PREDICTING FRESHMAN PERSISTENCE AND VOLUNTARY DROPOUT DECISIONS: A Replication

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This paper describes the results of a replication of a study testing the predictive validity of a 34-item instrument designed to assess the fundamental constructs of Tinto's model of college student attrition. A design, variables, and analytical procedures virtually identical to those of the original study (done at a large independent university) were used, and this research was conducted at a large public university. The five-factor structure, found in the original study to underlie the 34 items, was replicated almost exactly. As in the earlier work, the Institutional and Goal Commitment Scale was a significant predictor of attendance behavior even after controlling for a variety of students' precollege characteristics. Potential institutional differences in faculty members' influence on retention were identified. A cross-validation classification procedure suggests the five factors are reasonably stable predictors of attrition.

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As the comprehensive literature reviews of Spady (1970), Tinto (1975), Cope and Hannah (1975), and Pantages and Creedon (1978) all attest, considerable research has been done on college student attrition, and a considerable variety of statistically reliable associations among various student and institutional characteristics and attrition have been identified. It is equally clear, however, as these authors note, that most of the studies comprising this literature are atheoretical, offering a decidedly unpar-

simonious description of the influences on students' attendance patterns.

In an effort to bring some conceptual organization to this area of inquiry, Tinto (1975), building on the work of Spady (1970), developed an explanatory predictive model of the college student dropout process. The constructs of students' integration into the social and academic systems of an institution are at the model's conceptual core. Tinto conceives of the college student attrition process as a series of sociopsychological interactions between the characteristics students bring with them to college and the nature of their experiences while enrolled. According to Tinto, students' precollege traits lead to varying initial levels of goal and institutional commitments which, in turn, interact with the academic and social environment of the institution, resulting in varying levels of integration in the institution's social and academic systems. "Other things being equal, the higher the degree of integration of the individual into the college systems, the greater will be his commitment to the specific institution and to the goal of college completion" (Tinto, 1975, p. 96).

Recently, a small number of studies have produced evidence supporting the construct and predictive validity of Tinto's model (Pascarella & Terenzini, 1977; Terenzini & Pascarella, 1977, 1978). These studies can be faulted, however, for their somewhat indirect, and perhaps only superficial, assessment of the main constructs of the Tinto model.

Subsequently, Pascarella and Terenzini (1980) developed a 34-item measure specifically designed to operationalize the constructs of social and academic integration and institutional and goal commitment. Results of that study not only provide additional evidence supporting Tinto's theory but also suggest that the 34-item five-factor "integration" measure has substantial predictive validity (79% of the persisters and 76% of the voluntary leavers in an independent cross-validation sample were correctly classified).

While this latter study and its predecessors are based on different and independent samples of students entering higher education in different years, they were all conducted at the same institution. Thus, whether similar results might be obtained from a sample of students at a different institution is not known.

Given both the practical and theoretical promise of a measure that can reliably differentiate persisters from voluntary dropouts, this study sought to replicate the earlier study based on the 34-item "integration" measure (Pascarella & Terenzini, 1980). Specifically, this study sought to determine (1) whether the five-factor solution obtained from the 34 items in the first study was invariant across institutions, and (2) whether the substantive results of the first study could be replicated on a different campus.

METHODS

Background

The institutions at which the two studies were conducted are both large, comprehensive, research-oriented institutions in the Northeast with undergraduate enrollments of approximately 10,000 students. Whereas University A (at which Study 1 was completed) is an independent institution, University B (the site of this replication, or Study 2) is part of a state public higher-education system. Freshmen enroll at both institutions in approximately equal numbers (2,100 to 2,400), both institutions drawing substantial portions of their new freshmen from the New York City and Long Island metropolitan area, although University A attracts a higher proportion of its freshmen from out of state (approximately 50 vs. 2% at University B). About one-fourth of University A's freshmen and about 40 percent of those at University B ranked in the top 10 percent of their high school class. Both institutions are residential. University A's freshmen must meet certain distributive requirements while in the lower-division years and receive academic advising directly from faculty members throughout their college years. University B's only degree requirements are those imposed by the departments in which students major, and virtually all freshmen receive formal course and program advice from professional academic advisers (faculty advisers are assigned by the department in which a student majors, typically late in the sophomore year). The freshman-to-sophomore year voluntary attrition rate at University A has ranged from 12 to 17 percent in recent years; the comparable rate at University B was approximately 8 percent for freshmen who entered in the Fall of 1978. University A dismisses about 1 percent of an entering freshman class at the end of the first year for unsatisfactory academic performance, whereas approximately 2 percent of the freshmen at University B are denied sophomore year registration for academic reasons.

