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Jennifer Howard Smith
Applied Research Solutions, Inc

Fred B. Bryant
Loyola University Chicago, fbryant@luc.edu

David Njus
Luther College

Emil J. Posavac
Loyola University Chicago (Emeritus)

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Here Today, Gone Tomorrow: Understanding Freshman Attrition Using Person-Environment Fit Theory

Jennifer Howard Smith, Ph.D., Fred B. Bryant, Ph.D.,
Applied Research Solutions, Inc. Loyola University Chicago

David Njus, Ph.D., and Emil J. Posavac, Ph.D.
Luther College Loyola University Chicago (Emeritus)

Person-Environment (PE) fit theory was used to explore the relationship between student involvement and freshman retention. Incoming freshmen (*N*=382) were followed longitudinally in a two-wave panel study, the summer before beginning college, and again during the spring of their freshman year. Involvement levels, a variety of summer and spring preferences (Ps), and spring perceptions (Es) regarding specific aspects of their college environment were assessed. Twelve PE fit indicators were derived and compared with respect to their relationship with student involvement and retention. Results indicated that involvement was linked to some PE fit indicators. Traditional parametric statistical analyses were compared with a new, nonparametric technique, Classification Tree Analysis (CTA), to identify the most accurate classification model for use in designing potential attrition interventions. Discriminant analysis was 14% more accurate than CTA in classifying returners (97% *vs*. 85%), but CTA was 962% more accurate classifying dropouts (8% *vs*. 84%). CTA identified nine clusters—five of returners and four of dropouts, revealing that different subgroups of freshmen chose to return (and stay) for different reasons. Students' end-of-the-year preferences appear to be more important than anticipated preferences, college perceptions, or PE fit levels.

People most at risk of dropping out of organizational settings are those who have been there the shortest periods of time.[1] Thus, in college settings, students most at risk of dropping out are freshmen.[2,3] Although researchers have long known about college attrition problems and have proposed a variety of theoretical models as potential remedies, little progress has been made in actually reducing student dropout rates.[2-4] The act of leaving college prior to

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graduation is often seen as a form of failure on the part of the attritor, and not on the part of the institution. However, it may be that features of college environments may be at least partly responsible for the early withdrawal of some students.[3] This possibility makes a theory which addresses both person- and environment-focused variables (i.e., PE fit theory) potentially important in better understanding college attrition.

A large body of research has investigated the issue of college attrition, linking student departure to low levels of student integration and involvement. It is important to distinguish between two different conceptualizations of "involvement" discussed in the education literature. One way to define involvement is *behaviorally*—as the degree to which students participate in academic and social activities. Here, involvement is defined solely in terms of student behaviors (e.g., number of activities attended, frequency of participation). A second way to define involvement is *psychologically*—as students' level of perceived commitment to, or affiliation with, their university.[5,6] The present study uses only the behaviorally-based conceptualization of involvement.

Encouraging students to be involved in campus activities seems to be an effective way of positively influencing their perceptions and ultimately their persistence.[2-4,7-10] Student involvement has been shown to affect commitment to graduate; this commitment, in turn, has been linked to both intentions to remain enrolled and actual re-enrollment decisions.[2-4,11]

Calling students' freshman year a "strategic leverage point," Tinto claims that most attrition decisions arise either explicitly during the freshman year or have their roots in the first-year experience.[3] To maximize the chances for students to make a commitment to graduate, Tinto calls for an increase in freshman opportunities to engage in (formal and informal) social and academic activities. Astin's research also links college involvement to student development and college retention.[7-10,12,13] According to Astin, attritors' modal explanation for dropping out is boredom with college. Indeed, boredom may simply be another name for being uninvolved. Of course, being uninvolved may be caused by person-focused factors (e.g., student's lack of initiative), environment-focused factors (e.g., lack of college opportunities), or both.

One way to understand the interaction of person-focused and environment-focused factors on behavior is through Person-Environment (PE) fit theory. Several studies have demonstrated the relationship between the "fit" of student characteristics (P) and college attributes (E), and a plethora of educational variables including physical symptoms,[14,15] academic and social competency,[16] satisfaction,[17] academic achievement,[18] student stress and strain,[19] level of cognitive development,[20] withdrawal, alcohol consumption, anxiety, the use of mental health services, grade point average,[14] coping strategies,[21] volunteer motivation[22], school crime and misbehavior,[23] willingness to recommend their college to prospective students,[24] and retention.[25] However, few studies have investigated the direct link between PE Fit and student retention. Tinto alludes to PE fit in his retention model, but offers no specific recommendations concerning how to measure congruence between student preferences and college characteristics, nor conceptual or operational definitions of PE misfit. Empirical tests of Tinto's model also lack these components.[26] Astin also alludes to PE fit in his retention research. However, like Tinto, he does not explicitly measure PE misfit in ways recommended by congruence researchers, such as assessing PE variables on commensurate conceptually corresponding scales.

The task of validly assessing the match between personal properties and environmental features is difficult.[20,27-29] Researchers must determine which P and E variables are the most relevant to the population of interest. They also must find the best way to combine these salient dimensions into a congruence, or fit, score. Those studying PE fit must balance the two dimensions, giving equal consideration to both.

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Unfortunately, this often is not the case. Even when one is certain that this balance has been achieved, researchers must be certain that each personal variable has a commensurate environmental variable in order to justify calculating a valid PE fit score.[6,27,30-32] Whether to calculate single or multiple PE fit indicators is another important measurement issue to consider. The notion of breaking down complex environments into more manageably-sized Es can be traced to Barker[33] and Wicker,[34], and is still apparent today in studies of noisy production lines,[35] hospital wings,[36] college dormitories,[37] career counseling departments,[38,39] and classrooms.[40] A college campus may be an ideal candidate for this type of research since most university settings contain distinct sets of populations, opportunities, and values.[15,41] Tinto proposed that college environments actually are comprised of clusters of social and academic communities or subcultures.[3] If micro-environments within a school can be identified, it may be reasonable to derive PE fit indicators for each dimension, rather than to rely simply on one overall congruence score.

Researchers are far from reaching a consensus regarding how best to operationally define the PE fit construct. The most frequently used measure of congruence is the difference score, which really is an indicator of PE *misfit*.[32] P and E items are subtracted from one another, producing a "discrepancy" score. Traditionally, "Real E" items are subtracted from corresponding "Ideal P" items, with the underlying assumption that one's actual environment typically will not exceed one's ideal version of it. Some PE fit researchers compute the absolute value of this difference score, asserting that "P less than E" effects are similar to "E greater than P" effects.[14,25,36,42] Others, however, have preserved the direction of PE incongruence by eliminating the absolute value sign.[23,31,43-45]

It is crucial that the personal (P) and environmental (E) components comprising the congruence construct are carefully defined. Researchers, however, disagree on how best to do this. Examples of P conceptualizations are diverse and include dimensions such as: ideals,[19] expectations,[37] values,[46,47] needs,[11,48,49] interests,[18,50,51] personalities,[52] choices,[50] and demographic information.[7]

Researchers have conceptualized the environmental (E) component of PE congruence a variety of ways as well. Some define environments phenomenologically, by assessing occupants' images of a setting, rather than assessing a setting's objective features. Advocates of this approach believe that perceptions have real consequences.[3,24] From this perspective, university settings are defined in terms of their perceived "climates".[48,49] A second E conceptualization defines college environments in terms of the aggregate of students' characteristics.[5,6,50,53] Environments from this perspective are defined by who their occupants are (e.g., choice of major, ability levels, and ethnic backgrounds), rather than by what their occupants perceive.

A third way to conceptualize college environments is by the activities that occur on campus. Behaviorally-based E conceptualizations are concerned with what students and faculty actually do, rather than what perceptions they share or what characteristics they possess.[1,3,4,7,8,10] From this perspective both the opportunity for activities and the activities themselves combine to represent the E component.

Measures of student-college congruence will differ depending on which of these P and E conceptualizations are used to derive the congruence construct. Using the image-based E, PE fit assesses whether an institution lives up to the reputation or mystique surrounding it. Using the "characteristics-based" E, PE fit represents how closely each student matches the attributes of the student body majority. However, using the third, "behaviorally-based" conceptualization of "E," PE Fit assesses the match between students' preferences for involvement, and the actual opportunities to become involved in college.

If environments can be defined both subjectively (e.g., climates) and objectively

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(e.g., aggregate characteristics), so can congruence measures. According to French, "subjective" PE fit reflects the match between people's preferences regarding their self-concept and their setting, and their beliefs about these attributes.[31] "Objective" PE fit, on the other hand, uses information that is independent of the biases underlying human perceptions. Actual attributes of both the person (e.g., knowledge, abilities) and the environment (e.g., policies, activities) interact to produce these PE fit indicators.

