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Do Psychosocial and Study Skill Factors Predict College Outcomes? A Meta-Analysis

Steven B. Robbins
ACT

Kristy Lauver
University of Wisconsin—Eau Claire

Huy Le and Daniel Davis
University of Iowa

Ronelle Langley
ACT

Aaron Carlstrom
University of Wisconsin—Milwaukee

This study examines the relationship between psychosocial and study skill factors (PSFs) and college outcomes by meta-analyzing 109 studies. On the basis of educational persistence and motivational theory models, the PSFs were categorized into 9 broad constructs: achievement motivation, academic goals, institutional commitment, perceived social support, social involvement, academic self-efficacy, general self-concept, academic-related skills, and contextual influences. Two college outcomes were targeted: performance (cumulative grade point average; GPA) and persistence (retention). Meta-analyses indicate moderate relationships between retention and academic goals, academic self-efficacy, and academic-related skills (ρs = .340, .359, and .366, respectively). The best predictors for GPA were academic self-efficacy and achievement motivation (ρs = .496 and .303, respectively). Supplementary regression analyses confirmed the incremental contributions of the PSF over and above those of socioeconomic status, standardized achievement, and high school GPA in predicting college outcomes.

The determinants of success in postsecondary education have preoccupied psychological and educational researchers for decades. In their seminal book *How College Affects Students*, Pascarella and Terenzini (1991) identified over 3,000 studies in a 20-year period that addressed the college change process. They distinguished between verbal, quantitative, and subject matter competence and cognitive skills and between psychosocial, moral, and career domains when examining the theories and models of college student change. They suggested that the development of theoretical frameworks (e.g., Bean, 1980, 1985; Tinto, 1975, 1993) that synthesize and focus investigation into the college change process may be the single most important change during this 20-year window (cf. Bowen, 1977; Feldman & Newcomb, 1969).

During this same time period, a resurging interest in motivation theories within psychology has also taken place. This interest is evidenced by the recent use of goal theories and motivational dynamics to understand school achievement, child development, and educational psychology (cf. reviews by Covington, 2000, and Eccles & Wigfield, 2002). This resurgence reflects the important advances within the theories of self-regulation and expectancy-value models of motivation (Dweck, 1999; Eccles & Wigfield, 2002). Yet, surprisingly, there is little integration or research synthesis of the educational and psychological literatures when looking at college outcomes. This lack of integration limits a full understanding of the relative predictive validity across academic performance, psychosocial, and study skill constructs highlighted in these emergent educational persistence and motivational models.

Conceptual confusion occurs when defining college success and its determinants. A good example is the long-standing tradition within the educational literature (cf. Messick, 1979) of referring to noncognitive predictors as anything but standardized academic achievement and aptitude tests and school-based academic performance (e.g., grade point average [GPA] and class rank), whereas, within cognitive psychology, a broad range of constructs are viewed as cognitive, including self-concepts such as self-efficacy beliefs and outcome expectancies, meta-cognitive knowledge, and achievement and performance goals (Eccles & Wigfield, 2002; Harackiewicz, Barron, Pintrich, Elliot, & Thrash, 2002). Therefore, the primary purpose of our study is to bring together the psychological and educational literatures to increase the understanding of the relative efficacy of psychological, social, and study skill constructs on college success. Secondarily, the study's purpose is to examine the relative effects of these constructs vis-à-vis

Steven B. Robbins and Ronelle Langley, Research Division, ACT, Iowa City, Iowa; Kristy Lauver, Department of Management, University of Wisconsin—Eau Claire; Huy Le, Department of Management and Organizations, University of Iowa; Daniel Davis, Department of Quantitative and Psychological Foundations, University of Iowa; Aaron Carlstrom, Department of Psychology, University of Wisconsin—Milwaukee.

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Correspondence regarding this article should be addressed to Steven B. Robbins, Assistant Vice President for Research, ACT, Inc., Iowa City, IA 52243-0168. E-mail: steve.robbins@act.org

academic achievement and performance. Few, if any, studies have systematically examined effect sizes or derived incremental validity estimates across academic achievement and psychosocial domains, and there are no meta-analyses that have done this.

The National Debate—Going Beyond Traditional Predictors

The importance of understanding the effect of psychological, social, and study skills on academic achievement and performance is of both theoretical and practical importance. Currently, a national debate rages over what constructs to use when choosing college applicants. However, we believe that determining selection criteria and understanding the determinants of college success are two separate issues, with our focus being on the determinants of college success. Selection criteria are used for high-stakes decisions. These criteria must withstand problems with social desirability and must be standardized across settings. The use of standardized testing for selection into postsecondary education has a long and fascinating history rooted in this country's desire for a meritocratic rather than privileged class system (cf. Lehman, 1999). The use of alternative measures to standardized achievement testing for postsecondary selection is under intense review because of the ongoing and controversial public policy debate on the fairness of testing. This debate has arisen in part because of persistent test differences across racial and ethnic groups and also because of initiatives such as that of President Richard Atkinson of the University of California, Berkeley, to abolish use of the SAT because he believes there is an overemphasis on test preparation and test performance. In response to these pressures, there is an increased interest in the role of psychosocial and other factors in understanding college outcomes on the part of those involved in academic selection. The notion here is that if these alternative factors are associated with college performance and persistence and they can be measured under high-stakes conditions, they may serve as new alternatives to standardized testing. Although the results of this study may help address the national debate on selection, the study is focused on understanding the determinants of college outcomes without addressing the complex issues associated with high-stakes decision making.

Because of the past focus on traditional predictors (such as high school GPA and standardized test scores), this study also takes these into consideration. We know that a combination of high school grades and standardized achievement test scores account for approximately 25% of the variance when predicting first-year college GPA (ACT, 1997; Boldt, 1986; Mathiasen, 1984; Mouw & Khanna, 1993). Hezlett et al. (2001) conducted a comprehensive meta-analysis of prior research on the validity of the SAT when used as a selection tool to predict students' performance in college (high-stakes decisions). They accessed previously published studies and reports and extensive data files made available by the Educational Testing Service (the developer of the SAT). Correcting for attenuating effects due to range restriction and measurement error in college grades, they observed operational validities between .40 and .50.[1] Although the strength of association diminished over time, research in the personnel literature on the combination effects of ability and experience on job performance suggests these validities are actually quite stable (cf. Schmidt, Hunter, Outerbridge, & Goff, 1988, for discussion). Therefore, in addition to our intent to examine the correlations of each psychosocial and study skill predictor with specific college outcomes, our article also generates preliminary incremental validity estimates of these predictors when controlling for socioeconomic status (SES), high school performance (i.e., GPA), and standardized achievement test performance.

Toward Conceptual Clarity

There are two significant challenges in a systematic analysis of the differential effects of academic and psychosocial factors on college outcomes that this study attempts to address: First, there is lack of conceptual clarity or consistency with regard to what constitutes a college outcome. Using the evaluation learning outcomes as an analogy, there are immediate, intermediate, and ultimate outcomes—all of which are important but which imply a temporal sequence of events (cf. Linn & Gronlund, 2000). It is not surprising that studies have selected varying criteria, ranging from individual test behavior to class performance to cumulative GPA. Moreover, researchers have varied in the salience of psychological adjustment as an outcome—some view perceived well-being as a key determinant whereas others view it as its own outcome domain. For our purposes, we selected or targeted college outcomes from two central but distinct domains: performance and persistence. Performance pertains to class or subject matter achievement, typically measured by cumulative GPA. Despite problems with grading reliability and disciplinary and institutional grading differences, it is still the most widespread performance measure. Our other domain pertains to retention, or the length of time a student remains enrolled at an institution (toward completion of the program of study). We do not include time to degree completion within our definition because in a preliminary review of the literature, we could not identify more than five studies that used time to degree completion as the dependent variable. Although it is a positive indicator of retention, we view time to completion as a separate issue from retention.

The second challenge is the lack of clearly defined and adequately measured predictors. This challenge stems from the fact that the research literature ranges across many psychological and educational content domains, which dampens efforts at integrating or evaluating the empirical literature. The relative strength of the educational literature is to create comprehensive theories of college adjustment tested with longitudinal designs, but it is limited by atheoretical constructs and single-item survey measurement. At the same time, the psychological literature contains numerous

[1] When the SAT is used by colleges (together with other admission criteria) to select first-year students, its ranges of scores in the samples of college students are restricted, that is, variances of the scores in college student samples are smaller than in the college applicant population (high school students applying to colleges). Consequently, correlations between SAT scores and college GPA obtained in college student samples are attenuated. In other words, those correlations underestimate the validity of the SAT in predicting college performance of the college applicants (cf. Linn, 1983). Therefore, being interested in estimating the predictive validity of SAT as a selection tool to select first-year students (high-stakes decisions), Hezlett et al. (2001) made correction for range restriction, together with correction for measurement error in the college outcome criterion (cf. Schmidt & Hunter, 1977), in their study.

studies using theoretically rich constructs with adequate internal and external validity but that do not appear embedded within programmatic research focused prospectively on college success.

We have already highlighted the inherent problems distinguishing between psychosocial and academic achievement domains. If we view academic achievement as measured by standardized test and class performance, does this mean our interest is everything else? Certainly, a wide range of psychological, social, behavioral, and contextual factors are included in the theories of Tinto (1975, 1993) and Bean (1980, 1985), who focused on predicting student retention or persistence through the incorporation of precollege student characteristics, goals and institutional commitments, institutional contextual variables, and academic and social integration factors.

The conceptual distinction between academic achievement and other factors is further blurred for two reasons: First, as discussed previously, psychological, social, or behavioral factors are frequently used not as predictors but as outcome measures (e.g., desire to succeed, social involvement, and study skills, respectively, as both predictors and criteria). Second, there is inconsistent differentiation between psychosocial predictors and background factors such as gender, race, and SES. These background factors are important in their own right as both potential determinants and moderators of college outcomes (cf. Willingham, 1985; Willingham & Breland, 1982). For the purposes of our study, we examined models across both psychological and educational literatures and determined a potential classification of constructs from both arenas. We then verified the placement of these constructs by examining measures in the studies identified to make sure their placement under the determined constructs made sense theoretically.

Educational Persistence Models

Two dominant theories of college persistence have emerged, the theories of Tinto (1975, 1993) and Bean (1980, 1985). These theories have several common factors that serve as potential organizing tools when reviewing the research literature (see Cabrera, Castañeda, Nora, & Hengstler, 1992, for a review and empirical test of these models). Tinto's (1975) student integration theory proposes that certain background factors (e.g., family, SES, high school performance) help determine a student's integration into an institution's academic and social structures. This integration determines institutional commitment and goal commitment, which are mediators of social and academic integration when predicting retention behavior. The interaction of these factors over time enhances or detracts from a student's persistence. Bean's (1980, 1983) student attrition model highlights the centrality of behavioral indicators, particularly student contact with faculty and time spent away from campus. The premise here is that these indicators are proxies for student interaction and lack of involvement, respectively. In particular, there is considerable empirical support for the core constructs of academic engagement and social involvement (Beil, Reisen, Zea, & Caplan, 1999; Berger & Milem, 1999; Stoecker, Pascarella, & Wolfle, 1988). As Berger and Milem (1999) summarized, although Tinto and Bean differed on using perceptual versus behavioral measures of the student involvement construct, "student involvement leads to greater integration in the social and academic systems of the college and promotes institutional commitment" (p. 644). We summarize the salient constructs from these models in Table 1, emphasizing four broad categories: (a) contextual influences, which are factors pertaining to an institution that are likely to affect college outcomes, including institutional size, institutional selectivity, and financial support; (b) social influence, represented by perceived social support; (c) social engagement, typified by social involvement, which includes social integration and belonging; and (d) academic engagement, including commitment to degree and commitment to institution. For integrative reviews and comparative tests of the Tinto and Bean models, see Cabrera, Nora, and Castañeda (1992), Elkins et al. (2000), and Stoecker et al. (1988).

Motivational Theory Models

Within the psychological literature, contemporary motivational theories are emerging as strong explanatory models of academic achievement and other performance behavior. Several excellent reviews of the motivational literature (Covington, 2000; Dweck, 1999; Eccles & Wigfield, 2002) have highlighted the emergent theories of self-regulation and expectancy values and the need to integrate motivational and cognitive models. As Covington pointed out,

> the quality of student learning as well as the will to continue learning depends closely on an interaction between the kinds of social and academic goals students bring to the classroom, the motivating properties of these goals, and prevailing classroom reward structures. (Covington, 2000, p. 171)

It is beyond the scope of this study to fully capture the many differences within contemporary motivational theories. Rather, our aim is to identify key or defining motivational constructs associated within the prevalent literature and to determine their differential effects on college outcomes. For example, in Covington's review of goal theory, motivation and school achievement, dis-

Table 1
Salient Psychosocial Constructs From Educational Persistence Model and Motivational Theory Perspectives

Educational persistence models[a]	Motivational theories[b]
Contextual influences	Motives as drives
Financial support	Achievement motivation
Size of institutions	Need to belong[c]
Institutional selectivity	Motives as goals
Social influence	Academic goals[d]
Perceived social support	Performance and mastery goals
Social engagement	Motives as expectancies
Social involvement[c] (social integration, social belonging)	Self-efficacy and outcome expectations
Academic engagement	Self-worth
Commitment to degree[d]	Self-concept
Commitment to institution	

[a] Research syntheses of Tinto (1975, 1993) and Bean's (1980, 1985) models of educational persistence. [b] Compare to Covington's (2000) and Eccles and Wigfield's (2002) reviews of motivational theories and academic achievement. [c] These constructs are similar and likely to tap the same underlying phenomenon of social engagement. [d] These constructs are similar and likely to tap the same underlying construct of academic goal commitment.

tinctions were made between the historic view of motives as drives (cf. Atkinson, 1964; Paunonen & Ashton, 2001), including both the need to achieve and the need to belong, and the more recent conception of motives as goals (cf. Dweck, 1986, 1999; Urdan, 1997), including both achievement and performance goals. In a similar vein, Eccles and Wigfield (2002) highlighted the differences between intrinsic motivation, goal, and interest theories. They both also highlighted theories that integrate expectancy (e.g., self-efficacy and control) and value constructs and theories that integrate motivational and cognitive determinants of achievement behavior. Covington (1998, 2000) also included self-worth theory, based on the notion that people are motivated to establish and maintain a positive self-concept or image. Expectancies are also potentially important motivational constructs and relate to motivational expectancy theories (cf. Eccles & Wigfield, 2002). More specifically, the construct of academic self-efficacy (derived from Bandura's, 1982, 1986, social learning theory) encapsulates the notion that self-referent thoughts or beliefs play a central role in behavior. To summarize, and as highlighted in Table 1, we identify four broad domains: (a) motives as drives, including achievement motivation and the need to belong; (b) motives as goals, evidenced by academic goals and performance versus mastery goals; (c) motives as expectancies, typified by academic self-efficacy and outcome expectation; and (d) self-worth, represented by general self-concept.