Except where noted otherwise, the present study was virtually identical to Study 1 in overall design, population definition, sampling design and procedures, variables employed, and analytical procedures adopted.

Design and Sample

The overall study design was longitudinal and ex post facto. During the summer of 1978, the 2,147 prospective freshmen attending University B's summer planning conferences (a series of 2-day orientation programs) were asked to complete the 1978 Student Information Form developed by Alexander Astin and his associates in the Cooperative Institutional Research

Program (CIRP) sponsored by the American Council on Education and the University of California at Los Angeles. This instrument solicits a wide variety of information about students' personal, family, and educational backgrounds, as well as about their educational expectations and aspirations. (In Study 1, entering freshmen completed a similar but locally designed instrument.) Of the 2,255 first-time freshmen who subsequently matriculated at the university in the fall of 1978, a total of 1,360 (60.3%) had completed a usable questionnaire (including social security number, needed for the subsequent follow-up).

In April 1979, a detailed questionnaire soliciting information about their attitudes and freshman year experiences was sent to the 1,360 summer respondents. After a mail follow-up, usable responses were received from 469 freshman (34.5%). These respondents' academic records were reviewed in the fall of 1979 to identify those who had continued their education into the sophomore year (persisters, $n = 440$, or 93.8%), had voluntarily withdrawn (voluntary dropouts, $n = 25$, 5.3%), or had been dismissed for unsatisfactory academic performance (academic dismissals, $n = 4$, 0.9%). As with Study 1, this research was concerned with persisters and voluntary dropouts only.

Chi-square goodness-of-fit tests (or t tests) indicated that the 465 persisters and voluntary dropouts are representative of the corresponding freshman population with respect to racial or ethnic origin and academic aptitude (SAT scores). Women and persisters are overrepresented, however, and the typical respondent in this study, compared with the typical University B freshman, is also likely to have had a higher percentile rank in his or her high school class and to have earned a higher freshman year cumulative grade-point average. The absolute differences between the sample and the population are slight, but nonetheless statistically reliable. The potential influences of these response biases on the study's results are discussed in the concluding section.

While it might be argued that Tinto's model is intended to explain attrition during the second, third, or fourth year of college, as well as in the first year, studies by Iffert (1958), Eckland (1964), Marsh (1966), and Rootman (1972) strongly suggest that attrition is heaviest at the end of the freshman year. Based on this evidence, it was judged that analyses using freshmen would provide a reasonable assessment of the predictive validity of the Tinto model.

Instruments and Variables

Tinto suggests that a student's integration into the institution's academic and social systems may be evident in various ways. Academic integration

may manifest itself in the student's academic performance, sense of intellectual development, sharing the intellectual or academic values of peers and faculty members, and so on. Similarly, indicators of social integration include frequency and quality of contacts with peers, a sense of shared values in nonacademic areas, and involvement in the nonclassroom life of the institution. While the model places interactions with faculty in the domain of social integration, Tinto states that such interactions are also likely to enhance academic integration.

As levels of social and academic integration are influenced by precollege characteristics and level of commitment to a particular institution and to completing a degree program, so do the levels of social and academic integration, in turn, mediate subsequent levels of commitment to completing college. As this level of commitment increases, the likelihood of continued enrollment in the institution also increases.

