VOLUNTARY FRESHMAN ATTRITION AND PATTERNS OF SOCIAL AND ACADEMIC INTEGRATION IN A UNIVERSITY: A TEST OF A CONCEPTUAL MODEL

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This study assessed the validity of Tinto's (1975) theory of student attrition, which asserts that withdrawal relates most directly to students' integration in the social and academic systems of an institution. The study also examined the relative importance of these two dimensions. Multivariate analyses of variance indicated that both social and academic integration were significantly and independently related to voluntary freshman attrition. Discriminant analysis suggested, when the two variable sets were combined, that the joint contributions of the two sets were approximately equal, tending to support Tinto's assertion of the concomitant importance of these two constructs. The findings also suggest that informal interaction with faculty may play a more important role than presently specified by the model in the socialization of students, contributing to their integration into both the academic and social systems of the institution. The results also indicate that sizeable reductions in attrition may be possible only through actions which touch both the social and academic dimensions of the institutional environment.

Key words: voluntary freshman attrition

   Although national student attrition rates in higher educational institutions have held relatively constant at about 50% through the first half of this century (Summerskill, 1962) and, according to a recent study by Astin (1975), appear not to have changed markedly in the last decade, the phenomenon of student attrition may now be a more pressing concern than ever for higher educational administrators and planners. Recent increases in the costs of higher education and the projected leveling (if not decline) of student enrollments in the next five years have served only to exacerbate institutional concerns about the nature and remedies of the outward migration of students. This concern is particularly acute among the private

institutions, for whom institutional budgets are so closely tied to enrollment levels.

Efforts to understand this phenomenon and to reduce the misexpenditures of personal and institutional resources which attend student attrition have spawned an extensive, if uneven, literature on the nature and sources of attrition. Spady (1970) and Tinto (1975) provide recent, representative surveys of this literature, and both authors note the feast of descriptive studies of attrition but the comparative famine of conceptual frameworks to explain it. It seems clear, as both these authors conclude, that little is to be gained by additional descriptive, theoryless research employing univariate statistical procedures. What is needed, rather, if administrators and educational planners are to understand and deal with the complex process of student attrition, is theory-based research which adopts multivariate designs and statistical procedures.

Several explanatory theories of attrition have been developed in the last five years. Kamens (1971), for example, has reported empirical evidence to support his largely structural agrument that attrition can be explained by an institution's social charter and size. According to this model, large (and also more prestigious) institutions exert greater holding power over students by means of their stronger status-allocating roles. Because these institutions have a variety of professional schools and programs available on campus and established networks of corporate recruiters and alumni of these programs, enrolled students are afforded a greater choice and likelihood of access to a broad range of vocations and economic groups outside the academic profession. Students are dependent on the institution for access to these opportunities, and, consequently, their commitment to the institution is greater and they are more likely to remain.

Rootman (1972), on the other hand, has developed an interactional theory which asserts that voluntary withdrawal is functionally related to the goodness of the "person-role" fit between the individual and the normative environment of the institutional world he inhabits. To the degree that the fit is a poor one, the individual experiences strain, and withdrawal becomes a mechanism for coping when that tension becomes too great.

Spady (1970) has also developed an interactional model in which personal attributes such as dispositions, interests, attitudes, and skills interact with environmental influences and sources of demands such as courses, faculty members, administrators, and peers. This interaction provides a student with opportunities for successful assimilation into the social and academic systems of an institution, and the student's decision to remain or withdraw is heavily influenced by the sufficiency of the rewards he finds within these systems.

A conceptual model which is similar to, yet more elaborate than, Spady's has been given by Tinto (1975). Whereas the principal element in Spady's

conceptualization of attrition lies in the domain of social integration, Tinto asserts an approximate parity between the interacting influences of integration in both the social and academic systems of an institution. Furthermore, Tinto's model seeks to distinguish conceptually between those interactional patterns which lead to varying forms of dropout behavior normally subsumed under the general rubric of attrition. Specifically, he attempts to distinguish between those behaviors which lead to academic dismissal and those which lead to voluntary withdrawal from the college. It is with the validity of this latter model, specifically as it relates to voluntary withdrawal, that this paper is concerned.

According to Tinto:

> 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. Given prior levels of goal and institutional commitment, it is the person's normative and structural integration into the academic and social systems that lead to new levels of commitment. 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).

The model is complex. It takes into account students' background characteristics, levels of commitment to completing a postsecondary degree program, commitment to the institution in which a student is enrolled, elements of the environment external to the institution, and the influences of all these interrelated variables on social and academic integration and subsequent levels of commitment to institutional attendance. But a longitudinal assessment of the primacy in withdrawal decisions of students' interactions with the social and academic systems of an institution is likely to be beyond the present data resources of most colleges or universities.

