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PREDICTORS OF SUCCESS AND STATUS OF COLLEGE STUDENTS

ABSTRACT: The purpose of this study was to assess the ability of entrance tests as well as selected background variables to predict grade-point average among first-term full-time freshmen enrolled in an Alberta college. The entrance tests included a global measure of mental ability, a measure of reading comprehension, and two scales which purport to measure achievement motivation. Background variables included age, sex, and last completed grade of each student. None of the entrance tests were able to differentiate between dropouts and non-dropouts. The mental ability test was a significant predictor within certain academic programs.

The prediction of academic achievement through the use of intellectual and non-intellectual indices has unique implications within the context of the community college, in that the community college has essentially an "open door" policy regarding enrolment and also has the responsibility of responding to "the changing requirements of industry, the community and students (Campbell, 1971, p. 8)." This emphasis on sensitivity to the demands of the community and on the acceptance of individuals who vary widely in past educational background, academic ability, and academic and vocational interests, suggests that the purpose of such prediction procedures would be to aid in counselling the student regarding appropriate programs and in the establishment of programs and of changes within programs which meet the needs of the students.

Past research (Black, 1966; Conklin & Ogston, 1968; Lunneborg & Lunneborg, 1967) has found that secondary-school grade-point average (GPA) received upon graduation is quite consistently the most significant single predictor of academic achievement. However, this variable is not available for prediction purposes within the community college as many students lack complete secondary-school standing. Therefore, other possible predictor variables must be evaluated in an attempt to establish a means of predicting academic outcome. Intellectual predictors other than past academic achievement that have been frequently used include mental ability or aptitude tests and achievement tests (Black, 1966; Lavin, 1965; Lunneborg & Lunneborg, 1969).

Non-intellectual variables have been increasingly studied as predictors of academic achievement in recent years, due mainly to the finding that ability measures only account for approximately one-half of the variation in academic performance (Lavin, 1965). Achievement motivation (or need for achievement) is one of the personality constructs with which past prediction research has been concerned. Although some significant relationship has been established between achievement motivation and academic success (Holmes & Tyler, 1968; Reiter, 1964; Weiss, Wertheimer, & Grosbeck, 1959) it would appear that there is considerable work to be done if these measures are to be of consistent usefulness in predicting academic achievement (Shaw, 1961).

Two background variables used in prediction research are those of age and sex. Conflicting evidence emerges from research literature regarding these variables as predictors (Baird, 1969a; Lunneborg & Lunneborg, 1967, 1969; Russo, 1969). It has been suggested that sex may play a role as a moderator variable within prediction research (Baird, 1969b; Vick & Hornaday, 1962).

Another topic which has provoked considerable research and opinion within the post-secondary educational setting is that of student withdrawal or dropout. Research within this area has been concentrated on an identification of characteristics of dropouts versus nondropouts, as well as on evaluating the extent of the dropout problem (Marsh, 1966; Pervin, Reik, & Dalrymple, 1966; Summerskill, 1962). However, few studies have dealt with the prediction of dropout. Vorreyer (1963) and Sainty (1968) found that potential dropouts could be identified. Should a statistically significant relationship be established between predictor measures and student dropout, preventive measures might then be taken prior to the development of serious difficulties within a program on the part of the potential dropout.

In 1966, Mount Royal College, Calgary, adopted the community college policy with regard to educational services. An entrance testing program for freshman students was established as one aspect in making this policy operational. The entrance tests were instituted for several reasons, three of them being:

To provide students with some data on their individual strengths and weaknesses and resources available to help them optimize their strengths and minimize their weaknesses. . . . To encourage departments, as a result of the entrance data, to seek a more de-

tailed testing program for their students in areas such as student characteristics, approaches to learning, etc. . . . To encourage students, as a result of their entrance data, to take advantage of the Learning Skills program and/or the Counselling Services in general (Mount Royal College Counselling Steering Committee, 1973, p. 15).

It would strongly appear that the above objectives are based on the assumption that the entrance tests are predictive of academic outcome. Such a predictive relationship would be necessary for any validity to exist in the claims made for the use of these tests. Prior to the present study, the ability of the entrance tests used by Mount Royal College to predict academic outcome had not been established, however.

The purpose of this study was to assess the ability of the entrance tests used by Mount Royal College to predict first-term freshman GPA and also first-term freshman status of dropout versus nondropout. The entrance tests included a measure of mental ability, a measure of reading comprehension, and two measures of achievement motivation. The predictive ability of the variables "last completed grade of the student," age, and sex of student were also assessed in the present study. The contribution of the variables of sex and academic program as moderation variables was also considered.

METHOD

Sample

A total of 1,075 full-time students enrolled in Mount Royal College were included in the sample. Of these 989 were nondropouts and 86 were dropouts. This sample was used in the analysis of the dropouts vs non-dropouts. Within the regression analysis, all those who had received complete failure grades were excluded from the sample since their inclusion would violate considerably the statistical assumption of a normal distribution with regard to the variable of GPA. This provided a sample of 882 of whom 382 were male and 500 were female.