The independent variables of principal interest in this study are the five scales, developed in Study 1 (Pascarella & Terenzini, 1980) for operationalizing the Tinto model constructs of academic and social integration and institutional and goal commitment. Those scales are labeled as follows: (1) Peer Group Interactions, (2) Interactions with Faculty, (3) Faculty Concern for Student Development and Teaching, (4) Academic and Intellectual Development, and (5) Institutional and Goal Commitments. The 34 items on which these scales are based are scored on a five-point, Likert-type scale where 5 = strongly agree and 1 = strongly disagree. In Study 1, coefficient alphas for these scales ranged from .71 to .84.

Because considerable research suggests that students' interaction with, and responses to, the college environment are related to a variety of background characteristics (see Feldman & Newcomb, 1969), and because of the interest in this research (and in Study 1) in the predictive power of the scales just described, both studies controlled for the following precollege characteristics, which the literature suggests are important correlates of attendance patterns (Spady, 1970; Tinto, 1975; Cope & Hannah, 1975; Pantages & Creedon, 1978):

Sex
Racial or Ethnic Origin (nonminority or minority)
Initial Program of Enrollment (liberal arts or professional)
Academic Aptitude (combined Scholastic Aptitude Test scores)
High School Achievement (percentile rank in high school class)
Parents' Combined Annual Income (in thousands of dollars)
Mother's Formal Education (seven ordinal categories from "some grammar school" to "graduate degree")
Father's Formal Education (same categories)

Student's Highest Expected Academic Degree (Bachelors to Ph.D, Ed.D.,
    M.D., J.D., etc.).
This University's Rank as a College Choice (first choice to fourth or lower
    choice)

Additionally the study controlled for two other variables: freshman year
cumulative grade point average and extent of involvement in extracurricu-
lar activities during the year (for Study 1, the number of extracurricular
activities in which 2 hours or more per week were spent on the average; for
Study 2, the number of hours spent per week on the average). Tinto has
suggested that these two behaviors are potentially significant aspects of
academic and social integration. For this reason, it was judged important to
take their influence into account when determining the independent pre-
dictive contributions of the institutional integration items.

The present inquiry, unlike the earlier work, did not control for the
extent of high school extracurricular involvement, expected frequency of
contact with faculty members, prematriculation importance of graduating
from college, and preregistration confidence that the decision to attend this
university was the right one.

Attendance behavior (dummy coded: 1 = persister and 0 = voluntary
dropout) was the dependent variable. Data were drawn from one of three
sources: the summer CIRP questionnaire, the follow-up instrument, or
official university records.

Statistical Analysis

Since one of the purposes of this study was to determine whether the
factor structure of the 34 academic and social integration items obtained in
Study 1 was invariant across institutions, statistical analysis began with a
principal components analysis (with varimax rotation) of the item re-
sponses of University B students. Then, repeating the analytical proce-
dures of Study 1, the 440 freshman persisters in the present study were
randomly divided into two groups of approximately two-thirds ($n = 307$)
and one-third ($n = 133$). Because of the already small number of voluntary
dropouts ($n = 25$), this group was not similarly divided. The larger of the
two persister groups and all the voluntary dropouts were then used as the
"calibration sample" for subsequent analyses. The smaller of the persister
groups was withheld from these procedures for subsequent use in a cross-
validation classification analysis.

Setwise discriminant function analysis was used with the calibration
sample to determine whether the academic and social integration scales
could reliably differentiate persisters and voluntary dropouts with the

precollege traits (10 variables), freshman year grade point average, and involvement in extracurricular activities statistically controlled. The standardized discriminant weights were then used to determine the relative contributions of each of the integration scales to group differentiation. Finally, a classification analysis was performed on both the calibration samples and the cross-validation group of persisters to estimate the stability of the discriminant function and the predictive power of the integration scales. With the exception of the absence of a cross-validation group of voluntary dropouts, these procedures represent an exact duplication of the procedures followed in Study 1.

