments in several different areas. Accordingly, using the combined male and female distributions, the item in each of the six achievement scales claimed least frequently was identified. These six accomplishments form the Infrequency Scale; the score is simply the number of these rare achievements claimed by the student.

For each sex, the mean, standard deviation, K-R 20 reliability coefficient, and correlations with all other scales of the Infrequency Scale were computed. Results are summarized in Table 3. The Infrequency Scale appears to have moderate reliability. The correlations between the Infrequency Scale and the six achievement scales are spuriously high because of item overlap. Since common items constitute one-sixth of the Infrequency Scale and one-eighth of the achievement scales, we might consider a correlation of .35 to .41 the result of overlap alone. The correlations in Table 3 are only slightly larger than this, suggesting that exaggeration has only a minor influence on the achievement scales. Most students give a frank account of their accomplishments.

As a further check on the influence of exaggeration, we identified students with high scores on the Infrequency Scale (a high score was defined as a score of 4, 5, or 6). There were 151 students, of whom

Table 3

Means, Standard Deviations, and Correlates of the Infrequency Scale

Variable	Men	Women
ACT English	-01	-01
ACT Mathematics	-02	02
ACT Social Studies	00	00
ACT Natural Science	00	01
HS English	01	03
HS Mathematics	01	01
HS Social Studies	02	00
HS Natural Science	02	03
Leadership Achievement	46	38
Music Achievement	43	32
Drama & Speech Achievement	50	45
Art Achievement	55	47
Writing Achievement	57	44
Science Achievement	49	53
Reliability (K-R 20)	.71	.62
Mean	.32	.28
Standard Deviation	.80	.73

Note. --Correlations between Infrequency and achievement scales are exaggerated by item overlap. Decimal points are omitted for correlations.

93 were men and 58 were women, with high scores, or less than 1% of the sample. These 151 students were omitted from the sample, and the means, standard deviations, and intercorrelations of the ACT tests, high school grades, and non-academic achievements were recomputed. Results are presented in Table 4. The K-R 20 reliabilities of the extra-curricular achievement scales were also computed again with the high scoring (Infrequency) students excluded (see Table 5).

Table 4

The Intercorrelations between ACT Scores, Grades, and Achievement When Students with High Infrequency Scores are Excluded

Variable		1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. ACT English		--	61	68	65	41	31	36	31	10	10	05	-05	20	12
2. ACT Mathematics		62	--	61	62	37	47	36	37	08	02	-03	-08	09	15
3. ACT Social Studies		70	61	--	75	38	27	41	30	09	03	05	-03	18	13
4. ACT Natural Sci.		66	61	74	--	34	30	34	33	07	05	04	-02	13	20
5. HS English		40	37	39	37	--	44	56	48	19	05	11	-03	20	11
6. HS Mathematics		30	44	27	29	44	--	42	50	11	02	03	-05	07	14
7. HS Social Studies		34	34	39	34	55	42	--	48	19	-01	08	-05	15	12
8. HS Natural Science		29	32	28	29	46	46	49	--	14	02	05	-02	09	16
9. Leadership Ach.		05	07	04	05	16	11	15	15	--	19	38	14	32	26
10. Music Achievement		05	04	00	02	06	02	03	02	20	--	23	10	14	16
11. Drama & Speech Ach.		03	-01	02	03	10	04	06	06	35	24	--	15	34	21
12. Art Achievement		00	-01	03	04	-02	-04	-04	-02	12	03	14	--	16	16
13. Writing Ach.		19	12	19	16	21	09	15	14	33	12	32	15	--	22
14. Science Ach.		04	11	04	09	06	10	08	10	22	10	15	13	19	--
Men	Mean	18.03	21.33	20.95	21.30	2.45	2.29	2.66	2.37	2.21	1.29	1.05	.50	.68	1.02
	S.D.	4.97	6.38	6.28	6.09	.85	.99	.90	.92	1.92	1.82	1.43	1.14	1.11	1.48
Women	Mean	19.96	18.08	20.74	19.75	2.95	2.44	2.88	2.62	2.40	1.87	1.45	.64	1.10	.55
	S.D.	4.86	6.35	6.24	5.84	.80	.96	.87	.89	1.83	1.89	1.56	1.20	1.30	1.09

Note. --Correlations for men are shown above the diagonal and for women below. Decimal points are omitted.

