Assessing the Validity of College Success Indicators for the At-Risk Student: Toward Developing a Best-Practice Model

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Leslie Tucker¹ and Oscar McKnight²

Abstract
This study assessed the feasibility of using precollege success indicators to identify at-risk students at a large 4-year public research university in the Midwest. Retention data from students who participated in an established student success program were examined. The findings affirm that the initial admissions assessment identifying at-risk students is a feasible predictor of academic success, including high school (HS) grade point average (GPA) could predict student success over and above the variance accounted for by American College Test alone; the semester in which students are admitted is a predictor of success; first-semester college GPA can predict academic success over and above chance; there is a significant positive relationship between cognitive ability (i.e., American College Test × HS GPA) and SUCCESS; HS GPA could be used as the single best predictor of student success; and using all three variables to identify student success appears warranted. A PASS model is offered to assist in the development of interventions and success programs.

Keywords
at-risk students, predictor variables, higher education, intervention support services, retention

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Student retention is perhaps the most highly investigated topic in higher education (Seidman, 2005). One reason being, although the demographic composition of colleges and universities has become more diverse over the past 40 years, according to Brock’s (2010) report on college entrance and increased access, student success in college as measured by persistence and degree attainment has not improved at all. For example, Black, Hispanic, Native American, and Pacific Islander students are about half as likely to earn a bachelor degree as their White and Asian classmates (Berkner, He, & Cataldi, 2002; Carey, 2004; U.S. Department of Education, 2014). Further, low-income students are much less likely to earn a college degree than students whose family incomes are above the bottom quartile (AD Council, 2006; Tough, 2014). In addition, while almost one third of first-generation students enter college, only approximately 73% return for their second year (Stebleton & Soria, 2012; Stuber, 2011). Given that the college graduation rate overall has hovered around 50% for decades (Kuh, Kinzie, Schuh, Whitt, & Associates, 2005), continued efforts to address these skewed and inequitable outcomes are necessary. While colleges and universities rely upon predictive analytics and resources including advising, tutoring, and community-building programs in efforts to increase student success outcomes (Winkelmes et al., 2016), more must be done to bring proven practices to scale and to test new ideas that might lead to better success (Brock, 2010).

To better understand the causes and consequences of student retention and attrition, more must be discovered as to how the current predictor variables contribute to and interact with effective educational practices for at-risk students (Kuh, Cruce, Shoup, Kinzie, & Gonyea, 2007). At-risk students are identified as low-income, (Advisory Committee on Student Financial Assistance, 2010; Tinto & Pusser, 2006), first-generation (Choy, 2001; Collier & Morgan, 2007), academically disadvantaged (Heisserer & Parette, 2002), and minority students (Fenske, Porter, & DuBrock, 2000; Tinto, 2003). Race and ethnicity along with family income are especially significant because the nature of the college experience of historically underserved students can differ considerably from other student populations (Allen, 1999; Gloria, Kurpius, Hamilton, & Willson, 1999; Rendon, Jalomo, & Nora, 2000). Based on the aforementioned statistics; researchers, policy makers, and practitioners must do much more to identify effective intervention strategies to increase retention for at-risk student populations (Kuh, Kinzie, Buckley, Bridges, & Hayek, 2007).

**Literature Review and Conceptual Framework**

There is a relatively large body of literature on the predictor variables relevant to degree attainment. This research can be divided into two types of predictors: ability or cognitive measures and noncognitive measures. Historically, cognitive variables relevant to academic success (e.g., grade point average [GPA], the
Scholastic Assessment Test (SAT), and the American College Test (ACT) were presumed as accurate appraisals (Cohn, Cohn, Balch, & Bradley, 2004; Kobrin, Patterson, Shaw, Mattern, & Barbuti, 2008; Pharr & Lawrence, 2007). Further, Popham (2006) noted the significance the test scores have on the typical high school students as it is common practice to remember the scores long after the tests are taken as if students are branded by the test results. Popham (2006) also evaluated the tests with regard to their purported efficacy. The SAT, first administered in 1926, was designed to test aptitude or inborn ability. The ACT, conversely, developed by E. F. Lindquist, attempted to test achievement or prior learning. In some institutions, the value placed on the test scores cannot be overstated due to the bragging rights and publication of entering students’ average ACT test scores (Welborn & Lester, 2015). Most semicompetitive schools, however, lean toward a combination formula that includes both the test scores and high school (HS) GPA in their admission decisions (Stumpf & Stanley, 2002). This was confirmed in the National Association for College Admission Counseling, whereas ACT and SAT test scores in relationship to students’ overall HS GPA establish the foundation for the college admission criteria (Evans, 2000). Further, according to Astin (1993), HS GPA and standardized test scores were considered the strongest predictors of college GPA. And later, Sawyer (2013) reported that standardized test scores are more useful than HS GPA for students capable of greater academic achievement.