RESULTS

As in Study 1, a Scree Test indicated that five factors should be rotated. When this was done (to the varimax criterion) and the resultant principal components structure compared with that from Study 1, results indicated that the University B structure was almost a perfect replicate of the University A structure. Study 1's five-factor solution explained 44.4 percent of the total variance, whereas the structure derived in this study accounted for 44.6 percent of the total variance in the 34 items. Three of the four items that failed to load at .40 or above at University A also failed to meet this criterion at University B. Only four variables failed to load on the same factor to which they contributed in Study 1. In two of these cases, the highest loading (but less than .40) was on a factor consistent with the Study 1 structure. Because of the remarkably close similarity of the two structures, it was decided to constitute the five integration scales for this study using the structure obtained in Study 1. As in the earlier research, factor scale scores were then computed by summing the raw item scores for the variables that loaded .40 or above on a given factor (Armor, 1974). The scoring of negatively worded items was reversed prior to the calculation of scale scores.

Table 1 gives the two highest loading items on each scale from the Study 1 solution. The loadings of these items in the present study's solution are also shown. Only three of the items shown (II.2; III.2; and V.2) were not also the second highest loadings on these factors in the present study. Table 1 also gives the internal consistency (coefficient alpha) reliabilities of the scales in both studies (scales based on the Study 1 solution). Only the reliability of the fifth scale in the present study falls below conventionally acceptable levels. The item composition of these scales is given in Pascarella and Terenzini (1980). The complete component structures for both studies are available upon request.

At University A, the intercorrelations of the five scales ranged in abso-

TABLE 1. Alpha Reliabilities and the Two Highest Loading Items in Studies 1 and 2 on Five Factorially Derived Measures of Social and Academic Integration.

Scale and Items	Factor Loading		Alpha Reliability	
	Study 1	Study 2	Study 1	Study 2
I. *Peer Group Relations* (seven items)			.84	.84
1. Since coming to this university I have developed close personal relationships with other students	.82	.81		
2. The student friendships I have developed at this university have been personally satisfying	.82	.84		
II. *Informal Interactions with Faculty* (five items)			.83	.83
1. My nonclassroom interactions with faculty have had a positive influence on my personal growth, values, and attitudes	.86	.87		
2. My nonclassroom interactions with faculty have had a positive influence on my career goals and aspirations	.83	.80[a]		
III. *Faculty Concern for Student Development and Teaching* (five items)			.82	.71
1. Few of the faculty members I have had contact with are genuinely interested in students[b]	−.77	−.79		
2. Few of the faculty members I have had contact with are genuinely outstanding or superior teachers[b]	−.72	−.56[c]		
IV. *Academic and Intellectual Development* (seven items)			.74	.69
1. I am satisfied with the extent of my intellectual development since enrolling in this institution.	.68	.67		
2. My academic experience has had a positive influence on my intellectual growth and interest in ideas	.67	.67		
V. *Institutional and Goal Commitments* (six items)			.71	.58
1. It is important for me to graduate from college	.69	.63		

TABLE 1 *(Continued)*

	Factor Loading		Alpha Reliability	
Scale and Items	Study 1	Study 2	Study 1	Study 2
2. I am confident that I made the right decision in choosing to attend this university	.63	.43[c]		

[a]Third highest loading on this factor in Study 2 solution.
[b]Scoring on negatively worded items reversed before factor scales scores calculated. The complete item and factor matrices for both studies are available upon request.
[c]Fourth highest loading on this factor in Study 2 solution.

lute magnitude from .01 to .33, with a median correlation of .23. For the University B sample, the scale intercorrelations ranged from .04 to .38, with a median of .25.

Table 2 arrays, for both studies, persisters' and voluntary dropouts' means and standard deviations on each of the integration scales. Within both studies, the direction of the differences between the mean scores of persisters and voluntary leavers on each of the five scales is consistent with Tinto's model: in each case, persisters' means indicate higher levels of integration than are apparent among voluntary dropouts at the same institution. As will be seen below, however, not all these within-institution differences are statistically reliable.

A series of 10 t-tests (two-tailed) indicates that in only three instances are the scale means of persisters or dropouts at one institution reliably different from those of their counterparts at the other university. Persisters at University A (Study 1) reported more positive perceptions of their interactions with faculty than persisters at University B ($t = 6.35, df = 741, p <$ .001). However, the voluntary dropouts from University B (compared with those at University A) reported more positive interactions with faculty and more favorable perceptions of faculty members' concern for student development and teaching ($t = -2.09$ and -2.33, respectively, $df = 84, p <$ .05 in both cases).