Table 5

K-R 20 Reliabilities of Non-academic Achievement Scales When Students with High Infrequency Scores are Excluded

Variable	Men	Women
Leadership Achievement	.69	.63
Music Achievement	.83	.76
Drama & Speech Achievement	.71	.67
Art Achievement	.81	.77
Writing Achievement	.71	.66
Science Achievement	.81	.77

A comparison of Tables 4 and 5 with Tables 1 and 2 indicates that the largest effect of excluding students with high Infrequency scores is to reduce the correlations among the achievement scales, although even this effect is a small one. As expected, the reliabilities of the achievement scales are somewhat lower. The intercorrelations of ACT scores and the correlation of high school grades with non-academic achievements tend to be slightly higher, but the correlations between ACT scores and high school grades were virtually unaffected. Overall, these results mean that the tendency of a few students to exaggerate may change some of the details of the relationships among academic potential, academic achievement, and non-academic achievement, but this bias will not change the main patterns and interpretations of such relationships.

Another factor not controlled in previous studies of the relationship between academic and non-academic achievement is the effect of a student's interests and aspirations. For example, there are some bright students who have no interest in science. Perhaps this explains our failure to find a relationship between academic potential and non-academic

accomplishment in science. Interest may be a "moderator variable" of the relationship between the two types of achievement (Frederikson & Melville, 1954; Frederikson & Gilbert, 1960; Saunders, 1956; Ghiselli, 1963).

To provide some control of interest, our sample (excluding students with high Infrequency scores) was sorted into nine curricular groups on the basis of a student's intended major field. These broad educational fields are: Social, Religious, and Educational; Administrative, Political, and Persuasive; Business and Finance; Scientific; Engineering, Agriculture, and Technology; Medical; Arts and Humanities; Other Fields; and Undecided.[3] For each of the non-academic achievement scales, and for each of the major field groups, the mean, standard deviation, and correlation with ACT scores and high school grades were computed. (Results are summarized in Tables B through G in the Appendix.) The results suggest that interest is a determinant of non-academic achievement, since, for example, students intending to major in science tend to have higher scores on science achievement. There is also some indication that in a few cases interest does act as a moderator of the relationship between academic and non-academic achievement, so that this relationship is noticeably greater within major fields than for the total group.[4]

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[3]The specific major fields included in the first seven of these groups are shown in Table A of the Appendix.

[4]Results for females majoring in Engineering, Agriculture, and Technology should be discounted because of the small N (18) for this group.

In the case of Writing Achievement for males intending to major in the Arts and Humanities, the moderator effect is substantial. Nevertheless, the overall pattern of these results confirms earlier conclusions that academic potential and achievement are usually poor predictors of achievement outside the classroom, and at best are only moderate predictors.

Table 6

Means and Standard Deviations of Achievement Scales for Various Groups

Variable	Men					
	HS Juniors		HS Seniors		Others	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Total Sample						
Leadership Ach.	2.33	2.01	2.30	1.96	1.94	1.94
Music Achievement	1.80	2.13	1.37	1.90	1.10	1.77
Drama & Speech Ach.	1.12	1.75	1.14	1.55	1.00	1.53
Art Achievement	.59	1.44	.56	1.32	.69	1.53
Writing Achievement	.91	1.40	.78	1.33	.64	1.29
Science Achievement	1.30	1.82	1.14	1.63	.83	1.47
Students with High Infrequency Scores Excluded						
Leadership Ach.	2.29	1.98	2.26	1.92	1.89	1.88
Music Achievement	1.73	2.06	1.32	1.83	1.04	1.68
Drama & Speech Ach.	1.04	1.63	1.07	1.42	.95	1.42
Art Achievement	.46	1.11	.48	1.09	.62	1.37
Writing Achievement	.81	1.19	.70	1.10	.57	1.10
Science Achievement	1.22	1.71	1.07	1.50	.75	1.30
	Women					
	HS Juniors		HS Seniors		Others	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Total Sample						
Leadership Ach.	2.44	1.84	2.45	1.86	2.18	1.84
Music Achievement	2.31	1.91	1.92	1.93	1.61	1.89
Drama & Speech Ach.	1.69	1.76	1.49	1.62	1.45	1.67
Art Achievement	.70	1.36	.69	1.34	.71	1.35

Table 6 (cont.)