However, it is possible, and it is the purpose of the present study, to assess cross-sectionally the validity of the two central principles of the Tinto model. Specifically, this investigation sought to determine (1) the degree to which a freshman student's integration in the social and academic systems of an institution is functionally related to attrition or retention, and (2) the relative explanatory potency of these two dimensions of the theoretical framework.

The present investigation is limited in several ways. As will be seen in the following section, the data are cross-sectional (whereas the full Tinto model is longitudinal), are based on students enrolled in a single college (albeit the largest, enrolling 49.2% of the freshman class) at a single institution, and are derived from variables which probably only begin to measure the complexity of Tinto's major constructs. Additionally, the model specifies the importance of students' background characteristics:

while the present study adopts a multivariate design and statistical procedures, the sample sizes were not sufficiently large to include all variables in the analyses. The results of post hoc comparisons of groups on certain background variables for which data existed are, however, reported. Finally, no information was available on such potentially important variables as students' social and economic attributes which may influence patterns of social and academic integration and interaction.

METHODOLOGY
Instrument

If a student is fully integrated in the social and academic systems of an institution, then presumably that individual will have more positive perceptions of those two dimensions of the institutional environment, participate more extensively in social activities, and perform at a higher level of academic achievement than will less fully integrated students.

To assess levels of normative integration in the academic system of the university, subjects were asked to indicate their perceptions of their academic program; these self-reports were supplemented by each subject's cumulative grade-point average, taken directly from students' academic records, at the end of the freshman year. Grade-point average is specifically identified by the model as a measure of a student's structural academic integration (Tinto, 1975, p. 92).

Assessments of subjects' integration in the social system of the university were made on the basis of their perceptions of their nonacademic lives, the number of extracurricular activities in which they reported participation, and the number of times they reported interacting informally with faculty members outside of class for ten minutes or more. Clearly, informal interaction with faculty members may well comprise both academic and social dimensions: "interaction with the faculty not only increases social integration and therefore institutional commitment but also increases the individual's academic integration" (Tinto, 1975, p. 109). Nonetheless, interaction with faculty is placed clearly within the social integration portion of his conceptual scheme (Tinto, 1975, p. 95), and for that reason, the present study treated the amount of informal contact with faculty members as an index of social integration.

As a measure of their ratings of their academic program, students were asked to rate the statement "I have found my academic program at S.U. to be:" on the Adjective Rating Scale (ARS) (Kelly and Greco, 1975). The ARS was also used by subjects to respond to the statement "I have found my nonacademic life at S.U. to be:." The ARS consists of 24 adjectives (e.g., good, enjoyable, demanding, boring, useless, practical, interesting) against which the respondent rates certain statements using the following four-point scale: 1 = extremely, 2 = very, 3 = somewhat, and 4 = not at

all. The adjectives initially selected in the development of the instrument were chosen from descriptors typically employed by students to rate the instruction received in individual undergraduate courses. A series of factor analytic studies using different methods of factor analysis indicated a stable, underlying solution consisting of five factors. The internal consistency reliability of the scales derived from these factors ranged from .71 to .85 and, over a seven-week period, test-retest reliability coefficients ranged from .66 to .98. Subsequent validational analysis indicated substantial correlations ($r = .58$ to .93 in magnitude) among the five factors of the ARS and the evaluation, potency and activity dimensions of the Semantic Differential (Kelly and Greco, 1975).

Additional items on the instrument asked students to indicate both the number of times during the spring semester they had met informally with faculty members, outside of class, for ten minutes or more, and the number of organized extracurricular activities in which they had participated during the year.

Sample

The setting for the study was Syracuse University, a large, private university with a total undergraduate enrollment of approximately 10,000 students located in central New York state. A simple random sample of 500 freshmen was drawn by computer from the population of freshmen enrolled in the College of Arts and Sciences at that institution. The Arts and Sciences population from which the sample was drawn was approximately 54% male and 46% female at the beginning of the spring, 1975 semester.

Instruments were distributed by mail in late March 1975. Subsequent to a mail follow-up, conducted on a random sample of nonrespondents approximately three weeks after the initial mailing, usable responses had been obtained from 379 subjects, yielding a response rate of 75.8%. The representativeness of the sample was suggested by the relatively high rate of response and a chi-square analysis indicating nonsignificant differences between the distribution of responding males and females and the distribution of males and females in the population from which the sample was drawn.