Table 3 summarizes the results of the multivariate analyses of covariance and discriminant function analyses for the two studies. As indicated, in neither study did the set of covariates produce a statistically reliable separation of persisters and voluntary dropouts (in this study, the multivariate F ratio for the 12 covariates was 1.07, $df = 12/319, p <$ n.s.). When the five integration scales were entered, they made statistically significant increases in the explained variance in both studies, although the increment

TABLE 2. Integration Scale Means and Standard Deviations for Persisters and Voluntary Dropouts in Two Studies.

	Persisters[a]					Voluntary Dropouts[b]				
	Study 1		Study 2			Study 1		Study 2		
Integration Scale	Mean	SD	Mean	SD	p[c]	Mean	SD	Mean	SD	p[c]
Peer group interactions	26.64	5.09	27.02	5.74	n.s.	22.95	6.85	23.00	7.24	n.s.
Interactions with faculty	14.48	4.19	12.37	4.72	<.001	9.82	3.71	11.84	4.70	<.05
Faculty concern for student development and teaching	16.21	3.33	15.73	3.62	n.s.	12.44	4.42	14.88	4.21	<.05
Academic and intellectual development	22.97	4.41	22.84	4.72	n.s.	20.59	4.88	20.48	5.73	n.s.
Institutional and goal commitments	24.17	3.66	24.31	3.36	n.s.	19.89	4.83	20.48	5.10	n.s.

[a]Calibration samples only: Study 1, n = 436; Study 2, n = 307.
[b]Calibration samples only: Study 1, n = 61; Study 2, n = 25.
[c]Two-tailed t test for independent samples.

TABLE 3. Summary of Setwise Discriminant Analysis on Calibration Samples (Study 1: $N = 497$; Study 2: $N = 332$).

Variables	Change in Canonical R^2		Univariate F Ratio[b]		Unique F Ratio[c]		Standardized Weights	
	Study 1	Study 2	Study 1	Study 2	Study 1	Study 2	Study 1	Study 2
Covariates								
Precollege characteristics, academic achievement, and involvement in extracurricular activities	.045	.039			All n.s.	All n.s.	|.02|to |.13|	|.01|to |.29|
Institutional Integration Scales	.215***	.085***						
Peer group interactions			25.56***	10.86**	1.20	2.88	.10	.30
Interactions with faculty			67.76***	.29	29.67***	.43	.47	-.12
Faculty concern for student development and teaching			62.72***	1.24	12.35***	.10	.32	.06
Academic and intellectual development			15.21***	5.61*	.01	.04	.01	.04
Institutional and goal commitments			66.83***	27.42***	35.57***	16.53***	.53	.73

[a]Study 1 = 16 variables; Study 2 = 12 variables.
[b]Degrees of freedom: Study 1 = 1/495; Study 2 = 1/330.
[c]All covariates and all other integration scales held constant. Degrees of freedom: Study 1 = 1/475; Study 2 = 1/314.
*$p < .05$.
**$p < .01$.
***$p < .001$.

in Study 1 was nearly three times as great as that obtained in the present research. In this investigation, the multivariate F for the integration scales upon entry was 6.11 ($df = 5/314, p < .001$).

The somewhat reduced explanatory power of the integration scales in this study is further reflected in the comparison of univariate F ratios for the five scales in the two studies. Whereas all five scales produced significant univariate F ratios with the Study 1 sample, only three of the five produced similar results in the present study (Peer Group Interactions, Academic and Intellectual Development, and Institutional and Goal Commitments). Because of the intercorrelations among the scales, however, the probability statements associated with the univariate F ratios are somewhat ambigiuous.

Inspection of the unique F ratios in the two studies indicates only a partial replication of the earlier study's results. These F ratios reflect each variable's ability to make a unique and reliable contribution to group discrimination with all other covariates and integration scales controlled. As can be seen in Table 3, in neither study did any of the covariates make a statistically significant and unique contribution to the explanation of variance in attendance behavior. Three of the five integration scales made a unique and significant contribution in Study 1, whereas only the Institutional and Goal Commitments scale made such a contribution in the present research. It is noteworthy, however, that the Institutional and Goal Commitments scale makes the largest unique contribution to group differentiation in both studies.

