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An Analysis of the Academic Success Inventory for College Students: Construct Validity and Factor Scale Invariance

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AN ANALYSIS OF THE ACADEMIC SUCCESS INVENTORY FOR COLLEGE STUDENTS: CONSTRUCT VALIDITY AND FACTOR SCALE INVARIANCE

By

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I dedicate this to Brian Dionne, who will always be remembered for his passion for helping those less fortunate than him.

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TABLE OF CONTENTS

LIST OF TABLES

ABSTRACT

The Academic Success Inventory for College Students (ASICS) is a newly developed self-report instrument designed to measure academic success in college students. The findings in this study provide evidence for the construct validity of the ASICS by proving reliability and the following subvalidities: face, content, factor, and discriminant. Using MANOVA to compare honors and at-risk college students, significant differences were indicated on most of the scales of the ASICS in the expected direction of more positive functioning by the honors students. Two of the scales, external motivation/future and lack of anxiety indicated no statistically significant differences. Further analysis of factor scale invariance was implemented using MG-CFA, which involved estimation of a series of models testing invariance by comparing the GFI statistics of particular models with between-group constraints. An omnibus test of equality of covariance matrices and mean vectors across two groups was highly significant. Additional configural invariance testing indicated that the general pattern of fixed and free factor loadings in the ten-factor model does not hold across groups. An examination of the MIs revealed that in both groups most items have small to moderate factor loadings on factors with which they are not supposed to be correlated. Explanations for partial invariance are offered and implications for practice and future research are discussed.

CHAPTER ONE

INTRODUCTION

The Academic Success Inventory for College Students (ASICS) is a newly developed self-report instrument designed to measure academic success in college students. The ASICS is a time efficient, Internet-based survey that evaluates many constructs previously obtained only by administering numerous individual measures. The initial paper and pencil measure with 72 items was developed based on theory, empirical precedent, and interviews with experts in the field of academic success. The survey was administered during a pilot study to 315 undergraduates in general education classes at a large public university in the southeastern United States. Initial analyses revealed that ten of the fourteen scales had good evidence of reliability (coefficient alpha > .80). Based on feedback from course instructors of the pilot participants, a scale was added to measure self-organizational skills. Furthermore, based on the responses to open-ended questions, a scale was added to measure the efficacy of instruction. The resulting measure had 62 items and was put into an on-line format.

A validation study of the new on-line version of the ASICS was conducted with 929 students enrolled at a large public university in the southeastern United States. Data were collected over the course of two semesters from undergraduate students in classes in education, sociology, communications, and career development. An exploratory factor analysis and confirmatory factor analysis (Prevatt, Drehar, Welles, Yelland, & Li, submitted November 2008) indicated a 10-factor, 50-item structure explaining 64% of the variance (see tables A1, A2 & A3). Finally, the internal consistency of the 50-item measure was also examined. The Cronbach alpha for the total ASICS was .93, lending support for the internal consistency of the total questionnaire (please see figure A1. for a visual representation of the development of the ASICS). The new scale factors were given the following names and defining characteristics:

1. **Skills**: a combination of effort expended, study skills, and self-organization strategies
2. **Quality of the Instruction**: the ability of the instructor to hold students' attention, organize, teach, and assess student progress
3. **Career Decidedness**: progress toward and certainty of one's decision about a career goal
4. **External Motivation/Future**: an external incentive to perform, with an emphasis on the future relevance of the class

5. **Self-confidence**: belief in one's abilities to perform well academically
6. **Personal Adjustment**: personal issues that detract from one's ability to perform academically
7. **Concentration and Self-regulation**: ability to concentrate and pay close mental attention
8. **Socializing**: partying, drinking or lack of class attendance to the detriment of one's academic performance
9. **Internal Motivation/Interest**: internal motivation to perform, with an emphasis on a personal interest in the subject
10. **Lack of Anxiety**: lack of anxiety or nervousness with regard to studying or tests