Some researchers have expressed a concern about the potential for excess error within subjective PE fit variables, claiming that an over-reliance on perceptual data may lead to the attenuation of true effects.[19] They argue that any one person's assessment of the actual environment (the E component) will contain associated error variance resulting from personal biases and the lack of relevant environmental information.[6,27] For example, students are often unaware of, or even denied access to, information concerning specific activities and interactions occurring on their campus. This lack of knowledge may add error to E scores and attenuate the true effects of PE congruence.

In response to these concerns, some researchers have suggested that the measurement gap between objective and subjective reality be narrowed.[42] Tracey and Sherry proposed that a more accurate measure of the actual environment is the *mean* of all respondents' "Real E" ratings. They claim that these environmental "consensus" scores are highly reliable because they are unlikely to be affected by individual variation. They also claim that these more objective congruence measures possess more construct validity, for they better represent the discrepancy between ideal and actual settings.

Tracey and Sherry used this technique to examine the relationship between PE fit and student strain in a college residence hall. They asked residents to describe the preferred characteristics (P) of a residence hall and then to describe the actual characteristics (E) of their own residence hall. In addition to creating subjective discrepancy scores by subtracting each participant's P score from her E score, Tracey and Sherry also created an objective PE fit indicator by computing the mean of all floormates' E scores and subtracting this measure of central tendency from each P score. It was found that discrepancy scores based on a consensus of E were more highly correlated with student stress and strain than respondents' own "subjective" PE fit scores. The superior strength of using the mean of "Real E" scores has been demonstrated in other studies investigating student-college congruence.[16] However, advocates of these "objective" measures of PE fit are not without their critics. Edwards is leery of congruence meas-ures that hold one element constant, such as when the mean of "actual" ratings is used to represent E.[54,55] He argues that when PE fit is computed this way, discrepancy scores merely represent the variance attributable to one element (e.g., P), and thus do *not* represent PE congruence at all.

Besides determining *how* to measure PE fit, another unresolved issue involves *when* to measure congruence. The traditional approach to measuring PE fit is to ask respondents to provide both their personal preferences (P) and their environmental descriptions (E) concurrently.[16,35,46] While this strategy is convenient (i.e., requiring only one data collection session), this design may suffer from a number of conceptual and methodological problems, such as restriction in range due to natural attrition. Individuals who experience PE misfit over time either exit or adapt to their environments, thus spuriously shrinking the range of the personal characteristics remaining and reducing the measure's predictive power.[14,15,56] Selective attrition results, leaving only those most congruent, and presumably those most productive and satisfied, to occupy the setting, and to complete researchers' measures. This may pose a problem, since most participants of PE fit studies are individuals who have occupied their settings the longest.[29] Individuals with considerable experi-

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ence and familiarity with a setting (e.g., tenured employees, seniors in college) are likely to possess synchronized preferences and perceptions. These members are typically few in number and may comprise an unrepresentative sample.[5] Range restriction problems also raise the issue of external validity threats. If tenured occupants possess a unique set of similar characteristics, results from any one PE fit study may be lacking with respect to generalizability.[57] One way to remedy this problem is to examine longitudinally populations that recently have entered an environment. College freshmen may serve as an ideal group for this approach.

Instead of measuring congruence at one point in time, several researchers have begun to utilize longitudinal research strategies to better understand *degrees* of, or changes in, PE fit. This nonconcurrent approach to measuring PE fit, although more time consuming, offers many benefits. For instance, these designs enable researchers to assess occupants' desires and perceptions both before and after they are influenced by the impact of their environments. If planned carefully, nonconcurrent designs are also able to include both congruent and incongruent individuals in their pool of respondents. Additionally, these designs also allow for different PE fit scores both *before* (e.g., "Anticipatory PE fit") and *after* ("Present PE fit") individuals enter and familiarize themselves with a setting to be calculated.[14,46]

Statistical Analysis Options

One goal of this project was to describe and classify as accurately as possible two groups of freshmen—those who returned as sophomores and those who did not—using PE fit variables and involvement indices. Two statistical techniques were compared with respect to their ability to accuracy classify returners and attritors. In addition to a traditional discriminant analysis (DA), an alternative statistical technique also was performed on the data. Optimal Data Analysis (ODA) is a unique nonparametric approach to statistical classification that explicitly maximizes the average *p*ercentage *a*ccuracy in *c*lassification (PAC) across groups in a sample.[58] ODA works by finding an optimal classification solution which consists of a cutpoint (the point that lies midway between successive observations that are from different groups) and a direction, which is analogous to the "sign" of a conventional statistic like a correlation. ODA finds the cutpoint and direction combination such that no other combination can result in fewer misclassifications: by definition, the resulting model is always optimal.[58]

A special application of ODA, hierarchically optimal classification tree analysis (hereafter referred to as CTA) was used in the present study, to distinguish returners from attritors. CTA is an *iterative* ODA procedure that constructs a classification tree which hierarchically maximizes the mean percent accuracy in classification (mean PAC) for a sample.[58] CTA is accomplished after several steps. First, a stopping rule is determined *a priori* (e.g., experimentwise Type I error of $p<0.05$). Second, ODA is performed for every attribute (predictor) separately, using the total sample. The attribute yielding the greatest standard effect size is then chosen and the cases are split according to this model's cutscore and direction on the attribute having greatest effect strength (the model will likely be imperfect, making both correct and incorrect classifications). Third, ODA is performed again using all of the attributes, but only on a *subset* of the sample—the respondents who were predicted to be in one class only (e.g., dropouts) in an attempt to improve classification for this partition only. If a new attribute is found to improve the predictive value it is added to that particular "branch" of the classification tree. If not, the branch ends there. The classification tree "grows" until a sufficient number of attributes is found that best describes each subset of the sample. Branches are then "pruned" (i.e., nodes are removed) if their Type I error exceeds a set criterion, or if the branches do not enhance the model's overall mean PAC.[58,59]

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Traditional DA assumes that a set of attributes is equally relevant and meaningful to all members of a particular sample.[59] CTA, in contrast, creates separate discriminant functions for different subsets of the sample while describing clusters of individuals that share the same common pathway. For example, it may be that students choose to leave or to remain for different reasons. One segment of the freshman class may return for social reasons, while another segment may return for academic reasons. These specialized student clusters, which would be overlooked with traditional DA, may help to identify unique sets of "at-risk" freshmen.

Another advantage of CTA is freedom from the restrictive assumptions underlying parametric tests. DA requires that several assumptions be satisfied, such as independence, linearity, and distributions that are normal, in order for the estimated Type I error rate to be valid.[61] In contrast, for CTA "*p*" (i.e., the probability of making a Type I error) is *exact* and always valid, because it is based solely on the structural features of a particular data set. [58]

Because bias may enter a classification solution if the coefficients used to assign a participant to a particular group are derived using that person's data, it is important to perform leave-one-out (LOO) validity analysis (also called the jackknife procedure).[58] This procedure is then repeated, holding a different case out each time, for every case. An advantage of CTA is that LOO analysis is performed at every step in the analysis.

Purpose and Hypotheses

This study was conducted with three purposes in mind. The main purpose of this study was to assess the degree to which involvement in college activities was associated with first year students' PE fit levels, and the degree to which these PE fit levels impacted their decisions to return as sophomores. A second purpose was to determine the relative contributions that different PE fit derivations make in explaining student involvement and attrition. Finally, this study sought to compare traditional multivariate statistical strategies with nonparametric optimal analyses. Based on previous empirical tests of PE fit theory and college retention models, these three goals resulted in the following six predictions.

1. The first hypothesis addressed the dimensionality of the PE fit construct, and predicted that student "Ideals" (Ps) with respect to college environment preferences would be multidimensional, and thus multiple PE fit indicators would be derived—one per dimension. It also was expected that these dimensions would be stable over time, from summer until spring.

2. The second hypothesis addressed the relationship between students' participation in college activities and their subsequent PE congruence levels. It was hypothesized the more that students participated in college activities, the greater would be their degree of PE fit.

3. The third hypothesis addressed the relationship between PE fit and retention decisions. It was proposed that students with greater PE fit would be more likely to return for their sophomore year than students with more incongruent levels.

4. In-coming freshmen may not be as certain of their college environment preferences prior to beginning college, so the fourth hypothesis predicted "Present" PE fit (*Posttest* Ideals minus Posttest Reals) scores would be a better predictor of return status, and a better criterion of college involvement, than "Anticipatory" PE fit (*Pretest* Ideal minus Posttest Real).

5. Because it is likely that no one student can accurately describe all dimensions of a college environment, "Objective" PE fit (Posttest Ideals minus the *mean* of Posttest Reals) was hypothesized to be a better predictor of return status, and a better criterion for college involvement, than "Subjective" PE fit (individual Posttest Ideals minus individual Posttest Reals).

6. Lastly, it was proposed that PE congruence measures would be more strongly related to college involvement and retention deci-

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sions than either college preferences (P) or college perceptions (E) alone.