In September 1975, it was determined that 66 of the original sample members had not returned for the start of their sophomore year. Six of these 66, because of academic reasons, had been denied permission to register. Because of their small number, it was not possible to treat ''academic drops'' as a discrete group, and consequently, they were excluded from all analyses. Thus, this study focuses on the differences between students who continued their enrollment into their sophomore year and those who voluntarily withdrew at the end of their freshman year.

A random sample of 60 of the 313 stayers was drawn for purposes of making comparisons with the group of leavers. A series of goodness-of-fit tests and comparisons of variable means and standard deviations indicated that this sample of 60 stayers was representative of the larger sample from which it was drawn. The remaining 253 stayers were held for use in a cross-validation analysis to be discussed in the next section of this paper.

Analysis

Although the factor structure of the Adjective Rating Scale was previously developed on a sample of 769 subjects, the stimulus statement to which the subjects responded pertained to specific courses (Kelly and Greco, 1975). In the present study, students were being asked to rate somewhat broader experiences, i.e., the academic program and their nonacademic life. It was, therefore, judged necessary to empirically determine the factor structure which held for this somewhat different use of the ARS and verify its degree of structural similarity with the original factor solution.

Analysis of the data thus began with a principal-components analysis of subjects' ARS responses, one's being placed in the diagonal of the correlation matrix instead of estimated communalities in order to avoid the assumptions and indeterminacies associated with the use of the latter (Rummel, 1970). A separate analysis was done for each of the two statements rated. Following Kaiser's (1959) varimax criterion, components with eigenvalues > 1.0 were extracted and subjected to varimax rotation. The rotated components will hereafter be referred to as factors. "Program relate" (Veldman, 1967) was used to compare the structural similarity of the original solution reported by Kelly and Greco (1975) and the factor solution yielded by the use of the ARS in the present study. Program relate permits the comparison of factor structures from two independent sample groups by holding one structure fixed and rotating the second structure on it until maximal similarity is achieved among the individual test vectors (test vectors in the present study are the 24 adjective scales). The degree of rotation required to achieve maximal similarity is expressed as a matrix of cosines, which may be regarded as a matrix of correlations between the two sets of factor vectors.

Mean factor scales were computed for each respondent by summing his raw scores on variables with rotated factor loadings of .40 and above on a particular factor and dividing by the number of variables. A variable which loaded above .40 on two dimensions was included in the computation of factor scales for that factor on which it had the higher loading. The purpose of computing factor scales by using characteristic variables rather than a complete estimation method (in which all variables, regardless of their

factor loadings, are used) was to increase the internal consistency (alpha) reliability of the individual factor scales (Armor, 1974). At the same time, using only those variables with high loadings to compute factor scales may result in the loss of orthogonality and lead to substantial interscale correlations. The authors judged that it would be preferable to optimize the internal consistency reliability of each scale despite the potential loss of orthogonality, since the latter situation can be dealt with effectively by employing multivariate procedures which control for the correlations among variables, specifically discriminant analysis.

To determine if the measures of academic and social integration could differentiate independently of one another between the groups of leavers and stayers, the two variable sets were subjected separately to multivariate analysis of variance and to stepwise discriminant analysis. To assess the *relative* contributions of academic and social integration measures to the separation of leavers and stayers, the combined variable sets were also employed as predictors in a stepwise discriminant analysis. At this third stage, in the interest of parsimony and conceptual clarity, the minimum F-to-Enter (the criterion controlling the order of entry into the equation) was set at 1.0 in order to select only those variables which optimally differentiate between the groups. This procedure was in contrast with the previous two discriminant analyses in which the full model was used, all variables entering the equation.

Finally, to permit some estimation of the potency of the discriminant functions in all analyses, and to assist judgment on which variable set was more important in students' withdrawal decisions, a classification analysis based on the pooled covariance matrix and individual discriminant scores was performed. In this portion of the analyses, the 253 stayers whose scores had not been employed in the derivation of the discriminant function were also classified as a means of cross-validating the predictive power of the functions obtained.

Computer programs employed in the data analyses were program relate (Veldman, 1967), and subprogram factor and subprogram discriminant from the "Statistical Package for the Social Sciences" (Nie et al., 1975).

RESULTS

Factor analysis of students' ARS ratings of their academic program and their ARS ratings of their nonacademic life yielded five and four factors, respectively, with eigenvalues greater than 1.0. The composition of these two sets of factors is shown in Tables 1 and 2. Asterisked loadings indicate those variables on each factor used to compute factor scales. Each factor has been given a tentative name which was felt to represent the underlying psychological construct tapped. The reader is cautioned, however, against

attributing surplus meaning to the factors beyond the scales which characterize them.