Combining the Literature

Because we decided not to limit the scope of our study but rather to integrate the literatures, similarities within and across the literatures need to be examined. Within the educational theories of Tinto (1993) and Bean (1985), college degree commitments can be viewed as a form of academic goal motivation (cf. D. Allen, 1999; Ramist, 1981). Educational theories also incorporate achievement motivation by placing the students' ability to sustain targeted energy and action despite obstacles as central to college student performance (cf. Robbins et al., 2002). Eppler and Harju (1997), for example, examined the relation of achievement motivation and academic performance within a model that also incorporated student background factors (e.g., SAT score) and study habits and work commitments. They found that achievement motivation is a better predictor of academic success (i.e., cumulative GPA) than the other predictors. Self-worth or general self-concept constructs are mentioned in both motivational (Covington, 1998; Thompson, Davidson, & Barber, 1995) and educational models (cf. Bean, 1985; Tinto, 1993). As Covington (2000) proposed, the desire to confirm one's worth promotes achievement of goals adopted by students. In particular, general self-concept is of central interest when examining college academic adjustment (e.g., Boulter, 2002; Byrne, 1996). At the same time, self-worth does not appear to be commonly used in empirical tests of the comprehensive educational models of persistence (e.g., Terenzini, Pascarella, Theophilides, & Lorang, 1985). Finally, measures within the motivational literature of the need to belong, as well as those falling within the educational persistence models as social involvement, seem to reflect the same phenomenon of social engagement.

What About Study Skills?

A final construct of interest when addressing academic performance is commonly described as study skills, or those activities necessary to organize and complete schoolwork tasks and to prepare for and take tests. This construct is frequently cited when describing attributes of academically successful students (cf. Mathiasen, 1984) and is a focal point of freshman year experience and other academic interventions (e.g., ACT, 1989; Ferrett, 2000). Typical skill areas include time management, preparing for and taking examinations, using information resources, taking class notes, and communicating with teachers and advisors. The underlying premise of this construct is simple: Behaviors directly related to productive class performance determine academic success. In a large-scale study (Noble, Davenport, Schiel, & Pommerich, 1999) of high school students' ACT performance, study skills were directly related not to standardized achievement but to course GPA, whereas course GPA was directly related to standardized achievement score. The researchers argued that academic behaviors precede positive course performance, which is related to scores on the ACT achievement test. Several studies (e.g., Kern, Fagley, & Miller, 1998; Robbins et al., 2002; Robyak, Downey, & Ronald, 1979) have demonstrated a link between positive academic behaviors and cumulative GPA. Finally, there is considerable research (e.g., Elliot, McGregor, & Gable, 1999; Robbins et al., 2002) to suggest that achievement goals and study skills are both connected to college performance outcomes.

Combining Theories

For the purposes of our study, we looked at studies across both the psychological and the educational literatures. We examined similarities within the models and then identified studies falling under each of the constructs, as shown in Table 1. The constructs within these studies were then distributed theoretically (where the construct would seem to belong), and their placements were verified by looking at how the constructs were measured and by making sure they still fit within the definitions we had derived. After examining the two different literatures and taking into consideration the educational persistence models and motivational theories (as highlighted in Table 1), as well as the literature on study skills, we determined nine broad constructs of psychosocial and study skill factors (PSFs) as follows: achievement motivation, academic goals, institutional commitment, perceived social support, social involvement, academic self-efficacy, general self-concept, academic-related skills, and contextual influences (including financial support, size of institutions, and institutional selectivity).

What Did We Expect to Find Out?

We did not expect that each predictor category would have the same effect size for both academic performance and persistence outcomes. The evidence is strong that motivational constructs are associated with college performance. The differential roles of achievement motivation and academic goal constructs are less clear. Certainly, several studies support a multiple-goals perspective (e.g., Elliot et al., 1999; Harackiewicz, Barron, Tauer, & Elliot, 2002) by suggesting that different motivational constructs

affect different educational outcomes. Harackiewicz, Barron, Tauer, and Elliot (2002) highlighted this point by finding that mastery goals predicted continued interest in college whereas performance goals predicted academic performance. There is also a demonstrated link between motivation and persistence. D. Allen (1999) examined the structural relationships between motivation, student background, academic performance, and persistence. He found that motivation was not directly connected to academic performance but that it did predict persistence. He also found that financial aid, parents' education, and high school rank directly affected academic performance. In a similar vein, Robbins et al. (2002) found that goal directedness, or a generalized sense of purpose and action, predicted a decrease in psychological distress, a key marker of first-year college dropout. At the same time, goal directedness did not directly predict end-of-year academic performance but was mediated by academic behaviors (e.g., study skills, class attendance, etc.).

Furthermore, Multon, Brown, and Lent (1991) conducted a meta-analysis of the relationships between self-efficacy beliefs and academic performance and persistence. They identified 36 published and unpublished studies with a range of performance measures ($n = 19$), including standardized test scores, class performance and grades, and basic skills tasks. Their data were collected primarily in elementary school settings, with both high- and low-achieving students. Despite significant heterogeneity among criterion measures, they found an average correlation of .38 between self-efficacy beliefs and academic performance (although they did not control for past achievements on ability levels). They also identified 18 studies looking at persistence, measured as either time spent on task or number of items completed. Only two studies looked at academic terms completed. They found a similar mean correlation (.34) despite problems with heterogeneity among criterion measures.

The role of academic self-efficacy predictors is less certain in college. Kahn and Nauta (2001) tested a social learning theory model of first-year college persistence using hierarchical logistic regression analyses to test precollege and first-semester college performance predictors. They found that past academic performance (i.e., high school rank and ACT score) and first-semester GPA significantly predicted persistence to second year of college. Contrary to their hypotheses, they did not identify a significant role of first-semester self-efficacy beliefs, outcome expectations, or performance goals. Interestingly, a similar finding was demonstrated within an experimental study that determined a negative relationship between self-efficacy and performance due to the likelihood of committing logic errors because of overconfidence (Vancouver, Thompson, Tischner, & Putka, 2002). On the other hand, Kahn and Nauta did find that second-semester self-efficacy beliefs and performance goals were significant predictors of return to college in the second year. These findings suggest that social–cognitive factors are most salient once students have attended college and that precollege academic markers remain the most likely predictors of persistence to second year.

Less clear is the interrelationship between the key constructs cited in these educational persistence models. For example, how do high school preparation and academic engagement factors interact to affect both college retention and performance? Do institutional characteristics and perceived social support promote greater social involvement (cf. Pike, Schroeder, & Berry, 1997)? Perhaps most important, do these theories of college persistence generalize to college performance outcomes after controlling for background characteristics including SES, high school performance, and standardized achievement test performance? Incremental validity estimates of academic performance are difficult to propose given the apparent ceiling effect of a squared multiple correlation (R^2) of 25% regardless of the combination of student background, high school performance, and standardized test predictors (cf. Mouw & Khanna, 1993; Noble & Crouse, 1996). The recent meta-analysis of the predictive validity of the SAT on college cumulative GPA (Vey et al., 2001) supports this belief, with operational validity estimates ranging from .44 to .62 ($R^2 =$ 16% to 36%) for the first year to between .40 and .50 the fourth year. Hezlett et al.'s (2001) meta-analytic research on the SAT and academic performance also used a small group of studies (6 to 11) to explore the degree to which the SAT predicts study habits, persistence, and degree attainment. They found operational validity effect sizes in the teens and concluded that "those individuals with higher SAT scores are more likely to have good study habits, remain in college, and complete their degrees" (Hezlett et al., 2001, p. 13).

From this brief examination of the literature, it stands to reason that academic goals, achievement motivation, and academic-related skills predictors should have strong effect sizes when predicting academic performance. When looking at persistence outcomes, general self-concept and academic goals should be expected to have an impact, as well as academic self-efficacy, perceived social support, and contextual influences. We did not expect to find much incremental validity from the psychosocial and study skill predictors once high school performance and standardized test scores were controlled when predicting performance the first year of college. However, past research findings have suggested that after controlling for standardized achievement testing and other background factors (e.g., high school GPA and demographics), there is substantial opportunity for psychosocial and study skill predictors to contribute incremental validity to predicting retention.

We sought to cast a broad rather than narrow net on the published literature in attempting to understand college performance and persistence effects. This approach was warranted because of a disparate literature and the pressing need to determine whether the PSFs can predict college outcomes and to establish incremental validity estimates. This broad approach increased the likelihood of measurement variability within each PSF predictor construct and for the retention and performance indicators. This measurement variability issue is similar to that discussed in Multon et al.'s (1991) meta-analysis of academic self-efficacy, which found substantial heterogeneity in the effect sizes, in part because of a broad definition of academic achievement. To counteract measurement variability as much as possible, we removed those studies where either predictor or criterion variable measurement was not consonant with our construct definitions. However, our definitions of the constructs remained broad as this study was of necessity an exploratory examination of the overall impact of the PSF constructs. Finally, we also knew that race, gender, and institutional differences serve as potential moderators between the PSF predictors and academic outcomes (Sconing & Maxey, 1998; Vey et al., 2001). Our ability to test for these effects was dependent on the available research.

Method

Literature Search

A comprehensive literature search strategy was implemented, including a computer search using PsycINFO (1984–present) and Educational Resources Information Center (1984–present) databases and a manual search of the *Journal of Counseling Psychology* (1991–2000), *Journal of Counseling and Development* (1991–2000), *Research in Higher Education* (1991–2000), and *Journal of Higher Education* (1991–2000) to double check results obtained from the electronic databases. Next, a manual search was conducted checking sources cited in the reference sections of literature reviews, articles, and studies from prominent sources. (For additional information on the search process and search terms used, see Appendix A.)

Criteria for Inclusion/Population of Interest

Studies selected for use had to include both a measure of the PSF constructs and an outcome measure of college success (GPA and/or retention). These searches yielded 408 criterion-related studies. Only 109 of these reported usable data (correlations between predictors and the criterion or some statistics convertible to correlations) and had a population coinciding with our population of interest. These studies were used for the analysis. (See Appendix B for a list of studies and samples included.)

To obtain comparable information, we limited the studies collected to those examining full-time students enrolled at a 4-year, higher education institution (colleges and/or universities) within the United States. Furthermore, unpublished studies were used only if the article included an established, standardized measure of assessment (such as the Learning and Study Strategies Inventory) and provided all the information that we required for the meta-analysis, including reliability estimates of the predictor (coefficient alpha), bivariate correlations, intercorrelations, and so on.[2]

Determining the PSF Constructs

Three of the authors met in several sessions to examine descriptions of the measures included in the studies collected and to categorize them into the nine broad constructs previously determined theoretically (Table 2). Through the process, we confirmed the commonalities previously suggested among measures of constructs under the two domains of educational retention models and motivational theories, verifying that the constructs could be integrated. Specifically, when looking at the constructs, we were able to confirm that measures of college degree commitment under the educational retention models appear to tap the same underlying construct of academic goal motivation suggested by the motivational theories. Similarly, it was confirmed that the measures of need to belong and those of social involvement reflect the same phenomenon of social engagement. Accordingly, these measures were grouped into two general constructs, academic goals and social involvement. There were not enough studies examining the motivational constructs of performance and mastery goals highlighted in Table 1, so we could not examine those constructs in our meta-analysis. This procedure resulted in confirming the existence of nine broad constructs: achievement motivation, academic goals, institutional commitment, perceived social support, social involvement, academic self-efficacy, general self-concept, academic-related skills, and contextual influences. As shown in Table 1, the last construct, contextual influences, includes three distinct subconstructs, which are financial support, institutional size, and institutional selectivity.[3] Though these three sub-constructs can be conceptually grouped under the general construct of contextual influences, they are operationally and empirically distinct. Therefore, in our analysis, we treated the subconstructs separately. Detailed definitions of the constructs and their representative measures are presented in Table 2.

Coding Procedure

A two-stage coding procedure was implemented. Four different coders were initially used, with each of the articles being coded by two separate coders. These coders recorded all the necessary information (described below) in the articles and initially categorized them into five broader domains of motivation, social, self, skills, and contextual. Two of the authors subsequently examined the coding results, recoding if necessary, then assigned the studies into the nine PSFs mentioned above. Coding sheets containing this data were then maintained. Articles were coded for retention (which was broken down into semester that this was measured), intent to persist (once again broken down by semester measured), GPA (identified by semester measured), PSFs, type of design used in each study, type of university (i.e., 4-year, 2-year, size, public or private, selectivity for admissions), gender, ethnicity, type of student (i.e. nontraditional, international), socioeconomic background, high school GPA, and ACT/SAT scores. Although we coded for each of these items, because of the limited number of studies reporting each of the variables of interest, we were limited to looking specifically at retention (overall), GPA (overall), and the PSFs for the main relationships and SES, high school GPA, and ACT/SAT scores as control variables.

Data Analysis

Meta-analysis was used for the primary analysis of the study. This procedure provides a quantitative technique for determining the cumulative generalizable knowledge essential in research. The study used the procedures developed by Hunter and Schmidt (1990b) that correct correlations individually for artifacts to analyze the data collected from the studies. This method was used because it enables corrections for the distortions in the observed correlations due to measurement and statistical artifacts, thereby providing more accurate estimates of the construct-level relationships between the predictors and criteria.

Besides being interested in estimating the construct-level relationship between the predictor and criteria, we also wanted to evaluate the practical

[2] Because of the enormous size and apparent diversity of the relevant literature, for practical purposes we decided to include only published studies and several high-impact research reports (albeit this is a relatively subjective judgment) in our analysis. Even with such a decision rule, the heterogeneity of studies examined, methodologically and conceptually, has created some uncertainties in our results (because of the variations of the relationships estimated). The decision rule, however, may raise concerns about the possible publication bias in our estimated relationships between the PSFs and the college outcome criteria (cf. Gilbody & Song, 2000; Hedges, 1992). Therefore, following the editor's suggestion, we applied the "trim-and-fill" technique (Duval & Tweedie, 2000) to examine this potential bias. Results of this analysis suggested that the bias is virtually nonexistent in 8 out of 11 relationships examined (not all the relationships were examined because we could only apply the trim-and-fill technique on those with a sufficient number of studies available). For the remaining 3 relationships (i.e., academic goals–GPA, academic self-efficacy–GPA, and academic-related skills–GPA), the additional analysis indicated that our results could have been overestimated (i.e., there might be positive biases in our estimates of the relationships between these PSFs and GPA). The biases, however, are small for these relationships and therefore unlikely to affect any research conclusions substantively. Details of the trim-and-fill analysis are available from us upon request. Overall, this additional analysis appears to justify our decision of including only published studies in the current study.

[3] Though these subconstructs were examined separately in our analysis, only the higher level construct of contextual influences is mentioned here because it is of the same conceptual breadth as the other eight constructs.