There are many valid measures of academic achievement for college students, but there is currently no multifaceted, self-report instrument that globally evaluates academic success beyond academic achievement and cognitive skills. The non-academic achievement measures that are available tend to target individual, specific constructs, such as motivation, study skills, self-confidence, drug and alcohol abuse, and career decidedness (see Table 1.) As Table 1 illustrates, examples of current published measures range from 17 to more than 140 items. Difficulty arises because combining multiple instruments measuring highly specific constructs necessitates an excessive amount of time for completion. In addition, when multiple scales are used, there are psychometric concerns related to the questionable correlation of tests standardized on different norm groups. The concept of academic success in college is complex and multifaceted. The ASICS was developed to measure multiple factors related to academic success for college students (see table A5 for the factors and items). The current study was designed to provide further evidence of the validity of the ASICS.

Table 1. Examples of Self-Report Measures of College Academic Success Factors

Instrument	Factors Measured	No. Items
Achievement Motivation Profile (Friedland, et al. 1995)	motivation, interpersonal strengths, inner- resources, work habits	140
Academic Self-Concept Scale (Reynolds, Ramirez, Magrina, & Allen, 1980)	self-concept	40
Career Thoughts Inventory (CTI, Sampson, et al., 1996)	dysfunctional thoughts related to career problem-solving and decision-making	48
College Self-Efficacy Inventory (CSEI, Solberg, et al., 1993)	perceived college self-efficacy	20
College Student Satisfaction Questionnaire (CSSQ, Betz, et al., 1989)	satisfaction in various aspects of college life	70
Depression, Anxiety and Stress Scale (DASS, Lovibond & Lovibond, 1995)	psychological health	21
Gadzella's Student Life Stress Inventory (Gadzella, 1991)	perceived academic stress and reaction to stress	51
General Self-Efficacy (GSE, Sherer, et al., 1982)	subjective global sense of general self-efficacy	17
Learning and Study Strategies Inventory (Weinstein & Palmer, 2002)	study skills, attitude, motivation, anxiety, concentration, information processing, self-organization	80
Motivated Strategies for Learning Questionnaire (Pintrich, et al. 1993)	student learning strategies and motivational orientations in a specific course	85
Patterns of Adaptive Achievement Learning Survey (PALS, Midgey, et al., 1997)	achievement goals	16
Trait and State Anxiety Scale (Spielbergers, 1980)	state & trait anxiety	40

Social and Professional Significance

To date, most universities have attempted to predict academic success using academic achievement measured by high school grade point average (GPA), class rank, and scores on standardized tests such as the SAT and ACT. As evidenced by the high attrition rates, these indications of school success are lacking as predictive measures for academic success in college. In fact, the literature indicates only 20-30% of the variance in college freshman GPA may be predicted by the school rank/SAT score combination (Hatcher, Kryter, Prus, & Fitzgerald, 1992). In their meta-analysis, Robbins, Lauver, Davis, Langley, and Carlstrom (2004) confirmed the incremental contributions of psychosocial and study skills over and above standardized test achievement and high school GPA in predicting college outcomes. The results of other recent studies (Coll & Stewart, 2002; Oliver, Guerin, & Gottfried, 2007) substantiate the idea that a broader concept of academic adaptability which takes into consideration multiple social, cognitive, and emotional variables may improve the ability to understand and predict academic success.

Approximately 40% of college students will leave higher education without getting a degree (Newby, 2002; Porter, 1990). Students drop out of college for a variety of reasons such as lack of financial assistance, academic failure, personal problems, and change in career plans. Whatever the reason, those who fail to attain a college degree have fewer career opportunities, earn less money on average, and achieve lower financial stability than their peers who graduate from college (Kane & Rouse, 1995). The identification and examination of the factors that contribute to the academic success of college students is of societal concern and professional significance for psychologists in college settings, and would be beneficial to students and universities. Improved prediction models may help universities with admissions decisions as well as program development for immediate intervention for students who are not achieving academic success in college.

Ryan and Deci (2000) proposed that the basic psychological needs of competence autonomy, and relatedness must be satisfied throughout the lifespan for an individual to experience an on-going sense of integrity and well-being. They suggest that the meeting of these psychological needs is energizing and contributes to the overall well being of an individual. On the other hand, if these psychological needs are not met, decreased quality of life or even pathology may result. The college experience provides an ideal social context to foster

competence, autonomy, and relatedness. However, if these needs are neglected at this highly impressionable time in their lives, students may be at risk for academic failure due to lack of motivation, alienation, psychopathology, or a combination of these things.

