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ABSTRACT

The study investigated (1) the prediction of attrition/persistence for disadvantaged and regular freshmen at the University of Nebraska at Omaha, and (2) the effectiveness, in terms of attrition/persistence, of an experimental program for disadvantaged students. Descriptive, variance, and correlational (single and multiple) analyses and chi square analyses related several factors (e.g., race; sex; financial aid; employment; general achievement/aptitude, ACT Composite scores; cumulative grade point average, GPA) with attrition/persistence. Separate regression equations for various groups and subgroups resulted in greater precision. Singly or multiply, GPA was the primary, significant predictor of attrition/persistence, making other predictors appear unnecessary. For the population and for nonexperimental freshmen, attrition/persistence was significantly delineated by GPA, ACT scores, and financial aid. For experimental and/or control freshmen, attrition/persistence was significantly delineated by GPA only. In terms of attrition/persistence, there were significant differences between experimental subjects and nonexperimental subjects or nonexperimental financial aid nonrecipients, but no significant differences between experimental subjects and control subjects or nonexperimental financial aid recipients. (Auth./RC)

Predicting Attrition/Persistence of College Freshmen: Disadvantaged and Regular

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Abstract

Investigated (a) the prediction of attrition/persistence for disadvantaged and regular freshmen at the University of Nebraska at Omaha, and (b) the effectiveness, in terms of attrition/persistence, of an experimental program for disadvantaged students. Descriptive, variance, and correlational (single and multiple) analyses (maximum n = 150) and chi square analyses (maximum n = 1,214) related several factors (e.g., race; sex; financial aid; employment; general achievement/aptitude, ACT Composite scores; cumulative grade point average, GPA) with attrition/persistence. Separate regression equations for various groups and subgroups result in greater precision. Singly or multiply, GPA is the primary, significant predictor of attrition/persistence, making other predictors appear unnecessary. For the population and for nonexperimental freshmen, attrition/persistence is significantly delineated by GPA, ACT scores, and financial aid. For experimental and/or control freshmen, attrition/persistence is significantly delineated by GPA only. In terms of attrition/persistence, there are significant differences between experimental subjects and nonexperimental subjects or nonexperimental financial aid nonrecipients, but no significant differences between experimental subjects and control subjects or nonexperimental financial aid recipients.

Predicting Attrition/Persistence of College Freshmen: Disadvantaged and Regular

Colleges and universities have relatively high attrition rates during the freshman year. This is true especially if the colleges and universities are large, non-live-in, and municipal. High attrition rates are costly to students and to institutions, in terms of money and time and effort. Attrition rates also indicate, in part, the extent to which these institutions are not meeting student needs.

There are many factors implicated in the prediction of attrition/persistence, for example, grades, achievement/aptitude, race, sex, marriage, social class, financial aid, employment (Pedrini & Pedrini, 1970, 1972, 1973a, 1973b, 1974). Attempts to offset waste of human energy and resources have been forthcoming with the development of special programs. This is of great importance to administrators, of greater importance to teachers, and of greatest importance to students. The latter (and their families) can profit most or least, and not just in terms of [illegible] education or training, but in terms of the credential (McClelland, [illegible]).

An experimental program at the University of Nebraska at Omaha (UNO), designed for disadvantaged students, differed significantly from most other special programs because it primarily assumed the competence of students admitted and secondarily, only, considered remediation. Provided were free tuition, some special humanities and social studies courses, and extensive counseling. The program, limited in the number of students it could accommodate, had to be selective. The screening procedure, which included reviewing standardized test scores, was intended to select persons with the

greatest potential.

This investigation evaluated (a) grades, ACT Composite scores, and other factors in the prediction of attrition/persistence for disadvantaged and regular freshmen, and (b) the experimental program for disadvantaged students in terms of attrition/persistence.

Method

Subjects

The population for this investigation included full-time, fall, beginning UNO freshmen of the 1972-73 academic year who had taken the ACT (n = 1,214). Delineated were two research samples, experimental and control, selected from the population. The experimental group consisted entirely of disadvantaged students enrolled in the UNO experimental program. There were 76 such students identified in the population. However, one student was excluded because his registration data were not available. Thus, 75 experimental subjects were categorized for race and sex yielding 16 Black men, 19 Black women, 18 White men, and 22 White women. The control group, equated in number for race and sex with the experimental group, was a random sample of regular students drawn from the stratified population. Thus, the total for experimental and control students was 150.