Table 2
Psychosocial and Study Skill Factor Constructs and Their Representative Measures

Psychosocial and study skill factor construct	Definition and measures
Achievement motivation	*Construct definition:* One's motivation to achieve success; enjoyment of surmounting obstacles and completing tasks undertaken; the drive to strive for success and excellence. *Representative measures:* Achievement Scale (Personality Research Form [Jackson, 1984], used in Paunonen & Ashton, 2001); Achievement Needs Scale (Pascarella & Chapman, 1983; derived from Stern's, 1970, Activities Index) need for achievement (Ashbaugh, Levin, & Zaccaria, 1973); Achievement Scale (College Adjustment Inventory [Osher, Ward, Tross, & Flanagan, 1995], used in Tross et al., 2000).
Academic goals	*Construct definition:* One's persistence with and commitment to action, including general and specific goal-directed behavior, in particular, commitment to attaining the college degree; one's appreciation of the value of college education. *Representative measures:* Goal commitment (Pascarella & Chapman, 1983; Pavel & Padilla, 1993; Williamson & Creamer, 1988); commitment to the goal of graduation (Pascarella & Chapman, 1983); preference for long-term goal (Non-Cognitive Questionnaire [NCQ; Tracey & Sedlacek, 1984]); degree expectation (Braxton & Brier, 1989; Grosset, 1991); desire to finish college (D. Allen, 1999); valuing of education (Brown & Robinson Kurpius, 1997).
Institutional commitment	*Construct definition:* Students' confidence of and satisfaction with their institutional choice; the extent that students feel committed to the college they are currently enrolled in; their overall attachment to college. *Representative measures:* Institutional commitment (e.g., Berger & Milem, 1999; Pike, Schroeder, & Berry, 1997); institutional attachment (Student Adaptation to College Questionnaire [Krosteng, 1992]).
Perceived social support	*Construct definition:* Students' perception of the availability of the social networks that support them in college. *Representative measures:* Family emotional support (College Student Inventory; D. Allen, 1999); social support (Coping Resources Inventory for Stress; Ryland et al., 1994); social stress (Solberg et al., 1998); family support (Solberg et al., 1998); Perceived Social Support Inventory (Gloria et al., 1999); Mentoring Scale (Gloria et al., 1999).
Social involvement	*Construct definition:* The extent that students feel connected to the college environment; the quality of students' relationships with peers, faculty, and others in college; the extent that students are involved in campus activities. *Representative measures:* Social Alienation From Classmates Scale (Daugherty & Lane, 1999); social integration (Ethington & Smart, 1986); University Alienation Scale (Suen, 1983); Personal Contact Scale and Campus Involvement Scale (Mohr et al., 1998); Class Involvement Scale (Grosset, 1991); Student–Faculty Interaction Scale (Pascarella & Terenzini, 1977).
Academic self-efficacy	*Construct definition:* Self-evaluation of one's ability and/or chances for success in the academic environment. *Representative measures:* Academic self-efficacy (Chemers et al., 2001); academic self-worth (Simons & Van Rheenen, 2000); academic self-confidence (Ethington & Smart, 1986); course self-efficacy (Solberg et al., 1998); degree task and college self-efficacy (Gloria et al., 1999).
General self-concept	*Construct definition:* One's general beliefs and perceptions about him/herself that influence his/her actions and environmental responses. *Representative measures:* Rosenberg self-esteem (White, 1988); NCQ general self-concept and realistic self-appraisal (Young & Sowa, 1992; Fuertes & Sedlacek, 1995); self-confidence (W. R. Allen, 1985); self-concept (Williamson & Creamer, 1988).
Academic-related skills	*Construct definition:* Cognitive, behavioral, and affective tools and abilities necessary to successfully complete task, achieve goals, and manage academic demands. *Representative measures:* Time-management skills, study skills and habits, leadership skills, problem-solving and coping strategies, and communication skills.
Contextual influences	*General definition:* The favorability of the environment; the extent that supporting resources are available to students, including (1) availability of financial supports, (2) institution size, and (3) institution selectivity. The three subconstructs are operationally distinct and are therefore treated separately in our analyses. Their specific definitions are further provided below.
Financial support	*Construct definition:* The extent to which students are supported financially by an institution. *Representative measures:* Participation in financial aid program (McGrath & Braunstein, 1997); adequacy of financial aid (Oliver et al., 1985).
Size of institutions	*Construct definition:* Number of students enrolled at an institution. *Representative measures:* Total institutional enrollment (Ethington & Smart, 1986).
Institutional selectivity	*Construct definition:* The extent that an institution sets high standards for selecting new students. *Representative measures:* Institutional selectivity or prestige (Stoecker et al., 1988), mean SAT/ACT score of admitted students (Ethington & Smart, 1986).

Note. Coded studies vary in proportion of representative measures within psychosocial and study skill factors category. Representative measures also vary in proportion between those studies examining retention and those examining grade point average.

use of a predictor measure to forecast the criteria outcomes. To examine this practical use of a measure, we estimated the relationship between the predictor and criterion without correcting for the attenuating effect of measurement error in the predictor. This estimated value is often referred to as the operational validities of the measure (cf. Hunter & Schmidt, 1990b). The operational validities enabled us to examine whether or not an actual measure of these predictors could be used to predict college outcomes.

When studies reported several correlations between measures included within one of the study's constructs, correlations were combined using the formula provided by Hunter and Schmidt (1990b, pp. 457–463) to estimate the overall correlation of the PSF variable composite with the academic outcome. Reliabilities of the newly formed combined measures were also computed accordingly. When reliability estimates were not provided, such information was obtained from the inventories' manuals and/or past articles reporting reliability of such scales. The reliability for both criterion

measures (retention and GPA) was assumed to be 1.0 when university records were used. For measures with only one item (e.g., many studies testing Tinto's model operationalized the constructs of institutional commitment and goal commitment by single-item measures), we estimated reliability by applying the reverse Spearman–Brown formula based on information on the mean reliability of multi-item measures of that construct found in other studies.

Most studies dichotomized the criterion variable of retention, providing only a point-biserial correlation. However, the dependent variable of interest is the length of time the student remains enrolled, a continuous variable (cf. Campion, 1991; Kemery, Dunlap, & Bedeian, 1989). Therefore, we transformed the observed point-biserial correlations into biserial correlations as suggested by Hunter and Schmidt (1990a; also see Kemery, Dunlap, & Griffeth, 1989). This procedure reflects our definition of the retention criterion, which is the length of time the student remains enrolled (cf. Williams, 1990). Use of biserial correlations also eliminates variability in the point-biserial correlations due solely to the heterogeneity in studies in terms of times when measures of retention (or dropout behavior) were obtained, which ranged from one semester to attainment of the undergraduate degree at 5 years (cf. Kemery, Dunlap, & Griffeth, 1989). As with statistical formulas to correct for other study artifacts (e.g., measurement error), this correction produces an estimated correlation with increased sampling error. This causes the variances due to sampling error in the observed correlations to be underestimated. Consequently, the estimates of residual variance not accounted for by artifacts are overestimated, making the results conservative in terms of the conclusion about the generalizability of the PSFs in predicting the retention criterion. Nevertheless, to provide the most accurate estimates for the mean values, results based on biserial correlations are reported. In addition to estimates of mean correlations, both confidence intervals (CIs) and credibility intervals are reported. It is important to report both because they answer different important questions about the studies included in the meta-analysis (Judge, Heller, & Mount, 2002). Credibility intervals provide an estimate of the variability of population correlations across studies, and CIs provide an estimate of the variability of statistical estimates of the mean around the estimated mean correlation (Whitener, 1990).

Additional Analyses

Additional analyses using multiple regression models based on the meta-analytic results were carried out to examine the extent to which retention and GPA are predicted by the PSFs after controlling for SES, high school GPA, and ACT/SAT scores. It is necessary to control for these variables because they have been used to predict retention and GPA in the past and are viewed as more traditional predictors. By including these variables in the regression models, we were able to examine whether or not the PSFs have incremental validities in predicting the college outcomes above and beyond the effects of these traditional predictors. To simplify the analyses, we included only the PSF constructs that were found in the meta-analyses to have zero-order correlations with the college outcome criteria equal to or larger than the smallest correlations between the traditional predictors and the corresponding criteria. This inclusion standard resulted in the inclusions of six PSF constructs (i.e., academic goals, institutional commitment, social support, social involvement, academic self-efficacy, and academic-related skills) in the retention criterion and three PSF constructs (achievement motivation, academic goals, and academic self-efficacy) in the performance criterion.[4] For the current analyses, the changes in R^2 resulting from adding each individual PSF into the regression models including the three traditional predictors provide an index of the incremental contributions of the PSF in predicting the outcome criteria.

Finally, to evaluate the combined effects of the PSFs as predictors for the college outcome criteria and to directly compare them with those of the traditional predictors, we examined six additional hierarchical regression models, three for each criterion. Model 1 includes only the traditional predictors (SES, high school GPA, and ACT/SAT scores) as the independent variables and retention as the dependent variable. In Model 2, only the PSF variables selected in the previous step (i.e., those meeting the inclusion standard) are included as predictors for retention. Examining Model 1 and Model 2 enables direct comparison of the predictabilities of the PSFs and the traditional predictors. Finally, Model 3, the general model, includes all the traditional predictors and PSF variables as predictors for retention. As such, Model 3 provides the comprehensive assessment for the abilities of all the available predictors in predicting retention as the college outcome of interest. For the performance criterion (GPA), we have Models 4, 5, and 6, which serve the same purposes as Models 1, 2, and 3, respectively. Specifically, Model 4 includes only the traditional predictors and GPA as the dependent variable. Model 5, on the other hand, includes only the PSF variables. All those predictors are present in Model 6, the most comprehensive model for the GPA criterion. It should be noted here that Model 4 represents the current ceiling effect of the predictability of current predictors for college performance. Thus, comparing Model 6 and Model 4 provides the comprehensive test for the elusive incremental contributions of the PSF variables above and beyond those of the traditional predictors in predicting GPA.

The procedure described above necessitates the estimates of intercorrelations among all the variables included in the regression models. These intercorrelations were meta-analytically derived from all the studies collected. We used Hunter's (1987) PACKAGE program Regress for the regression analyses.

Results

Description of the Database

A total of 476 correlations (197 correlations with the retention criterion and 279 correlations with the GPA criterion) were obtained from the 109 studies. Sample sizes ranged from 40 to 3,369 for the retention criterion and from 24 to 4,805 for the GPA criterion. Of the studies used, 108 were published and 1 unpublished. Information on the reliability of predictor measures is reported in Table 3. As is evident in Table 3, the standard deviations are variable, the largest being for academic-related skills (SD = .178). The standard deviations of reliability estimates indicate that some portion of the variation in the observed correlations is likely to be due to variation in scale reliabilities. At the same time, larger standard deviations may also indicate variability in the number of items in different measures of the same construct. On the other hand, the ranges of criterion reliabilities are much smaller: For GPA, all reliabilities were assumed to be 1.00 as they were taken from institutional records; for retention, the reliabilities range from .83 to .89 for measures of retention intention and were assumed to be 1.00 when obtained from institutional records.

Meta-Analytic Results

The meta-analytic results are presented in Tables 4 and 5. The results show the estimated correlations between each primary construct (achievement, academic goals, institutional commitment,

[4] Though the zero-order correlation between financial support and retention meets our inclusion standard, we could not include financial support in our analysis because there were not enough data for us to estimate its correlations with other traditional predictors (high school GPA, SES, and ACT/SAT scores).

Table 3
Distributions of Reliabilities of the Psychosocial and Study Skill Predictors

PSF	*k*	*M*	*SD*
Achievement motivation	19	.767	.082
Academic goals[a]	34	.708	.164
Institutional commitment[a]	19	.803	.119
Social support	33	.791	.094
Social involvement	47	.750	.133
Academic self-efficacy	19	.712	.147
General self-concept	16	.842	.110
Academic-related skills	36	.670	.178
Financial support	4	.785	.169
Institutional selectivity	6	.800	.155

Note. All reliabilities are coefficient alpha estimates. Reliabilities of 1.00 were assumed for institutional size. PSF = psychosocial and study skill factor; *k* = number of studies reporting reliabilities.
[a] There are many one-item measures for these constructs; we applied the reverse Spearman–Brown formula to the mean reliabilities to estimate the reliabilities of those measures. Results (i.e., reliability estimates of one-item measures) were used in our subsequent meta-analyses to correct for measurement error in these measures.

social support, social involvement, academic self-efficacy, general self-concept, academic-related skills, and contextual influences, which include financial support, institutional size, and institutional selectivity) and the criterion of interest (retention or GPA). Correlations uncorrected for measurement error in measures of the predictors (operational validities of the measures) as well as construct-level correlations (fully corrected for the effects of measurement error in measures of both variables) were estimated. As discussed earlier, the former correlations (operational validities) allowed us to examine how well actual measures of the PSF constructs (tests given to individuals) are able to predict the likelihood of individuals' success in college (as measured through retention and GPA). The latter, construct-level correlations address a more theoretical question: how highly each of the PSF constructs (as a concept) is related with the college outcomes.

The relationships between the PSFs and retention. Table 4 presents the results of the meta-analysis for the PSF variables and retention. The table includes, respectively, the total sample size (*N*), the number of correlation coefficients on which each distribution was based (*k*), the uncorrected (i.e., observed) mean correlation ($\bar{r}$), the lower (10%) and upper (90%) bounds of the CI for the observed correlation, the operational validity (ρ_0; corrected for measurement error in just the criterion measures), the true-score (construct-level) correlation between a PSF variable and the retention criterion (ρ), the lower (10%) and upper (90%) bounds of the CI for ρ, the estimated standard deviation of the true correlation (SD_ρ), the lower (10%) and upper (90%) bounds of the credibility interval for each distribution, and the percentage variance accounted for by artifacts. The number of correlations upon which the meta-analysis is based varies for each of the PSFs.