The stress experienced while in college has been reported to contribute to many common problems such as fatigue, anxiety and depression, and interpersonal uncertainty. In addition, given the combination of a developmental affinity for risk-taking behavior and experimentation and immature coping skills, college students may engage in alcohol or drug abuse (Hingson, Heeren, Winter, & Wechsler, 2005; Lanier, Nicholson, & Duncan, 2001), which makes them vulnerable to other severe problems such as legal issues, academic failure, emotional disorders, unwanted pregnancies, physical injury, and death (Hingson et al.). An empirically supported instrument that assesses both academic and nonacademic factors related to college success could be used in research to broadly contribute to an understanding of the complexities of college success. Such an instrument would also be a pragmatic tool for university professionals who work with individual college students struggling to succeed (Coll & Stewart, 2002).

Theoretical Foundation for Factors of Academic Success

During the development of the ASICS, key components of several theories (achievement goal, self-determination, cognitive information processing, expectancy-value, developmental, attribution, attachment, and engagement) were evaluated and these theoretical frameworks continued to be applied in this validation study. The main academic success factors being evaluated in this study are based on the key principle of self-determination theory, which is that college students achieve academic success when the basic psychological needs of competence, autonomy, and relatedness are being met.

Other key principles of theoretical frameworks used to conceptualize the ASICS include constructs such as mastery and performance goals from achievement goal theory (Pintrich, 2004) and the basic tenets underlying the concept of classrooms as "learning communities" in Tinto's theory of student engagement (Tinto, 1993). Achievement goal constructs such as mastery and performance goals are assumed to reflect the theory for approaching, engaging, and evaluating one's performance in an achievement context. In addition, pro-social predictors can account for variance in academic performance beyond the variance accounted for by cognitive measures (Case, 2008; Covington, 2000; Pintrich, 2004).

Numerous researchers have highlighted achievement goals as contributing to the emotional adaptability of college students (Conti, 2000; Covington, 2000; Pancer, Hunsberger, Pratt, & Allistat, 2000). For example, the autonomy of students' goals predicted improvement in social and emotional adjustment over time (Conti). Prosocial goals likely influence achievement in their own right, but they also likely act jointly with academic goals to influence achievement (Covington). One of the main principles of Tinto's theory of student engagement used to conceptualize the ASICS is that student participation in a collaborative or shared learning environment allows students to develop a supportive network that bonds them to the social community of the college and engages them more fully in the academic life of the institution. Finally, basic volitional factors from self-regulation theory have also been considered, such as goal setting, self-monitoring, activation and use of goals, discrepancy detection and implementation, self-evaluation, self-efficacy, meta-skills, and self-regulation failure.

Validity Theory for the ASICS

For the goal of providing evidence to establish construct validity of the ASICS, Messick's (1975) Construct Validity Hierarchy was used. The Messick model theorizes that construct validity is established by proving reliability and the following subvalidities: face, content, factor, convergent, discriminant, and criterion. Face and content validity were previously established during the pilot study (Prevatt et al., 2009). In the current study, I focus on establishing evidence for the discriminant and factoral validity of the ASICS.

In summary, the identification of factors related to academic success of college students continues to be of great societal concern (Cokely & Moore, 2007; Graunke, & Whoosley, 2005; Hingson et al., 2005; Kirby, White & Aruguete, 2007; Yan & Gaier, 1994). Theory and current research highlight a multitude of factors related to the academic success of college students (Deci & Ryan, 1985; Lin, McKeachie, & Kim, 2003; Locke & Latham, 2002; Pajares, 1996; Pancer, Hunsbergen, Pratt, & Allistat, 2000; Pintrich, 2004; Robbins et al., 2004; Ryan & Deci, 2000; Ryan, Deci, & Grolnik, 1995; Weiner, 1985; Zusho et al., 2003). For the most part, achievement goal theories dominate the current college achievement literature. Given the developmental life-stage of college students, studies grounded in self-determination, cognitive information processing, developmental, expectancy value, student engagement, attribution, and self-regulation theories also seem particularly pertinent to the college student population.