However, the experimental and control groups were not representative of the UNO ACT freshman population. The experimental and control groups were 47% Black and 53% White, 45% men and 55% women. Comparable figures for the UNO ACT freshman population (including the experimental and control students) were 11% Black and 89% White, 57% men and 43% women. Interestingly, most subjects in the UNO ACT freshman population responded to the

denotation of sex on registration forms, but only about three fifths responded to the denotation of race.

Materials

The basic materials used in this investigation were the American College Test (ACT), the cumulative freshman grade point average (GPA, or grades), and the attrition/persistence score. Specifically, the ACT Composite standard score, the cumulative freshman GPA for the fall and spring semesters, and the attrition/persistence score for enrollment were considered for each student.

Attrition/persistence referred to dropouts and persisters. A dropout was not continuously enrolled for the fall and spring semesters of the academic year and/or did not re-enroll for the fall semester of the following year. A persister was continuously enrolled for the fall and spring semesters of the academic year and re-enrolled for the fall semester of the following year.

Procedure

Various subsets were considered for descriptive, variance, correlational, and chi square analyses. For the descriptive, variance, and correlational analyses, the subsets referred to subjects within and between the experimental and control groups (maximum $n = 150$). For chi square analyses, the subsets referred to the UNO ACT freshman population (maximum $n = 1,214$).

In addition to race (Black; White) and sex (men; women), subsets were identified by financial aid (recipients; nonrecipients), general achievement/aptitude (subjects with below average ACT Composite scores, i.e., standard scores more than one standard deviation below the mean, based on college

bound seniors, ACT Program, 1972, p. 2; subjects with average or above average ACT Composite scores, i.e., standard scores within or above one standard deviation, based on college bound seniors, ACT Program, 1972, p. 2), grades (subjects with below average cumulative GPAs, i.e., less than 2.00, on a 4.00 scale; subjects with average or above average cumulative GPAs, i.e., equal to or greater than 2.00, on a 4.00 scale), race and sex (Black men; Black women; White men; White women).

For variance and chi square analyses, subjects were additionally subgrouped by instruction of financial aid recipients (special; regular), control group financial aid (assistance received; assistance not received), programs (special instruction and financial aid received; regular instruction and no financial aid received).

For correlational analyses, the experimental group, only, was subgrouped by employment, hours per week (0; 1-10; 11-20; 21-30; 31+). Employment information was not available for control subjects.

Results and Discussion

In this investigation, control group subjects, equated in number with the experimental group, were randomly chosen from a population stratified for race and sex. This procedure was used to prevent selection biases and to insure comparability between the groups. Descriptive and variance analyses were computed to test if this procedure had been successful in fulfilling its purpose.

The analyses (data not shown) revealed that the experimental and control groups manifested similar ACT patterns. That is, Blacks had consistently significantly lower scores than Whites, and their scores were restricted

in range. Persons with below average grades had much lower ACT scores than persons with average or above average grades. There were no marked ACT differences between financial aid recipients and nonrecipients, between men and women, or between dropouts and persisters. Thus, experimental and control subjects were considered comparable in terms of ability to do college work. Consequently, any attrition/persistence differences occurring between the experimental and control groups could not be attributed to differences of scholastic potential.

Prediction of Attrition/Persistence

Single and multiple predictors. Firstly, various product moment correlations were computed (data not shown) to determine effective predictors of attrition/persistence for the experimental group, control group, and subsets within and between these groups. Attrition/persistence (A: drop out, persist), as the dependent variable, was correlated separately with each of the following independent variables: group (U: experimental, control), general achievement/aptitude (T: ACT Composite scores), race (R: Black, White), sex (S: men, women), financial aid (F: assistance received, assistance not received), grades (G: cumulative GPA), and employment, hours per week (E: 0, 1-10, 11-20, 21-30, 31+).

The restricted variability of ACT scores for Blacks lowered their T x A point biserial correlations. Although correction procedures for restricted range (Wells & Fruchter, 1970) are available, they do not apply to point biserials.