As evident in Table 4, the relationships between three PSF constructs (academic-related skills, academic self-efficacy, and

Table 4
Meta-Analysis Results: Predictors of Retention

Predictor	*N*	*k*	$\bar{r}$	CI_r 10%	CI_r 90%	ρ_0[a]	ρ	CI_ρ 10%	CI_ρ 90%	SD_ρ	10% CV	90% CV	% var. acct.
Psychosocial and study skill factors													
Achievement motivation	3,208	7	.105	.042	.168	.105	.066	.042	.168	.116	−.083	.214	28.03
Academic goals	20,010	33	.210	.160	.261	.212	.340	.270	.410	.314	−.062	.742	6.60
Institutional commitment	20,741	28	.204	.150	.258	.206	.262	.192	.331	.286	−.105	.628	4.60
Social support	11,624	26	.199	.142	.255	.204	.257	.193	.321	.254	−.068	.583	7.39
Social involvement	26,263	36	.166	.132	.201	.168	.216	.183	.249	.157	.037	.657	9.60
Academic self-efficacy	6,930	6	.257	.243	.272	.259	.359	.354	.363	.009	.347	.370	95.05
General self-concept	4,240	6	.059	.007	.109	.061	.050	−.001	.101	.098	−.076	.175	17.79
Academic-related skills	1,627	8	.298	.099	.497	.301	.366	.126	.606	.337	−.065	.797	5.08
Financial support	7,800	6	.182	.150	.214	.182	.188	.173	.203	.029	.151	.225	49.57
Institutional size	11,482	6	−.010	−.030	.017	−.010	−.010	−.000	.020	.048	−.070	.056	20.94
Institutional selectivity	11,482	6	.197	.127	.266	.197	.238	.148	.328	.172	.018	.459	2.46
Traditional predictors													
SES	7,704	6	.212	.173	.252	.213	.228	.202	.254	.049	.165	.291	24.63
High school GPA	5,551	12	.239	.180	.297	.240	.246	.190	.302	.151	.053	.439	15.07
ACT/SAT scores	3,053	11	.121	.079	.164	.121	.124	.089	.159	.090	.009	.239	49.35

Note. *k* = number of correlation coefficients on which each distribution was based; $\bar{r}$ = mean observed correlation; CI_r 10% = lower bound of the confidence interval for observed *r*; CI_r 90% = upper bound of the confidence interval for observed *r*; ρ_0 = mean operational validity of the predictor measure, which is the average correlation between measures of the predictor and retention (i.e., the correlation is corrected for measurement error in the retention criterion but not for measurement error in the predictor); ρ = estimated true correlation between the predictor construct and the retention criterion (fully corrected for measurement error in both the predictor and criterion); CI_ρ 10% = lower bound of the confidence interval for ρ; CI_ρ 90% = upper bound of the confidence interval for ρ; SD_ρ = estimated standard deviation of the true correlation; 10% CV = lower bound of the credibility interval for each distribution; 90% CV = upper bound of the credibility interval for each distribution; % var. acct. = percentage of observed variance accounted for by statistical artifacts; SES = socioeconomic status; GPA = grade point average.
[a] These values are virtually the same as the values uncorrected for retention reliability because almost all retention data were from college records and were assumed to have reliability (r_{yy}) of 1.00.

Table 5
Meta-Analysis Results: Predictors of GPA

Predictor	*N*	*k*	$\bar{r}$	CI_r 10%	CI_r 90%	ρ_0[a]	ρ	CI_ρ 10%	CI_ρ 90%	SD_ρ	10% CV	90% CV	% var. acct.
Psychosocial and study skill factors													
Achievement motivation	9,330	17	.257	.221	.292	.257	.303	.263	.344	.131	.136	.471	11.64
Academic goals	17,575	34	.155	.135	.175	.155	.179	.157	.201	.099	.052	.306	20.56
Institutional commitment	5,775	11	.108	.075	.141	.108	.120	.088	.151	.081	.016	.223	25.75
Social support	12,366	33	.096	.075	.118	.096	.109	.087	.130	.097	−.015	.232	27.13
Social involvement	15,955	33	.124	.098	.150	.124	.141	.114	.168	.122	−.015	.297	14.87
Academic self-efficacy	9,598	18	.378	.342	.413	.378	.496	.444	.548	.172	.275	.717	7.67
General self-concept	9,621	21	.037	.006	.068	.037	.046	.012	.080	.121	−.109	.201	17.76
Academic-related skills	16,282	33	.129	.098	.161	.129	.159	.121	.197	.097	.035	.283	23.86
Financial support	6,849	5	.195	.142	.248	.195	.201	.155	.248	.081	.097	.305	9.57
Traditional predictors													
SES	12,081	13	.155	.136	.174	.155	.155	.139	.171	.044	.099	.211	35.10
High school GPA	17,196	30	.413	.376	.451	.413	.448	.409	.488	.170	.231	.666	4.68
ACT/SAT scores	16,648	31	.368	.334	.403	.368	.388	.353	.424	.154	.191	.586	6.15

Note. k = number of correlation coefficients on which each distribution was based; $\bar{r}$ = mean observed correlation; CI_r 10% = lower bound of the confidence interval for observed r; CI_r 90% = upper bound of the confidence interval for observed r; ρ_0 = mean operational validity of the predictor measure, which is the average correlation between measures of the predictor and academic performance (i.e., the correlation is corrected for measurement error in the performance criterion but not for measurement error in the predictor); ρ = estimated true correlation between the predictor construct and the performance criterion (fully corrected for measurement error in both the predictor and criterion); CI_ρ 10% = lower bound of the confidence interval for ρ; CI_ρ 90% = upper bound of the confidence interval for ρ; SD_ρ = estimated standard deviation of the true correlation; 10% CV = lower bound of the credibility interval for each distribution; 90% CV = upper bound of the credibility interval for each distribution; % var. acct. = percentage of observed variance accounted for by statistical artifacts; SES = socioeconomic status; GPA = grade point average.
[a] These values are the same as the values uncorrected for reliability of the criterion because all data of student GPAs were from college records and were assumed to have reliability (r_{yy}) of 1.00.

academic goals) and retention are highly positive. The mean operational validities for academic-related skills, academic self-efficacy, and academic goals were estimated to be .301, .259, and .212, respectively, and the corresponding mean true-score correlations were .366, .359, and .340, respectively. The relationships between most other PSF constructs (institutional commitment, social involvement, social support, and two contextual factors: institutional selectivity and financial support) and retention are also moderately positive, ranging from .168 to .206 (operational validities) and .188 to .262 (true-score correlations). Somewhat surprising, however, are the findings of low relationships of general self-concept and achievement motivation with retention (estimated true-score correlations are .050 and .066, respectively). The remaining contextual-influences construct, institutional size, was also found to be uncorrelated with retention (−.010 for both operational validity and true-score correlation).

Some estimated relationships (achievement motivation, general self-concept, academic self-efficacy, academic-related skills, and all the contextual influences) were based on rather small numbers of studies (k = 6 to 8) and sample sizes (N = 1,627 to 11,482). Thus, the magnitudes of those relationships should be interpreted with caution. However, it should be noted that the problem of small sample sizes and number of studies in meta-analyses is less likely to seriously affect the estimates of mean correlations (ρ) than to influence estimates of the variation of the correlations (SD_ρ; Hunter & Schmidt, 1990b).

Overall, the findings indicate that actual measures of most PSF constructs are correlated with retention as a measure of college success. All the CIs of the true-score correlations (ρ), except those of general self-concept and institutional size, did not include zero, indicating that the mean true-score (construct-level) correlations are positive in the population. Statistical and measurement artifacts do not account for most of the variance in observed correlations between the PSFs and retention, except for that of academic self-efficacy (95.05%). This may be due to the number of disparate measures included in each of the PSF constructs. This may also be due to the fact that many of the sample sizes were very large, so that there was little sampling error to be accounted for. Also, because the credibility intervals are very wide, many either including zero or being very close to including zero for all of the PSFs, moderators are likely to be present. The most likely moderator is the type of measures used. Nevertheless, these findings indicate positive mean correlations for typically used measures of these constructs. Arguably, a psychometrically sound and theory-based measure of a PSF predictor should be able to predict the retention criterion better than the average values found herein, which were based on many ad hoc, convenient, single-item measures of the constructs.

Table 4 also provides the estimated relationships between the traditional predictors (SES, high school GPA, and ACT/SAT test scores) and the retention criterion. It can be seen therein that relationships between high school GPA and SES and retention were moderate (operational validities are .240 and .213, respectively), whereas the relationship between ACT/SAT test scores and retention is lower (operational validity is .121). As mentioned earlier, the latter value (i.e., relationship of ACT/SAT and retention) was used as the standard to select the PSFs for subsequent regression analyses.

It is important to note here that the estimated correlations mentioned above are not corrected for the effect of range restriction in high school GPA and ACT/SAT test scores. Because institutions often base their admission decisions on these traditional predictors, variations of the predictors in the population of admitted first-year students are reduced (i.e., their ranges are restricted). Consequently, the correlations between these predictors (high school GPA and ACT/SAT scores) and retention estimated in the student population are affected by range restriction (cf. Kuncel, Campbell, & Ones, 1998; Linn, 1983). In other words, because of range restriction, the correlations between high school GPA, ACT/SAT scores, and retention estimated in the college student population are different from (i.e., smaller than; cf. Linn, 1983) the correlations in the population of college applicants. Thus, whether correction for range restriction is needed or not is the question that should be answered based on the population of interest. If one is interested in examining the relative effectiveness of high school GPA and ACT/SAT (vis-à-vis the PSF constructs) for predicting college outcomes of admitted students (e.g., determining at-risk students for counseling purpose), no correction is needed because the correlations are estimated in the population of interest. On the other hand, if the interest is in examining the validities of these predictors when they are used as tools to select first-year students from the college applicant population, correction for range restriction should be required. For the latter case, the correlations between high school GPA and ACT/SAT and retention provided in Table 4 are underestimated. Because the main purpose of our study was to provide an integrative examination of constructs suggested by the two literatures (educational retention models and motivational theories) whose population of interest is mainly college students, we did not correct for range restriction. For these reasons, although our results properly address the former question (i.e. relative effectiveness of the PSFs and traditional predictors in predicting college outcomes of admitted students), these findings may not generalize to high-stakes selection situations.

The relationships between the PSFs and GPA. Table 5 includes the same information as listed for Table 4, except the criterion here is GPA. As can be seen therein, results strongly support the predicted relationships between almost all the PSF constructs and GPA. Academic self-efficacy remains the best PSF predictor of GPA, with the estimated operational validity of .378 and true-score correlation of .496. Different from results obtained with the retention criterion, however, here achievement motivation was the second highest predictor, with an operational validity of .257 and a true-score correlation of .303. Financial support, academic goals, academic-related skills, and social involvement were also found to have some impact on GPA (.195, .155, .129, and .124, respectively, for operational validities; .201, .179, .159, and .141, respectively, for true-score correlations). Again, the unexpected finding of a low relationship between general self-concept and college outcomes was further confirmed here (.037 and .046 for operational validity and true-score correlation, respectively). Overall, except for the analysis concerning financial support, the number of studies and the sample sizes for all the analyses included in this section were relatively large ($k = 11$ to 34; $N =$ 5,775 to 17,575), providing confidence for the results obtained herein about the relationships between the PSFs and GPA.

The CIs of the operational validities and true-score correlations of all the PSF predictors excluded zero, indicating zero is not a plausible value for any of these mean correlations. Again, statistical artifacts did not account for most of the variance in true-score correlations between the PSF predictors and GPA. Coupled with the findings that the credibility intervals around the true-score correlations with GPA for all the PSFs are noticeably wide, these results suggest the existence of some moderator or moderators that influence the variation of the correlations across studies. Nevertheless, for most of the PSF predictors (exceptions are general self-concept, social involvement, and social support), credibility intervals did not include zero, indicating that the constructs underlying these PSF measures are positively correlated with GPA across most (90%) situations.

Table 5 also presents the estimated relationships between the traditional predictors (high school GPA, SES, and ACT/SAT scores and GPA). Consistent with earlier findings in the literature (e.g., Hezlett et al., 2001; Mouw & Khanna, 1993), the relationships were moderate, with operation validities ranging from .155 (SES) to .413 (high school GPA). Because of the problem of range restriction discussed earlier, the relationships between high school GPA and ACT/SAT scores and GPA in the college applicant population are underestimated. Again, decision to correct for range restriction should be based on the research question. As discussed earlier, because of the main purpose of our study, we did not apply the range restriction correction.

Additional Analyses

Data used. Tables 6 and 7 provide the matrices of correlations needed for the secondary analysis. Table 6 presents (a) the operational validities of the PSF variables and the traditional predictors (i.e., the correlations between either a PSF or a traditional predictor and an outcome criterion corrected for measurement error only in the latter) and (b) the mean intercorrelations among the PSFs and the traditional predictors uncorrected for measurement error in both variables. Table 7 includes the correlations among the PSF variables, the traditional predictors, and the two criteria fully corrected for measurement error. For both tables, the correlations between the PSFs and retention and GPA were obtained from the meta-analyses described in the previous sections (see Tables 4 and 5). Similarly, the correlations between the traditional predictors (high school GPA, SES, ACT/SAT scores) and the college outcome criteria also came from the primary meta-analyses (see Tables 4 and 5). Intercorrelations among the PSF variables and the traditional predictor variables were derived by further meta-analytically combining the correlations found across all the studies included in the meta-analysis. However, two intercorrelations in the matrices, both pertaining to academic-related skills (skills–institutional commitment and skills–social support), could not be estimated because the data needed for such estimations were not available in the studies. Although these two missing correlations did not create any problems for our analyses examining the individual incremental contributions of academic-related skills over and beyond the traditional predictors in predicting college outcomes, they made it impossible to include academic-related skills in our further examination of the combined effects of the PSF variables (i.e., Models 2 and 3).

Table 6
Mean Observed (Uncorrected) Intercorrelations Among Variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Achievement motivation	—	5,825 (5)	440 (2)	327 (1)	848 (4)	724 (3)	327 (1)	4,805 (1)	705 (2)	5,976 (3)	5,857 (3)	3,208 (7)	9,330 (17)
2. Academic goals	.468	—	3,409 (5)	4,345 (10)	3,868 (9)	1,311 (5)	3,461 (7)	5,601 (2)	6,706 (9)	12,143 (12)	6,929 (5)	20,010 (33)	17,575 (34)
3. Institutional commitment	.186	.147	—	5,493 (10)	5,645 (10)	296 (3)	2,469 (3)	NA	3,351 (5)	7,727 (10)	3,427 (8)	20,741 (28)	5,775 (11)
4. Social support	.030	.185	.266	—	7,059 (16)	1,553 (8)	4,488 (13)	NA	3,111 (6)	5,345 (12)	3,406 (10)	11,624 (26)	12,366 (33)
5. Social involvement	.152	.127	.272	.209	—	7,329 (6)	3,494 (7)	758 (2)	12,708 (12)	11,344 (16)	3,024 (6)	26,263 (36)	15,955 (33)
6. Academic self-efficacy	.324	.318	−.009	.266	.152	—	569 (3)	110 (1)	7,051 (5)	7,436 (10)	639 (5)	6,930 (6)	9,598 (18)
7. General self-concept	.130	.075	−.123	.041	−.044	.600	—	164 (1)	2,110 (3)	2,467 (4)	555 (2)	4,240 (6)	9,621 (21)
8. Academic-related skills	.614	.514	NA	NA	.471	.331	.144	—	2,531 (1)	4,616 (5)	6,229 (4)	1,627 (8)	16,282 (33)
9. SES	.070	.071	−.035	.070	.103	.251	.001	.050	—	9,194 (8)	1,184 (2)	7,704 (6)	12,081 (13)
10. High school GPA	.326	.135	.038	.046	.086	.518	.027	.140	.139	—	9,127 (12)	5,551 (12)	17,196 (30)
11. ACT/SAT scores	.142	.125	−.004	.028	−.039	.217	.127	.120	.100	.459	—	3,053 (11)	16,648 (31)
12. Retention	.105	.212	.206	.204	.168	.259	.061	.298	.213	.240	.121	—	10,558 (16)
13. GPA	.257	.155	.108	.096	.124	.378	.037	.129	.155	.413	.368	.443	—

Note. Lower diagonal triangle: mean correlations among variables; upper diagonal triangle: sample size and number of studies (in parentheses) from which the means were derived. GPA = grade point average; NA = the correlation could not be estimated because the necessary data were not available; SES = socioeconomic status.