In addition to theoretical considerations, an extensive review of the literature on college students' academic success reveals the following factors related to academic success for college students: academic achievement, effort expended, study skills, self-organization strategies, quality of course instruction, career decidedness, motivation (both external and internal), confidence in one's own abilities to perform well academically, personal adjustment, concentration, self regulation, socializing, and academic anxiety. These factors are measured by the ASICS.

Research Questions

Whenever a psychosocial interpretation is placed on responses generated from any instrument, a measurement model provides a description of the numerical and theoretical relationship between observed scores and the corresponding latent variables. Examining a measurement model across groups tests the hypothesis that similar meaning can be derived from a set of scores on that instrument. This study analyzed an instrument in the early stages of validation that was developed based on the idea that academic success in college is truly multi-dimensional in nature and has multivariate indicators. Specifically, this study contributes to an understanding of the factor structure of the ASICS and establishes evidence for its construct validity. To this end, this study was guided by the following research questions:

1. Does the ASICS discriminate between high and low achieving groups of college students?
2. Are the group differences due to true response differences or to different psychometric responses to the scale items?

To answer research question one, multivariate analysis of variance (MANOVA) was the method of data analysis implemented to ascertain differences between honors students and students at risk for failing out of college. The MANOVA compared at-risk and honors college students' response patterns based on the factors found on the initial validation of the ASICS (Prevatt et al., 2009). In other words, the MANOVA compared the dependent variables (subscale scores based on the factors mentioned above) across these two groups of college students.

To answer question two, a multiple group-confirmatory factor analysis (MG-CFA) was applied to examine the established factor structure of the ASICS (see Figure 1.) This method was implemented due to its framework of modeling and controlling for measurement error (Hancock, 2004). The goals of the MG-CFA in this study were to: a) provide evidence of the construct validity of the ASICS by demonstrating the ability to differentiate among honors and at-risk students, b) test a hypothesized factor model and evaluate whether the same general factor structure of the ASICS is supported in these two groups of college students, and c) conduct additional invariance tests to establish factorial invariance. To accomplish these goals the analysis specified the initial model and evaluated the model fit (admissibility, etc.). Multiple indexes of fit (CFI, TLI, and SRMR) were examined along with the chi-square test statistic. Other multiple group analyses included missing data estimation, latent variable interactions, and non-linear factor analysis using maximum likelihood, non-linear parameter constraints, bootstrap standard errors and confidence intervals, and modification indices and estimated parameter changes.

Operational Definitions

The following terms are defined operationally for use in this study:

- *Academic Wholism*: self-awareness, self-motivation and internalization of the demands of academic maturity
- *Alienation:* a student's experience of feeling disconnected from academic tasks
- *Autonomy*: refers to being the perceived origin or source of one's own behavior (Deci & Ryan, 2002)
- *At-risk students*: students on academic probation who are at risk for failing out of college
- *Basic psychological needs*: within self-determination theory, these are considered essential psychological conditions which are necessary for the growth and well-being of people's personalities and cognitive structures (Ryan & Deci, 2004)
- *Competence:* refers to feeling effective in one's ongoing interactions with social environments and experiencing opportunities to exercise and express one's capacities (Deci & Ryan, 2002)
- *Construct* v*alidity*: the extent to which an instrument measures a particular construct or concept