Variable	Women					
	HS Juniors		HS Seniors		Others	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Total Sample (cont.)						
Writing Achievement	1.19	1.33	1.18	1.42	.98	1.34
Science Achievement	.78	1.48	.63	1.28	.41	1.10
Students with High Infrequency Scores Excluded						
Leadership Ach.	2.41	1.81	2.42	1.84	2.17	1.82
Music Achievement	2.28	1.88	1.88	1.89	1.58	1.85
Drama & Speech Ach.	1.64	1.69	1.44	1.55	1.41	1.60
Art Achievement	.64	1.20	.63	1.19	.67	1.25
Writing Achievement	1.14	1.22	1.12	1.30	.94	1.25
Science Achievement	.72	1.34	.56	1.09	.37	.95

Because an increasing number of students each year are taking the ACT test in their junior year of high school, another question is raised. To what extent do juniors obtain lower scores on the achievement scales than they would if they had taken the test in their senior year? Since the juniors who took the test in 1964-65 are not a random sample of juniors who will apply to ACT colleges, a definitive answer to this question is not yet possible. Such an answer will require a longitudinal study in which the scores of the same students are compared as juniors and seniors. Nevertheless, these data can provide some information; accordingly, means and standard deviations of the non-academic achievement scales were computed for three groups--high school juniors, high school seniors, and all other students. The results, summarized in Table 6, indicate that in this sample the average scores of high school juniors are just as high as

the average scores of seniors.

Discussion

The present study strengthens earlier investigations in several ways. The use of a student sample that explicitly represents a national population of 612,000 high school seniors removes "narrow range of talent" as a plausible explanation of the negligible or low relationships found between academic and non-academic measures. The use of the Infrequency Scale to eliminate students who exaggerate or err in recording their non-academic achievements makes "student distortions" an unlikely explanation. Similarly, a student's choice of training is only a weak explanation of generally negligible relationships. And when the present study is coupled with the closely related study by Holland and Richards (1965), we negate the remaining major hypotheses that have been offered to account for our findings. In the Holland and Richards study (1965), curvilinear relationships and defective scaling of the achievement scales as explanations received no substantive support. In short, it is reasonable to believe that academic and non-academic achievement, as we have defined them, are relatively independent kinds of talent. People who have one kind of talent may or may not have others.

The results of this study pertain mainly to what students do in high school and are not directly concerned with predicting performance in college, or in life outside or after college. Recently, Holland and Nichols (1964), using the same records of non-academic performance employed in the present study, found in a sample of extremely bright students that

such records are the best predictors of non-academic performance in the freshman year of college. Equally important, the predictive validities for such records averaged .38, while the Scholastic Aptitude Test, for example, did not contribute significantly to any multiple correlation in that study. Although it does not provide direct evidence about the relationships in question here, a recent review of the literature (Hoyt, 1965) reveals that the relationships between college grades and adult accomplishment are typically negligible.

The present study lends strong support to earlier studies which obtained similar results but generally used a narrow range of talent. For example, the studies by Thorndike and Hagen (1959), MacKinnon (1960), Richards, Taylor, and Price (1962), Gough, Hall, and Harris (1963), Holland and Nichols (1964), and Astin (1962) all suggest that the relationships between measures of aptitude or academic potential and various measures of real life achievement or originality are typically small. Our study implies that these earlier findings may also hold for broad ranges of talent. In addition, the criticism of all these earlier findings on the basis of methodological and statistical defects--restriction of range and unreliability of predictors or criteria--is now less plausible. Taken together, these studies make it clear that academic potential and achievement have little relationship to some kinds of non-academic potential and socially important performance. Since our criteria of non-academic accomplishment are only a sample of such accomplishments, measures of academic potential and achievement may have substantial

positive correlations with some non-academic accomplishments. However, the negligible relationships observed so far make this possibility unlikely.

The implications of the present study and its forerunners are important for the selection and training of students and employees and for the process of education. Since academic potential appears to be only one of several relatively independent dimensions of talent, we should continue to develop other independent measures of achievement and originality. Further, we should consider such measures important in their own right and not as weak, supplementary measures to remedy the slight defects of conventional aptitude and achievement tests. At the same time, we should not make the same mistake that the proponents of aptitude and intelligence tests have made in the past; that is, to rely on only one kind of measure and to neglect others.