The use of noncognitive variables in identifying factors that contribute to student success in college is gaining momentum (Hoover, 2013). However, although noncognitive research has raised doubts as to the exclusivity of cognitive measures (i.e., SAT or ACT), supporting noncognitive variables in student success and retention efforts for at-risk students has been largely ignored. Sizable research has looked at the significance of noncognitive factors in achieving college success (Credé & Kuncel, 2008; Reid & Moore, 2008; Seldacek & Sheu, 2008; Sparkman, Maulding, & Roberts, 2012; Ting, 2009; Ting & Seldacek, 2000). For example, Byrd and MacDonald (2005) used a qualitative measure to assess the probable themes of noncognitive variables and found that students perceived noncognitive measures (i.e., family, goal focus, and self-concept) as being potentially more important than academic skills (i.e., math, reading, and writing). Further, according to Schuh’s (1999) report, “while high school GPA and standardized test scores have been shown to be the best predictors of college success, recent research has demonstrated that high school GPA and ACT scores are unrelated to the prediction of college graduation” (p. 195). The author postulated that standardized test data and GPA have yielded modest prediction results on a consistent basis. In addition, Sparkman et al. (2012) reported on college retention and academic performance and found that ACT and SAT scores accounted for only 25% of the variance as reflected by GPA.

Reid and Moore (2008) assessed the significance of noncognitive variables of first-generation urban college students and college readiness. An important
finding from this study indicated students from urban backgrounds are more inclined to not be as focused on their education as students from suburban schools (Reid & Moore, 2008). The researchers advised early college planning, expectations of excellence, campus environments, study habits, and time management skills, all were important variables for college readiness and academic success.

Crede and Kuncel (2008) aimed to distinguish whether noncognitive variables of study habits, skills, and attitudes (SHSAs) were significant predictors of college success. A meta-analysis that compared data samples of students SHSA’s to students’ academic performance confirmed that SHSAs were significant indicators of college success.

Ting (2009) combined an academic variable (SAT scores) and an array of noncognitive influences (i.e., acquired knowledge in a field, community service, positive self-concept, and preference for long-term goals) to investigate college readiness. Discovered in this research was a statistically significant relationship between the combined variables and academic success and persistence. Ting (2009) recommends that combining noncognitive and cognitive variables in success and retention efforts.

Two studies used structural equation modeling to include noncognitive assessments in their quest for a model that more effectively predicts college GPA. Naumann (1999) found that a number of self-regulated learning variables such as cognitive strategy predicted college success over and above what was possible using SAT and ACT scores alone. Further, Tobey (1996) used structural equation modeling to test an early intervention program for at-risk college students and found that self-concept and other components relating to academic issues such as anxiety and support of family and friends were significant predictors of retention and persistence.

The search for solutions to the college persistence and completion problem begins with an understanding of its underlying causes (Brock, 2010). Students do not complete a college degree for a multitude of reasons including change in academic intentions, academic challenges, social isolation, incongruence between the students and their campus environments, insufficient student–faculty contact, feelings of marginalization, external obligations, and financial issues (Kuh, Cruce, et al., 2007; Tinto, 2007). Further, although Tinto (1993) acknowledged that students enter college with a variety of skills, abilities, and personal motivation and objectives that influence their ability to be academically successful, he believes that what happens to them after they arrive on campus is at least as important as what happens before. He further indicated that it is the quality and frequency of interactions between students, faculty, and staff that shape the experiences that students have and thus how well the students fit into their environment. The emphasis on nontraditional predictors of academic success is not a new phenomenon—as Tinto (2007) so eloquently put it, “what is
needed and what is not yet available is a model of institutional action that provides guidelines for the development of effective policies and programs that institutions can reasonably employ to enhance the persistence of all their students” (p. 6). Consequently, according to Tinto (1999), although academic preparation and performance play a significant role in the retention of at-risk students, up to 75% of students that are not retained stem from nonacademic reasons. Tito advised that these nonacademic factors can be summarized into three lenses through which retention efforts should be viewed: financial, psychological, and institutional. Reason being, low-income students are less likely to attend college or graduate (Advisory Committee on Student Financial Assistance, 2010; Tinto & Pusser, 2006), the psychological need to fit in to the university’s social and academic life appears to be particularly significant for at-risk students (Choy, 2001; Kuh, Kinzie, et al., 2007; Lumina Foundation for Education, 2010; Tinto, 1999; Walton & Cohen, 2011; Wells, 2008), and instructional interventions like mentoring and faculty or student interactions (Aronson, Fried, & Good, 2002; Astin, 1993; Balduf, 2009; Oseguera & Rhee, 2009; Veenstra, 2009), community building interventions (Hausmann, Feifei, Schofield, & Woods, 2009), and advising programs (Heisserer & Parette, 2002; Patton, Morelon, Whitehead, & Hossler, 2006). Nevertheless, regardless of whether using the ACT, SAT, and HS GPA score of entering freshmen as valid predictors of academic success, they are the assessed entrance scores utilized at the university featured in this study.