- *Content* v*alidity*: the extent to which the content of a test elicits responses that represent the domains being measured
- *Criterion-related* v*alidity*: the extent to which the instrument is related to some performance criteria external to the test itself
- *Discriminant* v*alidity*: the degree to which the operationalization of academic success (as measured by the ASICS) in honors students is not similar to or diverges from the operationalization (as measured by the ASICS) of academic success of at-risk students
- *Deep processing strategies*: sophisticated cognitive processing strategies for learning
- *Effort*: the way in which students try to regulate their behavior in the face of difficult or uninteresting tasks
- *Engagement*: a student's experience of being actively involved in academic coursework
- *Identity* c*onfusion*: conflicted emotion that is a developmentally appropriate part of college students' identity formation
- *Relatedness*: the feeling of being connected to others, caring for and being cared for by others, and having a sense of belongingness with other individuals and with the community (Baumeister & Leary, 1995)
- *Reliability*: the extent to which the same event produces the same score each time it is measured (Heiman, 2002)
- *Self-organization*: skills such as time management, workload balance, and help-seeking behavior
- *Study* s*kills*: academic-related skills that enhance students' comprehension and retention of learned materials
- *Surface* processing strategie*s*: lower-level cognitive processing strategies for learning
- *Validity:* the extent to which a test or other form of measurement actually measures what it is supposed to measure (Messick, 1975)

Assumptions

The present investigation is predicated on three major assumptions. First, participants are expected to complete the surveys accurately and honestly. In this stage of the instrument development, the ASICS does not contain scales to control for social desirability, faking good, or faking bad. Second, within the framework of self-determination theory, basic psychological needs are universal, innate requirements rather than acquired motives and as such are expected to be evident in all cultures and developmental levels. Finally, it is assumed that the instrument is being validated on a representative sample of both honors and at-risk college students that contains normally distributed characteristics of high-achieving and low-achieving students.

Delimitation

The completion of questionnaires on-line is a relatively inexpensive, easily administered method of obtaining data from large numbers of subjects. In addition, on-line questionnaires tend to have higher completion rates than traditional pencil and paper surveys (Denscombe, 2006). As a result, on-line questionnaires have become widely used in psychosocial research. Nevertheless, there is currently little research establishing evidence of their reliability. Jones, Fernyhough, De-Wit, and Meins (2007) concluded that the administration of traditional measures of psychopathology through questionnaire is a reliable method of data collection, but more research is needed in this area. Until that time, any study using on-line questionnaires, including this study, may have a differential pattern of responses by participants due to variables such as the display of plain text on a screen and the absence of social contextual cues that could affect participant response patterns.

CHAPTER TWO

REVIEW OF THE LITERATURE

The purpose of this chapter is two-fold. The first purpose is to offer a critical analysis of the current literature about the theoretical basis of the factors measured by the Academic Success Inventory for College Students (ASICS). The second is to discuss empirically-driven standards for evaluating the validity of measures.

The ASICS is a 50-item scale developed to measure multiple factors related to the academic success of college students. It has 10 subscales intended to measure general academic skills, career decidedness, quality of instruction, internal motivation/interest, external motivation/future, confidence, concentration/self-regulation, socializing, personal adjustment and lack of anxiety. The ASICS is internet-based and time-efficient and may be utilized to identify specific areas of functioning that may warrant intervention.

Theoretical Bases of the ASICS

Theory provides a framework to study the contribution of specific constructs related to academic success for college students. The main academic success factors being evaluated in this study explore the key principle of self-determination theory, which is that humans experience an on-going sense of well-being when the basic psychological needs of competence, autonomy and relatedness are being met; therefore college students are most likely to achieve academic success when these needs are being satisfied. Other key principles of theoretical frameworks used to conceptualize the ASICS include constructs such as mastery and performance goals from achievement goal theory, and the basic tenets underlying the concept of classrooms as "learning communities" in Tinto's theory of student engagement (1993).

Achievement goal constructs such as mastery and performance goals are assumed to reflect the theory for approaching, engaging, and evaluating one's performance in an achievement context. The current research also indicates that pro-social predictors account for variance in academic performance beyond the variance accounted for by cognitive measures (Case, 2008; Covington, 2000; Pintrich, 2004).

Studies highlight achievement goals as contributing to the emotional adaptability of college students (Conti, 2000; Covington, 2000; Pancer et al., 2000). Prosocial goals likely influence achievement in their own right, but they also likely act jointly with academic goals to

influence achievement (Covington, 2000). In the case of Tinto's theory of student engagement, one of the main principles used to conceptualize the ASICS is that student participation in a collaborative or shared learning environment allows students to develop a supportive network that bonds them to the social community of the college and engages them more fully in the academic life of the institution. Finally, basic volitional factors from self-regulation theory have also been considered, such as goal setting, self-monitoring, activation and use of goals, discrepancy detection and implementation, self-evaluation, self-efficacy, meta-skills, and self-regulation failure.