Table 7
Mean Construct-Level (Corrected) Intercorrelations Among Variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Achievement motivation	—	5,825 (5)	440 (2)	327 (1)	848 (4)	724 (3)	327 (1)	4,805 (1)	705 (2)	5,976 (3)	5,857 (3)	3,208 (7)	9,330 (17)
2. Academic goals	.645	—	3,409 (5)	4,345 (10)	3,868 (9)	1,311 (5)	3,461 (7)	5,601 (2)	6,706 (9)	12,143 (12)	6,929 (5)	20,010 (33)	17,575 (34)
3. Institutional commitment	.228	.256	—	5,493 (10)	5,645 (10)	296 (3)	2,469 (3)	NA	3,351 (5)	7,727 (10)	3,427 (8)	20,741 (28)	5,775 (11)
4. Social support	.039	.285	.399	—	7,059 (16)	1,553 (8)	4,488 (13)	NA	3,111 (6)	5,345 (12)	3,406 (10)	11,624 (26)	12,366 (33)
5. Social involvement	.207	.212	.409	.291	—	7,329 (6)	3,494 (7)	758 (2)	12,708 (12)	11,344 (16)	3,024 (6)	26,263 (36)	15,955 (33)
6. Academic self-efficacy	.459	.489	−.008	.431	.239	—	569 (3)	110 (1)	7,051 (5)	7,436 (10)	639 (5)	6,930 (6)	9,598 (18)
7. General self-concept	.162	.104	−.173	.056	−.068	.785	—	164 (1)	2,110 (3)	2,467 (4)	555 (2)	4,240 (6)	9,621 (21)
8. Academic-related skills	.817	.689	NA	NA	.559	.339	.191	—	2,531 (1)	4,616 (5)	6,229 (4)	1,627 (8)	16,282 (33)
9. SES	.080	.096	−.056	.084	.131	.345	.000	.060	—	9,194 (8)	1,184 (2)	7,704 (6)	12,081 (13)
10. High school GPA	.391	.180	.054	.059	.099	.703	.032	.180	.139	—	9,127 (12)	5,551 (12)	17,196 (30)
11. ACT/SAT scores	.171	.146	−.004	.034	−.049	.283	.177	.150	.100	.459	—	3,053 (11)	16,648 (31)
12. Retention	.066	.340	.262	.257	.216	.359	.050	.366	.213	.246	.124	—	10,558 (16)
13. GPA	.303	.179	.120	.109	.141	.496	.046	.159	.155	.448	.388	.443	—

Note. Lower diagonal triangle: mean correlations among variables; upper diagonal triangle: sample size and number of studies (in parentheses) from which the means were derived. GPA = grade point average; NA = the correlation could not be estimated because the necessary data were not available; SES = socioeconomic status.

Incremental contributions of the PSF variables in predicting retention. As explained earlier, we included in this analysis only six PSF variables: academic goals, institutional commitment, social support, social involvement, academic self-efficacy, and academic-related skills. Table 8 provides the results of the regression analyses when including SES, high school GPA, and ACT/SAT along with each of the PSFs individually as predictors of retention. The regression analyses were run twice. First, data (the intercorrelation matrix) in Table 6 were used, which means that the analyses were based on the operational validities of measures of the PSFs (correlations corrected only for measurement error in measures of the criteria) and the uncorrected mean intercorrelations among the variables. Results from this set of analyses provide the estimate of the predictabilities of measures of the predictors (PSFs and the traditional predictors) in predicting retention. Second, analyses based on the true-score correlations between the variables (Table 7) were carried out. Results of these analyses represent the hypothetical situation where there is no measurement error. In other words, they show the predictabilities of the constructs underlying the predictor measures in predicting the retention criterion. Results for this set of analyses are presented in parentheses in Table 8.

As can be seen in Table 8, the changes in R^2 resulting from adding the PSF variables range from .015 (academic self-efficacy) to .068 (academic-related skills). All the beta-weight of each of the PSF variables examined is positive when controlling for the effects of SES, high school GPA, and ACT/SAT. Therefore, it can be concluded that these PSF variables contribute incrementally in predicting retention above and beyond the prediction of SES, high school GPA, and ACT/SAT scores. Academic-related skills and institutional commitment were found to have relatively high beta-weights (.265 and .205 at the level of measures, respectively, and .328 and .263 at construct level, respectively), indicating that they can be valuable predictors of retention, equal to or even better than the other traditional predictors (SES, high school GPA, and ACT/SAT). All the other PSF variables (academic goals, social support, social involvement, and academic self-efficacy) also have beta-weight estimates that are comparable to those of the traditional variables, suggesting their potential as supplementary predictors for retention. With regard to the traditional predictors, across all the analyses, high school GPA is found to be moderately predictive of the criterion, as expected.

Table 9 shows the results from the three models examining the combined effects of the PSFs in predicting retention. As can be seen therein, the traditional predictors can account for about 9% of variance in the retention criterion (Model 1), with high school GPA providing the highest contribution to that effect ($\beta = .212$ measure level; .218 construct level). When measures of the five PSF variables were used to predict retention (Model 2; we could not include academic-related skills because of lack of information, as discussed above), they could explain about 13% of variance in retention. The constructs underlying the PSFs accounted for 21.3% of variance of this criterion. Academic self-efficacy and institutional commitment are the two strongest predictors in the model. When all the available predictors were put together in Model 3, they (the predictors) could account for 17.1% of variance in the retention criterion (22.8% was accounted for by the constructs underlying the predictors). Compared with the percentages of variances accounted for by the traditional predictors in Model 1, these values show meaningful improvements (8% at measure level, 13.5% at construct level), confirming the incremental contributions of the PSFs in predicting retention above and beyond those of the traditional predictors.

Incremental contributions of the PSF variables in predicting GPA. Table 10 presents results of the analyses for the college performance (GPA) criterion. As shown therein, although the two traditional predictors, ACT/SAT scores and high school GPA, were consistently the strongest predictors for GPA as normally expected, academic self-efficacy and, to a lesser extent, achievement motivation appeared to contribute meaningfully to the prediction of this criterion. (Changes in R^2 resulting from including academic self-efficacy and achievement are .033 and .016 at measure level, respectively, and .065 and .019 at construct level, respectively.) Academic goals, however, contributed only marginally (.007 at measure level and .006 at construct level) to the predictability of the regression model where the traditional predictors were included. More extensive evaluations of the incremental contributions of these PSFs are provided in Table 11, which presents results from the three models that include the traditional predictors only (Model 4), the PSF variables only (Model 5), and all the available predictors for GPA (Model 6). Results for Model 4 closely replicate the well-established findings in the literature (e.g., Hezlett et al., 2001) about the combined effect of the three traditional predictors: Percentages of variance in GPA accounted

Table 8
Examining the Incremental Contributions of the PSF Above and Beyond Those of the Traditional Predictors in Predicting Retention

	Beta weights						
Construct	PSF	SES	HS GPA	ACT/SAT	Multiple *R*	R^2	ΔR^2
Academic goals	.174 (.295)	.174 (.162)	.196 (.178)	−.008 (−.017)	.347 (.420)	.120 (.176)	.029 (.083)
Institutional commitment	.205 (.263)	.191 (.199)	.201 (.198)	.011 (.015)	.364 (.402)	.132 (.162)	.041 (.069)
Social support	.182 (.231)	.171 (.164)	.206 (.207)	.004 (.004)	.382 (.382)	.124 (.146)	.033 (.053)
Social involvement	.134 (.177)	.170 (.160)	.196 (.193)	.019 (.028)	.329 (.351)	.108 (.123)	.017 (.030)
Academic self-efficacy	.146 (.320)	.156 (.101)	.138 (−.004)	.010 (.023)	.325 (.372)	.106 (.138)	.015 (.045)
Academic-related skills	.264 (.328)	.175 (.171)	.185 (.173)	−.013 (−.022)	.399 (.443)	.159 (.196)	.068 (.103)

Note. The values in parentheses are based on correlations fully corrected for measurement error in both predictor and criterion variables, so they are hypothetical values representing the optimal situation where there is no measurement error (i.e., they are estimates of the construct-level relationships among the variables). The psychosocial predictors were selected to be included in the analyses on the basis of the magnitudes of their zero-order correlations with the college outcome criteria. SES = socioeconomic status; HS GPA = high school grade point average; ACT/SAT = achievement; ΔR^2 = the increase in variance of the criterion accounted by the predictors resulting from adding the psychosocial and study skill factor (PSF).

Table 9
Combining Multiple Psychosocial and Study Skill Factors (PSFs) and Traditional Predictors to Predict Retention

Predictor beta weight	Model 1: Traditional predictors only	Model 2: PSFs only	Model 3: Traditional predictors and PSFs combined
SES	.183 (.182)		.158 (.135)
HS GPA	.212 (.218)		.146 (.059)
ACT/SAT	.005 (.006)		.008 (.013)
Academic goals		.104 (.138)	.110 (.166)
Institutional commitment		.154 (.217)	.151 (.201)
Social support		.078 (−.001)	.094 (.035)
Social involvement		.067 (.030)	.053 (.026)
Academic self-efficacy		.196 (.287)	.075 (.166)
Multiple *R*	.301 (.305)	.363 (.461)	.414 (.478)
R^2	.091 (.093)	.132 (.213)	.171 (.228)
ΔR^2			Model 3 − Model 1: .080 (.135)
			Model 3 − Model 2: .039 (.016)

Note. The values in parentheses are based on correlations fully corrected for measurement error in both predictor and criterion variables, so they are hypothetical values representing the optimal situation where there is no measurement error (i.e., they are estimates of the construct-level relationships among the variables). The psychosocial predictors were selected to be included in the models on the basis of the magnitudes of their zero-order correlations with the college outcome criteria (except for skills, which is not included in the retention model because there is no data enabling estimation of the intercorrelations between skills and several other variables). SES = socioeconomic status; HS GPA = high school grade point average; ACT/SAT = achievement.

for by the predictors were estimated about 21.9% at the measure level and 25% at the construct level, with high school GPA and ACT/SAT contributing almost equally. Interestingly, the combined effect of the three PSF variables (Model 5) is somewhat comparable (16.4% at the measure level, and 27.3% at the construct level). When all the predictors were included in Model 6, their combined effect accounted for 26.2% of the variance in GPA (measure level; 33.8% construct level). From that, the incremental contribution of the three PSF variables over and beyond those of the traditional predictors was estimated to be 4.3% of the variance in the GPA criterion (measure level; 8.8% for construct level). In Model 6, ACT/SAT and academic self-efficacy are the two strongest predictors (.231 and .200 at measure level, respectively; .274 and .466 at construct level, respectively). The predictive power of high school GPA diminished substantially compared with that in Model 4 where there was no PSF included (.162 in Model 6 compared with .298 in Model 4 at the measure level; −.040 in Model 6 compared with .332 in Model 4 at the construct level). Finally, academic goals and SES appeared to have minimal incremental effects in predicting GPA.

Discussion

Our meta-analysis begins the systematic exploration of the role of PSFs as predictors of college performance and persistence. The zero-order relations were examined first for retention and then for GPA. Most of the PSF variables tested (academic goals, institutional commitment, social support, social involvement, academic self-efficacy, academic-related skills, and two contextual constructs, financial support and institutional selectivity) were found to correlate positively with retention. Academic goals, academic self-efficacy, and academic-related skills were shown to be the strongest predictors of college retention.

The relationships between PSF variables and GPA, though still mostly positive, are not as strong. Interestingly, the patterns of relationships here are different from those found under the reten-

Table 10
Examining the Incremental Contributions of the PSF Above and Beyond Those of the Traditional Predictors in Predicting GPA

Construct	Beta weights				Multiple *R*	R^2	ΔR^2
	PSF	SES	HS GPA	ACT/SAT			
Achievement motivation	.136 (.151)	.088 (.082)	.254 (.273)	.223 (.229)	.485 (.519)	.235 (.269)	.016 (.019)
Academic goals	.083 (.082)	.087 (.081)	.291 (.321)	.215 (.221)	.475 (.506)	.226 (.256)	.007 (.006)
Academic self-efficacy	.218 (.383)	.051 (−.011)	.188 (.065)	.229 (.251)	.502 (.561)	.252 (.315)	.033 (.065)

Note. The values in parentheses are based on correlations fully corrected for measurement error in both predictor and criterion variables, so they are hypothetical values representing the optimal situation where there is no measurement error (i.e., they are estimates of the construct-level relationships among the variables). The psychosocial predictors were selected to be included in the analyses on the basis of the magnitudes of their zero-order correlations with the college outcome criteria. SES = socioeconomic status; HS GPA = high school grade point average; ACT/SAT = achievement; ΔR^2 = the increase in variance of the criterion accounted by the predictors resulting from adding the psychosocial and study skill factor (PSF).

Table 11
Combining Multiple Psychosocial and Study Skill Factors (PSFs) and Traditional Predictors to Predict Grade Point Average

Predictor beta weight	Model 4: Traditional predictors only	Model 5: PSFs only	Model 6: Traditional predictors and PSFs combined
SES	.091 (.086)		.053 (−.023)
HS GPA	.298 (.332)		.162 (−.040)
ACT/SAT	.222 (.227)		.231 (.274)
Achievement motivation		.161 (.198)	.110 (.190)
Academic goals		−.027 (−.193)	−.014 (−.202)
Academic self-efficacy		.334 (.499)	.200 (.466)
Multiple *R*	.468 (.500)	.405 (.523)	.512 (.581)
R^2	.219 (.250)	.164 (.273)	.262 (.338)
ΔR^2			Model 6 − Model 4: .043 (.088)
			Model 6 − Model 5: .098 (.065)

Note. The values in parentheses are based on correlations fully corrected for measurement error in both predictor and criterion variables, so they are hypothetical values representing the optimal situation where there is no measurement error (i.e., they are estimates of the construct-level relationships among the variables). The psychosocial predictors were selected to be included in the models on the basis of the magnitudes of their zero-order correlations with the college outcome criteria (except for skills, which is not included in the retention model because there is no data enabling estimation of the intercorrelations between skills and several other variables). SES = socioeconomic status; HS GPA = high school grade point average; ACT/SAT = achievement.

tion criterion. Specifically, achievement motivation was found to be among the strongest predictor for GPA. The relationship between academic-related skills and GPA (ρ = .159) is noticeably smaller than that with retention (ρ = .366). Also puzzling is the low estimated correlation between general self-concept and GPA (ρ = .046). This last finding is especially surprising considering recent reviews (e.g., Boulter, 2002; Covington, 2000) suggesting that self-worth is an important motivational construct determining college academic outcomes. We speculate that the general self-concept construct breadth is a mismatch with college outcome criteria. Arguably, general self-concept is a broad construct, including people's overall evaluation of themselves vis-à-vis their social connections. As such, it is likely to determine broad criteria, like life satisfaction or long-term happiness. On the other hand, college outcomes, represented by GPA and retention, are narrower insofar as they pertain to students' behaviors in college settings that are relevant only to a certain period of their lives. Broad predictors are not likely to be highly predictive for narrow criteria (cf. Ajzen & Fishbein, 1977; Fisher, 1980; Hamish, Hulin, & Roznowski, 1998; Roznowski & Hamish, 1990). Indirectly supporting this speculation, academic self-efficacy, narrower and apparently more relevant to college-related behaviors, was found to be the best predictor for both college outcomes in our analyses.