Inspection of the standardized discriminant weights for the two studies mirrors the pattern of variable importance provided by the unique F ratios. In both studies, the Institutional and Goal Commitment scale has the highest weight. (The absolute magnitudes of the weights are not comparable across studies; only the *relative* size *within* each set has meaning.) Moreover, the comparative unimportance of the two faculty interaction scales in the present study is reflected again, contrasting with their importance in Study 1. The negative weight for the Interactions with Faculty scale in Study 2 is unexpected. However, given the observed direction of the difference in means on this scale for persisters and voluntary dropouts (see Table 2), the sign is most likely a reflection of a suppression effect (Cohen & Cohen, 1975).

Table 4 summarizes the results of the classification analyses for both calibration and cross-validation samples in each study. Independent cross-validation samples were developed in both studies to avoid the spuriously high proportions of correct classifications attendant in classifying the same subjects used to develop the discriminant function. For all groups, the prior probability of correct classification was set at .5 (i.e.,

TABLE 4. Percentage of Cases Correctly Classified[a].

Variables and Groups	Calibration Samples		Cross-validation Samples	
	Study 1[b]	Study 2[c]	Study 1[b]	Study 2[c]
Covariates only				
Persisters (%)	62.2	62.2	58.2	61.7
Voluntary dropouts (%)	59.0	76.0	34.5	NA[d]
Covariates and institutional integration scales				
Persisters (%)	81.9	77.2	81.4	83.5
Voluntary dropouts (%)	80.3	72.0	75.8	NA
Institutional integration scales only				
Persisters (%)	80.3	73.9	78.9	75.2
Voluntary dropouts (%)	79.4	64.0	75.8	NA

[a]Prior probabilities of correct classification = .5 for all groups.
[b]Calibration sample: persisters, n = 436; voluntary dropouts, n = 61. Cross-validation sample: persisters, n = 237; voluntary dropouts, n = 29.
[c]Calibration sample: persisters n = 307; voluntary dropouts, n = 25. Cross-validation sample: persisters, n = 133; voluntary dropouts, n = 0.
[d]Not applicable; no group formed.

chance). While the proportion of correct classifications would be maximized by setting prior probabilities equal to the size of the persister group (the largest one), the principal intent in each of these studies was not simply to produce the highest possible percentage of overall correct classifications but rather to test the discriminating power of the independent variables themselves. As Cooley and Lohnes (1971, p. 263) have noted, "Even if the . . . vector variable has no predictive validity for the taxonomic criterion variable, a set of powerful prior probabilities can lead to successful classification of subjects and the illusion of predictive validity. When the object of computing is to display the predictive validity of the measurement system, prior probabilities can be misleading." In a two-group case, setting prior probabilities equal to .5 has the effect of forcing the classification of subjects solely on the basis of what is known about their scores on each of the independent variables.

As can be seen in Table 4, the covariates by themselves generally produced only moderate improvements on chance in each study. The one exception is the proportion of voluntary dropouts in the calibration sample of the present study. It may be recalled that this group was too small to develop a cross-validation sample.

Focusing on the percentages of correct classification in the cross-validation samples, we can see that in both studies the entry of the five integration scales produced substantial improvements on chance over what was obtained with the covariates only. Moreover, when the cross-validation classification was performed with the integration scales only, the slippage in the percentage of cases correctly classified was modest in both studies, although somewhat greater in the present investigation (from 83.5 to 75.2%). In this study, the percentage of cross-validation persisters correctly classified is a statistically significant ($p < .05$) improvement on chance for all variable sets. These results suggest reasonable discriminating power and stability in the discriminant functions produced in both studies.

Additional Analyses

As in Study 1, 20 cross-product interaction terms were created and then entered into the analyses following the covariates and five integration scales. The interaction terms were created by multiplying each respondent's sex, racial or ethnic origin, academic major, and combined SAT scores with each of the five integration scales.

