Ernest T. Pascarella
Patrick T. Terenzini

Predicting Freshman Persistence and Voluntary Dropout Decisions from a Theoretical Model

In their comprehensive reviews of the literature on the college dropout both Spady [17] and Tinto [23] argue that much of the current lack of understanding of the college dropout process is due to the fact that the research emphasis has been descriptive rather than theory-based. In short, the vast majority of studies have searched for student or institutional variables significantly related to dropout behavior with no conceptual model to guide or focus inquiry. As a result there appears to be a wealth of statistically reliable, ex post facto associations that offer a markedly unparsimonious explanation of the dropout process [9, 14, 17, 23].

In an attempt to bring some coherence to the research as well as providing a conceptual framework to guide future inquiry, Tinto [23] has built on Spady's [17, 18] work to develop an explanatory, predictive model of the dropout process which has at its core the concepts of academic and social integration in the institution. The model is longitudinal and regards persistence or dropout behavior primarily as a function of the quality of a student's interactions with the academic and social systems of the college.

The model asserts that students come to a particular institution with a range of background characteristics (e.g., sex, race, academic ability, secondary school performance, family social status) and goal commitments (e.g., highest degree expected, importance of graduating from college). These background characteristics and goal commitments influ-

Ernest T. Pascarella is associate professor of education, University of Illinois at Chicago Circle. Patrick T. Terenzini is director of institutional research, State University of New York at Albany.

0022-1546/80/0180-0060$00.50/0
Journal of Higher Education, 1980, Vol. 51, No. 1

ence not only how the student will perform in college, but also how he or she will interact with, and subsequently become integrated into, an institution's social and academic systems. "Given individual characteristics, prior experiences, and commitments, . . . it is the individual's integration into the academic and social systems of the college that most directly relates to his continuance in that college" [23, p. 96].

Recently, a small number of studies have presented evidence that at least partially supports the predictive validity of the Tinto model (e.g., [15, 20, 21]). These investigations can be faulted, however, by their somewhat indirect, and perhaps only surface assessment of Tinto's concepts of academic and social integration. The purpose of the present study was to examine the predictive validity of a measure constructed specifically to assess these two dimensions. In particular the study sought to determine whether a multidimensional measure of social and academic integration based on the elements of Tinto's conceptual model would significantly discriminate between freshman year persisters and voluntary dropouts with the influence of students' entering characteristics held constant.

The results of such an investigation might have significant implications for decisionmakers concerned with alleviating the potentially wasted resources associated with attrition at their institutions. Clearly not every decision to withdraw from an institution represents lost or wasted resources. It may well be the case, however, that a significant portion of student attrition might be prevented through timely and carefully planned institutional interventions. Such interventions will be most effective if those students with a high probability of dropping out can be accurately identified.

Method

Design and Sample

The study was longitudinal and was conducted at Syracuse University, a large independent university in central New York State with a total undergraduate enrollment of approximately 10,000 students. In July 1976 a simple random sample of 1,905 persons was drawn by computer from the total population of incoming freshmen. Sample members were sent a detailed questionnaire designed to assess their expectations of a variety of aspects of the college experience, as well as to collect selected background information; usable responses were received from 1,457 students (76.5 percent) who subsequently enrolled. During the spring semester of

the following year (1977), a second questionnaire was mailed to these 1,457 students seeking information on the reality of their college experience. After a mail and telephone follow-up, usable responses were received from 773 freshmen (53.1 percent response). Chi square goodness of fit tests indicated that the 773 freshmen were representative of the freshman population from which they were drawn with respect to sex, racial/ethnic origin, college of enrollment, academic aptitude (SAT scores), and freshman year cumulative grade point average.

A review of each student's records in September, 1977, indicated that 10 of the 773 had been dismissed or advised to withdraw because of unsatisfactory academic performance and 90 had voluntarily withdrawn from the university at the end of their freshman year. Since this study focuses on voluntary attrition the 10 academic drops were excluded from all further analyses. (The voluntary dropout rate of 11.8 percent in the sample is similar to previous known freshman year voluntary dropout rates at this institution.)

While it might be argued that Tinto's model is intended to explain attrition during the second, third, or fourth years of college as well as in the first year, evidence from Iffert [12], Eckland [10], Marsh [13], and Rootman [16], strongly suggests that attrition is heaviest at the end of the freshman year. Based on this evidence it was judged that analyses based on freshman students would provide a reasonable assessment of the predictive validity of the Tinto model.