Tables 1 and 2 also show the alpha (or internal consistency reliability) coefficients computed for each set of factor scales. As shown in Table 1,

TABLE 1. Varimax Factor Loadings Derived From Subjects' Adjective Rating Scale Responses to the Statement "I Have Found My Academic Program To Be:" (N = 379)

Variable	I Interest value	II Dullness/ apathy	III Practical appeal	IV Difficulty/ challenge	V Uniqueness	h^2
Enjoyable	.778*	—.120	.133	—.010	.177	.669
Exciting	.756*	—.102	.184	.065	.240	.677
Stimulating	.738*	—.212	.112	.039	.078	.609
Enlightening	.706*	—.102	.216	.172	.153	.608
Interesting	.668*	—.369	.104	.204	—.137	.654
Rewarding	.660*	—.214	.368	.042	.027	.627
Good	.615*	—.264	.214	.232	—.056	.551
Provocative	.584*	—.010	.194	.063	.061	.396
Informative	.535*	—.293	.264	.265	—.136	.530
Irrelevant	—.005	.753*	—.310	—.008	—.103	.673
Dull	—.393	.706*	.003	.072	—.062	.661
Boring	—.412	.658*	.039	—.067	.090	.617
Useless	—.209	.647*	—.418	.019	—.151	.660
A waste	—.239	.623*	—.375	—.060	—.205	.632
Necessary	.159	—.084	.739*	.105	.145	.610
Practical	.352	—.179	.602*	.015	.076	.524
Valuable	.512	—.281	.583*	.148	—.067	.707
Worthwhile	.498	'—.374	.513*	.068	—.053	.658
Relevant	.322	—.398	.442*	.124	—.135	.491
Demanding	.094	—.024	.069	.855*	.125	.761
Difficult	.054	.111	—.025	.852*	—.027	.743
Challenging	.318	—.218	.267	.687*	.137	.711
General	—.025	.386	.011	—.078	—.695*	.640
Different	.353	.162	.202	.154	.549*	.518
Eigenvalues (pre-rotated)	9.229	2.100	1.527	1.070	1.005	
Eigenvalues (rotated)	5.534	3.374	2.650	2.233	1.123	
%variance	23.08	14.06	11.01	9.33	4.67	
Cum. Variance	23.08	37.14	48.15	57.48	62.15	
Alpha reliability	0.898	0.852	0.817	0.778	0.274	

Note: Variance percentages are rotated figures.
*Indicates variables used to compute factor scales and alpha reliability coefficients for each scale.

scales for factor V, uniqueness, had a computed coefficient alpha of only .274. This dimension was therefore not included in further analyses. Similarly, factor IV, unnamed in Table 2, was not included in further

TABLE 2. Varimax Factor Loadings Derived From Subjects' Adjective Rating Scale Responses to the Statement "I Have Found My Non-academic Life To Be:" (N = 379)

Variable	I Interest value	II Demand/ challenge	III Practical appeal	IV Unnamed	h²
Exciting	.836*	.146	.154	.001	.745
Enjoyable	.814*	—.052	.264	—.030	.735
Good	.783*	.043	.311	—.083	.718
Interesting	.717*	.073	.318	—.004	.621
Stimulating	.709*	.141	.379	—.049	.668
Rewarding	.706*	.213	.345	.171	.691
Enlightening	.666*	.168	.290	.139	.576
Boring	—.633*	.173	—.194	.319	.571
Worthwhile	.605*	.179	.531	.074	.685
Dull	—.601*	.097	—.329	.373	.619
Valuable	.585*	.189	.556	.085	.694
Provocative	.565*	.207	.240	.135	.438
Demanding	.128	.779*	.088	—.128	.648
Challenging	.215	.745*	.181	—.020	.635
Difficult	—.279	.735*	—.108	.106	.641
Different	.294	.418*	.149	—.060	.287
Irrelevant	—.238	.037	—.724*	.237	.638
Useless	—.268	—.003	—.713*	.300	.670
A waste	—.275	.002	—.696*	.279	.639
Relevant	.375	.122	.628*	.235	.604
Practical	.264	.167	.544*	.209	.438
Informative	.391	.231	.544*	.290	.586
Necessary	.353	.211	.487*	.213	.452
General	.029	—.133	—.015	.698	.507
Eigenvalues (pre-rotated)	9.969	2.113	1.278	1.147	
Eigenvalues (rotated)	6.645	2.311	4.248	1.299	
% variance	27.66	9.60	17.70	5.45	
Cum. variance	27.66	37.20	54.90	60.35	
Alpha reliability	0.941	0.694	0.836	—	

Note: Variance percentages are rotated figures.
*Indicate variables used to compute factor scales and alpha reliability coefficients for each scale.

analyses because it was judged to be uninterpretable within the context of the statement rated.