Method

Participants. In-coming freshmen from a large Midwestern Catholic university were surveyed during summer registration sessions, and again during the spring of their freshman year either in residence halls (for on-campus students) or by postal mail (for commuters). A total of 1,108 freshmen of the 1,186 students comprising the freshman class (93.4%) completed summer questionnaires, and 420 of these freshmen (38%) completed spring questionnaires (12 additional students completed the posttest, but not the pretest.) Of the 420 spring participants, 382 placed a confidential identification number on both questionnaires, allowing their summer and spring responses to be linked and compared. Data from these 382 "pretest-posttest" students were subsequently used to test the hypotheses; they represented 34.5% of the original sample.

Procedure and Instruments. Pretest data were obtained during summer registration sessions before the students' first semester. Posttest data were obtained at the end of participants' freshman year. Social security numbers were used to match students' pretest and posttest responses. The confidential treatment of responses was clearly emphasized to participants and was strictly enforced.

Pretest. In an attempt to increase the response rate, pretest data were collected during summer orientation sessions. All but 78 students who comprised the freshman class (1,108 of 1,186) gathered in groups of approximately 200 in a university auditorium the first morning of their respective registration sessions (numerous sessions were held throughout the summer). After completing math placement exams, freshmen completed the PE fit pretest questionnaire.

Pretest items assessed respondents' college preferences. These items represented "anticipated" ideals (Ps), since they were completed before students actually experienced college life. Participants evaluated various features of a college environment using 7-point scales, ranging from "very undesirable" to "very desirable."

The pretest questionnaire contained 46 items which were either created specifically for this college environment or were borrowed from past PE congruence instruments. Eleven items were chosen to correspond to the various components of a new university program designed to encourage freshman participation and to enhance freshman retention implemented that year. For example, freshmen were asked to indicate how desirable it would be to go on a retreat, to use electronic-mail to communicate with faculty, and to go to the symphony or theater. Fourteen items corresponded to activities common to any university setting, such as voting in a campus election, or attending a social event. Twenty-one items were borrowed and modified from the Organizational Culture Profile Item Set.[46] This set of items tapped students' preferences for certain environmental "presses" or images. For example, freshmen were asked to indicate how desirable it would be for their college environment to be rule-oriented, to be supportive, to foster independence, and to allow them time to themselves.

Posttest. The posttest questionnaire was distributed in the spring of respondents' first year, approximately 9 months after the pretest. Students residing on-campus were given posttest questionnaires in their residence halls. Commuter students were surveyed via the mail.

Respondents rated the same set of college dimensions that were included in the pretest questionnaire with the exception of three items ("reward minimal effort with high grades;" "reward good performance with high grades;" "have the same classmates in several of my courses") which were eliminated due to the findings of an exploratory principal components analysis which are discussed below. However, unlike the pretest instrument which contained only items assessing college ideals ("Anticipatory" Ps), the posttest instrument contained both

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college preference ("Present" P) and college perception (i.e., "Real" E) items presented on commensurate scales.

For preference (P) ratings, students were asked to indicate the degree to which they desired various college attributes, and the degree to which they would desire participating in a variety of college activities (1=not at all; 7= very much). For perception (E) ratings, students were asked to indicate the extent to which each attribute accurately described their college impressions and experiences (1=not at all; 7=very much). Anchors differed depending on whether E items were presented as continuous (1=never; 7=very often) or discrete (yes/no) variables.

Attributes

Three major groups of attributes were measured to test the specified hypotheses.

Student Involvement. Sixteen "Real" (E) items were combined to create an involvement index which assessed the extent to which students participated in both academic activities (e.g., speaking up in class; seeking out one's advisor) and social activities (e.g., attending a cultural event; being active in campus politics) during their first year. Psychologically-based aspects of involvement, such as students' commitment to the university, were not assessed.

Five of the 16 involvement items tapped activities that could be done repeatedly throughout one's freshman year (e.g., chat with an instructor, go to church with friends), and were rated on 7-point scales ranging from "never" to "very often." The remaining 11 items included events that, for the most part, students would engage in only once or twice during the school year (e.g., go on a retreat, dine with a professor). To indicate whether or not they engaged in these activities, students circled either "Yes" or "No."

To create an overall index of involvement for each student, the sum for each of the two sets of items was converted to standard (*z*) scores, and multiplied by the number of items comprising those sets (5 and 11, respectively). These scores were then added together and divided by 16 to create an overall standardized involvement index.

PE Fit. Derivation of PE fit indicators was complex, and involved four steps. First, two principal components analyses were performed on the summer and spring sets of Ideal data to determine the dimensionality of student college preferences (Ps). Three factors were revealed and named "College Image," "Student Experience," and "Traditional-Catholic." E items were then categorized on the basis of these factors so that PE fit scores could be derived (see Results).

The second step involved computing PE Fit indicators as difference scores. PE fit indicators were computed at the factor level only.[31] However, in contrast to French's congruency formula, the absolute values of these differences were used so that specific multivariate statistical analyses could be performed.[31] Thus, for the present study, PE fit was calculated as the absolute value of the difference between the sum of student preference (P) items and the sum of the commensurate set of student perception (E) items for each of the three dimensions: PE Fit=$|\Sigma P - \Sigma E|$. These differences were then divided by the number of commensurate pairs in each of the three factors (16, 13, and 8 items, respectively). The magnitude of absolute difference scores increases as P and E ratings become increasingly discrepant, so small congruence scores represent greater PE fit.

Because several authors suggest different ways to derive PE fit scores, the third step involved deriving four distinct kinds of discrepancy scores (Table 1).[19,30,44] First, to determine the degree of congruence for students who had not yet experienced college life, "Anticipatory" PE fit scores were computed by taking the difference between *pretest* Ideal ratings and *posttest* Real ratings. Second, to determine students' level of congruence at the end of their first year, "Present" PE fit scores were derived by computing the difference between *posttest* Ideal ratings and *posttest* Real ratings.

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Table 1: PE Fit Components and Derivations

Component	Operational Definition
Anticipatory Personal Preferences (P)[a]	Pretest Ideal items
Present Personal Preferences (P)	Posttest Ideal items
Actual Environmental Properties (E)	Posttest Real items
Type of PE Fit[b]	**Derivation of Difference Score[c]**
Anticipatory Subjective PE Fit	Pretest Ideals minus Posttest Reals
Anticipatory Objective PE Fit	Pretest Ideals minus (mean) Posttest Reals
Present Subjective PE Fit	Posttest Ideals minus Posttest Reals
Present Objective PE Fit	Posttest Ideals minus (mean) Posttest Reals

Note: [a]This construct was assessed during summer orientation sessions. All other attributes were derived using data collected at the end of respondents' first year. [b]These variables were computed for each of the three dimensions (College Image, Student Experience, and Traditional-Catholic). [c]All PE fit derivations used the absolute value of the differences.

The third and fourth types of PE fit indicators differed with respect to how the E attributes were computed. "Subjective" congruence scores were derived by taking the difference between each freshman's set of (posttest) Ideal and Real scores. "Objective" fit scores were computed by replacing respondents' individual Real scores with the *mean* of all students' Real rating. Crossing Anticipatory and Present congruence measures with Subjective and Objective measures, a total of four PE fit indicators resulted: (a) Anticipatory Subjective PE Fit; (b) Present Subjective PE Fit; (c) Anticipatory Objective PE fit; and (d) Present Objective PE fit.

The final fourth step in the derivation of PE fit indicators involved computing congruence scores across the three dimensions revealed in the first step. The four PE fit indicators derived for each of these factors resulted in a total of 12 types of PE fit indicators (see Table 2).

Return Status. Retention information was obtained via the university's Department of Institutional Research. Respondents failing to return for the sophomore year were classified as attritors, regardless of the reason for departure.

Results

Pretest-Posttest Respondents vs. Pretest-Only Respondents. Analyses comparing respondents who completed only the pretest with respondents who completed both measures were performed. Summer Ideal responses, as well as additional demographic and academic information, were compared. Because comparisons are meaningful only for students who had the *opportunity* to complete both measures, 44 students who completed the fall semester but who did not re-enroll for the spring semester were omitted from these analyses.

Results revealed that pretest-posttest and pretest only students were comparable on several important dimensions. For instance, these groups did not differ greatly with respect to attrition rates (10.5% *vs*. 13.7%, respectively), nor did they differ statistically with respect to anticipatory preferences on the three PE fit dimensions (*p*s>0.05, mean effect size=0.10). These groups also did not have different expectations regarding first-semester GPAs (3.51 *vs*. 3.57, respectively, effect size=0.04), or first-year cumulative GPAs (3.61 for both groups).