Instruments and Variables

According to the Tinto model academic and social integration consist of several basic components. Extent of academic integration is determined primarily by the student's academic performance and his or her level of intellectual development. Social integration is primarily a function of the quality of peer-group interactions and the quality of student interactions with faculty. While the model places interactions with faculty in the domain of social integration, Tinto clearly suggests that such interactions may also enhance academic integration.

Levels of social and academic integration lead to an additional component which the model terms "commitments." This component consists of commitments to the institution and to goals associated with graduation and career. As level of institutional and goal commitment increases there is a corresponding increase in the likelihood of persisting at the institution.

In order to assess the various dimensions of social and academic integration, and goal and institutional commitment, a series of five-response

Likert items were developed. The items were constructed to tap the various aspects of each dimension as developed by Tinto. For example: *intellectual development:* "My interest in ideas and intellectual matters has increased since coming to this university"; *peer-group interactions:* "It has been difficult for me to meet and make friends with other students"; *interactions with faculty:* "My nonclassroom interactions with faculty have had a positive influence on my career goals and aspirations"; *institutional and goal commitments:* "It is important for me to graduate from college."

Initially fifty-five items were constructed. This list was subsequently shortened to thirty-four items which the authors judged to be those most adequately tapping the dimensions of the Tinto model. These thirty-four "institutional integration" items were then incorporated in the follow-up instrument administered to the sample during the spring semester of their freshman year. The items were coded 5 = strongly agree to 1 = strongly disagree.

A rather substantial body of research on college impact suggests that students' interactions with the college environment are not independent of the particular background characteristics that they bring to college (e.g., [3, 4, 6, 22]). Thus, an important issue in the study of college attrition, and Tinto's model, is the extent to which the assessment of differential levels of social and academic integration and institutional/goal commitment contribute to the prediction of persistence/dropout behavior when the influence of pre-college characteristics is taken into account.

The present study controlled for the following pre-college characteristics suggested as potentially important correlates of persistence/dropout behavior by various critical reviews of attrition research [9, 14, 17, 23]:

Sex
Racial/ethnic origin (nonminority or minority)
Initial program of enrollment (liberal arts or professional)
Academic aptitude (combined Scholastic Aptitude Test—SAT—scores)
High school achievement (percentile rank in high school class)
Number of high school extracurricular activities (of two hours or more per week on the average)
Expected number of informal contacts with faculty (per month of ten minutes or more outside of class)
Parents' combined annual income (in thousands of dollars)
Mother's formal education (seven 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.)
Importance of graduating from college (''extremely important'' to ''not at all important'')
Choice in attending this university (1st Choice to 4th or lower choice)
Confidence that choosing to attend this university was the right decision (''extremely confident'' to ''not at all confident'').

Additionally the study controlled for two other variables, freshman year cumulative grade point average and extent of involvement in extracurricular activities during the freshman year (of two hours or more per week on the average). Tinto has suggested that these two behaviors are potentially significant aspects of academic and social integration. Thus, it was judged important to take their influence into account when determining the independent predictive contributions of the institutional integration items.

The dependent variable, freshman year persistence/voluntary dropout behavior, was dummy coded 1 = persisters and 0 = voluntary dropouts. Data on all variables were obtained either from the follow-up instrument or from official university records.

Statistical Analysis

Data analysis began with a principal components factor analysis of the thirty-four institutional integration items to determine if the underlying factors were reasonably consistent with the dimensions posited by the Tinto model [7].[1] Multivariate analysis of covariance and discriminant analysis were then used to determine the predictive validity of the institutional integration scales derived from the thirty-four items. Multivariate analysis of covariance was employed initially to determine if the institutional integration scales significantly differentiated between freshman year persisters and voluntary dropouts with the influence of all preenrollment variables and academic performance and extracurricular involvement controlled statistically. Subsequently, setwise discriminant

[1]Factors were extracted according to the scree test [5] and rotated to the varimax criterion. Factor scale scores were computed for each respondent in the sample by summing the raw scores on items with rotated factor loadings of .35 and above on particular factor [1]. The purpose of computing factor scale scores by using characteristic items (rather than a complete estimation method in which all variables are used, regardless of their factor loadings) was to increase the internal consistency (alpha) reliability of the individual factor scales [1].

analysis and classification analysis were used to estimate variable contributions to group discrimination and the predictive utility of the scales.[2]

Prior to any statistical analysis the overall sample of 763 subjects was randomly divided into two samples of approximately ⅔ (n = 497) and ⅓ (n = 266). The larger of these two was used as a calibration sample for all statistical analyses. The discriminant function derived on the calibration sample was then applied to the raw data of the smaller, cross-validation sample for the purposes of judging the efficiency of the function in correctly classifying persisters and voluntary dropouts [11].