Seven students (two experimental, five control) did not receive grades. Therefore, the G correlations included 143 (rather than 150) students.

The correlational trends implied that attrition/persistence was very closely associated with grades--staying in college with higher grades, leaving college with lower grades. For men, only, attrition/persistence was somewhat associated with group--staying in college with being in the experimental group, leaving college with being in the control group. Variables T, R, S, F, and E produced no significant single correlations with A.

Secondly, stepwise multiple correlations were computed (data not shown) to determine the best predictors of attrition/persistence for the experimental group, control group, and subsets within and between these groups. Corrections for multiple correlations (resulting in cRs) and for standard errors (resulting in cSEs) were required because of the relatively large number of predictor variables employed with small samples (Guilford & Fruchter, 1973, pp. 366-367).

Confounded variables U (group: experimental, control) and F (financial aid: assistance received, assistance not received) were not considered in the same regression equations. Hours of employment (E) pertained to expermental subjects only. Thus, multiple predictors which considered experimental subjects, exclusively, included variable E.

The separate multiple correlations were not necessarily independent of each other. But in cumulating results, trends were important.

The prediction of attrition/persistence when grades were not a variable revealed that none of the corrected multiple correlations were significant. That is, attrition/persistence could not be significantly predicted for subjects when grades were not a consideration. Thus, the prediction of attrition/persistence for incoming freshmen, using the variables of group or

financial aid, general achievement/aptitude, race, sex, and employment could not be computed at a level better than chance.

The prediction of attrition/persistence when grades were a variable revealed that 33 of 47 corrected multiple correlations were significant. G was the first variable in each of the multiple correlations, significant or nonsignificant. In most of the 33 corrected multiple predictions there appeared to be no significant difference between grades as a single predictor and grades as part of a multiple predictor for attrition/persistence. For example, considering all subjects, the single correlation between G and A was .53 and accounted for approximately 28% of the attrition/persistence variance; the corrected multiple correlation for A was .53 and accounted for approximately 28% of the attrition/persistence variance. Grades were the prime predictors of attrition/persistence. And, generally, grades alone were adequate for the significant prediction of attrition/persistence.

Other trends for subjects were noted. In terms of attrition/persistence, experimental subjects, financial aid recipients, Blacks, men, and subjects with below average ACT scores were more predictable than control subjects, financial aid nonrecipients, Whites, women, and subjects with average or above average ACT scores, respectively. In other words, multiple predictions of attrition/persistence for the former were higher than for the latter.

Dyadic and triadic combinations of the categories (for subjects) did not necessarily manifest higher multiple correlations, uncorrected or corrected. Stated differently, going from a single category to a

double category to a triple category did not necessarily increase multiple correlations.

In predicting attrition/persistence, the corrected multiple correlations for all subjects (two equations) were .53 and the range of significant correlations was from .33 to .83. Thus, considering students according to various sets and subsets proved more efficacious than considering all subjects together.

The efficiency of the regression equations was tested with larger samples. For all subjects and for financial aid recipients, actual attrition/persistence scores (1 = dropout, 2 = persister) were compared with predicted attrition/persistence scores (developed from the regression equations). The median of the predicted attrition/persistence scores was the arbitrary cut-off point (i.e., students with scores below the median were designated dropouts, students with scores equal to or above the median were designated persisters). Since F and U were confounded (mentioned previously), two regression equations (one which included F, financial aid, as a variable; one which included U, group, as a variable) had to be computed for all subjects (n = 143): attrition/persistence = 1.33 + .29G - .10R - .01T - .01F, cR = .53, cSE = .39; attrition/persistence = 1.40 + .29G - .10R - .01T - .05U, cR = .53, cSE = .39. Using the above equations, overall accuracy for predicted versus actual attrition/persistence scores was about 64%, with F as a variable, or about 68%, with U as a variable. Analogously, dropout accuracy (predicted vs. actual attrition) was about 73% or 80%, and persister accuracy (predicted vs. actual persistence) was about 60% or 63%. For financial aid recipients (n = 96, attrition/persistence = 1.34 + .31G - .11R - .01T - .04U + .03S,

$cR = .59$, $cSE = .36$), comparable figures (overall accuracy, dropout accuracy, persister accuracy) were 66%, 80%, and 61%.