The results of program relate indicated a high degree of structural similarity between the original Kelly and Greco (1975) factor solution and the two solutions yielded in the present study. Cosines (interpretable as correlation coefficients) between the original ARS factors and those derived from the present sample's ARS ratings of their academic program ranged from .87 to .97. Similar congruence was indicated between the original factors and students' ARS ratings of their nonacademic lives, these cosines ranging from .70 to .95.

Table 3 displays the means, standard deviations, and univariate analysis of variance F-ratios for each of the ten predictor variables, as well as the multivariate analysis of variance F-ratios for each of the variable sets when analyzed separately. As the multivariate F-ratios indicate, the academic integration set differentiated significantly between the vectors of means for leavers and stayers at the .01 level, while vectors of means for the two groups on the social integration set were significantly different at the .001 level. The univariate F-ratios are useful in descriptive interpretations, but because of the intercorrelations among the variables within and between variable sets, the univariate tests of significance are not independent, and therefore the probability statements associated with them are difficult to interpret reliably. Since discriminant analysis takes the correlations among variables into account, the information it provides is more meaningful.

The results of the stepwise discriminant analyses, indicating the relative importance of each variable in each set, as well as in the combined analysis, are shown in Table 4. In the combined analysis, six variables entered the equation and yielded a multivariate F of 6.14 (d.f. $=6/113$, p$<$ .001).

A test of the significance of the discriminant function for the academic integration set (Part A of Table 4) produced a x^2 value of 15.572 (d.f. $=5$, p $<$ .01) and a canonical correlation of .355 with group membership. Interest value in the academic program made the largest change in Rao's V (an index of the amount of incremental discrimination attributable to each variable, given those variables which are already in the equation) and also contributed the most to the discriminating power of the function, as indicated by its standardized discriminant weight.* As shown in Table 3, stayers reported having significantly more interest in their academic

*Standardized weights are an index of the relative contribution of each variable to the separation of groups and are interpretable as beta weights in a multiple regression. Like beta weights, they must be interpreted cautiously. The order in which a variable enters the analysis and the amount of change in Rao's V are two other clues to a variable's importance. The standardized coefficients were judged to be the best indicators, however (Tatsuoka, 1971), and in this study they bear the major interpretive burden.

TABLE 3. Means, Standard Deviations, and Univariate F-Ratios for Leavers and Stayers for Ten Dependent Variables

Variable	Stayers (n = 60) Mean	S.D.	Leavers (n = 60) Mean	S.D.	Univariate F-ratio [a]
Academic integration:					
Interest value (acad. prog.)	2.48	.55	2.83	.46	14.60**
Dullness/apathy (acad. prog.)	3.43	.50	3.19	.55	6.34*
Practical appeal (acad. prog.)	2.32	.60	2.69	.55	12.56**
Difficulty/challenge (acad. prog.)	2.37	.63	2.49	.56	1.16
Cumulative grade-point average	2.45	.72	2.45	.75	.01

Multivariate F = 3.37, with 5 and 114 degrees of freedom (p < .01)

Variable	Stayers (n = 60) Mean	S.D.	Leavers (n = 60) Mean	S.D.	Univariate F-ratio [a]
Social integration:					
Interest value (nonacad. life)	2.03	.58	2.36	.59	9.08†
Demand/challenge (non-acad. life)	2.71	.56	3.06	.47	13.23**
Practical appeal (nonacad. life)	1.79	.51	2.00	.58	4.69*
Informal interaction with faculty	5.75	7.11	2.07	2.65	14.14**
No. of extracurricular activities	1.77	1.72	1.47	2.32	.64

Multivariate F = 5.72, with 5 and 114 degrees of freedom (p < .001)

[a] Univariate degrees of freedom = 1 and 118.
 *p<.05
 †p<.01
 **p<.001

Note: The Adjective Rating Scale is scored: 1 = extremely, 2 = very, 3 = somewhat, and 4 = not at all. Thus, for example, lower scores are more positive on interest value, while the reverse is true on dullness/apathy.

programs than did leavers. (Recall that the ARS is scored 1 = extremely, to 4 = not at all.) The practical appeal factor of students' ARS ratings of their academic program also made a contribution to the function but slightly less than two-thirds as much as the interest value factor. Given Tinto's theory, this indicates a significantly higher level of academic integration among stayers than among leavers. It also appears, from the discriminant weights, that cumulative grade-point average does not discriminate meaningfully between the two groups.