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Table 2: Descriptive Statistics for PE Fit Indicators

Objective PE Fit[a]

Student Image	College Behavior	Traditional-Catholic
Anticipatory PE Fit[c]	Anticipatory PE Fit	Anticipatory PE Fit
M=0.88 sd=0.47 (378)	M=1.69 sd=0.87 (376)	M=0.82 sd=0.59 (378)
Present PE Fit[d]	Present PE Fit	Present PE Fit
M=0.88 sd=0.47 (360)	M=1.64 sd=0.91 (358)	M=0.88 sd=0.66 (345)

Subjective PE Fit[b]

Student Image	College Behavior	Traditional-Catholic
Anticipatory PE Fit	Anticipatory PE Fit	Anticipatory PE Fit
M=0.97 sd = 0.74 (342)	M=1.72 sd=0.94 (347)	M=0.88 sd=0.64 (338)
Present PE Fit	Present PE Fit	Present PE Fit
M=0.82 sd = 0.68 (344)	M=1.61 sd=0.94 (345)	M=0.73 sd=0.62 (337)

Note: M=mean; sd=standard deviation. Smaller means indicate smaller discrepancy scores and greater PE fit. Numbers in parentheses indicate the sample sizes. [a]Objective PE fit scores were derived from Individual "Ideals" and the mean of "Reals". [b]Subjective PE fit scores were derived from Individual "Ideals" and Individual "Reals." [c]Anticipatory PE fit scores were derived from Summer "Ideals" and Spring "Reals." [d]Present PE fit scores were derived from Spring "Ideals" and Spring "Reals."

However, some important differences were revealed. Although pretest-posttest and pretest-only students possessed similar GPA *expectations*, they did statistically differ in the GPAs they later *earned*. Students who completed both measures earned higher fall GPAs (3.06 *vs*. 2.97, $t(989)=2.15$, $p<0.032$), higher spring GPAs (3.06 *vs*. 2.89, $t(1017)=3.62$, $p<0.0001$), and higher first-year cumulative GPAs (3.07 *vs*. 2.94, $t(1009)=3.23$, $p<0.001$). However, the effect sizes corresponding to these differences were small (0.19, 0.28, 0.30, respectively, mean effect size= 0.26). Additionally, both gender and place of residence impacted whether or not students participated in both waves of the study. A greater percentage of women comprised the pretest-posttest group (72.5%) than the pretest-only group (57.3%). Freshmen residing off-campus were also less likely to complete both measures.

Tests of Hypotheses

Dimensionality of PE Fit. To determine whether college preferences, and the PE fit construct, were uni- or multi-dimensional, a principal components factor analysis with varimax rotation was performed on the Present Ideal data. Only participants providing both pretest and posttest information were used (n=382). Six Present Ideal items ("Is easy-going;" "Is unpredictable;" "Fosters risk-taking;" "Work under pressure;" "Rewrite a paper/Redo a project;" and "Use e-mail to communicate with faculty and classmates") did not have factor loading exceeding 0.30, and therefore were not included in the factor solution.

A total of three dimensions meaningfully described the Present Ideal data (Table 3). The first factor, labeled "College Image," reflected a set of variables which described environmental

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features emanating from students' impressions of what a college should be like. The factor included items such as "fosters independence," "is highly organized," and "is distinctive/different from other colleges," and closely resembled Pace and Stern's impression-based definition of a college environment's "perceived climate".[49]

Table 3: Item Loadings for Present Ideal Factors

Item	Factor 1: College Image	Loading
Is supportive		0.68
Is people-oriented		0.65
Is highly organized		0.63
Fosters independence		0.62
Is effort-oriented		0.61
Allows you time to yourself		0.60
Fosters social responsibility		0.60
Is academically demanding		0.56
Fosters social interactions		0.56
Demands good performance from you		0.53
Fosters friendships in the classroom		0.53
Fosters friendships in residence halls		0.49
Lead an active social life		0.48
Identify yourself as a [college name] student		0.40
Is distinctive/different from other college environments		0.38
Is competitive		0.35
Item	Factor 2: Student Experience	Loading
Speak before a group of your peers about a topic important to you		0.72
Attend a professor's presentation as a part of a faculty lecture series		0.60
Imagine yourself president of a club or organization		0.60
Chat with an instructor outside of class		0.60
Share ideas/Speak up in class		0.59
Become active in political groups on campus		0.59
Eat dinner with a professor		0.58
Volunteer in the local community		0.56
Go to a subsidized cultural event (such as the symphony or theater)		0.51
Vote in a campus election		0.50
Go on a retreat		0.42
Encourages volunteering to meet local community needs		0.36
Seek out your advisor for advice		0.35
Item	Factor 3: Traditional-Catholic	Loading
Go to mass/church with your friends		0.66

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Emphasizes a Catholic/Jesuit mission	0.62
Emphasizes a single set of values throughout the university	0.52
Attend a Pep-Rally before a game	0.50
Is rule-oriented	0.48
Go to a planned social event in your residence hall	0.46
Is team-oriented	0.44
Is grade-oriented	0.40

Note: Displayed items include only Present Ideal items with factor loadings>0.30. For factors 1, 2 and 3, respectively: Chronbach's alpha=0.85, 0.83, and 0.78; eigenvalue=8.19, 3.10, and 2.27.

The second factor represented respondents' preferences regarding academic and social experiences. Included in this dimension were "action" items, rather than "image" items like those comprising the first factor. This factor was labeled "Student Experience" and included items such as "share ideas/speak up in class," "volunteer in the local community," and "seek out your advisor for advice." This factor closely resembled Astin's behaviorally-based definition of "college environment".[9,10,12]

The third and final dimension combined both "image" and "behavior" items to reflect what seem to be respondents' preferences for a conservative college experience. Traditional college attributes as well as features related to religiously affiliated schools comprised this factor labeled "Traditional-Catholic" and included items such as "emphasizes a single set of values throughout the university," "is rule-oriented," and "attend a pep-rally before a big game." Correlations among these three college dimensions were positive (College Image and Student Experience, r=0.45; College Image and Traditional-Catholic, r=0.40; and Student Experience and Traditional-Catholic, r=0.41, all ps<0.01).

To test the stability of this three-factor solution, a principal components factor analysis with varimax rotation also was performed on the Anticipatory Ideal items. This factor solution was then compared to the factor structure resulting from the Present Ideal data using Coefficients of Congruence (COC). Results comparing the two three-factor solutions revealed that the underlying factor structures of the two data sets were highly congruent. The highest COC was between summer and spring Student Experience dimensions (0.96), with the College Image dimension also showing comparable factor structures (0.93). The Traditional-Catholic dimensions were least congruent, but the degree of factor correspondence was still high (0.70).

Because PE fit scores involve the difference between commensurate "Ideal" and "Real" scores, only one of these two factor solutions were used to compute the discrepancy scores. The dimensions resulting from the posttest data were chosen for two reasons. First, although the two sets of three-factor solutions displayed comparable internal consistencies (Cronbach alphas=0.84, 0.83, 0.81 for summer factors *vs*. Cronbach alphas=0.85, 0.83, 0.71 for respective spring factors), the Present Ideal factors account for a larger percentage of the variance (36.5% *vs*. 34.8%) in their respective data set.

The second reason for choosing the Present Ideal factors involved students' degree of familiarity with their college setting. After having experienced a college environment for nine months, students should be better able to describe their college preferences than before starting school. Spring factors thus served as the basis from which PE fit scores were derived.

Student Involvement and PE Fit. To test the prediction that highly involved freshmen would possess more congruent PE fit levels, correlations were calculated between the involvement index and eight PE fit indicators (the involvement index was derived using 16 Student

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Experience Real items: thus, the four congruence measures related to the Student Experience dimension were not included in these analyses due to the violation of the independence assumption). Supporting predictions, involvement level was significantly correlated with five of eight PE fit indicators (Table 4). However, although statistically significant, involvement accounted for little of the variance in any of the congruence measures: R^2 ranged from 2.4% for Anticipatory Subjective College Image, to 4.3% for Anticipatory Objective College Image. Degree of college involvement was related to three of four Subjective PE fit indicators and two of four Objective PE fit indicators. High involvement was associated with more congruent Subjective PE fit. However, contrary to predictions, highly involved freshmen were more likely to possess less congruent Objective PE fit levels.

Table 4: Correlations Between PE Fit Scores and Student Involvement

Objective PE Fit[a]	r	r^2	Effect Size (d)
College Image Fit (A)[c]	0.207**	0.043	0.424
College Image Fit (P)[d]	0.188*	0.035	0.381
Traditional-Catholic Fit (A)	0.064	0.004	0.127
Traditional-Catholic Fit (P)	0.002	0.000	0.004
Subjective PE Fit[b]			
College Image Fit (A)	-0.153*	0.024	0.314
College Image Fit (P)	-0.176*	0.031	0.358
Traditional-Catholic Fit (A)	-0.021	0.000	0.042
Traditional-Catholic Fit (P)	-0.170*	0.029	0.346

Note: Student Experience PE fit scores were excluded from analyses due to the independence assumption violation with the involvement variable. All analyses were performed with and without involvement items in the PE fit indicators: significance levels did not change. A single asterisk (*) indicates $p<0.05$ at the generalized (per-comparison) criterion, and double asterisks (**) indicate $p<0.05$ at the experimentwise criterion.[58] Derived from: [a]Individual "Ideals" and mean of respondents' "Reals"; [b]Individual "Ideals" and Individual "Reals"; [c]summer "Ideals" and spring "Reals"; and [d]spring "Ideals" and spring "Reals."