Results

Table 1 summarizes the results of the factor analysis of the academic/social integration and institutional/goal commitment items. The scree test yielded a solution of five factors with eigenvalues ranging from 6.14 to 1.67. This five factor solution accounted for 44.45 percent of the variance in the correlation matrix. Four items (not shown in Table 1) failed to load .35 or above on any factor and were not included in the computation of scale scores.

The composition of the five factors appeared generally consistent with the dimensions specified by the Tinto model. Items constructed to assess the quality of students' interactions with faculty, however, broke-out into two factors. The first, termed interactions with faculty, focused on faculty accessibility to students and the impact of student-faculty informal contacts. The second factor focused more on students' perceptions of faculty concern for student development and teaching and was so named. Items designed to measure goal commitment and institutional commitment tended to cluster together and yield a single, composite factor.

Table 1 also displays the alpha reliability for each factor scale as well as the simple and partial correlations with freshman year persistence/voluntary dropout decisions. The factor structure and alpha reliabilities are based on the entire sample, while the simple and partial correlations are based on the calibration sample. The alpha reliabilities of the scales

[2]Classification was based on the pooled covariance matrix and individual discriminant scores. Since accurate identification of potential dropouts might have greater utility for implementing institutional interventions than simply a high percentage of overall correct classification, prior probabilities were set at .50 for both groups despite a persister-dropout ratio in the sample of .882 to .118. This may have produced a conservative estimate of overall correct classification. However, it affords the discriminant function a greater opportunity to correctly classify withdrawals since they would have had less of a likelihood of being classified as persisters merely due to extremely low prior probabilities [8, 19].

TABLE 1

ITEM FACTOR LOADINGS, ALPHA RELIABILITIES, SIMPLE AND PARTIAL CORRELATIONS WITH PERSISTENCE/VOLUNTARY DROPOUT DECISIONS

Scale/Item	Loading	Scale Alpha	Simple *r*	Partial *r*
Scale I: Peer-Group Interactions		.84	.22*	.19*
Since coming to this university I have developed close personal relationships with other students	.82			
The student friendships I have developed at this university have been personally satisfying	.82			
My interpersonal relationships with other students have had a positive influence on my personal growth, attitudes, and values	.76			
My interpersonal relationships with other students have had a positive influence on my intellectual growth and interest in ideas	.72			
It has been difficult for me to meet and make friends with other students	−.71			
Few of the students I know would be willing to listen to me and help me if I had a personal problem	−.58			
Most students at this university have values and attitudes different from my own	−.37			
Scale II: Interactions with Faculty		.83	.35*	.34*
My nonclassroom interactions with faculty have had a positive influence on my personal growth, values, and attitudes	.86			
My nonclassroom interactions with faculty have had a positive influence on my intellectual growth and interest in ideas	.83			
My nonclassroom interactions with faculty have had a positive influence on my career goals and aspirations	.73			
Since coming to this university I have developed a close, personal relationship with at least one faculty member	.72			
I am satisfied with the opportunities to meet and interact informally with faculty members	.47			
Scale III: Faculty Concern for Student Development and Teaching		.82	.34*	.32*
Few of the faculty members I have had contact with are generally interested in students	−.77			
Few of the faculty members I have had contact with are generally outstanding or superior teachers	−.72			
Few of the faculty members I have had contact with are willing to spend time outside of class to discuss issues of interest and importance to students	−.58			
Most of the faculty I have had contact with are interested in helping students grow in more than just academic areas	.56			
Most faculty members I have had contact with are genuinely interested in teaching	.54			
Scale IV: Academic and Intellectual Development		.74	.17*	.16*

TABLE 1 (*Continued*)