The discriminant analysis of the social integration variables set (Part B of Table 4) yielded a function with a x^2 value of 25.837 (d.f. = 5, p < .001)

TABLE 4. Stepwise Discriminant Analysis Results for Academic and Social Integration Variable Sets Separately and Combined

Step	Variable	Change in Rao's V[a]	Standardized discriminant weights
	A. *Academic integration:*		
1.	Interest value (acad. prog.)	14.54**	— .71
2.	Practical appeal (acad. prog.)	1.13	— .44
3.	Cumulative grade-point average	.66	— .18
4.	Dullness/apathy (acad. prog.)	.10	— .13
5.	Difficulty/challenge (acad. prog.)	.51	.16
	[Discriminant function $X^2(5)$=15.572, p < .01. Canonical r = .355]		
	B. *Social integration:*		
1.	Informal interaction with faculty	14.14**	−1.22
2.	Demand/challenge (non-acad. life)	11.45**	1.03
3.	Interest value (nonacad. life)	3.85*	.84
4.	Practical appeal (nonacad. life)	.13	— .18
5.	No. of extracurricular activities	.00	.02
	[Discriminant function $X^2(5)$=25.837, p < .001. Canonical r = .448]		
	C. *Academic and social combined:* (F-to-enter 1.0)		
1.	Interest value (acad. prog.)	14.54**	— .30
2.	Demand/challenge (nonacad. life)	10.59**	−1.00
3.	Informal interaction with faculty	5.94*	.93
4.	Difficulty/challenge (acad. prog.)	2.44	.66
5.	Interest value (nonacad. life)	2.59	— .56
6.	Practical appeal (acad. prog.)	2.30	— .69
	[Discriminant function $X^2(6)$=32.413, p < .001. Canonical r = .496]		

[a] Indicates increase in discrimination attributable to each variable.

*p < .05   †p < .01   **p < .001

and a canonical correlation coefficient of .448 with group membership. The amount of informal interaction with faculty outside the classroom and the demand or challenge level found in students' nonacademic lives were the principal contributors to the separation between the groups. This is reflected both in the amount of change in Rao's V attributable to each of those variables and in the relative magnitudes of their standardized weights. The interest value factor for students' ARS ratings of their nonacademic lives made a moderate contribution to the function.

As indicated in Table 3, stayers reported significantly more informal contacts with faculty members and also found their nonacademic lives to be significantly more demanding and challenging than did leavers. This finding strongly suggests that stayers, when compared with leavers, were also significantly more involved in the social system of the university.

Results of the discriminant analysis of the combined variables sets (only those variables with an F-to-enter of 1.0 or greater entering the equation) are shown in Part C of Table 4. This portion of the analysis indicates the contribution of only the most discriminating variables and permits a simultaneous assessment of the importance of academic and social integration in students' withdrawal decisions. The discriminant function yielded a X^2 value of 32.413 (d.f.=6, p < .001) and a canonical correlation with group membership of .496. The standardized weights indicate that the demand/challenge factor of students' ARS ratings of their nonacademic lives is the single most important contributor to the separation of the two groups, followed closely by the amount of informal interaction with faculty members. Notably, cumulative grade-point average and the number of extracurricular activities did not enter the equation. Moreover, the correlations between variables of the two sets were modest (range =|.00|to |.36|, median r = .20).

To gain some indication of the sharpness of the separation between the groups and to ascertain the reliability of the discriminant functions, the discriminant scores of the 60 leavers and 60 stayers were subjected to classification analysis. The 253 known stayers whose raw scores had not been employed in the derivation of the functions were also used as a cross-validation group in the classification analysis.

The academic integration variable set correctly classified slightly more stayers (68.3%) than leavers (65.0%), with 57.3% of the cross-validation group being correctly classified. For the social integration set, the proportions of leavers and stayers correctly classified were roughly reversed, 70.0% of the leavers and 63.3% of the stayers being properly assigned to their group. The social integration variables permitted correct classification of 56.1% of the cross-validation group. Not surprisingly, when the sets were combined, the percentages of all three groups correctly classified were increased: 78.3% of the leavers, 66.7% of the stayers, and

59.3% of the cross-validation group members. In all three instances, the proportion of cross-validation stayers correctly classified represented significant improvements on chance: for the academic integration variables, p < .025; for the social integration measures, p < .05; and for the combined sets, p < .002. Since one might expect 50% correct classification by chance alone, the practical value of predicting group membership on the basis of the variables employed in this study is modest at best, despite the statistically significant improvements on chance.