Three contextual influence constructs suggested under the educational persistence models were examined in our analyses. As expected, financial support and institutional selectivity are correlated with the retention criterion. Though not suggested by the models, financial support was further found to be moderately predictive of the GPA criterion. Interestingly, the variables "available financial resources" and "hours planned on working during school" are key predictors of admissions decisions and of academic performance in ACT's enrollment management prediction services for 4-year postsecondary institutions (J. Sconing, director of statistical research, ACT, personal communication, May 21, 2003). Institutional ability to minimize financial strain may be an important factor whether viewing persistence or performance. The remaining contextual influence construct, institutional size, is virtually uncorrelated with retention. This finding questions the validity of institutional size as a contextual influence construct in the persistence models. Perhaps a modified, more fine-tuned variable reflecting the extent that institutional resources are available to students, such as student–instructor ratio, would be more appropriate here.

Our findings help clarify the relative salience of key constructs derived from both educational persistence and motivational theory perspectives. Our study took two important literatures and explored their theoretical contributions, tying together each of their individual theoretical aspects. Although contributions from each of these literatures have been important, integrating the literatures is essential to obtaining an overall understanding of how PSFs affect college outcomes on an entirety. Educational persistence models may underestimate the importance of academic engagement, as evidenced by academic goals, academic-related skills, and academic self-efficacy constructs, in college students' retention behavior. At the same time, motivational theories are relevant to both persistence and performance criteria. Self-expectancy constructs (cf. Eccles & Wigfield, 2002; Pintrich, 1989) appear to be the most important predictor as they generalize across criteria. Constructs subsumed under the value component of the expectancy-value model were also found to be predictive of the college outcome criteria. Specifically, achievement motivation, conceptualized as a task value construct in the model (attainment value; Eccles & Wigfield, 2002; Feather, 1992), is one of the strongest predictors of the college performance criterion. Academic goals, which can be considered as utility values (Eccles & Wigfield, 2002), were also found to be predictive of both the performance and the retention criteria. Interestingly, the pattern of relationships between this construct and the criteria is opposite to that of achieve-

ment motivation; that is, correlation of academic goals with retention (.34; true-score correlation) is much larger than its correlation with performance (.18; true-score correlation). These differential effects actually agree with the model's predictions. Arguably, achievement motivation is more relevant for the performance criterion, whereas academic goals can be seen as the values influencing students' determinations of staying in college over time. Taken together, our findings provide strong support for the relevance of the expectancy-value models in the educational context.

An important second question of this study was to compare PSFs with traditional predictors (SES, high school GPA, and ACT/SAT scores) used to predict success in academia. As seen in Tables 8 and 9, institutional commitment, academic self-efficacy, and academic goals maintained a positive relationship with retention when included in the regression equation with the traditional factors of SES and high school GPA. The incremental validity of 8% of accounted variance in the retention criterion for PSFs is solid but not as large as one might expect when predicting retention behavior. When looking at GPA, the incremental validity of PSFs was 4% of variance accounted for in the criterion. Academic self-efficacy and achievement motivation were the strongest additional contributors along with high school GPA and standardized test performance.

Are these incremental validity estimates for the PSFs meaningful? We believe so. Although it remains unknown whether or not interventions aimed at selected motivational factors substantially improve performance, the university intervention literature suggests that these factors are amenable to change. In a meta-analytic study of career education interventions that emphasized basic academic skills, good work habits, and work values, Evans and Burck (1992) found that the overall effect size of 67 studies was .16, producing a positive gain in academic achievement. Thus, not only is GPA important to predict but if students with higher risk for achievement difficulties can be identified, then additional programs can be provided to these students to help them succeed in the college or university setting.

The relatively moderate effect size for academic-related skills on academic performance is not surprising; what is surprising is the strong effect size on retention. Perhaps a sense of immediate mastery of learning demands evidenced in classroom performance is a strong motivator for persistence. The causal linkages between academic study skills, performance mastery, and persistence need to be further tested. We know that academic achievement in high school (as evidenced by standardized achievement tests and high school GPA) is the best precollege predictor of first-year college GPA (ACT, 1997; Noble & Crouse, 1996). We also know that study skills are likely to predict class performance in high school (high school GPA; cf. Noble et al., 1999). These findings suggest that study skills are a precursor of positive class performance, which drives later achievement and persistence behavior. Certainly, academic study skills remain a central focus of college success courses and workshops. Hattie, Biggs, and Purdie (1996) used meta-analysis to examine 51 study skills interventions to determine under what conditions interventions are effective. They found that the promotion of learner activity and contextual learning lead to the best outcomes.

The real question then may be not whether improved study skills alone raise academic performance but how study skills combine with social and motivational factors to ensure positive student action. In particular, researchers need to test the role of performance and mastery goals within the college adjustment process. A considerable body of research supports examining the complex interaction of mastery and performance goals (cf. Harackiewicz, Barron, Tauer, & Elliot, 2002; Midgley, Kaplan, & Middleton, 2001) in predicting educational outcomes. As Eccles and Wigfield (2002) proposed, multidimensional models are needed to test the complex interplay of motivational, skill, and performance factors. Toward that end, Pintrich (1989; Pintrich, Smith, Garcia, & McKeachie, 1993) suggested a model, combining motivation and study skills to predict students' performance in college, on which future research could be based to fully examine the nomological network determining college students' behaviors.

There are several limitations. The research literature ranges across many psychological and educational content domains, and the disparate quality of the empirical studies across these domains hinders integration and evaluation of the literature. We chose a broad net in our inclusion criteria within these literatures. This broad net is necessary in bringing the two different literatures together and in the beginning stages of exploration of theoretical psychosocial constructs. Although necessary, one could argue that our net was too broad, as the very inclusive approach we took also provides its own downfall. At the same time, our decision to exclude unpublished studies could be seen as an overrestriction of our sampling domain. Our choice to focus on the published literature may inflate our effect estimates because of confirmatory bias, or the tendency to publish only those studies with positive findings or those studies that do not report small, nonsignificant relationships. However, findings from our trim-and-fill analyses (see Footnote 1) suggest that inclusion of these unpublished studies would be unlikely to result in any appreciable changes in our findings. Another reason these findings may be inflated relates to the time of measurement of both outcome criteria. In a high percentage of studies, retention was measured at entry into second year of school (80%), and performance was measured as first-year cumulative GPA (75%). Whether these relatively proximal criterion measures to first-year enrollment reflect inflated effect sizes in comparison to longer term college outcomes still remains uncertain (see Hezlett et al., 2001, and Schmidt et al., 1988, for different perspectives on this issue).

Other weaknesses result from the current literature itself. Often, the empirical studies that we located were limited by atheoretical constructs, single-item survey measurement, or scale construction involving the modification of one or more established measures under a broad theoretical rubric. The literature is further complicated by the presentation of measures without a description of psychometric properties, rendering it difficult to assess the quality of measures and/or their relationships to outcomes. There were also many studies eliminated from the meta-analysis because of data not being reported in usable form (i.e., lack of correlations). Furthermore, some of the most commonly used measures failed to be supported by factor analysis or to provide intercorrelations between the measures, making the combining of different scales difficult and less accurate. Moreover, reliabilities of scales were often not reported, causing us to have to estimate reliability in some circumstances. Most flaws in actual databases are such that validity generalization conclusions are more conservative than they should be (Schmitt, Sackett, & Ellingson, 2002). Reporting bias, if present, could create distortions. However, this bias is not

believed to have existed in excess in this study, as data was pulled from entire populations at most of the universities. Finally, as with any meta-analytic study, relationships may, in particular settings, be slightly higher or lower than indicated by the meta-analysis findings. This, however, is considered a minor issue compared with the assurance that the relationship is present and is substantial (Schmitt et al., 2002).

We found evidence suggesting significant moderation effects for many of our predictors based on our estimated standard deviations of the true-score correlations, which were rather large. One explanation is the diversity of scales supposedly measuring the same constructs. It also could be the differences in the sample characteristics (i.e., gender, race, seniors vs. first-years, etc.). In any case, generalizability is better than expected, given the many different measures of the constructs. Despite the fact that variability was included in our effect estimates (based on variety of measures and variance in construct validity), there were still several credibility intervals that did not include zero. This indicates that the relationships between those PSF constructs and the college outcomes, though varied across studies, are mostly positive.

Unfortunately, we were unable to test for moderation effects along several potentially important dimensions given the nature of our study results. For example, we would expect institutional size or selectivity to moderate specific PSF predictors of retention. Gillespie and Noble (1992) tested components of Tinto's (1975) attrition model using background, academic achievement, and commitment variables. They found, as originally suggested by Tinto (1993), that predictive accuracy and contribution of selected variables varied across time and institution. As Willingham (1985) pointed out, it is difficult to abstract specific factors of student performance due to the interaction of individual differences and institutional characteristics. We also were unable to test for race differences. There is considerable research that demonstrates differential retention patterns between African American and Caucasian students (cf. D. Allen, 1999). Murtaugh, Burns, and Schuster (1999), for example, examined patterns of dropout across ethnic/racial groups. They found that although African American and Latino/a students had higher dropout rates than White students, when groups were matched on entering preparation factors, these differences disappeared.

Most of the limitations of our study become signposts for future research. It behooves researchers to use theoretically grounded and psychometrically sound measures and to include theoretical foundations and statistical properties in publications. The development of theoretically grounded, reliable, and valid PSF measures is important and in many instances is currently lacking. We also must continue to distinguish between persistence and performance outcomes, as we expect differential effects depending on each PSF predictor. In turn, measurement of these outcome criteria needs strengthening. There is conceptual confusion with retention. We know that first-to-second-year retention is not the same as time to degree attainment. Also, there are problems with the reliability of grading due to institutional and teacher differences in grading practices (cf. Etaugh, Etaugh, & Hurd, 1972; Valen, 1997).

Our findings provide partial support for the role of motivational factors in Tinto's (1993) and Bean's (1985) retention models. In Pascarella and Terenzini's (1983) elaboration of a multidimensional model of college withdrawal, they found that goal and institutional commitments and background factors are most likely to predict persistence. In turn, Pascarella and Chapman (1983) found that motivation and social integration are the primary predictors of persistence. At the same time, our understanding of the role of contextual factors was limited because of the small number of codable studies found within the research literature. We do know, however, that recent research (e.g., Berger & Braxton, 1998; Berger & Milem, 1999) has shown that the salience of student social and academic integration factors is contingent on institutional characteristics such as commuter versus residential, selectivity, and 2- versus 4-year programs.

Two important constructs suggested by the motivational theories (academic self-efficacy and achievement motivation) in particular seem promising as PSF predictors of college outcomes. This conclusion dovetails nicely with research in the applied psychology and workforce literature(s) on important determinants of work behaviors. For example, there is a strong connection between motivational drive constructs (e.g., conscientiousness from a Big Five personality perspective) and work performance (cf. Barrick & Mount, 1991; Judge & Ilies, 2002; Salgado, 1997). As Mount and Barrick (1995) described, conscientious people tend to be responsible, planful, hardworking, achievement oriented, and perseverant. Schmidt and Hunter (1998) also reported this finding. Judge and Bono (2001) demonstrated in their meta-analysis that core self-evaluation traits (self-esteem, generalized self-efficacy, locus of control, and emotional stability), which are similar to academic self-efficacy in a college setting, are among the best predictors of job performance and job satisfaction. Further work is needed to carefully define and measure motivational constructs relevant to college-age populations and postsecondary settings. These findings on motivation are also analogous to the role of motivation in workforce training, where there is a considerable literature viewing motivation as central to training outcomes. Colquitt, LePine, and Noe (2000) conducted a meta-analytic path analysis of 20 years of training motivation research. They found that this construct demonstrated incremental variance in training outcomes beyond the effects of cognitive ability and other knowledge. Their study also highlighted the important role of self-efficacy in predicting training performance and transfer. In particular, the direction, intensity, and persistence of behavior are most associated with positive training outcomes. Colquitt et al.'s impressive meta-analysis also pointed to the importance of studying the effects of tailored interventions aimed at promoting specific noncognitive predictors tied to a specified outcome. Put another way, what can researchers do to improve the moderate effect sizes typically reported for academic interventions (e.g., Evans & Burck, 1992)? We believe these findings suggest that tailored interventions can boost student success, particularly within the retention and enrollment management arena.

To conclude, results of our study highlight the need to reevaluate educational persistence models and motivational theories of college outcome behavior to ensure that researchers incorporate key PSFs into them. Certainly, more narrowly defined and measured constructs will aid researchers' ability to build upon the current body of research and to bridge the educational and psychological literatures. Researchers also need to create theoretical, causal models that can be tested prospectively to determine the linkages between motivational, social, and institutional constructs within the context of academic preparation and performance. Our hope is that the findings of this meta-analysis provide an impetus

to come up with common terms across the literatures, as well as to provide a distinction between different college outcomes.

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Appendix A

Literature Search Procedure

Searches were performed to locate articles regarding college student retention or college grade point average (GPA) as the dependent variable. To search for articles in which college student retention was the dependent variable, the following qualifiers were used: (a) *higher education,* or *undergraduate study,* or *undergraduate students,* or *college attendance,* and (b) *retention in school,* or *school holding power,* or *academic persistence,* or *attendance,* or *college attendance,* or *dropout research,* or *dropouts,* or *enrollment management,* or *student attrition,* or *students,* or *truancy,* or *withdrawal.* To search for articles in which college GPA was the dependent variable, the following qualifiers were used: (a) *higher education,* or *undergraduate study,* or *undergraduate students,* and (b) *academic achievement, academic performance,* or *grades* (*scholastic*), or *grade point average.* Multiple terms for independent variables were used to search for articles (as indicated below). Terminology searched for varied slightly for PsycINFO and Educational Resources Information Center on the basis of different terminology used in the theoretical models for psychological and educational literature.