It should be noted that cutoff points can be arbitrarily chosen to maximize predictive efficiency--for overall attrition/persistence, for attrition, or for persistence. Using the median technique is well known and popular. But, in the instances above, choosing a cutoff below the median would have substantially increased the overall and persister accuracy percentages.

Summary. For the single prediction of attrition/persistence, grades ($r = .53$, $n = 143$, $p < .01$) were adequate. Specifically for men, group was related to attrition/persistence, but less notably.

For the multiple prediction of attrition/persistence excluding grades as a variable, there were no significant correlations. For the multiple prediction of attrition/persistence including grades as a variable, grades typically accounted for the plurality of attrition/persistence variance. Furthermore, attrition/persistence was predicted well for the majority of groups and subgroups using grades alone. That is, multiple predictors usually appeared unnecessary. The attrition/persistence of experimental subjects, financial aid recipients, Blacks, men, and persons with below average ACT scores was more predictable than for their contrasts. Although multiple predictions did not necessarily increase when subjects were differentially subgrouped, the results were varied and more precise (range of cRs from .33 to .83). The overall accuracy of the regression equations for the prediction of attrition/persistence with large samples ($cR = .53$, $cSE = .39$, $n = 143$), using a median cutoff technique, was about 64% (including financial aid, but not its confound, group, as a predictor) or 68% (including group, but not financial aid, as a predictor).

Evaluation of the Experimental Program

Analyses of variance. Mean[illegible]l variance analyses were computed to determine if the groups and subgroups of students were significantly different in terms of attrition/persistence and to identify factors which could discriminate between dropouts and persisters. Each analysis used a four (2x 2x2x2) or five (2x2x2x2x2) factor unweighted means solution. Four-factor analyses of variance had to be used in some instances to avoid an excessive number of blank cells. In any analysis of variance, there were no more than two blank cells and these did not appear in the same array column or row. Winer's (1971, pp. 487-490) formula to estimate missing data was used to fill blank array cells.

For any of the analyses of variance, if there were significant main effects the interpretations were straight forward (since each factor had only two levels). If there were significant interactions, further tests of simple effects were computed using Kirk's (1968, pp. 179-182) technique to determine critical values.

Attrition/persistence scores were the array inserts. Analyses I-VII (summarized in Table 1) considered various factors--U (group: experimental, control), I (instruction of financial aid recipients: special, regular), C (control group financial aid: assistance received, assistance not received), P (programs: special instruction and financial aid received, regular instruction and no financial aid received), R (race: Black, White), S (sex: men, women), T (general achievement/aptitude: below average, average and above average), G (grades: below average, average and above average). Sample sizes varied because different subgroups were considered, and because

subjects who did not receive grades had to be eliminated from analyses which included G.

Insert Table 1 about here

Grades contributed robustly to attrition/persistence in every analysis of variance which included G. Persons with below average grades dropped out significantly more than persons with average or above average grades, Analysis I, F (1, 111) = 24.97, $p < .01$; Analysis III, F (1, 80) = 19.68, $p < .01$; Analysis V, F (1, 54) = 11.10, $p < .01$; Analysis VII, F (1, 104) = 28.56, $p < .01$. In this section (analyses of variance), the foregoing and following statements could be stated conversely.

Grades also reached criteria in the three significant interactions (see Table 1). Men with below average grades dropped out more than men with average or above average grades, Analysis III, G at S_1, F (1, 80) = 21.47, $p < .01$. Men regular instruction financial aid recipients with lower grades dropped out more than men regular instruction financial aid recipients with higher grades, Analysis III, G at I_2S_1, F (1, 80) = 19.08, $p < .003$. Men control financial aid recipients with lower grades dropped out more than men control financial aid recipients with higher grades, Analysis V, G at C_1S_1, F (1, 54) = 12.14, $p < .003$. The latter three-factor interactions and interpretations refer to the same men.