The questionnaire also asked respondents to rank faculty members, academic work, other students, and extracurricular activities as sources of positive influence on their intellectual growth and on their personal development. Based on the previous results of the discriminant analyses, it was hypothesized that stayers would rank faculty members higher as a positive influence in both areas than would leavers. Directional Mann-Whitney U-tests (Hays, 1963, pp. 633-635) for the significance of differences in means for ordinal data supported this hypothesis. Stayers did in fact rank faculty members higher as a positive influence on both their intellectual growth ($z = -2.46$, p < .01) and on their personal development ($z = -2.77$, p < .01) than did leavers. This finding, when coupled with the fact that stayers had a significantly higher frequency of informal contact with faculty than leavers, further tends to support Tinto's view that informal interaction with faculty members is related both to academic and to social integration and consequently, according to the theory, to attrition and retention.

Background characteristics were not included in the design because data on some subjects were incomplete. Supplementary post hoc analyses indicate, however, no statistically reliable differences between leavers and stayers in this study with respect to sex; academic aptitude, as measured by SAT verbal and quantitative scores; or preregistration expectations of the college environment, as measured by College Characteristics Index (CCI) scores (Stern, 1970). Nor were reliable differences observed between the groups, following a semester and a half in attendance, with respect to their expected major courses of study; their orientations toward college, as defined by the Clark-Trow typology (Gottlieb and Hodgkins, 1968); or their primary preference of educational goals. Furthermore, a series of canonical correlation analyses indicated that students' ARS ratings of their academic and nonacademic experiences were not significantly related at p < .05 to either their personality needs, as measured by the Activities Index (AI) (Stern, 1970) or their expectations of the institutional environment (CCI). AI and CCI data were available for 242 of the 379 subjects.

DISCUSSION

The findings of this study largely tend to support the predictive validity of the principal elements of Tinto's theoretical conception of student attrition (Tinto, 1975). Separate multivariate analyses of variance of the academic and social integration variable sets indicate that each set, independent of the other, is able to differentiate significantly between groups of stayers and voluntary leavers. Predictably from Tinto's conceptual framework, stayers had significantly more positive perceptions than leavers of both their academic programs and their nonacademic lives. However, while higher levels of normative integration in the institution's academic system is apparently related to retention, the role of students' structural integration, reflected in the model and this study by cumulative grade-point average, does not appear to be a salient dimension of voluntary withdrawal. Nor were the groups initially different in academic aptitude.

Similarly, level of integration in the normative social system of the institution successfully discriminated those who withdrew voluntarily from those who remained. Consistent with predictions based on the theoretical model, stayers reported significantly more contacts with faculty members and also reported finding their nonacademic lives to be significantly more demanding and challenging than did leavers. The expectation that stayers would also be more active than leavers in extracurricular activities was not, however, supported by the data.

When the two variable sets were combined in a discriminant analysis, to gain some insight into the relative importance of the individual variables from each set, the standardized discriminant weights indicated that the separation between groups derived principally from the degree to which students found their nonacademic lives to be demanding or challenging and the amount of informal interaction with faculty members. Moderate contributions were also made by the practical appeal and difficulty/ challenge factors associated with the academic program and the interest value factor related to students' ratings of their nonacademic lives.

The results of these analyses tend to confirm Tinto's theoretical view that social and academic integration are approximately equally important in students' decisions to remain or withdraw. Both variable sets significantly discriminated between stayers and voluntary leavers. When the sets were combined, the standardized discriminant weights suggested that the contribution of the social integration dimensions was somewhat greater than that of the academic integration indicators. However, it would be misleading to conclude that significantly greater discrimination is associated with the social integration set than with the academic integration measures. The second largest contributor to the discriminant

function based on both variable sets was the amount of informal interaction
with faculty members. Tinto acknowledges the practical and conceptual
overlap between faculty interaction and social and academic integration,
and had that variable been incorporated into this design as a measure of
academic integration, the effect would have been to bring the relative
importance of the two sets into even closer parity than they already appear
to be.

The role of faculty contact is of particular interest for another reason, and
it provides an important insight into the model and its topic. A
supplementary analysis of the rank-ordering of faculty members as a
source of positive influence on intellectual and personal development
indicated that in both instances stayers ranked faculty members
significantly higher than did leavers. Moreover, informal interaction with
faculty correlated somewhat higher with normative academic integration
dimensions (range = $|.15|$ to $|.36|$) than with normative social integration
measures (range = $|.07|$ to $|.14|$). These findings, together with the evident
importance of informal interaction with faculty in discriminating between
stayers and voluntary leavers, have several implications for the theoretical
framework.