Measures of academic potential are among the chief methods used to determine admission of students to college (Committee on School and College Relations, 1964). Our present findings, however, suggest that the emphasis in colleges and universities on academic potential, a relatively independent dimension of talent, has led to neglect of other equally important talents. If academic talent had a substantial relation with vocational and other non-classroom achievement, then this intense, pervasive concern with academic potential would be less disturbing. Unfortunately, college grades are generally poor predictors of real-life success (Price, Taylor, Richards, & Jacobsen, 1964; Richards et al., 1962;

Taylor, Smith, & Ghiselin, 1963; Hoyt, 1965) and are at best only inefficient predictors (Taylor, 1963). Since a college education should largely be a preparation for life, both in the community and in a vocation, we need to examine grading practices. Currently, a college education is mainly preparation for more education in graduate school.

Several practical applications of our findings emerge. If a sponsor is only interested in finding students who will excel in the college classroom, then high school grades and tests of academic potential are the best techniques available. On the other hand, if a sponsor also wishes to find college students who will do outstanding things outside the classroom and in later life, then he should continue to make an effort to secure a better record of the student's competencies and achievements in high school. Our results support some of the items used for this purpose in typical application blanks for admission to college, scholarships, and fellowships. But they also indicate the need to secure a more reliable and valid record of each student's past achievement and involvement.

Finally, since national surveys concerned with the conservation of talent use tests of academic potential almost exclusively, they probably present an inaccurate picture of the loss of talent for "real life"--that is, non-classroom--accomplishment. Such surveys should incorporate measures of other important dimensions of potential to remedy this distortion.

References

American College Testing Program. ACT technical report. Iowa City, Iowa: Author, 1965.

Astin, A. W. A note on the relationship between creative and academic achievement. Evanston, Ill.: National Merit Scholarship Corp., 1962.

Committee on School and College Relations. Admission to American colleges. New York: Educational Records Bureau, 1964.

Davidsen, O. M. Reliability of self-reported high school grades. Unpublished research report, American College Testing Program, 1963.

Eells, K. How will the ACT tests serve Illinois needs?--A research report. Committee on Freshman Testing, Illinois Joint Council on Higher Education, 1962.

Frederiksen, N., & Gilbert, A. C. F. Replication of a study of differential predictability. Educational and Psychological Measurement, 1960, 20, 759-767.

Frederiksen, N., & Melville, S. D. Differential predictability in the use of test scores. Educational and Psychological Measurement, 1954, 14, 647-656.

Ghiselli, E. E. Moderating effects and differential reliability and validity. Journal of Applied Psychology, 1963, 47, 81-86.

Gough, H. G., Hall, R. E., & Harris, W. B. Admissions procedures as forecasters of performance in medical education. Journal of Medical Education, 1963, 38, 983-998.

Holland, J. L., & Astin, A. W. The prediction of the academic, artistic, scientific, and social achievement of undergraduates of superior scholastic aptitude. Journal of Educational Psychology, 1962, 53, 132-143.

Holland, J. L., & Nichols, R. C. Prediction of academic and extracurricular achievement in college. Journal of Educational Psychology, 1964, 55, 55-65.

Holland, J. L., & Richards, J. M., Jr. Academic and nonacademic achievement: correlated or uncorrelated? Journal of Educational Psychology, 1965, 56, 165-174.

Hoyt, D. P. The relationship between college grades and adult achievement: a review of the literature. Iowa City, Iowa: American College Testing Program, 1965.

MacKinnon, D. W. What do we mean by talent and how do we test for it? In, The search for talent. New York: College Entrance Examination Board, 1960. Pp. 20-29.

Munday, L. Comparative predictive validities of the American College Tests and two other scholastic aptitude tests. Iowa City, Iowa: American College Testing Program, 1965.

Nichols, R. C., & Holland, J. L. Prediction of the first year college performance of high aptitude students. Psychological Monographs, 1963, 77 (7, Whole No. 570).

Price, P. B., Taylor, C. W., Richards, J. M., Jr., & Jacobsen, T. L. Measurement of physician performance. Journal of Medical Education, 1964, 39, 203-211.

Richards, J. M., Jr. Holland, J. L., & Lutz, Sandra W. The assessment of student accomplishment in college. Iowa City, Iowa: American College Testing Program, 1966.

Richards, J. M., Jr., Taylor, C. W., & Price, P. B. The prediction of medical intern performance. Journal of Applied Psychology, 1962, 46, 142-146.

Saunders, D. S. Moderator variables in prediction. Educational and Psychological Measurement, 1956, 16, 209-222.

Taylor, C. W., Smith, W. R., & Ghiselin, B. The creative and other contributions of one sample of research scientists. In C. W. Taylor and F. Barron (Eds.), Scientific creativity: Its recognition and development. New York: Wiley, 1963. Pp. 53-76.