ITEM FACTOR LOADINGS, ALPHA RELIABILITIES, SIMPLE AND PARTIAL CORRELATIONS WITH PERSISTENCE/VOLUNTARY DROPOUT DECISIONS

Scale/Item	Loading	Scale Alpha	Simple *r*	Partial *r*
I am satisfied with the extent of my intellectual development since enrolling in this university	.68			
My academic experience has had a positive influence on my intellectual growth and interest in ideas	.67			
I am satisfied with my academic experience at this university	.64			
Few of my courses this year have been intellectually stimulating	−.55			
My interest in ideas and intellectual matters has increased since coming to this university	.55			
I am more likely to attend a cultural event (for example, a concert, lecture, or art show) now than I was before coming to this university	.43			
I have performed academically as well as I anticipated I would	.41			
Scale V: Institutional and Goal Commitments		.71	.34*	.32*
It is important for me to graduate from college	.69			
I am confident that I made the right decision in choosing to attend this university	.63			
It is likely that I will register at this university next fall	.62			
It is not important to me to graduate from this university	−.59			
I have no idea at all what I want to major in	−.45			
Getting good grades is not important to me	−.44			

NOTE: Items scored 5 = strongly agree to 1 = strongly disagree, in computing factor scores items with negative loadings were recoded 1 = strongly agree to 5 = strongly disagree. In the column headed loading, only items with loadings of .35 or above were included in the computation of factor scale scores. In the column headed partial *r*, controlling for all pre-enrollment characteristics, freshman year academic achievement, and extent of participation in extracurricular activities; degrees of freedom = 479.

*$p < .01$.

ranged from .71 to .84 and were judged adequate for using the scales in further analyses. As Table 1 also indicates, both the simple and partial correlations of all scales with the criterion variable were significant at $p < .01$. The partial correlations represent the association between each scale and the criterion with the influence of all pre-enrollment variables, freshman academic performance, and involvement in extracurricular activities held constant.

The intercorrelations among the five scales were quite modest, ranging from .01 to .33 with a median correlation of .23. Thus, the scales would appear to be assessing dimensions of institutional integration that are substantially independent of one another.

Results of the multivariate analysis of covariance on the calibration sample yielded an overall multivariate F of 7.91 with 21 and 475 degrees of freedom ($p < .001$). The multivariate F for the covariates (i.e., pre-enrollment variables plus freshman year academic performance and extracurricular involvement) was nonsignificant ($F = 1.32$, $df = 16$ and 480, $p > .10$). The multivariate F for the five institutional integration scales, adjusted for the influence of the covariates, was 27.51 with 5 and 475 degrees of freedom, $p < .001$. The significant covariate analysis justified proceeding with discriminate analysis and classification procedures [11].

Table 2 summarizes the results of the setwise discriminant analysis as well as the descriptive statistics for persisters and voluntary dropouts in the calibration sample. The addition of the five institutional integration scales yielded an increase in the canonical R^2 (explanation of variation in group membership) of 21.46 percent. Each of the five scales significantly differentiated freshman persisters from voluntary dropouts at the univariate level with persisters tending to have higher scores on all factor scales than the voluntary dropout group. Because of the intercorrelations among variables, however, the probability statements associated with the univariate F ratios are somewhat ambiguous.

Inspection of the standardized discriminant weights, analogous to beta weights in a multiple regression, may be used to estimate the contributions of each variable to group discrimination [11, 19]. The relative size of the weights shown in Table 2 suggests that the institutional and goal commitments scale made the largest contribution to group discrimination followed by the interactions with faculty and the faculty concern for student development and teaching scales. Moreover these same three scales were the only variables to make individually significant unique contributions to group discrimination with all other covariates and institutional integration scales controlled (unique F in Table 2).

As already suggested by the nonsignificant change in the canonical R^2 attributable to the covariates, shown in Table 2, none of the unique contributions of the individual covariates were statistically significant at $p < .05$. In particular, neither freshman year grade performance, nor extent of involvement in extracurricular activities made significant contributions to the explanation of persistence/voluntary dropout decisions. The univariate F for freshman grade performance was 1.45 while the F for extracurricular involvement was 0.54.