Predictor Search Terms

Psychosocial factors, time management, study habits, study skills, problem solving (*conflict resolution, creative thinking, critical thinking, decision making, decision making skills, help seeking*), *social adjustment, student adjustment, adjustment* (*to environment*), *communication skills, adaptability* (*career development, vocational maturity*), *social skills, self-efficacy, expectation, self-perceptions, attribution theory, locus of control, student attitudes, self-concept, self-esteem, racial identity, student interests, vocational interests, goals* (*objectives, course objectives, educational objectives, guidance objectives, student educational objectives*), *goal commitment* (*goal orientation*), *educational planning, learning motivation, self-motivation, student motivation, achievement need, conscientiousness* (*work attitudes*), *world view* (*beliefs, life style, ideology, values*), *educational aspiration, occupational aspiration, career planning, college planning, faculty integration, social integration, teacher integration, institutional commitment, persistence intentions, intent to persist, social support networks* (*social support groups, social networks*), *interpersonal interactions* (*interpersonal communication, interpersonal relationships, interpersonal competence*), *school involvement, family involvement, community involvement, loneliness.*

Manual Search

In addition to the electronic searches described above, we carried out manual searches of the *Journal of Counseling Psychology* (1991–2000), *Journal of Counseling and Development* (1991–2000), *Research in Higher Education* (1991–2000), and *Journal of Higher Education* (1991–2000). These four are typical and important journals in educational research, so we selected them to search manually to confirm and refine the terms used in our electronic search.

Additional Search

In our revision of the article, we double checked the literature for any recent studies using more limited search terms based on the constructs previously determined (from the original broader search). The same search terms used for both PsycINFO and ERIC (with publication year specified to be from 2001 to 2003) are as follows.

Sample population: *High education* (or) *undergraduate study* (or) *undergraduate students* (or) *college attendance*

(and)

Criterion: *retention* (or) *academic persistence* (or) *dropouts* (or) *student attrition* (or) *student withdrawal* (or) *academic achievement* (or) *grade point average* (or) *grades*

(and)

Independent variables: *psychosocial factors* (or) *adjustment* (or) *study skills* (or) *motivation* (or) *institutional commitment* (or) *need for achievement* (or) *desire to succeed* (or) *goals* (or) *social integration* (or) *social involvement* (or) *support* (or) *self-efficacy* (or) *self-concept* (or) *self-esteem* (or) *self appraisal* (or) *study skills* (or) *size of institution* (or) *financial support* (or) *selectivity.*

(*Appendixes continue*)

Appendix B

Sample and Bivariate Correlation Information of Articles Included in the Meta-Analysis

Reference	Outcome	PSF construct	Design	*N*	Sample information	Uncorrected *r*
D. Allen (1999)	RA3	G1, SS	PA, CR, PL	442	4Pu, Med, 100% W	G1 r_b = .184, SS r_b = .168
D. Allen (1999)	GPA_3	G1, SS	PA, CR, PL	442	4Pu, Med, 100% W	G1 r_b = .170, SS r_b = .186
D. Allen (1999)	RA3	G1, SS	PA, CR, PL	139	4Pu, Med, 100% NonW	G1 r_b = .368, SS r_b = .170
D. Allen (1999)	GPA_3	G1, SS	PA, CR, PL	139	4Pu, Med, 100% NonW	G1 r_b = .190, SS r_b = .051
W. R. Allen (1985)	GPA_c	Ac, G1, GSf, SS, SI	CS, R, CR	327	4Pu, L, 100% AfA	Ac r_b = .060, G1 r_b = .090, GSf r_b = .090, SS r_c = .010, SI r_b = .080
W. R. Allen (1992)	GPA_c	G1, IC, GSf, SS, SI, Sk	CR, R, CS	1,800	M[u], 100% AfA	GSf r_b = −.130, G1 r_c = .280, IC r_b = .160, SS r_c = .234, SI r_b = .120, Sk r_b = .040
Ancis & Sedlacek (1997)	GPA_c	Sf, SS, Sk	PL, CR	1,930	4Pu, L, 100% F	Sf r_c = .050, SS r_b = .070, Sk r_b = .050
Ashbaugh et al. (1973)	RA2	Ac, SS	PL, CR	54	100% M	Ac r_b = 0, SS r_b = .370
Ashbaugh et al. (1973)	RA2	Ac, SS	PL, CR	64	100% F	Ac r_b = −.120, SS r_b = .066
Baker & Siryk (1984a)	GPA_s	G1	PL, CR	291		G1 r_b = .150
Baker & Siryk (1984a)	GPA_s	G1	PL, CR	309		G1 r_b = .150
Baker & Siryk (1984a)	GPA_s	G1	PL, CR	319		G1 r_b = .060
Baker & Siryk (1984a)	RA	G1	PL, CR	291		G1 r_b = .060
Baker & Siryk (1984a)	RA	G1	PL, CR	309		G1 r_b = .110
Baker & Siryk (1984a)	RA	G1	PL, CR	319		G1 r_b = −.030
Baker & Siryk (1984b)	RA	SI, Sk	PL, CR	183	47% M, 53% F	SI r_b = .230, Sk r_b = .150
Baker & Siryk (1984b)	RA	SI, Sk	PL, CR	171	47% M, 53% F	SI r_b = .420, Sk r_b = .130
Baker & Siryk (1984b)	RA	SI, Sk	PL, CR	201	47% M, 53% F	SI r_b = .250, Sk r_b = .160
Baker & Siryk (1984b)	GPA_s	SI, Sk	PL, CR	183	47% M, 53% F	SI r_b = −.050, Sk r_b = .320
Baker & Siryk (1984b)	GPA_s	SI, Sk	PL, CR	171	47% M, 53% F	SI r_b = −.050, Sk r_b = .320
Baker & Siryk (1984b)	GPA_s	SI, Sk	PL, CR	201	47% M, 53% F	SI r_b = −.050, Sk r_b = .180
Bank et al. (1992)	RA	G1	PL, CR	1,017	4Pu, L	G1 r_c = .210
Bank et al. (1994)	GPA_1	G1, IC	PL, R, CR	591	4Pu, L	G1 r_c = .137, IC r_c = .097
Bank et al. (1994)	RI1	G1	PL, R, CR	591	4Pu, L	G1 r_c = .484
Beil et al. (1999)	RA6	IC, SI	PL, CR, PA	512	4Pr, Med, 40% M, 60% F	IC r_b = .230, SI r_c = .150
Bender (2001)	GPA	Sk	CR	73		Sk r_b = .500
Berger & Braxton (1998; also Berger, 1997)	RI2	IC, SS, SI	CR, PL, PA	718	4Pr, HiS, 49% M, 51% F	IC r_c = .090, SS r_b = .110, SI r_b = .480
Berger & Milem (1999)	RA3	G1, SS, SI	PA, CR, PL	387	HiS	G1 r_b = .070, SS r_c = −.102, SI r_b = .030
Beyers & Goossens (2002)	RI	IC	CR, PL	368	20% M, 80% F	IC r_b = .140
Beyers & Goossens (2002)	GPA	IC	CR, PL	368	20% M, 80% F	IC r_b = −.140
Braxton & Brier (1989)	RA2	G1, IC, SI, ASf	PA, CR, PL	104	4-year Med, urban	G1 r_b = .180, IC r_c = .226, SI r_b = .050, ASf r_b = .070
Braxton et al. (1995)	RI2	G1, IC, SS, SI	PL, CR	263	M[u] in Indiana	G1 r_b = .184, IC r_b = .448, SS r_b = −.021, SI r_b = .191
Britton & Tesser (1991)	GPA_c	Sk	CR, PL	90	U. of Georgia—Athens	Sk r_c = .310
Brown & Robinson Kurpius (1997)	RA	G1, SS, SI, Sk	PL, CR	288	4Pu, L, 100% NA	G1 r_b = .070, SS r_c = .174, SI r_b = .020, Sk r_b = .910

Appendix B (*continued*)

Reference	Outcome	PSF construct	Design	*N*	Sample information	Uncorrected *r*
Burleson & Samter (1992)	GPA_c	SS	CR, CS	208	49% M, 51% F	SS $r_b = -.120$
Cabrera et al. (1992)	RA3	G1, IC, SS, SI, Co1	PA, CR, PL	466	4Pu, L	G1 $r_c = .129$, IC $r_b = .173$, SS $r_c = .315$, SI $r_b = .140$, Co1 $r_c = .159$
Cabrera et al. (1999)	RA3	G1, IC, SS, SI	PL, CR	315	M^u, 4Pu, 100% AfA	G1 $r_b = -.270$, IC $r_b = .470$, SS $r_b = .430$, SI $r_b = .020$
Cabrera et al. (1999)	RA3	G1, IC, SS, SI	PL, CR	1,139	M^u, 4Pu, 100% W	G1 $r_b = .040$, IC $r_b = .380$, SS $r_b = .290$, SI $r_b = .070$
Chemers et al. (2001)	GPA	ASf	CR	256		ASf $r_b = .290$
Crook et al. (1984)	GPA_c	GSf	PA, CR, CS	174	4Pu, 36% M, 64% F	GSf $r_b = .230$
Daugherty & Lane (1999)	RAG	SS	PL, CR	382	All-male military college	SS $r_b = .240$
Donovan (1984)	RA	SI, Sk	PL, CR, PA	379	M^u, 100% AfA	SI $r_b = .211$, Sk $r_b = -.100$
Dreher & Singer (1985)	GPA_s	G1, Sk	CR, CS	796	M^u	G1 $r_b = .320$, Sk $r_c = .240$
Eaton & Bean (1995)	RA	SS, SI	PL, PA, CR	262	4Pu, L, 38% M, 62% F	SS $r_c = .129$, SI $r_b = .051$
Eiche et al. (1997)	GPA_s	G1, GSf, SI, Sk	CR, CS	73	4Pu, L, 70% M, 30% F	G1 $r_b = .140$, GSf $r_c = .077$, SI $r_b = .350$, Sk $r_c = .400$
Elias & Loomis (2002)	GPA	Ac, ASf	CR	138	38% M, 62% F	Ac $r_b = .310$, ASf $r_c = .520$
Elkins et al. (2000)	RA2	IC, SS	PA, CR, PL	411	4Pu	IC $r_b = .016$, SS $r_b = .248$
Eppler & Harju (1997)	GPA	G1, Ac	CR, CS	212	TS	G1 $r_b = .300$, Ac $r_b = .130$
Eppler & Harju (1997)	GPA	G1, Ac	CR, CS	50	NonTS	G1 $r_b = .280$, Ac $r_b = .080$
Ethington & Smart (1986)	RAG	ASf, SI, Co2, Co3	PA, CR, PL	2,873	100% M	GSf $r_c = .200$, SI $r_c = .251$, Co1 $r_b = .191$, Co2 $r_b = .026$, Co3 $r_b = .331$
Ethington & Smart (1986)	GPA_c	ASf, SI, Co2, Co3	PA, CR, PL	2,873	100% M	GSf $r_b = .450$, SI $r_b = .216$, Co1 $r_b = .271$, Co2 $r_b = -.008$, Co3 $r_b = .255$
Ethington & Smart (1986)	RAG	ASf, SI, Co2, Co3	PA, CR, PL	3,369	100% F	GSf $r_c = .170$, SI $r_c = .283$, Co1 $r_b = .186$, Co2 $r_b = .042$, Co3 $r_b = .305$
Ethington & Smart (1986)	GPA_c	ASf, SI, Co2, Co3	PA, CR, PL	3,369	100% F	GSf $r_b = .405$, SI $r_b = .225$, Co1 $r_b = .176$, Co2 $r_b = -.053$, Co3 $r_b = .167$
Fass & Tubman (2002)	GPA	SS, ASf	CR	357	29% M, 71% F	SS $r_c = -.010$, ASf $r_c = .264$
Fuertes et al. (1994)	GPA_c	GSf, SI, Sk	CR, PL, R	431	4Pu, L, 58% M, 42% F	GSf $r_c = .160$, SI $r_b = .130$, Sk $r_b = .220$
Fuertes & Sedlacek (1995)	GPA_c	G1, GSf, SS, Sk	CR, PL	156	49% M, 51% F, 100% HL	G1 $r_b = .100$, GSf $r_c = .040$, SS $r_b = -.030$, Sk $r_c = .040$
Gadzella et al. (1985)	GPA_c	GSf	CR, CS	129	4Pu, L, 47% M, 53% F	GSf $r_b = .110$
Gadzella et al. (1987)	GPA_c	Sk	CR, CS	132	4Pu, 21% M, 79% F	Sk $r_b = .480$
Gadzella & Williamson (1984)	GPA_c	GSf, Sk	CR, CS	110	4Pu, 25% M, 75% F	GSf $r_b = .260$, Sk $r_b = .520$
Garavalia & Gredler (2002)	GPA	Sk	CR	69		Sk $r_a = .324$
Geiger & Cooper (1995)	GPA_c	Ac, SI	CR, CS	81	4Pu, L, 50% M, 50% F	Ac $r_c = .190$, SI $r_b = -.170$
Gerardi (1990)	GPA	ASf	CR, PL	98	City U. of New York	Sf $r_b = .570$
Gerardi (1990)	RA3	ASf	CR, PL	98	City U. of New York	Sf $r_b = .240$
Gloria & Kurpius (1996)	RI	SS	CR, CS	429	U. of California, Irvine & Arizona State	SS $r_c = .500$
Gloria et al. (1999)	RI	ASf, GSf, SS	CR, CS	98	4Pu, L, 27% M, 71% F	ASf $r_c = .243$, GSf $r_b = .360$, SS $r_c = .479$
Gold et al. (1990)	GPA_s	IC, SI, Sk	CR, CS	29	4Pu, Med, 21% M, 79% F	IC $r_c = .213$, SI $r_b = .185$, Sk $r_b = .480$
Grosset (1991)	RA3	G1, SS, SI	PL, CR	263	36% M, 64% F	G1 $r_b = .200$, SS $r_b = .200$, SI $r_b = .150$

(*Appendix continues*)

Appendix B (*continued*)