PE Fit and Retention. To test the prediction that PE fit scores would help to distinguish returners from dropouts, linear DA and CTA were performed. PE fit scores served as attributes, and return status as the class variable. None of the 12 PE fit variables (four fit indices across each of three dimensions: Student Image, College Behavior, Traditional-Catholic) qualified for DA or CTA analysis.

Additional Analyses

Because the attribute set outlined above did not adequately classify returners from dropouts, further analyses were performed in which several predictor variables were used. CTA and stepwise DA were performed. For CTA all single-item Ideal and Real variables were used, as was the involvement index and the Ideal, Real, and PE fit factors. For DA only the set of single item variables was used because the inclusion of construct-level variables would violate the independence assumption underlying this procedure.

Stepwise DA Model. The DA resulted in a linear model that distinguished returners from dropouts (canonical $R=0.39$, $\chi^2(7)=46.53$, $p<0.0001$). Seven predictors combined to yield a significant discriminant function after 7 steps (Table 5). The loading matrix of correlations between predictors and the discriminant function suggest that together, three variables discriminated respondents on the basis of return status (predictors having loadings less than 0.50 were not interpreted[62]).

The best predictors for distinguishing returners from attritors assessed how organized and how competitive respondents perceived their college environment to be at the end of their freshman year. Dropouts described their college environment as more organized than returners (means=5.18 *vs*. 4.87, respectively), but less competitive than returners (means=4.65 vs. 5.52, respectively). One posttest preference rating also contributed to the classification model. Returners and dropouts differed in the degree to which they wanted to identify them-

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selves as members of their college community, with returners possessing stronger desires (means=5.88 vs. 5.17, respectively).

Table 5: Standardized Canonical Discriminant Function Coefficients for Stepwise DA

Step	Item[a]	Coefficient[b]	Wilks Lambda
1	competitive environment (Real)	0.59	0.96
2	fosters risk-taking (Ideal)	0.31	0.94
3	highly organized college (Real)	-0.57	0.91
4	identify self as college member (Ideal)	0.53	0.89
5	team-oriented college (Ideal)	-0.32	0.87
6	fosters risk-taking (Real)	0.39	0.86
7	attend pep-rally (Ideal)	-0.33	0.85

Note: [a]All items included in the solution were assessed during the spring of students' freshman year. No summer (i.e., "anticipatory") items significantly contributed to the discriminant function. [b]Standardized canonical discriminant function coefficients.

Although the model classified almost all of the returners correctly, it performed poorly in its classification of dropouts. Group PACs for returners and attritors were 97.2% and 17.9%, respectively. The mean PAC across both groups of returners and dropouts was 57.6% (Table 6).

Table 6: DA Classification Results

Actual Group	N	Predicted Group: Dropouts	Returners	
Dropouts	39	7	32	7.9%
Returners	324	9	315	97.2%
		43.8%	90.8%	

Note: ESS=5.1 (weak effect).

CTA Model. CTA yielded a different solution, outperforming DA especially with respect to classifying attritors. The CTA model correctly classified 84% of dropouts and 85% of returners, with an overall mean PAC of 84.5% (see Table 7).

Table 7: CTA Classification Results

Actual Group	N	Predicted Group: Dropouts	Returners	
Dropouts	31	26	5	83.9%
Returners	317	48	269	84.9%
		35.1%	98.2%	

Note: ESS=68.8 (relatively strong effect).

Presented in Figure 1, CTA also revealed that different groups of dropouts left, and different groups of returners stayed, for different reasons. The CTA model revealed *four* clusters of dropouts and *five* clusters of returners.

Four common pathways through the measured attributes described the participants who did not return to the university for their sophomore year. As seen, dropouts on Path 1 ("Drop 1" in Figure 1), "Small Dose Participators" possessed little desire to identify themselves as a university member (≤0.5), chatted frequently with instructors outside of class (>3.5), desired a team-oriented environment (>5.5), but did not desire to dine with instructors (≤4.5).

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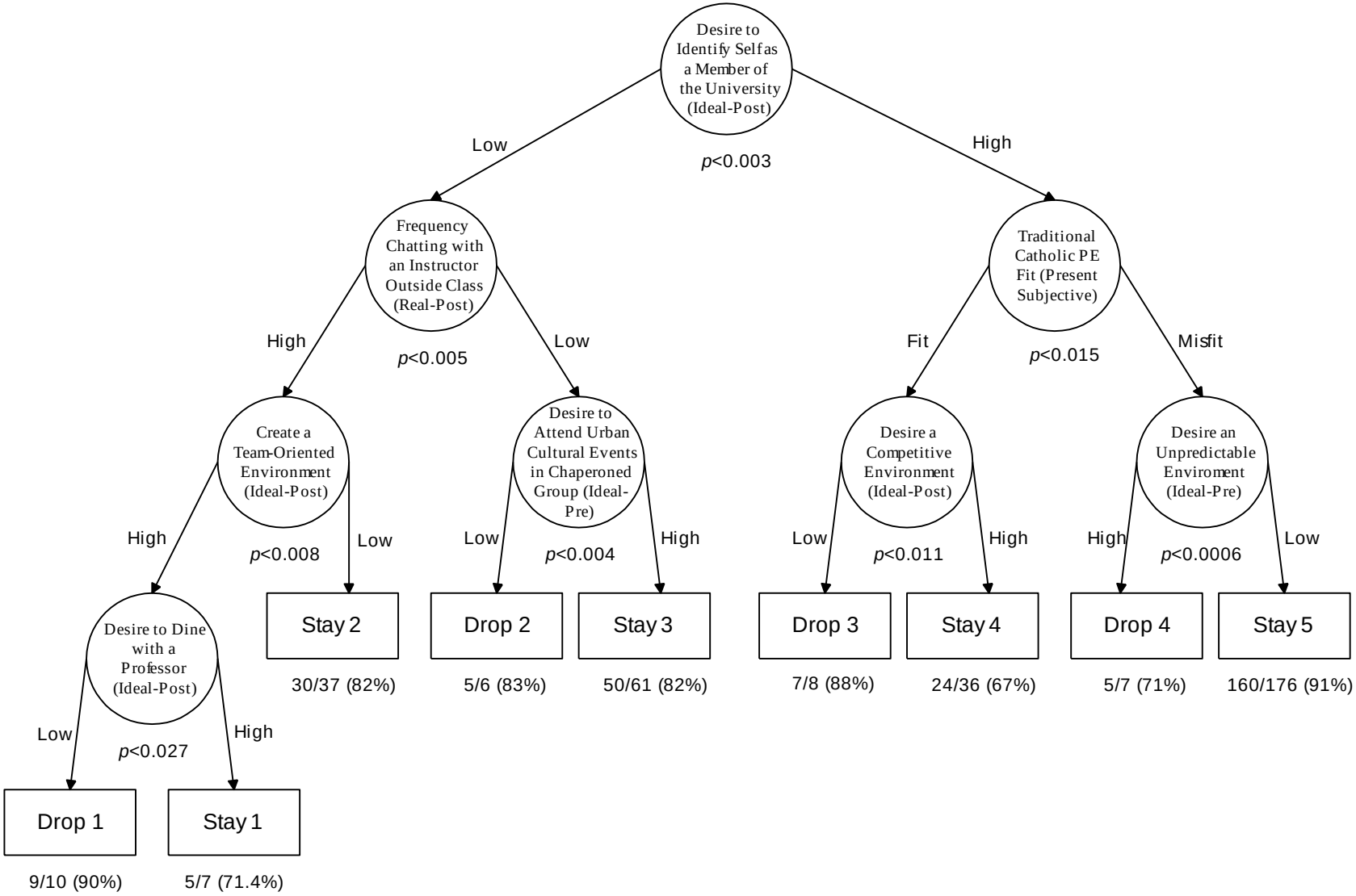
Figure 1: CTA Model for Classifying Dropouts and Returners



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Dropouts on Path 2 (Drop 2), "Involvement Avoiders," also possessed little desire to identify themselves as a university member (≤5.5), but rarely chatted with their instructors outside of class (≤3.5). "Involvement Avoiders" also indicated during summer registration that they were not interested in attending urban cultural events in a chaperoned group (≤4.5).

Dropouts on Path 3 (Drop 3), "Congruent Non-Competitors," differed from the first two clusters. These students *did* want to identify themselves as a university member (>5.5). Although this cluster of dropouts possessed strong Traditional-Catholic PE fit (≤0.19), they did not desire a competitive college environment (≤5.5).