Instruments

The test battery given to all full-time freshman students at Mount Royal College on a compulsory basis included:

1. The Wonderlic Personnel Test (Wonderlic, 1970). This test provides a global measure of mental ability.
2. The Van Wagenen Rate of Comprehension Scale (Van Wagenen, 1953). This is a measure of reading comprehension and requires four minutes to administer.
3. The Costello-Comrey Need Achievement Scales (Costello, 1967). This scale purports to measure achievement motivation or need for achievement. Part I of this scale is made up of 10 items which supposedly measure "disposition to do well when performing a task," while Scale II is made up of 14 items which imply "a need to be a success" through the emulation of the success of others (Costello, 1967, p. 234).

Analysis

To test for significance of effects as they pertain to the prediction of dropout versus nondropout, the statistical technique of discriminant analysis was used. In order to test for significance of effects between the predictor variables and the criterion variable of GPA, multiple regression analysis was used. Both techniques were based on the multivariate analysis of variance model as described by Bock (1965) and Bock and Haggard (1968). The level of confidence established for all analyses was $p < .01$.

Within discriminant analysis and multiple regression the independent variables are ordered in terms of their perceived relevance to the problem. In this study the order of the predictor variables was as follows: (1) Wonderlic, (2) Van Wagenen, (3) Costello-Comrey Scale I, (4) Costello-Comrey Scale II, (5) last completed grade, (6) age, (7) sex.

RESULTS

The results of the discriminant analysis in testing for significance of effects between the predictor variables and the dropout-nondropout criterion are presented in Table 1. The overall F ratio for this analysis

TABLE 1
DISCRIMINANT ANALYSIS RESULTS FOR DROPOUTS VERSUS NONDROPOUTS

Covariate	Observed Cell Mean	Stepdown F
Wonderlic.....	26.663 ^a 27.631 ^b	2.484
Van Wagenen.....	213.965 ^a 219.073 ^b	.020
Scale I.....	7.163 ^a 7.471 ^b	1.621
Scale II.....	7.081 ^a 6.937 ^b	.071
Last Completed Grade.....	3.558 ^a 3.699 ^b	2.625
Age.....	1.593 ^a 1.408 ^b	5.657
Sex.....	.047 ^a .543 ^b	6.043

^aDropouts

^bNon-dropouts

was 2.659 ($p < .010$). While the overall effect was found to be $p < .01$ (the pre-established level of confidence), the relationships between the individual predictor variables and the criterion were not significant. As a result, it was assumed that further breakdown of the sample would not provide any significant findings.

The results of the regression analysis in testing the significance of the relationship between the predictor variables and the GPA criterion for the overall nondropout sample are presented in Table 2. The resulting multiple R was .3777 ($p < .001$). However, only 13 percent of the variance in GPA was accounted for by the predictors as a group. As the Costello-Comrey Scale II measure indicated a negligible contribution in this analysis ($p < .816$), it was eliminated from subsequent analyses.

TABLE 2
REGRESSION ANALYSIS RESULTS FOR OVERALL SAMPLE

Covariate	Stepdown F
Wonderlic.....	7.734*
Van Wagenen.....	23.029*
Scale I.....	20.692*
Scale II.....	.054
Last Completed Grade.....	14.060*
Age.....	17.171*
Sex.....	45.741*

* $p < .01$

The results of the regression analyses in testing for significant effects between the prediction variables and the criterion of GPA within each of the selected program groups are presented in Table 3. As the students within the Nursing, Aviation, and Early Childhood Education groups were all of one sex, the sex variable as a predictor was eliminated for these groups. The results indicate that the predictor-criterion relationships were generally not significant. Of the 13 program groups assessed, significant effects were found in the University Transfer program, the Business Administration program, the General Arts and Science program, and the Nursing program. Of these groups, the highest amount of variance in GPA accounted for by the predictors as a group occurred in the Nursing program (37 percent). It should be noted, however, that a higher amount of variance was accounted for by the predictors as a group within the Business Administration program (45 percent) than within the Nursing program. However, the small sample assessed within the Business Administration