First, they suggest what appears to be a critical role for faculty members
in the socialization process, a role not identified by the model as being any
more salient than that of other elements. Second, the results suggest that,
for those students who persist, the impact of faculty as socializing agents
may have both cognitive and affective dimensions. Third, they imply that
informal contact with faculty may be as important to the normative
academic integration of students as to their social integration, the domain
to which it is not conceptually consigned.

Unaddressed by this study and the model (conceptual weaknesses of
both, perhaps) are issues relating to how student interaction with faculty is
initiated, the specific nature(s) of that contact, the processes that are
involved, the contexts in which it occurs, and a clearer specification of the
outcomes of that interaction. Nor do the data in this study speak to the
issues of student value systems or social attributes which may promote or
obstruct such interaction. Information relating to faculty members, their
institutional reward systems, and educational philosophies is similarly
missing.

Supplementary, post hoc analyses failed to support the concomitant
importance in the model of students' background characteristics. In this
study, no reliable differences were observed between the groups with
respect to sex, academic aptitude, or preregistration expectations of the
institutional environment. Nor were significant differences found between
the groups, after a semester and a half in attendance, with respect to areas
of planned major course of study, Clark-Trow orientation toward college, or

primary preference in educational goals. Furthermore, students' ratings of their academic and nonacademic experiences were found to be largely independent of their personality needs and their initial expectations of the institutional environment. It is quite possible, of course, that background factors other than those examined here play important roles in determining students' "proneness" to withdrawal, but the determination of the importance of those factors, relative to those investigated here (and others), must await further research.

The results of this study have several other implications—both for future theoretical research and for educational policy. In the main, the Tinto model appears to represent a useful conceptual tool for understanding and explaining student attrition. In several areas, however, and as warranted by the results of future research, the model might be modified. Specifically, the possibility that frequent interaction with faculty members may represent a principal vehicle of the socialization of students into both the social and academic realms of an institution needs to be verified and clarified by further study. Such investigations might fruitfully assess those individual characteristics of students and faculty members which facilitate such interaction, as well as the processes by which, and the contexts in which, it occurs. Research dealing with the context of this interaction will need to address a number of structural considerations: To what degree do such considerations as institutional size, faculty reward systems, academic counseling program structures, faculty development programs, and hiring criteria promote or inhibit frequent student contact with faculty members?

Peer group interactions, an element of the model unexamined in this study, also warrants further attention, both as they relate to the normative integration of students in an institution's social system and as they distribute social rewards or sanctions for interacting with faculty members. To what degree are the influences and rewards of faculty and peers working at crosspurposes in the socialization process?

Finally, with respect to future research, this study highlights the need for research with designs and statistical procedures suited to the complexity of the problem. Studies such as those suggested above might well be based on path models. Clearly, conventional multivariate procedures can take us only so far; powerful as these techniques may be, their applicability in this area is severely restricted by statistical considerations. Path analysis will require data on diverse variables already known to be associated with attrition, but withdrawal decisions are a labyrinthine phenomenon and such a problem is not likely to yield to the application of simple designs or univariate statistical procedures.

Administrators and policy planners who seek *the* lever by means of which substantial reductions in attrition might be realized are not likely to find much solace in the results of this study. There appears to be no single

area that can be addressed in institutional efforts to effect significant reductions in attrition rates, at least among freshmen. Rather, major savings may be realizable only through broadly conceived institutional changes, revisions which touch both the social and academic environments of the institution. Measures of both social and academic integration were found to be independently related to attrition, and the two variable sets were only minimally correlated.

One area amenable to institutional influence which this study highlighted is the level of contact between students and faculty members. Institutional policies which promote or impede such interaction need to be identified. Programs which bring students and faculty into more frequent contact might be instituted or expanded. Faculty reward systems may require revision. Small sums of money might be earmarked for use by faculty members in defraying costs of entertaining students in their homes. But whatever strategies one ultimately adopts to put faculty members and students into more frequent contact, the results of this study suggest that the latter's social and academic integration into the institution is likely to be promoted and their chances of dropping out correspondingly reduced.

The research reported here must be considered exploratory at best. The principal elements of a complex explanatory theory were tested and found to be generally adequate to their task. While certain portions of the model may require redefinition, and while other elements certainly require additional validation through future research, Tinto's theoretical contribution appears to be a substantial step forward in our understanding of the attrition process.

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