The final set of Path 4 dropouts (Drop 4), "Incongruent Thrill-Seekers," were similar to those on Path 3 in that they desired to identify themselves as university members. However, these attritors revealed incongruent Traditional-Catholic PE fit levels (>0.19), and possessed pre-enrollment desires to attend a college with an unpredictable environment (>5.5).

The PACs for Paths 1, 2, 3, and 4 classifying dropouts were 90% (9/10), 83.3% (5/6), and 88% (7/8), and 71% (5/7), respectively.

Five common pathways were used to classify students who chose to return to the university as sophomores.

Path 1 returners (Stay 1), "Large-Dose Participants," possessed little desire to identify themselves as a university member (≤5.5), chatted frequently with their instructors outside of class (>3.5), desired a team-oriented environment (>5.5), and also desired to dine with their instructors (>4.5).

Returners on Path 2 (stay 2), "Academically Involved Independents," were similar to those on Path 1 in that they possessed little desire to identify themselves as a university member (≤5.5) and chatted frequently with their instructors outside of class (>3.5). However, they differed from "Large Dose Participants" in that they did *not* desire a team-oriented college environment (≤5.5).

Returners on Path 3 (Stay 3), "Culture Seekers," also possessed little desire to identify themselves as a university member (≤5.5), and indicated that they did *not* often chat with their instructors outside of class (≤3.5). However, "Culture Seekers" indicated during summer reistration sessions a desire to attend urban cultural events with classmates and faculty members (>4.5).

Returners on Path 4 (stay 4), "Congruent Competitors," *did* want to identify themselves as a university member (>5.5), possessed good Traditional-Catholic PE fit (≤5.5), and desired a competitive college environment (>5.5).

Finally, returners on Path 5 (Stay 5), "Incongruent Routine-Seekers," wanted to identify themselves as university members (>5.5), possessed little Traditional-Catholic PE fit (>0.19), and did not desire a unpredictable environment (≤5.5).

The PACs for these five pathways were 71.4% (5/7); 81.8% (30/37); 82.0% (50/61); 66.7% (24/36); and 90.9% (160/176), respectively.

Objective vs. Subjective PE Fit. It was predicted that Objective PE fit scores would be more closely related to involvement, and would better predict students' return status, than Subjective PE fit scores. Results did not support these predictions. No Objective PE fit score contributed to the understanding of student retention and attrition. Only one subjectively derived congruence measure (Present Traditional-Catholic PE Fit) assisted in classifying returners and attritors, but only for the expanded ODA-CTA model.

A surprising pattern emerged when the involvement index was correlated with both Subjective and Objective PE fit indicators. The relationship between Subjective PE fit and involvement was in the opposite direction of the relationship between Objective PE fit and involvement. As predicted, highly involved students tended to have more congruent subjectively derived PE fit scores. However, contrary to predictions highly involved students tended to

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have more incongruent PE fit scores when this variable was computed using the *mean* of all respondents' Real scores. Thus, it appears that the direction of the relationship between student involvement and PE congruence may be contingent upon how the PE fit scores were derived. This unexpected relationship might best be explained by measurement artifacts, rather than true effects (discussed below).

Anticipatory vs. Present PE Fit. It was hypothesized that Present PE fit scores would better predict return status and be more closely associated with students' involvement levels than Anticipatory PE fit scores. The logic behind this prediction was that first-year students would have a better understanding of what they desired in a university after having experienced college life for two semesters.

Results revealed that Present congruence measures were only slightly better than Anticipatory congruence measures with respect to involvement and return status. Three *Present* PE fit scores, but only two *Anticipatory* PE fit scores, were associated with students' level of participation in college activities (see Table 4). With respect to return status, the only congruence measure that was included in any of the classification models was Present Subjective Traditional-Catholic, derived from posttest items (see Figure 1).

PE Fit vs. P and E Variables. It was hypothesized that PE fit difference scores would outperform P (Ideal) and E (Real) scores alone. Results did not support this prediction. Student involvement was more highly correlated with the P factors and E factors than with the PE fit factors (see Table 8). To test the relationship between P and E dimensions and retention, MANOVAs and discriminant analyses were performed, using the six Ideal (P) and three Real (E) factors in place of the PE Fit indicators to test for group differences between returners and non-returners. P and E factors did not improve the accuracy in classifying freshman returners from dropouts.

Table 8: Correlations Between Student Involvement and Ideal (P) and Real (E) Factors

Ideal (P) Dimension	r	r^2	Effect Size (d)
College Image (A)[a]	0.250**	0.063	0.519
College Image (P)[b]	0.210**	0.044	0.429
Student Experience (A)	0.348**	0.121	0.742
Student Experience (P)	0.439**	0.190	0.969
Traditional-Catholic (A)	0.357**	0.127	0.763
Traditional-Catholic (P)	0.401**	0.161	0.876
Real (E) Dimension			
College Image	0.293**	0.086	0.613
Traditional-Catholic	0.539**	0.291	1.280

Note: The Student Experience Real factor was excluded from these analyses due to the independence assumption violation between this variable and the involvement attribute. All analyses were performed with and without involvement items in the Real and Ideal factors: significance levels did not change. Double asterisks (**) indicate $p<0.05$ at the experimentwise criterion.[58] [a]Anticipatory (derived from summer items). [b]Present (derived from spring items).

Additionally, three CTA and three DA procedures were run—each containing the two P (Anticipatory and Present) and one E factor corresponding to the three college dimensions (College Image, Student Experience, Traditional-Catholic). Neither CTA nor DA procedures generated a classification solution with respect to return status when Real and Ideal factors replaced PE fit factors. However, as discussed above, when ancillary analyses expanded discriminant procedures to include single-item P and E variables, preferences and perceptions outperformed PE fit scores in distinguishing freshman returners from non-returners.

Discussion

The PE Fit literature has linked student-college congruence to a host of desirable educational variables (e.g., academic achievement, perceived competency), yet has virtually ignored attrition and retention variables. The pre-

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sent study attempted to merge the separate retention and PE Fit paradigms, by investigating the relationships among involvement, student-college congruence, and withdrawal decisions for one population of college freshmen over a period of one year.

Although most PE fit indicators were linked to student involvement levels, the correlations between separate P and E factors and involvement were stronger. The variable most highly correlated with student involvement measured students' perceptions (E) regarding the Traditional-Catholic nature of their college. Students who believed that the "press" of their college environment emphasized religious values, grades, and school rules, were most likely to participate in campus activities. Highly involved students also seemed to have *desired* these characteristics, since the variable correlated next highly with involvement was the Traditional-Catholic P factor.

It appears that the relationship between involvement and student-college congruence was contingent upon the way that the PE Fit indicator was derived. When subjective congruence scores were used, the relationship between these PE fit indicators and involvement was as predicted; the greater students' level of involvement, the greater the match between students' preferences and perceptions. However, when objective congruence scores were used, greater student participation resulted in more discrepant congruence scores.

One explanation for this change in direction may lie in the relationship between involvement and the Ideal (P) component of the PE fit score. By using the average "Real" rating across all respondents to derive Objective PE fit scores, any variability related to the E component of congruence was lost. Thus, variability in objectively derived PE fit scores was due to differences in student preferences (P items) only. This was not the case with subjectively derived congruence scores in which both P and E responses were free to vary.

In this study, involvement was, in fact, positively correlated with all six Ideal ratings (*r*s ranged from 0.21 to 0.44, all *p*s<0.01, mean effect size=0.72). Thus, the relationship between Objective PE fit and involvement may simply have represented a measurement artifact. Because students with the highest college standards (P ratings) were likely to have been the same students who frequently participated in college activities, it was made to appear that greater participation was linked to greater (objective) incongruence.

This is consistent with Edwards' assertion that PE fit measures must allow both the P and E components to contribute to the total variability.[54,55] When only one component is permitted to vary, Edwards claims that PE fit is no longer being assessed. Since this may have been the case in the present study, all analyses using Objective PE fit scores should be rendered suspect.

So, how is it that several congruence researchers have demonstrated that Objective PE fit was superior to Subjective PE fit in their studies? The answer may simply be they have not. A closer examination of these studies revealed that measurement problems suggested by Edwards may also explain these findings as well. For instance, Tracey and Sherry studied the relationship between Objective PE fit, Subjective PE fit, and student distress.[19] They found that objective measures of congruence were more highly correlated with distress than Subjective PE fit measures. However, this was only the case when students' Ideal (P) ratings *also* were negatively correlated with distress. When distress and college preferences were positively related, Subjective PE fit scores were more highly correlated with college distress than Objective PE fit. Thus, Tracey and Sherry's findings may suffer from the same problems as those found in the present study.

Although many studies suggest that the congruence between preferences (Ps) and perceptions (Es) is superior to either component alone in predicting behavior, studies do exist

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that refute this claim.[63,64] The present study might be included in this group since no classification model differentiated returners from attritors when psychometrically constructed PE fit indicators were used as predictors.