Taylor, D. W. Variables related to creativity and productivity among men in two research laboratories. In C. W. Taylor and F. Barron (Eds.), Scientific creativity: Its recognition and development. New York: Wiley, 1963. Pp. 228-250.

Thorndike, R. L., & Hagen, Elizabeth. 10,000 careers. New York: Wiley, 1959.

APPENDIX

Table A

Fields Included in Groups of Intended Majors

Social, Religious, & Educational
Counseling & Guidance
Educational Administration
Elementary Education
Home Economics
Special Education
Physical Education
Psychology
Secondary Education
Social Work
Sociology
Theology & Religion
Social Science
Area Studies, American Civilization, American Studies
Library & Archival Science

Administrative, Political & Persuasive Fields
Advertising
Business Administration
Law
Public Administration
Industrial Relations
Merchandising & Sales
Military
Political Science & Government
International Relations, History, Foreign Services, Government
Public Relations

Business & Finance
Accounting
Business & Commerce
Economics
Secretarial Science
Finance

Scientific Fields
Anatomy
Anthropology
Archaeology
Astronomy
Biology
Botany
Chemistry
Entomology
Geography
Geology
Genetics
Mathematics & Statistics
Meteorology
Oceanography
Physics
Physiology
Zoology

Engineering, Agriculture, & Technology
Agriculture
Engineering
Fish & Game Management
Forestry
Industrial Arts
Skilled Trades
Soil Conservation Work

Medical Fields
Dental Hygiene
Dentistry
Dietetics
Medicine
Medical Technology
Mortuary Science
Optometry
Osteopathy
Pharmacy
Veterinary Medicine
X-Ray Technology
Nursing
Occupational Therapy
Physical Therapy

Arts & Humanities
Art & Sculpture
Architecture
Creative Writing
Drama & Theater
English & English Literature
Foreign Language & Literature
Journalism
Radio--TV--Communications
Music
Philosophy
Speech
Other Arts & Humanities

Other
Field not included in list above

Table B

Leadership Achievement and Its Academic Correlates for Students Classified by Intended Major Field

Variable	Gp.1	Gp.2	Gp.3	Gp.4	Gp.5	Gp.6	Gp.7	Gp.8	Gp.9	T
					Men					
Number in Group	1227	1428	757	952	2121	782	690	181	1827	9980
ACT English	07	09	06	12	13	15	03	13	09	10
ACT Math	06	11	04	07	09	12	03	15	09	08
ACT Social Studies	07	12	08	07	07	12	04	15	09	09
ACT Natural Science	05	12	05	04	05	08	02	-01	09	07
HS English	16	20	16	18	19	14	21	26	18	19
HS Math	08	12	14	06	14	13	12	14	13	11
HS Social Studies	17	21	17	16	16	16	22	19	19	19
HS Natural Science	14	13	18	13	15	14	13	10	16	14
Mean	2.39	2.54	1.86	2.17	2.13	2.57	2.37	1.53	1.92	2.21
Standard Deviation	1.94	2.04	1.69	1.91	1.88	1.92	1.96	1.77	1.85	1.92
					Women					
Number in Group	3232	404	704	387	18	1148	1054	145	1144	8247
ACT English	04	15	07	-04	-30	02	00	-01	06	05
ACT Math	08	11	06	-05	-24	04	00	04	11	07
ACT Social Studies	03	19	06	-08	-48	01	-01	-04	05	04
ACT Natural Science	04	14	05	-06	-37	02	02	-12	07	05
HS English	13	23	16	18	-21	12	17	08	23	16
HS Math	11	11	12	11	-07	08	12	05	12	11
HS Social Studies	13	23	14	11	00	12	16	12	16	15
HS Natural Science	13	22	17	18	-47	13	16	08	14	15
Mean	2.38	2.64	2.18	2.62	3.00	2.34	2.64	2.23	2.24	2.40
Standard Deviation	1.84	1.84	1.80	1.74	2.10	1.82	1.86	1.64	1.83	1.83

Gp. 1 = Social, Religious, & Educational
Gp. 2 = Administrative, Political, Persuasive
Gp. 3 = Business & Finance
Gp. 4 = Scientific Fields
Gp. 5 = Engineering, Ag., & Technology
Gp. 6 = Medical Fields
Gp. 7 = Arts & Humanities
Gp. 8 = Other Fields
Gp. 9 = Undecided
T = Total

Note.--In Tables B-G, students with high Infrequency scores are excluded, and students who gave no response about major field plans are omitted from specific field breakdown but are included in total group. Decimal points are omitted for correlations.