Table 3 summarizes the results of classification analysis of both the calibration and cross-validation samples. As the table indicates, classification based on the covariates alone provided only a slight im-

TABLE 2

SUMMARY OF SETWISE DISCRIMINANT ANALYSIS ON THE CALIBRATION SAMPLE ($N=497$)

Variables	Change in Canonical R^2	PERSISTERS ($N=436$) M	SD	VOLUNTARY DROPOUTS ($N=61$) M	SD	Univariate F	Unique F	Standardized Discriminant Weight
Covariates: Precollege characteristics, academic achievement, and involvement in extracurricular activities (16 variables)	.0445						all n.s.	.02–.13
Institutional integration scales	.2146*							
Peer-group interactions		26.64	5.09	22.95	6.85	25.56*	1.20	.10
Interactions with faculty		14.48	4.19	9.82	3.71	67.76*	29.67*	.47
Faculty concern for student development and teaching		16.21	3.33	12.44	4.42	62.72*	12.35*	.32
Academic and intellectual development		22.97	4.41	20.59	4.88	15.21*	0.01	.01
Institutional and goal commitments		24.17	3.66	19.89	4.83	66.83*	35.57*	.53

NOTE: Overall Canonical R^2 with group membership = .2591; approximate chi square = 145.24 with 21 degrees of freedom, $p < .001$. Canonical R^2 based on the five institutional integration scales alone = .2381; approximate chi square = 134.26 with five degrees of freedom, $p < .001$. In the column headed univariate F, degrees of freedom = 1 and 495. In the column headed unique F, all covariates and all other institutional integration scales held constant, degrees of freedom = 1 and 475.

*$p < .001$.

TABLE 3
SUMMARY OF CLASSIFICATION ANALYSIS (IN PERCENTAGES)

	Classified Group			
	Calibration Sample		Cross-Validation Sample	
Actual Group/Variables	Persisters (N=436)	Voluntary Dropouts (N=61)	Persisters (N=237)	Voluntary Dropouts (N=29)
Covariates only				
Persisters	*62.2*	37.8	*58.2*	41.8
Voluntary dropouts	41.0	*59.0*	65.5	*34.5*
Overall correct	61.8*		55.6	
Covariates & institutional integration scales				
Persisters	*81.9*	18.1	*81.4*	18.6
Voluntary dropouts	19.7	*80.3*	24.2	*75.8*
Overall correct	81.7*		80.8*	
Institutional integration scales only				
Persisters	*80.3*	19.7	*78.9*	21.1
Voluntary dropouts	20.6	*79.4*	24.2	*75.8*
Overall correct	79.5*		78.5*	

NOTE: Percentage correct classification for each group italicized.
*$p < .001$; testing whether correct classification is significantly better than chance (i.e., 50 percent).

provement on chance (i.e., 50 percent correct, based on 2 groups). Substantial improvements in correct classification, however, were realized with the addition of the five institutional integration scales to the function. Correct classification was 81.7 percent for the calibration sample and 80.8 percent when the function was applied to the cross-validation sample. (The five academic integration scales alone correctly classified 79.5 percent of the calibration sample and 78.5 percent of the cross-validation sample, suggesting that little predictive accuracy is lost if the classification is based only on the five scales.) Such classification results suggest reasonable discriminating power and stability in the function.

Additional Analysis

It seems a reasonable assumption that the different dimensions of social and academic integration might have differential influences on decisions to persist or withdraw for different kinds of students [18, 20, 23]. To test for the presence of such interactions a series of twenty product terms were developed between student sex, racial/ethnic origin, initial college of enrollment, and academic aptitude on the one hand and each of the five institutional integration scales on the other. These product terms were then entered in the discriminant function, controlling for all covariates and all five institutional integration scales.

The addition of twenty interaction terms increased the explained variance in group membership from 25.91 percent to 30.91 percent (R^2 change = 5.00 percent, $F = 1.64$ with 20 and 455 degrees of freedom, $p < .05$). Of that 5.00 percent, however, 3.24 percent was explained by interactions between sex and the five institutional integration scales. Only two of the twenty interactions, made significant ($p < .05$) unique contributions to the explained variance in group membership with all other interactions controlled (sex × peer-group interactions, $F = 11.86$, $df = 1/455$; and sex × institutional and goal commitments, $F = 6.67$, $df = 1/455$).

The plots of the unadjusted means, shown in Figure 1, suggest that the quality of peer-group interactions may have been a more important factor in females' decisions to persist or withdraw than in males. Conversely, males' levels of institutional and goal commitments appear to have been somewhat more strongly associated with their likelihood of persisting or withdrawing than were those of the females in the sample.