When exploratory analyses were expanded to include student preferences and perceptions measured at the individual item level, the present study supports the notion that P and E components may be more important in classifying returners from attritors than congruence measures that combined these components. Only one of the 12 PE fit indicators significantly classified returners from non-returners, and this was only for the expanded CTA model. Present Subjective Traditional-Catholic PE fit scores assisted in the classification of two clusters of dropouts and two clusters of returners. No congruence score was included in the traditional discriminant function. All other variables in both models were either P or E items.

Ideal and Real factors differed in their contribution to the classification models. Although the DA solution was comprised of both P and E variables, the CTA model was comprised almost completely of P variables. The only E item in the classification tree assessed the frequency of student-teacher interactions outside of the classroom.

The time of the year in which P variables were assessed also made a difference. The majority of the DA and the CTA items comprising these classification solutions contained responses that were assessed in the spring of respondents' freshman year. Spring preferences were better predictors of college retention than previous summer preferences perhaps because in their second semester, students did not have to speculate about aspects of college life they had yet to experience.

The CTA model may be consistent with Tinto's theory that links freshman involvement with retention.[3] According to Tinto, different types of involvement are critical at different points in time. Upon arriving to campus, the social sphere is critical to students, as they seek to find a support network. However, the focus soon switches to the academic sphere once freshmen begin their second month of college. After the first few weeks on campus, classrooms become first year students' "gateways to [future] involvement" in other social and academic arenas (p. 134). Here, fledgling students learn to engage in both formal and informal activities with both faculty and peers. Thus, according to Tinto, the quality of the learning experience (e.g., contact with, and helpfulness of, faculty and classmates) is not freshmen's first priority when they arrive on campus, but soon becomes the crucial predictor of their overall satisfaction with the college experience.

The left side of the CTA model (see Figure 1) seemed to reflect this emphasis on informal academically-oriented interactions. All behaviorally-based items in the CTA model involved informal interactions with faculty members. Both brief (chat with instructor) and extended (dine with professor; attend a cultural event) faculty interactions helped to distinguish returners from non-returners. Thus, it appears that student-teacher interactions may have been more important for enhancing freshman retention than purely social peer-only interactions.

Although the left side of the CTA model contained mostly behaviorally-based variables, the right side of the tree contained image-based preferences in addition to a Traditional-Catholic congruence variable. This side, then, reflected retention decisions based on the value-system of one's institution (Traditional-Catholic congruence) as well as the degree of thrill-seeking "press" that was thought to exist on campus. Interestingly, this "thrill-seeking" component was similar to the most important items in the traditional DA classification model. In that model, perceptions regarding how "competitive" and "organized" their college was contributed greatly to the differentiation of dropouts from attritors. However, unlike the CTA model, no behaviorally-based items were included in the DA model. These findings emphasize one of CTA's major strengths. Clusters of respond-

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ents that would not have been found with one linear discriminant function, were revealed with CTA.

Although results from these models are interesting, three important limitations must be noted. First, both the CTA and the DA classification solutions yielding a solution on the basis of retention were exploratory. Only after the psychometrically derived constructs were unable to distinguish attritors from returners, were individual "ideal" and "real" items included in the analyses.

Second, although the CTA model held up under LOO (jackknife) tests for overfitting, neither model was able to be cross-validated using a training sample, for which group membership was known, and a holdout sample, for which group membership was predicted, and later compared to reality. Although the pretest sample size was large enough to divide, the posttest sample size was not. Future studies that intend to follow freshmen students longitudinally should focus on increasing the response rate in spring phases of data collection. Special efforts also should be made to encourage commuting freshmen and freshmen who are struggling academically to participate, since these groups were somewhat under-represented in this study.

Finally, neither classification model was able to classify students on the basis of return status better than simply relying on the base rates. Because the vast majority of freshmen did return to campus for their sophomore year, simply using the classification rule, "Predict all students to return" would have resulted in a classification accuracy of close to 90%. Neither the DA model nor the CTA model could beat this rule.

However, it is important to note that the beating the base rates may not be a relevant criterion with which to base the adequacy of the classification models in this study. Because exploring the perceptions and behaviors of students most at-risk of dropping out is of utmost importance to college administrators, finding the model that most accurately classifies this "vulnerable" group may be more important than finding the model that most accurately classifies all students (dropouts and returners). The expanded CTA model was able to do just that.

The relationship between PE fit and retention might have been stronger if the reasons driving students' decisions to exit or remain in their academic setting were assessed. Factors impacting one's decision to leave college are both numerous and complex. Researchers have discussed several kinds of dropouts, including temporary or permanent; voluntary or involuntary; and attrition for academic or social reasons.[3,7,65] Additionally, leaving college may not necessarily result in negative outcomes if, for instance, one's experience with a university results in highly aversive outcomes, and better options exist elsewhere.[66] It may be that PE fit levels impact only certain kinds of attrition.

Future researchers might want to fine-tune the return-status variable to better assist college personnel in stream-lining their retention efforts. Reasons for dropping could be assessed using an exit interview or written questionnaire at the time of departure. An interesting and potentially important future study could combine the use of exit interviews with CTA techniques to better understand freshman attrition. If reasons for leaving differed among the different "clusters" of attritors, CTA models could be used as diagnostic tools for college admissions directors and administrators.

There are four important findings that may be of interest for those in the business of enhancing freshman involvement and retention. First, it may be important to encourage both students and faculty to seek each other out when they are not in the classroom. Behaviorally-based items that helped to distinguish returners from non-returners included, not peer-interactions, but different types of faculty-student interactions.

Second, in addition to desires for interactions with faculty members, students' *images* of their college are also important to students. The

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value system that a college promotes, as well as the competitiveness and predictability of its climate, all appear to be important components in the understanding of student retention. These factors may help to impact how much of a college "member" students feel they are.

Third, college preferences may be more important than college perceptions in classifying freshmen on the basis of return status. It also may matter when researchers document these college desires. If students really do not know what they want in a college until they have occupied it for some time, administrators may want to wait until the spring of students' freshman year to assess college preferences and perceptions.

Finally, there appears to be specific statistical analysis which is ideally suited for the task of understanding college student attrition. CTA was far superior in classifying dropouts than traditional discriminant analysis techniques (84% *vs*. 18%). This finding is important since attritors comprise the group about which college administrators are most concerned. Additionally, CTA was able to identify unique clusters of dropouts (and returners) implying that, indeed, students choose to leave their colleges for a plethora of reasons. This ability to refine our understanding of college attrition may be an important first step in actually reducing the number of students who choose this route.

References

[1]Schneider, B. (1987). E = f (P, B): The road to a radical approach to person-environment fit. *Journal of Vocational Behavior, 31,* 353-361.

[2]Tinto, V. (1975). Dropout from higher education: A theoretical synthesis of recent research. *Review of Educational Research, 45,* 89-125.

[3]Tinto, V. (1993). *Leaving college: Rethinking the causes and cures of student attrition*. Chicago: University of Chicago Press.

[4]Chapman, D. W., & Pascarella, E. T. (1983). Predictors of academic and social integration of college students. *Research in Higher Education, 19,* 295-322.

[5]Moos, R. H. (1976). *The human context: Environmental determinants of behaviors.* New York: Wiley.

[6]Moos, R. H. (1979). *Evaluating educational environments.* San Francisco: Jossey-Hill.

[7]Astin, A. W. (1975*). Preventing students from dropping out.* San Francisco: Jossey-Bass Publishers.

[8]Astin, A. W. (1985). Involvement: The cornerstone of excellence. *Changes,* 35-39.

[9]Astin, A. W. (1991). *Assessment for excellence: The philosophy and practice of assessment and evaluation in higher education.* NY: American Council on Education: Macmillan.

[10]Astin, A. W. (1993). *What matters in college?* San Francisco: Jossey-Bass Publishers.

[11]Stern, G. (1970). *People in context: Measuring person-environment congruence in education and industry.* New York: Wiley.

[12]Astin, A. W. (1968). *The college environment*. Washington, D.C.: American Council on Education.

[13]Astin, A. W. (1977). *Four critical years*. San Francisco: Jossey-Bass Publishers.

[14]Cook, J. R. (1987). Anticipatory person-environment fit as a predictor of college student health and adjustment. *Journal of College Student Personnel, 28,* 394-398.

[15]Nielsen, H. D., & Moos, R. H. (1977). Student-environment interaction in the development of physical symptoms. *Research in Higher Education, 6,* 139-156.

Copyright 2010 by Optimal Data Analysis, LLC
2155-0182/10/$3

[16]Janosik, S., Creamer, D. G., & Cross, L. H. (1988). The relationship of residence halls' student-environment fit and sense of competence. *Journal of College Student Development, 29,* 320-326.

[17]Pervin, L. A. (1967). Satisfaction and perceived self-environment similarity: A semantic differential study of student-college interaction. *Journal of Personality, 35,* 623-634.