TABLE 3
REGRESSION ANALYSIS RESULTS FOR INDIVIDUAL PROGRAMS

Programs	Covariates (Stepdown <i>F</i>)						Age	Sex
	Multiple R	Wonderlic	Van Wagenen	Scale I	Last Completed Grade			
University Transfer (N = 225)	.349°	2.067	5.591	6.813*	3.373	1.428	9.797*	
Business Administration (N = 26)	.674	11.852*	.807	.305	1.487	.504	1.234	
Applied Social Sciences (N = 44)	.414	.346	2.254	2.265	.033	2.730	.021	
Interior Design (N = 57)	.407	4.690	.783	.286	2.125	.081	1.935	
Journalism (N = 26)	.607	.269	.957	3.874	.936	2.552	1.635	
Broadcasting (N = 36)	.602	2.944	4.060	4.671	2.718	.166	.737	
Leisure Education (N = 48)	.461	1.347	2.914	.676	2.613	.797	2.280	
General Arts and Science (N = 96)	.418*	3.510	4.851	.572	.455	677	7.960*	
Police Science (N = 31)	.438	.235	.602	.119	1.248	1.630	1.727	
Therapeutic Recreation (N = 27)	.550	3.146	.168	1.390	3.170	.729	.161	
Nursing (N = 39)	.609*	11.656*	.503	2.624	.803	2.751		
Aviation (N = 32)	.197	.165	.220	.193	.050	.464		
Early Childhood Education (N = 25)	.393	.609	1.100	.220	.125	1.513		

**p* < .01

program negated the opportunity of establishing whether this larger effect occurred on other than a chance basis. The highest amount of variance accounted for by a single predictor occurred in the Business Administration program (Wonderlic: *r* = .33, *p* < .002).

The results of the analyses to test for significance of effects between the predictors and the GPA criterion within the sex groups are pre-

TABLE 4
REGRESSION ANALYSIS RESULTS FOR SEX GROUPS

Covariate	Males (N = 382)	Females (N = 500)
	Stepdown <i>F</i>	
Wonderlic	5.627	12.929*
Van Wagenen	7.171*	2.090
Scale I	2.027	13.871*
Last Completed Grade	11.002*	4.614
Age	16.637*	.276

**p* < .01

sented in Table 4. The multiple R for the male group was .324 ($p < .0001$), with 10.4 percent of the variance in GPA being accounted for. The analysis for the female group yielded a multiple R value of .280 ($p < .0001$), with 7.81 percent of the variance in GPA being accounted for. Of the individual predictor variables, the age variable accounted for the greatest amount of variance in the male group (3.96 percent), while the Scale I measure accounted for the greatest amount of variance within the female group (2.64 percent).

DISCUSSION

With the exception of the overall F ratio, the results of the analyses attempting to discriminate dropouts from nondropouts were not significant. It could thus be concluded that the predictor measures used in the present study would not allow one to predict those students who would encounter difficulties in their programs.

The analysis to predict GPA of the overall nondropout sample was significant at the pre-established level of confidence. However, as only 13 percent of the variance in GPA was accounted for, there would appear to be considerable doubt as to the usefulness of such a predictor-criterion relationship to the estimation of academic achievement of future students.

The amount of variance accounted for by the predictors within academic program groups would not appear to be sufficiently high to be considered of use for predictive purposes. It should be noted, however, that variability among programs with regard to the level of significance of various predictor-criterion relationships was found. Such intergroup differences were also found for the male and female groups, thus indicating that further research might incorporate both program and sex variables as moderator variables.

Of the predictor variables, the results suggest that only the Wonderlic might be worth retaining in further attempts to establish predictors of academic achievement of Mount Royal College students. Moreover, it would appear that even the Wonderlic should be retained only for those programs in which it accounted for a substantial amount of variance in the criterion.

It is also recognized that the criterion of GPA may have contributed to the lack of significant results. Should such be the case, more consistent and objective measures of achievement might be established prior to further research within this area at Mount Royal College. Such measures should be consistent with the philosophy of the institution — a philosophy which encompasses a larger number of elements than are found within the traditional academic concept of GPA. These criteria should also be clearly specified. By clearly specifying the criteria within the programs, a set of predictors which more closely measure the intellectual and nonintellectual requirements of the programs might be established.

With regard to the construct of achievement motivation, it would appear that a more relevant measure than the Costello-Comrey scales might emphasize work habits, interests, and commitment of the individual regarding his academic undertaking (Tyler, 1965).

Further research on the prediction of academic achievement and of student status would appear to be worthwhile. However, the results of the present study would suggest that prediction of student status and of GPA using the present entrance-test battery at Mount Royal College would involve the risk of misinformation to both staff and students.

RESUME: Le but de cette étude était d'évaluer la capacité des tests d'admission et de certaines variables antécédentes à prédire les résultats académiques d'étudiants inscrits à temps complet dans leur première année d'un collège de l'Alberta. Les tests d'admission comportaient une mesure d'habileté mentale générale, une mesure de compréhension de textes écrits et deux échelles qui avaient pour but de mesurer la motivation à la réussite. Les variables antécédentes incluaient l'âge, le sexe et le dernier niveau d'études complété par chaque étudiant. Aucun des tests d'admission n'a pu différencier ceux qui sont restés de ceux qui ont abandonné. Le test d'habileté s'est avéré un prédicteur significatif dans le cas de certains programmes d'études.

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