The literature indicates that theoretical models of success in college share some specific ideas and assumptions, such as a strong emphasis on motivation and self-regulatory strategies as key factors in academic success (Baumeister & Leary, 1995; Deci & Ryan, 1985; Ryan & Deci, 2000; Zimmerman, 1998). Furthermore, these theories work under the assumption that students have at least average academic ability and expect to achieve academic success in college (Weiner, 1985), evidenced by the fact that they would probably not be accepted to college without some record of past academic achievement. Most models also acknowledge the importance of conscious goals and self-efficacy (Atkinson, 1958; Bandura, 1997; Deci & Ryan; Ryan & Deci; Weiner). Some are developed from a social cognitive perspective and emphasize well-being and self-satisfaction in a variety of contexts as important for the quality of life of the student (Bandura; Deci & Ryan). More recently, scholars have attempted to offer alternative perspectives to characterize the college student's experience in a way that does not separate "learning" from the broader experience of being a student (Case, 2008; George, Dixon, Stansal, Gelb, & Pheri, 2008, Tinto, 2006). Given the developmental stage of the college student, satisfying the basic psychological needs for autonomy, competence, and relatedness within self-determination theory play an energizing role in identity formation for college students (Luyckx, Vanteenkiste, Goossens, & Duriez, 2009).

An extensive review of the literature on the various theories about important variables of college students' academic success highlights significant key factors. This literature review, combined with the results of a pilot study and preliminary empirical analysis with the ASICS, suggests a ten-factor model structure. Those factors are: skills, quality of instruction, career decidedness, external motivation/future, confidence in abilities, personal adjustment, concentration and self-regulation, socializing, internal motivation/interest, and lack of anxiety.

In the following sections, I discuss the current theory-based literature regarding these factors and academic success for college students.

Skills

As a subscale on the ASICS, "skills" refers to a combination of effort expended, study skills, and self-organizational strategies. Self-determination theory focuses on human reactions to social environments that either enhance or thwart motivation and well-being (Ryan & Deci, 2000). Researchers using the SDT model have empirically identified three psychological needs that appear to be essential for optimal functioning and facilitating human behavior and decision making: competence, autonomy, and relatedness. In the case of college students, the concept of competence links variables such as study skills and academic self-confidence to academic success. The ability to competently employ study skills meets a student's need to succeed at tasks to attain desired outcomes. In addition, resulting perceptions of mastery and personal success increase academic self-confidence.

Similarly, during the "forethought" phase of self-regulation theory, task analysis involves a student's setting goals and strategic planning. Highly self-regulated individuals engender goal systems that are organized in such a way that process goals are proximal regulators of distal outcome goals (Zimmerman, 2000). Well-developed strategic planning skills enhance performance by assisting cognitive processes, controlling affect, and guiding motoric execution (Bandura, 1997).

Effort. According to Pintrich (2004), effort is the way in which students try to regulate their behavior in the face of difficult or uninteresting tasks. Self-determination theory asserts that autonomy is the individual's need to experience choice in the initiation, maintenance, and regulation of behavior that is related to motivation of individuals to expend effort on given tasks (Ryan & Deci, 2000).

Research highlighting temperament characteristics, such as attention span and effortful control, supports the idea that nonintellectual factors such as task orientation are an important contribution to academic achievement (Rothbart & Jones, 1998). Oliver, Guerin, and Gottfried (2007) examined the longitudinal relation of task orientation to major educational outcomes in high school and college using college entrance, GPA, and degree completion as outcomes. They found that individual differences in temperament characteristics of task orientation, such as persistence and effortful control, contributed significantly to the prediction of academic success

in high school and college, even after controlling for the traditional predictors of socioeconomic factors and ability. These findings supported and extended findings from similar studies with younger populations and were consistent with other findings that students with higher persistence, ambition, and diligence had higher academic achievement (O'Connor & Paunonen, 2007).