**Research Purpose and Questions of Interest**

It is common practice in higher education to identify at-risk students and develop interventions and support programs aimed at increasing their likelihood of success. This study examined the outcome variables of at-risk students who participated in an intervention program comprising of signed contracts, progress reports, specialized advising, tutoring, and workshops. The purpose of this research was to assess the feasibility of using the ACT, SAT, and HS GPA to identify at-risk students. Seven research questions were posed:

1. Does the initial admissions assessment correctly identify at-risk students?
2. Is ACT or HS GPA a better predictor of student success?
3. Does the semester of admission predict outcome success?
4. Can a student’s first-semester college GPA predict future success?
5. Can using the interaction between ACT and HS GPA predict student success?
6. Can a student’s over achievement in high school predict student success?
7. Does HS GPA predict student success when holding constant the effects of ACT and over achievement?
Methodology and Statistical Analysis

The research questions that guided this study were addressed by examining demographic and success outcome data pertaining to 2,030 students enrolled in a midsized public research university in the Midwest. The research data spanned a 5-year period and commenced in the fall of 2006. All students included in this examination had completed at least one semester of coursework. The university demographics gathered for this study included the standardized ACT test score, whereby a score of 18 reflects the 25th percentile, and a score of 24 represents the 75th percentile. There are approximately 23,000 undergraduate students on the campus of whom 73% are white and 96% are classified as in-state.

For the purpose of this investigation, the variable SUCCESS was defined as a student’s ability to maintain good academic standing and continue making progress toward graduation or graduating from college. The operational definition of an incoming at-risk student referred to a student that achieved one or both of the following factors: ACT below 16 and HS GPA below 2.3. Variables considered in this study were as follows: composite ACT score, HS GPA, semester of admission (i.e., Fall or Spring), first-semester college GPA, cumulative college GPA, TOTAL ACADEMIC ABILITY — operationally defined as ACT × HS GPA, and over achievement — operationally defined given the found statistically significant relationship between a student’s ACT score and HS GPA.

All statistical analyses were performed via the statistical package SPSS version 19. The testing of hypotheses employed specific statistical model comparisons, correlational approaches, or simple and multiple-regression analyses, to answer the aforementioned research questions. All alpha levels used .05 when assessing significance.

Research Findings

Seven research questions guided this study.

Question 1. “Does the initial admissions assessment correctly identify at-risk students?” The results confirmed that ACT scores below 16 and a HS GPA below 2.3 are reliable predictors of both low college GPA and SUCCESS (see Table 1).

Question 2. “Is ACT or H.S. GPA a better predictor of student success?” The results indicated that although ACT independently could predict student success, HS GPA could predict student success over and above the variance accounted for by ACT alone. As can be seen by the restricted statistical models tested, by adding HS GPA to the full model, the additional variance accounted for was 10.4% (see Table 2).

Question 3. “Does the semester of admission predict outcome success?” The results showed that at-risk students experience statistically significant negative outcomes irrespective of the semester of admission (see Table 3).
Can a student’s first-semester college GPA's predict future success? The results strongly suggest that the first-semester college GPA can predict students' academic success over and above chance, as confirmed by the regression findings, $F(1, 2028) = 1077.39, p < .0001$. In this analysis, the minimum GPA cutoff point of 2.15 was used; therefore, any GPA above this point increases SUCCESS probability. When the data pertaining to the general population were examined, the findings revealed that students who enter college in the fall semester are statistically more likely to be successful than the spring enrollees (see Table 4).
Table 4. General Student Body: Semester of Admission and Predict Success (N = 2,030).