Race (R) was able to distinguish dropouts from persisters once in seven analyses. Therefore, the relationship between race and attrition/persistence did not appear viable. However, when race did produce a significant effect,

Blacks tended to persist more than Whites, Analysis VII, F (1, 104) = 4.45, $p < .05$. Remembering that unweighted means solutions were used, significance of main and interaction effects could be determined on the basis of means of means (viz., noncollapsed cells) or on the basis of overall means (viz., collapsed cells). In this investigation, means of means were used. Typically, the means of means and the overall means produced the same trends for factors. Interestingly, however, when the overall means were considered for R, there were no apparent significant racial differences with regard to attrition/persistence.

Generally, neither ACT scores nor sex differentiated attrition/persistence. T as a significant overall main effect occurred once in four analyses--persons with below average ACT scores tended to drop out more than persons with average or above average ACT scores, Analysis VI, F (1, 109) = 7.32, $p < .01$. S did not occur as a significant main effect in seven analyses. But as a simple effect, S reached significance once in three interactions--men financial aid recipients who received regular instruction and had below average grades tended to drop out more than their female counterparts, Analysis III, S at I_2C_1, F (1, 80) = 10.73, $p < .003$. No strong statements could be made with regard to ACT scores or sex differentiating dropouts and persisters. It should be understood that the significances or nonsignificances were due, in part, to codifications and sample sizes.

Summary. For large samples (ns from 70 to 143), the experimental and control groups did not differ significantly in attrition/persistence. Grades were potent distinguishers of attrition/persistence. Persons with lower grades dropped out significantly more than persons with higher grades, and

the latter persisted significantly more than the former. For men, especially those who were control (in other words, regular instruction) financial aid recipients, grades were particularly effective in discerning dropouts and persisters. That is, the relationship between lower grades and dropping out (as well as higher grades and persisting) prevailed. Attrition/persistence was not viably differentiated by instruction and/or financial aid, ACT scores, race, or sex.

Chi squares. Proportional differences (2x2, fourfold contingencies) were computed between attrition/persistence and other variables for the UNO ACT freshman population and for subsets (experimental students, nonexperimental students) within the population. Attrition/persistence (A'), as the dependent variable, was contrasted with each of the following independent variables: U' (group: experimental, nonexperimental), P' (programs: special instruction and financial aid received, regular instruction and no financial aid received), I' (instruction of financial aid recipients: special, regular), F' (financial aid: assistance received, assistance not received), R' (race: Black, White), S' (sex: men, women), T' (general achievement/aptitude: below average, average and above average), G' (grades: below average, average and above average). Significances, determined by two-tailed tests, are summarized in Table 2.

Insert Table 2 about here

Considering group and attrition/persistence (U' x A') for the population, the fraction of experimental students who dropped out was significantly

smaller than the fraction of nonexperimental students who dropped out. Similarly, in relating programs and attrition (P' x A'), the ratio of special instruction financial aid recipients (in other words, experimental students) who dropped out was significantly smaller than the ratio of regular instruction financial aid nonrecipients who dropped out.

Interestingly, the I' x A' chi square did not produce significant results. That is, when financial aid was controlled, instruction (special or regular) was not related to attrition/persistence. Furthermore in the F' x A' chi squares, for the population and for nonexperimental freshmen, the proportion of dropouts was significantly smaller for financial aid recipients than for nonrecipients. Thus, it might be that persistence is more closely related to financial aid than to special instruction. This problematic relationship could be solved if an experimental group received no financial aid.

Focusing on the T' x A' results for the population and for nonexperimental freshmen, persons with below average ACT scores were about evenly divided between dropping out and persisting; whereas, persons with average or above average ACT scores tended to persist. More important was the lack of significant T' x A' differences for experimental subjects. In this instance, experimental subjects, those with lower ACT scores and those with higher ACT scores, tended to persist (without significant proportional differences, for an n of 75).

There were significant differences for each of the G' x A' chi squares (see Table 2). Students with below average grades tended to drop out, and students with average or above average grades tended to persist. The latter relationship was especially marked for the experimental freshmen. Few of

them, with higher grades, dropped out.