Yan and Gaier (1994) compared possible causal attributions for college success and failure across two culturally different groups of college students: American-born and Asian-born. Compared with Asian-born students, American-born students attributed academic success significantly more often to ability than Asian-born students. Furthermore, American students appeared to believe that effort was more important for success than lack of effort for failure. On the other hand, Asian students attributed effort as equally important for success and failure. Yan and Gaier suggested that these cultural variations may echo different cultural emphases such as the higher value placed on individualism in the United States.

Robbins et al. (2004) found that academic discipline, defined as the amount of effort students put into schoolwork and the degree to which they see themselves as hardworking and conscientious, was incrementally predictive of academic performance and retention of first-year college students, controlling for institutional effects and traditional predictors.

Self-Organization. Self-organization includes skills such as time management, workload balance, and help-seeking behavior. Time management involves making schedules for studying and allocating time for different activities (Pintrich, 2004). Effective time management skills are frequently cited as a way to enhance the academic achievement of college students (George et al., 2008; Heikkila & Lonka, 2006; McKenzie & Schweitzer, 2001; Misra & McKean, 2000; Pintrich, 2004).

For example, Misra and McKean found that time management behaviors had a greater buffering effect on academic stress than leisure satisfaction activities, and females had more effective time management behaviors than males. Although males demonstrated less effective time management behavior, they benefitted from leisure activities more than their female counterparts. Similarly, George et al. found time management skills to be one of the greatest predictors of GPA, personal success, and total success in college. Less time spent in passive leisure was also a predictor of GPA and total success. McKenzie and Schweitzer found that the influences of employment responsibilities on time and academic workload management were

significant; full-time students with no employment had higher GPAs than students with part-time employment responsibilities. McKenzie and Schweitzer suggested that this difference might have been explained by time restraints on studying. Pintrich identified another behavioral regulatory strategy – help-seeking – as an important self-organizational skill. Students with help-seeking skills seemed to improve learning approaches, regulation of learning, and cognitive strategies (Heikkila & Lonka, 2006).

Study Skills. Study skills enhance students' comprehension and retention of learned materials. It is possible that variables such as effort and intrinsic value interact with study skills and have both direct and indirect effects on college GPA. Nonetheless, the findings regarding the predictive value of study skills for academic success are mixed. Robbins et al. (2004) found a moderate relationship between academic-related skills and retention in college, with rehearsal as a study strategy as a significant predictor of academic performance in a college population. On the other hand, McKenzie and Schweitzer (2001) did not find that study skills were related to GPA.

Ruban and Reis (2006) summarized and ranked the top study strategies employed by low and high achieving college students (Ruban & Reis). Study strategies fell into eight categories: self-evaluating, managing time and redistributing workload, organizing and transforming material, structuring the environment, memorizing, rehearsing and retaining material, reviewing records and clustering material, and utilizing support networks. The top five study skills used by high achieving college students were: creating flash cards, condensing notes, using mnemonics and visual cues, memorizing material routinely, and reviewing notes. Not surprisingly, high achievers reported using larger numbers of strategies and more advanced deep processing strategies, while low achievers used fewer strategies and simpler surface processing study skills. Other study skills variables mentioned in the literature include time spent studying, clearly defined goals (George et al., 2008) and guided note-taking (Austin, Carr, & Lee, 2004). Study time and intelligence were strongly associated with GPA but appeared to have little influence over personal successes that were nonacademic in nature (George et al.). Clearly defined goals were predictive of personal success and total success, but not of GPA (George et al.).

Quality of Instruction

Tinto (1993) introduced a theory of student engagement in which classrooms were linked to student persistence. Tinto's findings supported some basic tenets underlying the concept of

classrooms as "learning communities." First, student participation in a collaborative or shared learning group allows students to develop a supportive network that bonds them to the social community of the college and engages them more fully in the academic life of the institution. Second, students are influenced by classroom settings where learning comes from a variety of perspectives beyond that of the individual professor. Third, students' perceptions of the quality of learning were deeper and richer in a collaborative setting than in a traditional lecture setting. Finally, a collaborative learning environment was found to promote student involvement and achievement, even in settings where high levels of engagement are traditionally difficult to attain (e.g., community colleges, commuter colleges).