Table C

Musical Achievement and Its Academic Correlates for Students Classified by Intended Major Field

Variable	Gp.1	Gp.2	Gp.3	Gp.4	Gp.5	Gp.6	Gp.7	Gp.8	Gp.9	T
					Men					
Number in Group	1227	1428	757	952	2121	782	690	181	1827	9980
ACT English	13	05	03	13	08	08	04	00	12	10
ACT Math	04	-02	07	-02	02	02	-05	00	06	02
ACT Social Studies	06	-03	-01	03	04	04	-06	00	06	03
ACT Natural Science	09	-01	05	03	03	05	00	-01	08	05
HS English	03	06	06	00	03	03	02	12	06	05
HS Math	03	01	01	-01	-02	02	04	-04	05	02
HS Social Studies	-03	-03	-02	-04	-01	-01	-08	11	02	-01
HS Natural Science	-01	00	00	01	01	01	02	09	07	02
Mean	1.23	1.19	1.00	1.42	1.21	1.67	2.22	1.01	1.07	1.29
Standard Deviation	1.77	1.72	1.62	1.81	1.71	1.97	2.45	1.70	1.64	1.82
					Women					
Number in Group	3232	404	704	387	18	1148	1054	145	1144	8247
ACT English	05	03	07	-05	27	06	-02	04	07	05
ACT Math	06	01	08	-07	13	02	-05	13	14	04
ACT Social Studies	00	01	02	-06	11	04	-13	-03	05	00
ACT Natural Science	02	02	02	01	21	02	-10	14	08	02
HS English	03	11	12	-04	29	08	-01	14	11	06
HS Math	04	03	-01	-13	44	00	00	10	10	02
HS Social Studies	03	07	-02	-08	66	06	01	16	07	03
HS Natural Science	05	02	00	-09	43	01	-02	06	08	02
Mean	1.82	1.75	1.75	1.66	2.15	1.90	2.36	1.83	1.70	1.87
Standard Deviation	1.85	1.83	1.83	1.74	1.51	1.86	2.14	1.98	1.80	1.89

Gp. 1 = Social, Religious, & Educational
Gp. 2 = Administrative, Political, Persuasive
Gp. 3 = Business & Finance
Gp. 4 = Scientific Fields
Gp. 5 = Engineering, Ag., & Technology
Gp. 6 = Medical Fields
Gp. 7 = Arts & Humanities
Gp. 8 = Other Fields
Gp. 9 = Undecided
T = Total

Note.--In Tables B-G, students with high Infrequency scores are excluded, and students who gave no response about major field plans are omitted from specific field breakdown but are included in total group. Decimal points are omitted for correlations.

Table D

Drama and Speech Achievement and Its Academic Correlates for Students Classified by Intended Major Field

Variable	Gp. 1	Gp.2	Gp.3	Gp.4	Gp.5	Gp.6	Gp.7	Gp.8	Gp.9	T
					Men					
Number in Group	1227	1428	757	952	2121	782	690	191	1827	9980
ACT English	05	07	-04	05	08	05	13	-04	00	05
ACT Math	-05	01	-03	-05	00	-02	04	00	-02	-03
ACT Social Studies	07	07	-02	00	04	06	12	05	00	05
ACT Natural Science	04	07	00	-01	03	05	11	00	03	04
HS English	10	16	12	09	13	08	13	06	06	11
HS Math	04	04	06	-02	07	05	01	00	06	03
HS Social Studies	11	14	05	04	09	06	11	-02	04	08
HS Natural Science	08	08	10	05	10	05	07	-09	02	05
Mean	1.23	1.21	.81	1.04	.89	1.09	1.55	.85	.91	1.05
Standard Deviation	1.53	1.54	1.23	1.33	1.29	1.40	1.83	1.29	1.32	1.43
					Women					
Number in Group	3232	404	704	387	18	1148	1054	145	1144	8247
ACT English	02	04	04	-10	40	04	-05	01	02	03
ACT Math	01	06	-01	-02	-08	-06	-11	01	04	-01
ACT Social Studies	02	00	-01	-03	06	01	-05	-16	06	02
ACT Natural Science	02	10	04	-06	24	-01	01	-18	06	03
HS English	08	23	10	11	44	04	04	05	17	10
HS Math	06	14	02	08	25	-01	-06	02	08	04
HS Social Studies	06	12	06	11	79	06	-02	-11	11	06
HS Natural Science	06	05	10	01	28	05	01	-02	13	06
Mean	1.39	1.44	1.21	1.34	1.31	1.40	2.01	1.31	1.33	1.45
Standard Deviation	1.51	1.54	1.40	1.56	.91	1.52	1.81	1.34	1.51	1.56