Summary. For very large samples (ns from 247 to 1,214), experimental treatment and/or financial aid were conducive to persistence. However, absence of experimental treatment and/or financial aid did not promote the corollary, attrition. For freshmen and nonexperimental freshmen, average or above average achievement/aptitude (ACT scores) was a good indicator of continued student enrollment. However, below average achievement/aptitude did not necessarily denote discontinued student enrollment. Experimental students were inclined to persist regardless of their ACT scores. Grades were the major determinant of attrition/persistence. Persons with below average grades tended to drop out; persons with average or above average grades tended to persist. The latter relationship was marked for experimental students--those with higher grades rarely dropped out.

Major Findings

1. In the single prediction of attrition/persistence for experimental (disadvantaged) and control (regular) freshmen, cumulative grade point average (GPA) was primary and significant. No other single predictors appeared viable.

2. In the multiple prediction of attrition/persistence for disadvantaged and regular freshmen, GPA was primary and significant. Additional variables usually appeared unnecessary.

3. Developing separate correlations and regression equations for the experimental and control groups and subsets within and between these groups was efficacious. That is, taking into account the heterogeneity of the data (rather than assuming homogeneity when it was unwarranted) produced significantly higher or lower correlations and therefore greater precision.

4. For the ACT freshman population and for subgroups (nonexperimental students, experimental and/or control students), attrition/persistence was significantly delineated (proportion and mean differences) by grades.

5. For the ACT freshman population and for nonexperimental freshmen (but not for experimental and/or control students), attrition/persistence was significantly delineated (proportion differences) by general achievement/aptitude.

6. For the ACT freshman population and for nonexperimental freshmen (but not for control students), attrition/persistence was significantly delineated (proportion differences) by financial aid. Since all experimental students received financial aid, they could not be included in these analyses.

7. In terms of attrition/persistence, experimental subjects did significantly better (dropped out less, persisted more) than nonexperimental subjects or than nonexperimental financial aid nonrecipients (proportion differences).

8. In terms of attrition/persistence, experimental subjects did not differ significantly from control subjects (mean difference) nor from nonexperimental financial aid recipients (proportion difference).

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Table 1

Analyses of Variance with Attrition/Persistence as Criterion

Analysis:	I	II	III	IV	V	VI	VII
Factors:	U	I	I	C	C	P	P
	R	R	R	R	R	R	R
	S	S	S	S	S	S	S
	T	T	G	T	G	T	G
	G						
Significant Main Effects:	G**		G**		G**	T**	R*
							G**
Significant Interaction Effects:			SG*		CSG*		
			ISG*				
Total n:	143	100	96	75	70	125	120
experimental n:	73	75	73	0	0	75	73
control n:	70	25	23	75	70	50	47

Note. Factors are denoted with letters: U (group: experimental, control), I (instruction of financial aid recipients: special, regular), C (control group financial aid: assistance received, assistance not received), P (programs: special instruction and financial aid received, regular instruction and no financial aid received), R (race: Black, White), S (sex: men, women), T (general achievement/aptitude: below average ACT scores, average and above average ACT scores), G (grades: below average, average and above average). Attrition/persistence, as criterion, was delineated as drop out, persist.

*p < .05.

**p < .01.

Table 2

Chi Squares with Attrition/Persistence as Criterion

UNO ACT Freshman Population			Experimental Freshmen			Nonexperimental Freshmen		
Variables	N	p	Variables	n	p	Variables	n	p
U' x A'	1,214	< .01						
P' x A'	1,042	< .01						
I' x A'	247	ns						
F' x A'	1,214	< .1				F' x A'	1,139	< .01
R' x A'	728	ns	R' x A'	75	ns	R' x A'	653	ns
S' x A'	1,214	ns	S' x A'	75	ns	S' x A'	1,139	ns
T' x A'	1,214	< .01	T' x A'	75	ns	T' x A'	1,139	< .01
G' x A'	1,156	< .01	G' x A'	73	< .01	G' x A'	1,083	< .01

Note. Variables were denoted by letters: U' (group: experimental, nonexperimental), P' (programs: special instruction and financial aid received, regular instruction and no financial aid received), I' (instruction of financial aid recipients: special, regular), F' (financial aid: assistance received, assistance not received), R' (race: Black, White), S' (sex: men, women), T' (general achievement/aptitude: below average ACT scores, average and above average ACT scores), G' (grades: below average, average and above average), A' (attrition/persistence: drop out, persist).