<table>
<thead>
<tr>
<th>At-risk admission</th>
<th>Fall entrance</th>
<th>Spring entrance</th>
<th>Success</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall entrance</td>
<td>1</td>
<td>−1</td>
<td>−.096*</td>
</tr>
<tr>
<td>Spring entrance</td>
<td>−1</td>
<td>1</td>
<td>−.096*</td>
</tr>
</tbody>
</table>

Note. *p < .001, two-tailed.

Table 5. Relationship Between ACT and Minimum High School GPA for Predicted Success.

<table>
<thead>
<tr>
<th>ACT score</th>
<th>Minimum GPA</th>
<th>ACT score</th>
<th>Minimum GPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Beyond model</td>
<td>19</td>
<td>2.37</td>
</tr>
<tr>
<td>7</td>
<td>Beyond model</td>
<td>20</td>
<td>2.25</td>
</tr>
<tr>
<td>8</td>
<td>Beyond model</td>
<td>21</td>
<td>2.14</td>
</tr>
<tr>
<td>9</td>
<td>Beyond model</td>
<td>22</td>
<td>2.05</td>
</tr>
<tr>
<td>10</td>
<td>Beyond model</td>
<td>23</td>
<td>1.96</td>
</tr>
<tr>
<td>11</td>
<td>Beyond model</td>
<td>24</td>
<td>1.88</td>
</tr>
<tr>
<td>12</td>
<td>3.75</td>
<td>25</td>
<td>1.80</td>
</tr>
<tr>
<td>13</td>
<td>3.46</td>
<td>26</td>
<td>1.73</td>
</tr>
<tr>
<td>14</td>
<td>3.21</td>
<td>27</td>
<td>1.67</td>
</tr>
<tr>
<td>15</td>
<td>3.00</td>
<td>28</td>
<td>1.61</td>
</tr>
<tr>
<td>16</td>
<td>2.81</td>
<td>29</td>
<td>1.55</td>
</tr>
<tr>
<td>17</td>
<td>2.65</td>
<td>30</td>
<td>1.50</td>
</tr>
<tr>
<td>18</td>
<td>2.5</td>
<td>31</td>
<td>1.45</td>
</tr>
</tbody>
</table>

Note. ACT = American College Test; GPA = grade point average. The beyond model statement indicates that no data were available to predict success. Italicized GPAs that occur for ACT scores of 23 and above, although possessing statistical probability of success, may not meet admission or financial aid standards.

Question 5. “Can using the interaction between ACT and HS GPA predict student success?” The results indicated a significant positive relationship between cognitive ability (i.e., ACT × HS GPA) and SUCCESS, as indicated by the regression findings, $F(1, 2028) = 324.13, p < .0001$.

The data indicate that HS GPA is required to predict success over and above chance, given the student’s ACT (see Table 5). The model is compensatory, indicating that lower ACTs must record a higher GPA in high school, whereas students with higher ACT scores can afford to have lower GPAs in high school.

Question 6. “Can a student’s Over Achievement in High School predict student success?” The findings showed that students’ over achievement in high school can predict student success with a significant correlation $R = .269,$
Therefore, if a student’s actual HS GPA is greater than predicted given the student’s ACT, this variable appears to be a reasonable predictor of student success (see Table 6). By using statistical regression to determine the cut-point (predicted GPA) and then comparing the result with the student’s actual GPA, this process determined the student’s over or under achievement assignment.

Question 7. “Does HS GPA predict student success when holding constant the effects of ACT and Over Achievement?” The results indicated a significant correlation between HS GPA and student success when holding constant the students’ overachievement status and ACT score. Thus, HS GPA could be used as the single best predictor of student success (see Table 7).

However, when using all three variables: ACT, over achievement, and HS GPA, an additional .032% significant variance is added to the model by including HS GPA. This amount of additional variance accounted for HS GPA is statistically significant. Therefore, using all three variables to identify student success appears warranted (see Table 8).