Gp. 1 = Social, Religious, & Educational
Gp. 2 = Administrative, Political, Persuasive
Gp. 3 = Business & Finance
Gp. 4 = Scientific Fields
Gp. 5 = Engineering, Ag., & Technology
Gp. 6 = Medical Fields
Gp. 7 = Arts & Humanities
Gp. 8 = Other Fields
Gp. 9 = Undecided
T = Total

Note.--In Tables B-G, students with high Infrequency scores are excluded, and students who gave no response about major field plans are omitted from specific field breakdown but are included in total group. Decimal points are omitted for correlations.

Table E

Artistic Achievement and Its Academic Correlates for Students Classified by Intended Major Field

Variable	Gp.1	Gp.2	Gp.3	Gp.4	Gp.5	Gp.6	Gp.7	Gp.8	Gp.9	T
					Men					
Number in Group	1227	1428	757	952	2121	782	690	191	1827	9980
ACT English	-03	-10	-10	-06	-07	-03	-15	09	00	-05
ACT Math	-06	-11	-05	-16	-10	-09	-16	17	-02	-08
ACT Social Studies	-02	-06	-06	-07	-08	05	-07	03	04	-03
ACT Natural Science	02	-04	-02	-06	-09	06	-07	03	04	-02
HS English	-04	-06	05	-12	-04	-02	00	09	-02	-03
HS Math	-04	-06	00	-21	-04	03	01	06	-03	-05
HS Social Studies	-03	-07	-03	-14	-09	03	-01	-01	-04	-05
HS Natural Science	-06	-06	02	-08	-03	01	03	09	03	-02
Mean	.42	.44	.29	.44	.46	.54	1.31	.70	.45	.50
Standard Deviation	.95	1.04	.78	1.03	1.02	1.19	1.98	1.52	1.02	1.14
					Women					
Number in Group	3232	404	704	387	18	1148	1054	145	1144	8247
ACT English	-02	05	-02	-10	-73	01	-06	-06	-01	00
ACT Math	-01	05	-06	-14	-19	-01	-01	-12	-02	-01
ACT Social Studies	00	08	01	01	-84	04	-05	06	02	03
ACT Natural Science	03	16	04	05	-66	01	02	-18	03	04
HS English	-03	01	-05	-07	-27	01	-08	-09	-06	-02
HS Math	-02	01	-04	-11	10	01	-08	-19	-08	-04
HS Social Studies	00	-06	-07	-10	04	-01	-12	-06	-09	-04
HS Natural Science	-01	-02	-07	-13	-31	05	-07	-03	-05	-02
Mean	.52	.49	.46	.59	1.15	.62	1.22	.98	.59	.64
Standard Deviation	1.00	1.99	.98	1.12	1.92	1.19	1.41	1.49	1.09	1.20

Gp. 1 = Social, Religious, & Educational
Gp. 2 = Administrative, Political, Persuasive
Gp. 3 = Business & Finance
Gp. 4 = Scientific Fields
Gp. 5 = Engineering, Ag., & Technology
Gp. 6 = Medical Fields
Gp. 7 = Arts & Humanities
Gp. 8 = Other Fields
Gp. 9 = Undecided
G = Total

Note.--In Tables B=G, students with high Infrequency scores are excluded, and students who gave no response about major field plans are omitted from specific field breakdown but are included in total group. Decimal points are omitted for correlations.