Conclusions

The essential purposes of this study have been two-fold: (1) to develop a multidimensional instrument that assesses the major dimensions of the Tinto [23] 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. When added to a discriminant analysis based on fourteen pre-college characteristics, freshman-year academic performance, and extracurricular involvement, the five institutional inte-

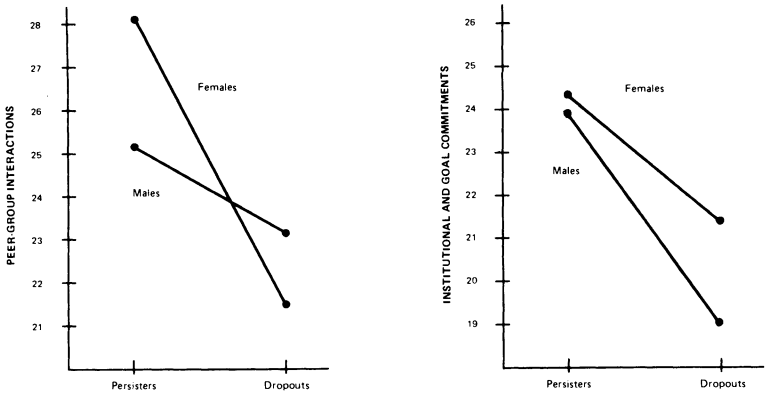

Fig. 1. Interactions Between Sex and Two Institutional Integration Scales

gration scales developed for this investigation increased correct identification of persisters and dropouts in a cross-validation sample from 58.2 percent to 81.4 percent and from 34.5 percent to 75.8 percent, respectively. Scores on the five scales alone correctly identified 78.9 percent of the cross-validation persisters and 75.8 percent of the students in the cross-validation sample who later dropped out.

Pantages and Creedon [14] have stressed the importance of identifying high probability dropouts so that intervention with counseling or other institutionally developed programs can be undertaken before withdrawal decisions are made. The performance of the five institutional integration scales in this study suggest that they may be useful in identifying potential freshman year voluntary dropouts during the second semester of the freshman year. Theoretically, discriminant analysis could be employed to develop a predictive equation based on the five scales which may be used to identify those students with a high probability of withdrawing. Random samples of these students might then be unobtrusively assigned to various experimental and control groups to determine the effectiveness of institutional interventions designed to decrease voluntary dropout rates.

The results generally support the predictive validity of the major dimensions of the Tinto model [23]. Of notable interest, however, were the particularly strong contributions of student-faculty relationships, as measured by the interactions with faculty and the faculty concern for student development and teaching scales, to group discrimination. Persisters' average scores on both scales were approximately one standard deviation higher than those students who dropped out voluntary at the end of their freshman year.

Such findings are consistent with previous research reporting significant associations between frequency of student-faculty informal contact and college persistence [15, 18]. Viewed in the perspective of previous findings, the present results suggest that the quality and impact of student-faculty informal contacts may be as important to students' institutional integration and, thereby, their likelihood of persisting in college as the frequency with which such interactions occur. Moreover, they underscore the potential importance of faculty, in both their formal teaching and informal nonteaching roles, as an influence on freshman students' decisions to persist or withdraw from a particular institution. Indeed, in the present sample scores on scales concerned primarily with the quality and impact of student-faculty relationships made greater estimated contributions to the prediction of subsequent decisions to persist or withdraw than did scores on the scale concerned with students' peer relationships.

Some caution must be observed, however, in estimating the relative contributions of each scale in the prediction of persistence/dropout decisions. An additional analysis indicated significant interactions between sex and scores on the peer-group interactions and institutional and goal commitments scales. Such evidence suggests that the relative utility of individual scales (and thereby the relative utility of individual dimensions of the Tinto model) in predicting persistence/dropout behavior may to some extent depend on the kinds of students being considered. In attempting to explain the complexities of the college attrition process, future research might profitably focus on similar interactions between student characteristics and specific institutional experiences.[3]

A second caution in interpreting the findings derives from the process by which decisions are made to persist or withdraw from a particular institution. While the five institutional integration scales appear reasonably useful in predicting students' subsequent membership in persister and voluntary dropout groups, it may well be that many students' decisions to withdraw occur substantially before the decision becomes official by their failure to register for the next year. Thus some students' responses on the five institutional integration scales might be biased by decisions to withdraw made prior to their completing the instrument.