**Discussion and Implications**

The purpose of this investigation was to assess the feasibility of identifying at-risk students using the traditional success predictor variables. The findings in this study confirmed that students with ACT scores below 16 and HS GPA scores below 2.3 are likely to achieve a low college GPA and achieve less than optimal academic success. The historical use of these indicators (with variance

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**Table 6. Regression: Over Achievement in High School Predict Student Success.**

<table>
<thead>
<tr>
<th></th>
<th>Success</th>
<th>Over achieved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>1</td>
<td>.269***</td>
</tr>
<tr>
<td>Over achieved</td>
<td>.269***</td>
<td>1</td>
</tr>
</tbody>
</table>

*Note. **Correlation is significant at the .01 level (two-tailed).*

**Table 7 Correlation: HS GPA Predict Student Success.**

<table>
<thead>
<tr>
<th>Control variables</th>
<th>Success</th>
<th>HS GPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overachieved and ACT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Success</td>
<td>1</td>
<td>.19</td>
</tr>
<tr>
<td></td>
<td>(df = 2026)</td>
<td></td>
</tr>
<tr>
<td>HS GPA</td>
<td>.190</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>(df = 2026)</td>
<td></td>
</tr>
</tbody>
</table>

*Note. ACT = American College Test; HS GPA = high school grade point average. Correlation is significant at the .01 level (two-tailed).*
accounted for) appears to be valid and stable over time. These results are compatible with Astin’s (1993) report, whereby HS GPA and standardized test scores are still identified as the strongest and most reliable predictors of college GPA. However, when looking at the interactions between HS GPA and ACT scores, HS GPA was found to be a better predictor of student success over and above the variance accounted for by ACT scores alone. This finding is congruent with earlier research on predictors of student success (Astin, 1993). Greater attention could be invested in maximizing students’ academic performance in high school as this has been found to have a great influence on their subsequent academic performance. Further, Reid and Moore (2008) proposed that early college planning, expectations of excellence, campus environments, study habits, and time management skills are significant factors in cultivating college readiness.

After examining the semester of initial enrollment, the findings revealed that at-risk students achieved statistically significant negative outcomes irrespective of the semester of entrance. However, the odds of success will theoretically increase for these students if admitted in the spring semester. Conversely, when the same analysis was performed for the general population, students who were admitted during the fall semester were found to be statistically significantly more likely to be successful than the spring enrollees. This is an interesting finding and thus needs appropriate attention. Because up to 75% of students that are not retained stem from nonacademic reasons (Tinto, 1999), it seems plausible to investigate what factors are contributing to this finding. Academic resources and intervention programs may be strategically planned for both the fall and spring semesters based on the specific needs of the students enrolled.

Further, students’ first-semester college GPAs were confirmed as a strong predictor of future academic success. This contention implies that academic and social strategies leveraged in the students’ first semester should, at least in theory, improve overall university retention and graduation outcomes. Again, this finding supports the recommendation of strategically using university resources by combining noncognitive and cognitive variables in success and

<table>
<thead>
<tr>
<th>Model</th>
<th>$R$</th>
<th>$R^2$</th>
<th>Adjusted $R^2$</th>
<th>Standard error of the estimate</th>
<th>$R^2$</th>
<th>$F$ Change</th>
<th>df1</th>
<th>df2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.346$^a$</td>
<td>.120</td>
<td>.119</td>
<td>.46890</td>
<td>.120</td>
<td>137.909</td>
<td>2</td>
<td>2027</td>
</tr>
<tr>
<td>2</td>
<td>.389$^b$</td>
<td>.151</td>
<td>.150</td>
<td>.46051</td>
<td>.032</td>
<td>75.589</td>
<td>1</td>
<td>2026</td>
</tr>
</tbody>
</table>

Note. $^a$Predictor: (constant), overachieved, ACT.  
$^b$Predictor: (constant) overachieved, ACT, and HS GPA.
retention efforts (Ting, 2009). Furthermore, Tinto (2007) recommended that through institutional action, guidelines for the development of effective policy and programs can begin and thus lead to student persistence in college.

Although the finding yielded by interaction between ACT and HS GPA was significant with variance accounting for approximately 14%, this was comparable to the results yielded by testing the main effects of ACT and HS GPA. Both models have relevancy, however, for the usefulness of understanding and perhaps improving hit-rates, an interaction model appears to be more parsimonious. Perhaps, constructing prediction tables or entering student applications into a computerized admission models may allow for efficient assessment of various prediction and intervention models.