[18]Reuterfors, D. L., Schneider, L. J., & Overton, T. D. (1979). Academic achievement: An examination of Holland's congruency, consistency, and differentiation predictions. *Journal of Vocational Behavior, 14,* 181-189.

[19]Tracey, T. J., & Sherry, P. (1984). College distress as a function of person-environment fit. *Journal of College Student Personnel, 25,* 436-442.

[20]Hadley, T., & Graham, J. W. (1987). The influence of cognitive development on perceptions of environmental press. *Journal of College Student Personnel, 28,* 388-394.

[21]Eagan, A. E., & Walsh, W. B.(1995). Person-environment congruence and coping strategies. *The Career Development Quarterly, 43,* 246-256.

[22]Sergent, M. T., & Sedlacek, W. E. (1990). Volunteer motivation across student organizations: A test of person-environment fit theory. *Journal of College Student Development, 31,* 255-261.

[23]Kulka, R. A., Klingel, D. M., & Mann, D. W. (1980). School crime and disruption as a function of student-school fit: An empirical assessment. *Journal of Youth and Adolescence, 9,* 353-370.

[24]Treadway, D. M. (1979). Use of campus-wide ecosystem surveys to monitor a changing institution. In L. A. Huebner (Ed.). *Redesigning campus environments: New directions for student services* (No. 8). San Francisco: Jossey-Bass.

[25]Pervin, L. A., & Rubin, D. B. (1967). Student dissatisfaction with college and the college dropout: A transactional approach. *The Journal of Social Psychology, 72,* 285-295.

[26]Fox, R. N. (1986). Application of a conceptual model of college withdrawal to disadvantaged students. *American Educational Research Journal, 23,* 415-424.

[27]Caplan, R. D. (1987). Person-environment fit theory and organizations: Commensurate dimensions, time perspectives, and mechanisms. *Journal of Vocational Behavior, 31,* 248-267.

[28]Osipow, S. H. (1987). Applying person-environment theory to vocational behavior. *Journal of Vocational Behavior, 31,* 333-336.

[29]Schneider, B. (1987). The people make the place. *Personnel Psychology, 40,* 437-453.

[30]Chatman, J. A. (1989). Improving interactional organizational research: A model of person-organization fit. *Academy of Management Review, 14,* 333-349.

[31]French, J. R. P., Jr., Rodgers, W., & Cobb, S. (1974). Adjustment as person-environment fit. In G. V. Coelho, D. A. Hamburg, & J. E. Adams (Eds.), *Coping and Adaptation.* New York: Basic Books.

[32]Rounds, J. B., Dawis, R. V., & Lofquist, L. H. (1987). Measurement of person-environment fit and prediction of satisfaction in the theory of work adjustment. *Journal of Vocational Behavior, 31,* 297-318.

[33]Barker, R. G. (1963). On the nature of the environment. *Journal of Social Issues, 19,* 26-27.

Copyright 2010 by Optimal Data Analysis, LLC
2155-0182/10/$3

[34]Wicker, A. W. (1972). Processes which mediate behavior-environment congruence. *Behavioral Science, 17*, 265-277.

[35]MacDonald, N., & Ronayne, T. (1989). Jobs and their environments: The psychological impact of work and noise. *The Irish Journal of Psychology, 10,* 39-55.

[36]Nehrke, M. F., Morganti, J. B., Cohen, S. H., Hulicka, I. M., Whitbourne, S. K., Turner, R. R., & Cataldo, J. F. (1984). Differences in person-environment congruence between microenvironments. *Canadian Journal on Aging, 3,* 117-132.

[37]Moos, R. H., & Gerst, M. (1974). *University residence environment scale manual.* Palo Alto, CA: Consulting Psychologists Press.

[38]Huebner, L. A. (1975). *An ecological assessment: Person-environment fit.* Unpublished doctoral dissertation. Colorado State University.

[39]Salamone, P. R., & Daughton, S. (1984). Assessing work environments for career counseling. *Vocational Guidance Quarterly, 33,* 45-54.

[40]Moos, R. H., & Trickett, E. J. (1974). *Classroom environment scale manual.* Palo Alto, CA: Consulting Psychologists Press.

[41]Evans, N. J. (1983). Environmental assessment: Current practices and future directions. *Journal of College Student Personnel, 24,* 293-299.

[42]Pervin, L. A. (1967). A twenty-college study of student x college interaction using TAPE (Transactional Analysis of Personality and Environment): Rationale, reliability, and validity. *Journal of Educational Psychology, 58,* 290-302.

[43]Boxx, W. R., Odom, R. Y., & Dunn, M. G. (1991). Organizational values and value congruency and their impact on satisfaction, commitment, and cohesion. *Public Personnel Management, 20*, 195-205.

[44]Caplan, R. D., & Van Harrison, R. (1993). Person-environment fit theory: Some history, recent developments, and future directions. *Journal of Social Issues, 49,* 253-275.

[45]Kaldenberg, D. O., & Becker, B. W. (1992). Workload and psychological strain: A test of the French, Rodgers, and Cobb hypothesis. *Journal of Organizational Behaviors, 13,* 617-624.

[46]O'Reilly, C. A., III, Chatman, J., Y Caldwell, D. F. (1991). People and organizational culture: A profile comparison approach to assessing person-organizational fit. *Academy of Management Journal, 34,* 487-516.

[47]Posner, B. Z. (1992). Person-organization values congruence: No support for individual differences as a moderating influence. *Human Relations, 45,* 351-361.

[48]Murray, H. A. (1938). *Explorations in personality.* New York: Oxford University Press.

[49]Pace, C. R., & Stern, G. G. (1958). An approach to the measurements of psychological characteristics of college environments. *Journal of Educational Psychology, 49,* 269-277.

[50]Holland, J. L. (1987). Some speculation about the investigation of person-environment transactions. *Journal of Vocational Behavior, 31,* 337-340.

[51]Spokane, A. R., & Derby, D. P. (1979). Congruence, personality pattern, and satisfaction in college women. *Journal of Vocational Behavior, 15,* 36-42.

[52]Pervin, L. A. (1968). Performance and satisfaction as a function of individual-environment fit. *Psychological Bulletin, 69,* 56-68.

Copyright 2010 by Optimal Data Analysis, LLC
2155-0182/10/$3

[53]Astin, A. W., & Panos, R. J. (1969). *The educational and vocational development of students.* Washington, D.C.: American Council on Education.

[54]Edwards, J. R. (1993). Problems with the use of profile similarity indices in the study of congruence in organizational research. *Personnel Psychology, 46,* 641-665.

[55]Edwards, J. R., & Perry, M. E. (1993). On the use of polynomial regression equations as an alternative to difference scores in organizational research. *Academy of Management Journal, 36,* 1577-1613.

[56]Finney, H. C. (1967). *Development and change of political liberalism among Berkeley undergraduates.* Unpublished Doctoral Dissertation, University of California, Berkeley.

[57]Cook, T. D., & Campbell, D. T. (1979). *Quasi-experimentation.* Chicago: Rand-McNally.

[58]Yarnold, P.R., Soltysik, R.C. (2005). *Optimal data analysis: A guidebook with Software for Windows*. Washington DC: APA Books.

[59]Yarnold, P. R. (1996). Discriminating geriatric and non-geriatric patients using functional status information: An example of classification tree analysis via uniODA. *Educational and Psychological Measurement, 56,* 656-667.

[61]Silva, A. P. D., & Stam, A. (1995). Discriminant analysis. In L. G. Grimm & P. R. Yarnold (Eds.), *Reading and understanding multivariate statistics.* (pp. 277-318). Washington, D.C.: American Psychological Association.

[62]Tabachnick, B. G., & Fidell, L. S. (1996). *Using multivariate statistics* (3rd ed.). Northridge, CA: HarperCollins.

[63]Bretz, R. D., Jr., Ash, R. A., & Dreher, G. F. (1989). Do people make the place? An examination of the Attraction-Selection-Attrition hypothesis. *Personnel Psychology, 42,* 561-581.

[64]Witt, P. H., & Handal, P. J. (1984). Person-Environment fit: Is satisfaction predicted by congruency, environment, or personality? *Journal of College Student Personnel, 25,* 503-508.

[65]Jacoby, B. (1989). *The student as commuter: Developing a comprehensive institutional response.* Washington, D.C.: The George Washington University.

[66]Louis, M. R. (1990). Surprise and sense making: What newcomers experience in entering unfamiliar organizational settings. *Administrative Science Quarterly, 25,* 226-251.

Author Notes

This research derives from Jennifer Howard Smith's doctoral dissertation under the direction of Emil J. Posavac, with assistance from dissertation committee members John D. Edwards, R. Scott Tindale and Eugene B. Zechmeister, and statistical consultation from Paul R. Yarnold and Fred B. Bryant. eMail: Jennifer@appliedresearchsolutionsinc.com.