Table F

Writing Achievement and Its Academic Correlates
for Students Classified by Intended Major Field

Variable	Gp.1	Gp.2	Gp.3	Gp.4	Gp.5	Gp.6	Gp.7	Gp.8	Gp.9	T
					Men					
Number in Group	1227	1428	757	952	2121	782	690	191	1827	9980
ACT English	22	14	11	23	19	17	37	28	19	20
ACT Math	08	10	03	15	10	11	12	28	13	09
ACT Social Studies	17	14	10	16	14	20	32	35	18	18
ACT Natural Science	12	12	09	13	11	14	16	11	16	13
HS English	20	19	14	16	20	18	35	26	16	20
HS Math	11	01	04	07	12	15	03	14	09	07
HS Social Studies	13	18	09	13	14	16	29	17	10	15
HS Natural Science	11	09	10	06	11	16	10	26	09	09
Mean	.79	.75	.50	.75	.53	.81	1.12	.53	.56	.68
Standard Deviation	1.17	1.19	.86	1.13	.97	1.18	1.44	.95	.99	1.11
					Women					
Number in Group	3232	404	704	387	18	1148	1054	145	1144	8247
ACT English	19	17	18	19	62	14	14	10	19	19
ACT Math	14	13	10	08	31	06	07	00	14	12
ACT Social Studies	20	17	15	15	30	15	14	04	20	19
ACT Natural Science	16	20	17	13	53	09	13	-04	20	16
HS English	22	11	18	17	49	16	21	-05	23	21
HS Math	13	-01	04	06	27	08	12	00	04	09
HS Social Studies	18	14	11	09	43	14	16	-05	13	15
HS Natural Science	14	04	11	12	50	12	17	03	14	14
Mean	1.06	.99	.83	1.18	1.50	1.02	1.62	.99	1.02	1.10
Standard Deviation	1.23	1.08	1.18	1.26	1.55	1.27	1.56	1.10	1.29	1.30

Gp. 1 = Social, Religious, & Educational
Gp. 2 = Administrative, Political, Persuasive
Gp. 3 = Business & Finance
Gp. 4 = Scientific Fields
Gp. 5 = Engineering, Ag., & Technology
Gp. 6 = Medical Fields
Gp. 7 = Arts & Humanities
Gp. 8 = Other Fields
Gp. 9 = Undecided
T = Total

Note.--In Tables B-G, students with high Infrequency scores are excluded, and students who gave no response about major field plans are omitted from specific field breakdown but are included in total group. Decimal points are omitted for correlations.

Table G

Scientific Achievement and Its Academic Correlates for Students Classified by Intended Major Field

Variable	Gp.1	Gp.2	Gp.3	Gp.4	Gp.5	Gp.6	Gp.7	Gp.8	Gp.9	T
					Men					
Number in Group	1227	1428	757	952	2121	782	690	191	1827	9980
ACT English	02	08	-01	13	15	09	00	05	05	12
ACT Math	01	09	07	08	15	08	11	07	08	15
ACT Social Studies	02	07	05	12	17	09	05	13	07	13
ACT Natural Science	09	14	07	17	18	19	11	18	15	20
HS English	00	12	-02	13	10	10	06	-06	06	11
HS Math	02	08	03	03	16	16	07	01	07	14
HS Social Studies	07	05	06	10	14	13	08	-04	07	12
HS Natural Science	04	09	12	13	15	12	11	-03	10	16
Mean	.74	.85	.62	1.76	1.23	1.56	.89	.60	.72	1.02
Standard Deviation	1.29	1.33	1.08	1.89	1.56	1.74	1.29	1.08	1.23	1.48
					Women					
Number in Group	3232	404	704	387	18	1148	1054	145	1144	8247
ACT English	02	07	-02	-04	19	06	-05	12	08	04
ACT Math	07	16	01	00	-15	09	05	20	15	11
ACT Social Studies	-02	10	03	00	-08	08	-02	09	10	04
ACT Natural Science	03	15	05	10	09	10	06	11	12	09
HS English	00	04	05	04	48	11	-01	02	17	06
HS Math	08	02	08	-02	01	07	10	24	11	10
HS Social Studies	03	07	06	01	50	16	06	09	12	08
HS Natural Science	08	05	04	02	02	12	09	08	09	10
Mean	.51	.41	.37	1.04	2.18	.70	.51	.63	.49	.55
Standard Deviation	1.04	.90	.88	1.46	1.85	1.20	1.11	1.28	1.00	1.09

Gp. 1 = Social, Religious, & Educational
Gp. 2 = Administrative, Political, Persuasive
Gp. 3 = Business & Finance
Gp. 4 = Scientific Fields
Gp. 5 = Engineering, Ag., & Technology
Gp. 6 = Medical Fields
Gp. 7 = Arts & Humanities
Gp. 8 = Other Fields
Gp. 9 = Undecided
T = Total

Note.--In Tables B-G, students with high Infrequency scores are excluded, and students who gave no response about major field plans are omitted from specific field breakdown but are included in total group. Decimal points are omitted for correlations.

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