**Recommendations**

Given the outcomes of this study, a “one size fits all” approach to providing services to students identified as at-risk is neither conducive to student success. According to Veenstra (2009), “Institutional action for helping students in the first year includes student support activities such as advising, tutoring, and mentoring” (p. 19); however, the services and interventions provided must be tailored to students’ individual academic and psychological needs. Given the findings reported here, a PASS MODEL is offered to assist in the development of interventions and success programs (see Table 9 later).

The findings yielded by this study suggest that examining preenrollment identification characteristics of at-risk students is a feasible measure of assisting administrators and advising offices in identifying the appropriate student-focused services necessary for all students. Administrators may consider performing at-risk assessments based on preestablished cutoffs for both ACT scores and HS GPA as conducive measures to success outcomes. Outlined in Table 10 are precollege characteristics identified by research literature as characteristics directly or indirectly related to retention. The precollege characteristics identified may vary with each institution, and each institution may consider having a data-driven approach in defining significant precollege characteristics necessary for identifying the necessary interventions (Veenstra, 2009). Again, by

<table>
<thead>
<tr>
<th>Table 9 PASS Model.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>P</strong> erform an at-risk assessment—pre-establish cutoffs for ACT and HS GPA.</td>
</tr>
<tr>
<td><strong>A</strong> llocate and triage resources according to the probability of success—develop prediction tables.</td>
</tr>
<tr>
<td><strong>S</strong> pecify enrollment dates – spring is best for at-risk students; fall is best for the non-at-risk.</td>
</tr>
<tr>
<td><strong>S</strong> pecify two groups of students at-risk—those coming in vs. those after the first semester.</td>
</tr>
</tbody>
</table>

ACT = American College Test; HS GPA = high school grade point average.
examining interactions between HS GPA and ACT and identifying interventions strategies using precollege characteristics, institutions can improve students’ academic potential simply by leveraging their social and academic resources based on the needs of each preestablished student group.

Another recommendation that emerged from this study is to triage or allocate resources according to the probability of success. Prediction tables can be used to position students into risk categories. In doing so, institutions would have the ability to allocate and manage their resources based on the timely and accurate information of all students. For example, as noted in the findings of this study, high risk students are those with both low ACT and HS GPA. They should be inundated with support services specific to their needs such as tutoring (Heisserer & Parette, 2002) and mentoring programs that are specifically tailored to increase the diversity and connectedness of students and allow them to embrace different cultural backgrounds, unique strengths, skills, experiences, and learning styles (Patton et al., 2006). Moreover, a functional relationship of organized action comparative to each of the precollege characteristics in Table 10 is necessary (Veenstra, 2009). Further, the students identified as moderate risk are those with both high ACT scores and low HS GPA, or with low ACT scores and high HS GPA. Although their academic aptitude is reasonably higher, these students still require resources specific to their needs. For example, students with a low HS GPA and a high ACT are an indication of low motivation and academic drive (Balduf, 2009). There are numerous hypothesized causes.

<table>
<thead>
<tr>
<th>Precollege characteristics</th>
<th>Measured by</th>
</tr>
</thead>
<tbody>
<tr>
<td>High school academic performance</td>
<td>HS GPA, HS rank, SAT total, or ACT composite</td>
</tr>
<tr>
<td>Quantitative skills (math and science skills)</td>
<td>ACT math or SAT math, ACT science reasoning</td>
</tr>
<tr>
<td>Confidence in quantitative skills</td>
<td>Confidence indicator and self-ratings</td>
</tr>
<tr>
<td>Study habits</td>
<td>High school hours per week studying</td>
</tr>
<tr>
<td>Commitment to career or degree</td>
<td>Indicator such as highest degree sought</td>
</tr>
<tr>
<td>Commitment to college the student is attending</td>
<td>Indicator whether this college was first choice</td>
</tr>
<tr>
<td>Financial needs not met</td>
<td>Survey indicator</td>
</tr>
<tr>
<td>Family support</td>
<td>Parents’ level of education</td>
</tr>
<tr>
<td>Social engagement</td>
<td>Survey indicator of social engagement in high school</td>
</tr>
</tbody>
</table>

such as lack of preparation, poor time management, and low motivation (Balduf, 2009) but these students may be best served with required visits to the counseling center, in order to assist them in developing persistence, self-regulation, motivation, and the “love of learning” (Dworkin & Lyddon, 2011). These traits, or lack thereof, have been discussed earlier in the same context as GPA and are found not a reflection of academic potential but rather a psychological profile that can either hinder or support learning (Dworkin & Lyddon, 2011). Importantly however, according to Dworkin and Lyddon (2011), counseling centers in higher education are experiencing their own issues of exhausted resources and “greater student demands, increased severity of problems, and long waiting lists are becoming a reality” (p. 403).