In the present sample, however, such bias may not be a particularly significant factor. The correlation between the item that appears most likely to reflect persistence/withdrawal intentions, "It is likely that I will enroll in this university next fall," and official persistence/withdrawal decisions was only .33. Thus, at the time at which the instrument was complete, only about 11 percent of the variance in students' expressed intentions to persist or withdraw (as estimated by the above item) was associated with subsequent actual persistence/withdrawal decisions. Such evidence suggests that the vast majority of student decisions to voluntarily withdraw were made subsequent to completing the instrument.

Limitations

While the results of this investigation suggest that the five scales constructed to measure the major dimensions of the Tinto model may be useful in predicting subsequent persistence/dropout decisions, the study is clearly limited to its single-institution, single-year sample. Replication of

[3]This line of reasoning was extended in a study from the same data base: "Interaction Effects in Spady's and Tinto's Conceptual Models of College Dropout," which appeared in the October 1979 issue of *Sociology of Education*.

the investigation on samples from other institutions which trace persistence/dropout behavior past the freshman year would be useful in further determining the predictive validity of the scales.

References

1. Armour, D. "Theta Reliability and Factoring Scaling." In *Sociological Methodology: 1973-1974,* edited by H. Costner, San Francisco: Jossey-Bass, pp. 17-50.
2. Astin, A. *Preventing Students from Dropping Out.* San Francisco: Jossey-Bass, 1975.
3. _____. "Productivity of Undergraduate Institutions." *Science,* 136 (1962), 129-35.
4. _____. "Undergraduate achievement and institutional excellence." *Science,* 161 (1968), 661-68.
5. Cattell, R. "The Scree Test for the Number of Factors." *Multivariate Behavioral Research,* 1 (1966), 245-76.
6. Centra, J., and D. Rock. "College Environments and Student Achievement." *American Educational Research Journal,* 8 (1969), 305-16.
7. Comrey, A. "Factored Homogeneous Item Dimensions in Personality Research." *Educational and Psychological Measurement,* 21 (1961), 417-31.
8. Cooley, W., and P. Lohnes. *Multivariate Data Analysis.* New York: Wiley, 1971.
9. Cope, R., and W. Hannah. *Revolving College Doors: The Causes and Consequences of Dropping Out, Stopping Out and Transferring.* New York: Wiley, 1975.
10. Eckland, B. "College Dropouts Who Come Back." *Harvard Educational Review,* 34 (1964), 402-20.
11. Huberty, C. "Discriminate Analysis." *Review of Educational Research,* 45 (1975), 543-98.
12. Iffert, R. *Retention and Withdrawal of College Students.* Washington, D.C.: U.S. Department of Health, Education and Welfare, Bulletin No. 1, 1958. Washington, D.C.: U.S. Government Printing Office.
13. Marsh, L. "College Dropouts—A Review." *Personnel and Guidance Journal,* 44 (1966), 475-81.
14. Panatges, T., and C. Creedon. "Studies of College Attrition: 1950-1975." *Review of Educational Research,* 48 (1978), 49-101.
15. Pascarella, E., and P. Terenzini. "Patterns of Student-Faculty Informal Interaction Beyond the Classroom and Voluntary Freshman Attrition." *Journal of Higher Education,* 48 (1977), 540-52.
16. Rootman, I. "Voluntary Withdrawal from a Total Adult Socializing Organization: A Model." *Sociology of Education,* 45 (1972), 258-70.
17. Spady, W. "Dropouts from Higher Education: An Interdisciplinary Review and Synthesis." *Interchange,* 1 (1970), 109-21.
18. _____. "Dropouts from Higher Education: Toward an Empirical Model." *Interchange,* 2 (1971), 38-62.

19. Tatsuoka, M. *Multivariate Analysis: Techniques for Educational and Psychological Research*. New York: Wiley, 1971.
20. Terenzini, P., and E. Pascarella. "The Relation of Students' Pre-College Characteristics and Freshman Year Experience to Voluntary Attrition." *Research in Higher Education*, 9 (1978), 347–66.
21. _____. "Voluntary Freshman Attrition and Patterns of Social and Academic Integration in a University: A Test of a Conceptual Model." *Research in Higher Education*, 6 (1977), 25–43.
22. Thistlethwaite, D., and N. Wheeler. "Effects of Teacher and Peer Sub-cultures upon Student Aspirations. *Journal of Educational Psychology*, 57 (1966), 35–47.
23. Tinto, V. "Dropout from Higher Education: A Theoretical Synthesis of Recent Research." *Review of Educational Research*, 45 (1975), 89–125.