Reference	Outcome	PSF construct	Design	*N*	Sample information	Uncorrected *r*
Hackett et al. (1992)	GPA_c	ASf, SS, Sk	CR, CS	197	4Pu, Med, 76% M, 24% F	ASf r_c = .265, SS r_c = .397, Sk r_b = .260
Haines et al. (1996)	GPA_s	Sk	CR, CS	120	4Pu, L, 37% M, 63% F	Sk r_b = .050
Hawken et al. (1991)	GPA_s	SI, Sk	CR, PL	200	4Pr, S, 42% M, 58% F	SI r_b = .080, Sk r_c = .016
Hickman et al. (2001)	GPA_s	GSf, SS	CR, CS	63	4Pu, L, 100% F	GSf r_b = .310, SS r_b = −.110
Hickman et al. (2001)	GPA_s	GSf, SS	CR, CS	38	4Pu, L, 100% M	GSf r_b = .010, SS r_b = .350
Hogrebe et al. (1985)	GPA_s	IC, ASf, SS	CR, CS	90	U. of Georgia, 100% M	IC r_b = −.030, ASf r_c = .240, SS r_b = −.110
Hogrebe et al. (1985)	GPA_s	IC, ASf, SS	CR, CS	102	U. of Georgia, 100% F	IC r_b = −.060, ASf r_c = .179, SS r_b = −.110
House (1995)	GPA_c	G1, ASf	CR, CS	545	4Pu, L	G1 r_b = −.069, ASf r_c = .047
House (1997)	GPA_c	Ac, G1, ASf	PL, CR	378	100% AsA, 48% M, 52% F	Ac r_b = .010, G1 r_b = .030, ASf r_c = .237
Huffman et al. (1986)	GPA_c	Ac, SI, SS	R, CS	38	100% NA	Ac r_b = .250, SI r_a = −.070, SS r_a = .110
Huffman et al. (1986)	GPA_c	Ac, SI, SS	R, CS	48	100% W	Ac r_b = .070, SI r_a = .130, SS r_a = .350
Kasworm & Pike (1994)	GPA_c	IC, SS, SI	PA, CR, CS	122	NonTS	IC r_b = .100, SS r_b = .130, SI r_b = −.120
Kasworm & Pike (1994)	GPA_c	IC, SS, SI	PA, CR, CS	977	TS	IC r_b = .170, SS r_b = .130, SI r_b = −.120
Kern et al. (1998)	RA4	Ac, G1, Sk	CR, PL	102	4Pu, rural, 52% M, 48% F	G1 r_c = .030, Ac r_b = .230, Sk r_c = .050
Kern et al. (1998)	GPA_s	Ac, G1, Sk	CR, PL	102	4Pu, rural, 52% M, 48% F	G1 r_b = .120, Ac r_c = .360, Sk r_c = .220
Krosteng (1992)	RA	IC	CR, PL	1,026	U. of Hartford	IC r_b = .168
Krosteng (1992)	RA	IC	CR, PL	952	U. of Hartford	IC r_b = .160
Larose et al. (1998)	GPA_c	SS, GSf, Sk	CR, PL	179	49% M, 51% F	SS r_b = .170, GSf r_b = .010, Sk r_b = .220
Larose et al. (1998)	GPA_c	SS, GSf, Sk	CR, PL	298	24% M, 76% F	SS r_b = .100, GSf r_b = .110, Sk r_b = .220
Lent et al. (1984)	GPA_c	ASf	CR, PL	24	Not available	ASf r_c = .442
Lin et al. (1988)	GPA	G1, ASf, SS, SI	CR, CS	508	4Pu, Med, 100% W	G1 r_b = .210, ASf r_b = .360, SS r_b = .050, SI r_b = .130
Lin et al. (1988)	GPA	G1, ASf, SS, SI	CR, CS	87	4Pu, Med, 100% NA	G1 r_b = .330, ASf r_b = .590, SS r_b = .140, SI r_b = .290
C. K. Long & Witherspoon (1998)	GPA_c	SI	CR, CS	72	4Pu, M, 24% M, 76% F	SI r_b = .500
J. D. Long et al. (1994)	GPA_c	Ac, G1, SI, Sk		195	4Pu, Med, 36% M, 64% F	Ac r_b = .140, G1 r_b = .140, SI r_b = .180, Sk r_c = .156
Macan et al. (1990)	GPA_c	SS, Sk	CR, CS	162	Not available	SS r_c = .129, Sk r_b = .230
McGrath & Braunstein (1997)	RA	Co1	CR, PL	322	Iona College—New York	Co1 r_b = .141
Mohr et al. (1998)	RAG	SI	CR, PL, R	90	4Pu, L, 25% M, 45% F	SI r_c = .199
Neumann et al. (1988)	GPA_c	Ac, GSf	CR, CS	200	4Pu, L	Ac r_b = .300, GSf r_b = .270
Nonis et al. (1998)	GPA_s	ASf, Sk	PA, CR, PL	164	4Pu, Med, 55% M, 45% F	ASf r_c = .610, Sk r_c = .122
Okun & Finch (1998)	RA	Ac, IC, SI	CR	240	26% M, 84% F	Ac r_b = .120, IC r_b = .260, SI r_b = .170
Okun & Finch (1998)	GPA	Ac, IC, SI	CR	240	26% M, 74% F	Ac r_b = .200, IC r_b = .070, SI r_b = .040
Oliver et al. (1985)	GPA_c	SS, SI, Co1	CR, R, CS	63	UCLA, 100% HL	SS r_b = .070, SI r_b = .260, Co1 r_b = −.190
Oliver et al. (1985)	GPA_c	SS, SI, Co1	CR, R, CS	75	UCLA, 100% AfA	SS r_b = .050, SI r_b = .000, Co1 r_b = −.010
Pascarella & Chapman (1983)	RA3	Ac, G1, IC, SI	CR, PA, PL	1,099	M^u	IC r_b = .320, G1 r_b = .075, Ac r_b = .015; SI r_c = .172
Pascarella & Chapman (1983)	RA3	Ac, G1, IC, SI	CR, PA, PL	805	M^u	IC r_b = .270, G1 r_b = .012, Ac r_b = .000, SI r_c = .000

Appendix B (*continued*)

Reference	Outcome	PSF construct	Design	*N*	Sample information	Uncorrected *r*
Pascarella & Terenzini (1977) and Pascarella et al. (1986)	RA3	SS	R, PL, CR	344	R, Syracuse U.	SS r_c = .240
Pascarella & Terenzini (1983) and Pascarella et al. (1986)	RA3	G1, IC, SI	PA, CR, R, PL	763	4Pu, Med	G1 r_b = .100, IC r_b = −.010, SI r_b = .350
Paunonen & Ashton (2001)	GPA	Ac	CR, PL	717	26% M, 74% F	Ac r_b = .260
Pavel & Padilla (1993)	RA	G1, IC, SI	PA, PL	191	Not available	G1 r_b = .128, IC r_b = .000, SI r_c = .235
Pavel & Padilla (1993)	RA	G1, IC, SI	PA, PL	197	Not available	G1 r_b = .000, IC r_b = .000, SI r_c = .235
Perry et al. (2001)	GPA	G1, ASf	CR	234		G1 r_b = .380, ASf r_c = .265
Pike et al. (1997)	RA	IC, SS, SI	CR, PL	130	U. of Missouri—Columbia	IC r_b = .397, SS r_a = .240, SI r_b = .020
Pike et al. (1997)	RA	IC, SS, SI	CR, PL	888	U. of Missouri—Columbia	IC r_b = .397, So r_a = .110, SI r_b = −.010
Pike et al. (1997)	GPA	SS, SI	CR, PL	130	U. of Missouri—Columbia	SS r_a = .040, SI r_b = −.120
Pike et al. (1997)	GPA	SS, SI	CR, PL	888	U. of Missouri—Columbia	SS r_a = .040, SI r_b = −.120
Platt (1988)	GPA_s	Ac, ASf	PA, CR, PL	208	4Pu, L, 82% M, 18% F	Ac r_c = .110, ASf r_c = .205
Rau & Durand (2000)	GPA_s	G1, SI	R, PA, CR, CS	295	R, Illinois State U.	G1 r_b = .189, SI r_b = −.124
Rubin et al. (1990)	GPA_c	Sk	PL, CR, PA	50	Not available	Sk r_c = .360
Rugsaken et al. (1998)	GPA_c	Ac, G1, Sk	CR, CS	4,805	Ball State U.	Ac r_c = .320, G1 r_b = .150, Sk r_c = .147
Ryland et al. (1994)	RA2	GSf, SS, Co1	CR, CS	301	40% M, 60% F	GSf r_b = .070, SS r_b = .130, Co1 r_b = .200
Sandler (2000)	GPA	GSf, SS, SI, G1, IC, Co1	CR	469	28.8% M, 71.2% F	GSf r_b = .056, SS r_b = .000, SI r_b = −.104, G1 r_b = −.036, IC r_b = .023, Co1 r_c = −.048
Sandler (2000)	RA1	GSf, SS, SI, G1, IC, Co1	CR	469	28.8% M, 71.2% F	GSf r_b = .151, SS r_b = −.196, SI r_b = −.053, G1 r_b = −.056, IC r_b = −.171, Co1 r_c = −.025
Scott & Robbins (1985)	GPA_s	G1, Sk	CR, PL	60	4Pu, 53% M, 47% F	G1 r_b = .370, Sk r_c = .161
Sedlacek & Adams-Gaston (1992)	GPA_s	G1, GSf, SS, SI, Sk	CR, PL	105	L, athletes, 64% M, 36% F	G1 r_b = .130, Sf r_c = .320, SS r_b = .300, SI r_b = .240, GSf r_c = .320, Sk r_c = .200
Simons & Van Rheenen (2000)	GPA_c	GSf, Sk	CR, CS	198	U. of California, Berkeley; athletes	GSf r_b = .480, Sk r_b = .360
Solberg et al. (1998)	RI	ASf, GSf, SS, SI	CR, CS	388	4Pu, L	ASf r_b = .240, GSf r_c = .195, SS r_c = .194, SI r_b = .140
Staats & Partlo (1990)	RI	G1	CR, CS	218	4Pu, L, 99% W	G1 r_b = .380
Steward & Jackson (1990)	GPA	GSf	PL	40	4Pu, L, 100% AfA	GSf r_b = .448
Steward & Jackson (1990)	RAG	GSf	PL	40	4Pu, L, 100% AfA	GSf r_b = .180
Stoecker et al. (1988)	RAG	SI, Co2, Co3	PL	2,312	M^u, 100% F, 100% W	SI r_b = .079, Co2 r_b = −.068, Co3 r_b = .044
Stoecker et al. (1988)	RAG	SI, Co2, Co3	PL	526	M^u, 100% F, 100% AfA	SI r_b = .056, Co2 r_b = .002, Co3 r_b = .136
Stoecker et al. (1988)	RAG	SI, Co2, Co3	PL	2,021	M^u, 100% M, 100% W	SI r_b = .070, Co2 r_b = −.062, Co3 r_b = .045
Stoecker et al. (1988)	RAG	SI, Co2, Co3	PL	381	M^u, 100% M, 100% AfA	SI r_b = .136, Co2 r_b = −.082, Co3 r_b = .043
Stoynoff (1997)	GPA_c	Ac, G1, Sk	CR, PL	77	4Pu, L, international students	Ac r_b = .180, G1 r_b = .050, Sk r_c = .170
Suen (1983)	RA	SI	CR, PL	67	Rural, Med, 100% AfA	SI r_b = .240
Suen (1983)	RA	SI	CR, PL	151	Rural, Med, 100% W	SI r_c = .030

(*Appendix continues*)

Appendix B (*continued*)

Reference	Outcome	PSF construct	Design	*N*	Sample information	Uncorrected *r*
Swanson & Hansen (1985)	GPA_c	G1	CR, CS	319	4Pu, L	G1 r_b = .260
Terenzini et al. (1981)	RA3	G1, SS, SI	PL	332	4Pu, L	G1 r_b = .480, SS r_c = .118, SI r_b = .330
Terenzini et al. (1985)	RA3	G1, IC, SI		723	4Pu, L	G1 r_b = .005, IC r_b = −.013, SI r_b = −.050
Ting (1997)	GPA_s	G1, SS	PL, CR	124	4Pu, L, 68% M, 32% F	G1 r_b = .300, SS r_b = .210
Ting & Robinson (1998)	GPA_s	G1, GSf, SS, SI, Sk	PL, CR	2,600	4Pu, L	G1 r_b = .090, GSf r_c = .006, SS r_a = .050, SI r_b = .100, Sk r_c = .080
Tomlinson-Clarke (1994)	GPA_c	G1	PL	29	4Pu, L, 100% M	SI r_c = .130
Tomlinson-Clarke (1994)	GPA_c	G1	PL	36	4Pu, L, 100% F	SI r_c = .300
Tomlinson-Clarke & Clarke (1994)	GPA_c	SI	CR, CS	47	4Pu, L, 100% M	SI r_c = .140
Tomlinson-Clarke & Clarke (1994)	GPA_c	SI	CR, CS	45	4Pu, L, 100% F	SI r_c = .030
Trockel et al. (2000)	GPA_s	SS, Sk	R, CS, CR	184	4Pr, L	SS r_a = .046, Sk r_b = .224
Tross et al. (2000)	GPA_2	Ac	CR, CS	844	4Pu, L, 70.5% M, 29.5% F	Ac r_c = .360
White (1988)	GPA_c	G1, GSf, SS, SI	CR, PL, R	201	U. of Wisconsin, 100% W	G1 r_b = .170, GSf r_b = .070, SS r_b = .010, SI r_b = .050
White (1988)	GPA_c	G1, GSf, SS, SI	CR, PL	109	U. of Wisconsin, 100% AfA	G1 r_b = .210, GSf r_b = .150, SS r_b = .050, SI r_b = .080
Williamson & Creamer (1988)	RA3	G1, GSf, SS, SI	CR, PL, PA	2,755	M^u	G1 r_c = .240, GSf r_b = −.002, SS r_c = −.025, SI r_b = .014
Young & Sowa (1992)	GPA_c	G1, GSf, SS, SI, Sk	CR, PL	87	4Pu, L, 100% AfA, Year 1	G1 r_b = .320, GSf r_c = .230, SS r_b = −.080, SI r_b = −.010, Sk r_b = .150

Note. Outcome: RA3 = actual retention, third semester; GPA_3 = third semester grade point average (GPA); GPA_c = cumulative GPA; RA2 = actual retention, second semester; RA = actual retention; GPA_s = semester GPA (specific semester not provided by author); GPA_1 = first semester GPA; RI1 = intent to persist, first semester; RA6 = actual retention, sixth semester; RI2 = intent to persist, second semester; RI = intent to persist; RAG = actual retention to graduation; RA4 = actual retention, fourth semester; GPA_2 = second semester GPA. Psychosocial and study skill factor (PSF) constructs: G1 = academic goals; SS = social supports; Ac = achievement motivation; GSf = general self-concept; SI = social involvement; IC = institutional commitment; Sk = academic-related skills; ASf = academic self-efficacy; Co1 = financial support; Co2 = institutional size; Co3 = institutional selectivity. Design: PA = path analysis; CR = correlational; PL = prospective/longitudinal; CS = cross-sectional; R = randomized. Sample information: 4Pu = 4-year public college/university; Med = medium-sized university; W = Caucasian students; NonW = non-Caucasian/Minority students; L = large university; AfA = African American students; M^u = multiple colleges/universities; F = female students; M = male students; 4Pr = 4-year private college/university; HiS = high selectivity; U. = University; NA = Native Americans; TS = traditional students; NonTS = nontraditional students; HL = Hispanic/Latino/Latina students; S = small-sized college or university; AsA = Asian American students; UCLA = University of California, Los Angeles. Uncorrected *r*: r_b = bivariate correlation; r_c = combined bivariate correlation; r_a = average correlation.

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