In the first study, the entry of the interaction vectors produced an increment of 5.0 percent in the canonical R^2 ($p < .05$). In the present study, the entry of identical terms produced an increment of 3.9 percent ($F = .69$, $df = 20/294$, $p <$ n.s.). Because the set of interaction vectors in this study failed to yield a statistically reliable increment in the canonical R^2, no further analyses were attempted. Study 1 had produced two interactions that were statistically reliable and unique (all covariates, integration scales, and other interaction terms controlled). In that study, the quality of peer group interactions was a more important factor in women's decisions to persist or withdraw voluntarily than it was for men. Conversely, institutional and goal commitments were more influential in the attendance decisions of men than in those of women.

CONCLUSIONS

The initial study had two primary purposes: "(1) to develop a multidimensional instrument which assesses the major dimensions of the Tinto (1975) model; and (2) to determine the validity of the instrument, and thereby the model, in accurately identifying freshmen who subsequently persist or drop out voluntarily" (Pascarella & Terenzini, 1980, p. 13). The results of the study were generally supportive of the construct validity of Tinto's model and of the instrument's predictive validity. The present

study undertook to replicate the original research, specifically to determine whether the five-factor structure of the 34-item instrument was invariant across institutions and whether the substantive results of the earlier study could be replicated and, therefore, the construct validity of Tinto's model supported at another institution. The present investigation employed an overall design, variables, and analytical procedures virtually identical to those of the earlier research.

Results of a principal components analysis based on the responses of students in this study produced a structure almost indistinguishable from that obtained in the earlier work. Each solution explained 44 percent of the total variance in the 34 items; each solution contained five components, and, with only four exceptions, the same items loaded on the same dimensions. The scales based on these dimensions yielded generally similar internal consistency (coefficient alpha) reliabilities. On the basis of such results, one can conclude only that the factor structure of the 34 items is indeed invariant across the two institutions, one a large independent university, the other a large public university.

Results of the discriminant analyses in the two studies indicate only moderate similarity, however. In both studies, the covariates (precollege student characteristics, freshman-year cumulative grade-point average, and level of involvement in extracurricular activities) made nonsignificant contributions to the explanation of variance in attendance patterns (4.5 and 3.9% in Studies 1 and 2, respectively). Moreover, in both studies, the five integration scales, as a set, made statistically reliable and unique contributions to group differentiation, although the increment in the present study (8.5%) was less dramatic than that in the first (21.5%). Three of the five integration scales made individually unique and significant increases in the canonical R^2 in the initial study, whereas only one scale made such a contribution in the present research. It is noteworthy, however, that the largest single contributor to group discrimination in both studies was the Institutional and Goal Commitment scale. The two faculty interaction scales made unique contributions in the first study, but this finding was not replicated in the present investigation. Despite this failure, however, it is worth noting that the differences between the means for persisters and voluntary dropouts in this study were in directions consistent with the Tinto model and the results of the initial study.

Perhaps more important than the variance in group membership explained or the F ratios for individual variables is the ability of the discriminant function to classify correctly persisters and voluntary withdrawals. In both studies, the entry of the five integration scales in a cross-validation classification analysis with an independent sample of respondents made substantial and statistically significant improvements in the percentage of

cases correctly classified. These results in both studies indicate reasonable discriminating power and stability in the discriminant functions produced and suggest the predictive utility of the five scales in identifying persisters and voluntary withdrawals.

In both studies, the entry of 20 cross-product interaction terms produced an increase in the amount of variance explained after controlling for the covariates and integration scales. In the first study, the increment (5.0%) was statistically reliable, whereas it was not in the second (3.9%).

Several explanations are possible for the failure of the present study to replicate with greater success the substantive results of the initial investigation. One possibility is that the relatively small number of voluntary dropouts in the present study ($n = 25$) introduced comparatively more sampling error than that present in the earlier work. The addition of 10 or 15 more dropouts to the present sample could make a significant difference in the results obtained. Clearly, detection of reliable differences is more difficult with small samples than with larger ones.