Additionally, other circumstantial variables such as being first-generation students, influences of socioeconomic status, and race and ethnicity have been shown to influence success outcomes (Kim, Newton, Downey, & Benton, 2010). These factors may contribute to the interface of students’ and their compatibility with the institutional environments also referred to as a goodness of fit between institutional milieu and students’ values, personalities, and interests (Eunhee et al., 2010). Conversely, the findings of the study indicated HS GPA as a better predictor of student success, over and above the variance accounted for by ACT alone. Identifying and institutionally recognizing these students formally for their outstanding performance (i.e., beyond what would have been expected given their standardized scores) could yield positive long-term outcomes on retention and graduation.

Further, as this study revealed, at-risk students appear to benefit from spring enrollment, while their non-at-risk counterparts appear to perform better when entering college in the fall semester. This finding may be specific to this institution, but nevertheless, in order to understand the relationships between certain personal variables (e.g., motivation, work ethic, critical thinking, and decision making), and success outcomes can be used as an opportunity for designing educational and supportive intervention strategies accordingly (Eunhee et al., 2010). Perhaps considering an assessment instrument that provides a quantitative measure of variables such as attitude, behaviors, and dispositions that can lead to student success. Assessment tools grounded in theoretical understandings can be used to measure factors influencing student success. In doing this, administrators can have utility in a screening and diagnostic tool in providing an understanding of what factors are influencing student outcomes (Eunhee et al., 2010). Further, the importance of intrusive advising at-risk students has been repeatedly emphasized in the student success and retention literature. Intrusive advising strategies are typically used for at-risk students and are found to be special techniques based on prescriptive, developmental, and integrated advising models (Heisserer & Parette, 2002). Perhaps, institutions may consider being intentional in their use of intrusive advising by using diagnostic assessment tools in assessing the needs of specific student populations and
examine the specific factors that are influencing or negating their success (Eunhee et al., 2010).

Finally, there appears to be a difference in performance depending on the enrollment semester, this too should be taken into account when considering strategic intervention strategies. This research confirmed that first-semester college GPA is a positive predictor of future success. Further findings found that students with low GPAs in the fall have decreased their chances of graduation and have become a retention risk, even if they were not originally classified as at-risk. According to Pitkethly and Prosser (2001), although institutional support programs can be positively correlated to student retention, there needs to be a greater focus on strategies aimed at addressing students’ learning and persistence in the early stages of their academic careers. For example, students’ academic confidence and sense of belonging are directly correlated with higher GPAs and persistence and retention rates, especially for at-risk students (Walton & Cohen, 2011). These findings of heightened academic confidence and sense of belong were found when students experienced heightened interactions with faculty and administrators that participated in their learning (Walton & Cohen, 2011). Findings indicate that for at-risk students, sense of belonging can indirectly increase their persistence behaviors (Hausmann et al., 2009).

**Limitations and Future Study**

As with any study, this research was influenced by several limitations. First, it was difficult to establish which students followed through with the required components of the success program and which did not. It was not possible to specifically examine elements of success that were applicable to individual students. Second, the number of support professionals, and the amount of time spent with each student were unknown and thus leaving gaps to be explored in future research. Third, in terms of generalizability, because this research was conducted at a large 4-year public research university, any attempts to infer any conclusions that would apply to other institution types should be done with caution. Finally, future research should examine if HS GPA is more of a psychological profile rather than a reflection of achievement.

**Conclusion**

What factors contribute to student success, retention, and attrition will continue to be at the forefront of deliberation. As seen in this article, there is compelling evidence that indicates that the traditional predictor variables have merit in their role of predicting student outcomes. Furthermore, the position that noncognitive measures are the best predictors of student success also warrants attention. Nevertheless, until researchers and professionals in higher education are successful at discovering how the current predictor variables contribute to and interact
with effective educational practices, students and particularly at-risk students will continue to have high rates of attrition. Again, a “one size fits all” approach to providing services to at-risk students is not an effective strategy. Rather it is proposed that through institutional actions, guidelines for developing effective intervention initiatives and success programs will be found based on students’ specific needs. In doing so, better student outcomes will follow.

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