Second, the failure of the Interactions with Faculty and Faculty Concern with Student Development and Teaching scales to make unique and significant contributions to the explanation of variance in attendance patterns may be related to the overrepresentation of women in the sample as compared with the target population. An earlier study (Pascarella & Terenzini, 1979) produced evidence indicating that faculty-related variables had a somewhat greater positive influence on persistence for men than for women. If this relation holds among University B's students, then the relatively small number of men in the present sample (47% men vs. 53% women) may militate against the predictive power of the faculty interaction scales.

A third alternative, of course, and perhaps the most likely, is that the findings reflect real institutional differences in faculty members' influence on students' freshman-to-sophomore year attendance patterns. As noted earlier, for example, University A's freshmen receive course and program advice from faculty members, whereas those at University B are advised by a group of professional academic counselors. Conceivably, such institutionalized nonclassroom contact between freshmen and faculty at University A may facilitate subsequent contact for other purposes. (Although simple frequency of student-faculty contact was not included as a variable in the analytical design of either study, evidence from the two data collections indicates that the freshmen rate of student-faculty informal interaction may be somewhat higher at University A than at University B.)

Finally, it is entirely possible that the discrepancies in results between the two studies are a function of all three alternatives given above: sampling error, response bias, and institutional effects. Only additional research

with a larger sample of voluntary dropouts is likely to resolve this issue.

Nonetheless, in both studies, the Institutional and Goal Commitments scale made the largest unique and significant contribution to group discrimination after all covariates and other integration scales had been controlled. In Tinto's model, the various dimensions of academic and social integration are theorized to lead to varying levels of commitment to the institution, which in turn leads to continued enrollment, voluntary withdrawal, or academic dismissal. Thus, theoretically, four of the five integration scales used in both studies influence the fifth, which in both studies was the largest unique contributor. Conceivably, then, the results may simply indicate a somewhat different pattern of antecedent influences at the two institutions.

In sum, the results of this replication appear to be reasonably consistent with those of the original study. The factor structure of the 34-item integration measure was almost precisely replicated. The set of covariates was comparatively unimportant in predicting attendance patterns in both studies, and the five integration scales made significant and unique contributions to the explanation of variance in both studies. In both, the Institutional and Goal Commitments scale was the largest unique contributor to group differentiation. While none of the other integration scales in the present study made reliable and unique contributions, the differences in group means were all in the expected direction.

Most important, perhaps, the entry of the integration scales in both studies made statistically reliable and substantial improvements in the percentage of cross-validation cases correctly classified, and in both studies only limited slippage in the correct classification percentages occurred when the integration scales alone were used in the cross-validation classification of cases. The percentages of correctly classified cases were also quite similar across the two institutions. Thus, despite some differences in the pattern and magnitude of the contribution of individual scales, the substantial classification efficiency in both investigations suggests that the five scales may be useful in developing specific prediction equations for individual institutions.

Numerous authors (e.g., Pantages & Creedon, 1978) have stressed the importance of identifying potential dropouts so that institutionally sponsored preventive intervention might be initiated before the student decides to withdraw. The performance of the five institutional integration scales in both of these studies indicates that they may be useful in identifying freshmen who are at some risk of dropping out. After some additional scale development work and replication with other students on other campuses, it may be reasonable to use these scales as a means of identifying students with a high probability of dropping out for participation in experimental

institutional retention programs. It is worth recalling that the dropouts in both of these studies were voluntary—all had the option of continuing their enrollment.

Despite some discrepancies in the substantive results of the two studies, moreover, the results of both generally support the construct and predictive validity of Tinto's model of college student attrition. The role of the model's institutional and goal commitment construct was central in both studies. The comparative influence of student-faculty contact in students' subsequent attendance decisions is less clear, however, appearing to be less important among students at one institution than among those at another. It is reasonable to suggest, however, that these dimensions of the model and instrument were not given a fair opportunity to perform in the present study because of comparatively larger sampling error (especially among voluntary leavers), response bias in the present study as compared with that in the earlier work, and potentially important differences in the academic advising systems at the two institutions. The model clearly deserves additional testing both for its potential practical administrative utility and for its conceptual usefulness in focusing future inquiry into the nature of students' attendance behaviors.

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