Instructor Effectiveness. An instructor's effectiveness is often demonstrated by whether he or she engages or alienates the student (Case, 2008). For example, Case describes a perspective suggesting that certain assessment practices such as examinations (success vs. failure) and confession tasks (e.g., journals, learning contracts) produce an alienated experience. In addition, high-stakes assessment of high-pressure workloads may lead students to a state of secondary alienation ("going through the motions") and a complete lack of feeling for their experience. Fenstermacher and Richardson (2005) argue that "quality teaching" consists of both the worthiness of the teaching activity and the realization of the intended learning outcome under certain conditions that are out of the instructor's control, such as student effort, social support, and time and resources. More recently, Steele and Fullagar (2009) conducted an empirical examination of intensely engaging experiences, which they referred to as "flow," and how these experiences mediated the relationship between academic work characteristics and psychological well-being in the context of college coursework. They suggested that restructuring academic work to be clear and autonomous and giving ample feedback opportunities significantly relates to student engagement and psychological well-being and outlined some mechanisms that facilitate optimal classroom functioning such as instructor promotion of engaged states of mind. In general, researchers in this area indicate that effective instructors connect with their students on an interpersonal level, engage rather than alienate students, provide collaborative classroom experiences including academic tasks that are clear and autonomous, and offer ample feedback opportunities.

Instructional style is also important to effectiveness. For example, Austin et al. (2004) compared undergraduate students' notes after traditional lecture, lecture with slides, and lecture

with slides plus guided notes. Three dependent variables (critical points, examples, and extra points) were evaluated under these three experimental conditions. Critical points were an index of the percentage of major and supporting points presented in the lecture that were included in the student's notes. Examples were represented by the percentage of examples that were recorded in the student's notes. Finally, extra points were the number of supporting statements students made that did not meet criteria for a critical point or example. In this study, students did not do a very good job of recording the content of a lecture on their own without visual aids and guidance; for every dependent variable, the usefulness of notes from guided notes lectures was significantly higher than for traditional lecture and lecture with slides only.

Student Relationships With Instructors. Prosocial goals are likely moderated by the teacher and the quality of the student/teacher relationship and depend on both the personal actions of the teacher and the instructional climate in which these actions occur (Covington, 2000). In addition, students' goals mediate the relationship between what instructors intend students to learn and what they actually learn, and professors expect that students come to college with a commitment to learning that is similar to their own (Donald, 1997). Unfortunately, students are often unprepared for the shift in the balance of responsibility for learning that occurs between high school and college. Many students enter college from a school setting where the teachers are primarily responsible for student learning and have trouble adjusting to an academic setting where students are in charge of their own learning and support systems are diminished (Donald). These diminished instructional and peer support systems combined with larger, less intimate class sizes may negatively impede interpersonal connectedness.

Furthermore, according to Luyckx et al. (2009), teachers' responses to students' roles in their own learning may affect students' experiences of autonomy, competence, and relatedness, subsequently aiding or interfering with basic need satisfaction and the process of identity formation. For example, it is important to healthy identity development that students believe their academic work represents their own feelings and talents so that they can assume ownership of their work and experience autonomy, competence, and relatedness.

Career Decidedness

Given the fact that one of the most important psychosocial tasks for college students is choosing a career, it stands to reason that decision-making and career problem-solving are

motivational variables related to a student's overall sense of identity, competence, autonomy, and general well-being and ultimate academic success. Cognitions, behaviors, and environments interact to influence behavior (Bandura, 1983), and career behaviors may be conceptualized as responses to cognitive representations of career environments. In addition, these cognitive career representations are functionally related to and modifiable through the application of laws of human learning and cognitive development; vocational cognitions, behaviors, and environments interact to influence behavior (Sampson, Peterson, Lenz, Reardon, & Saunders, 1996). In short, career problem-solving and decision-making may be viewed as an example of general human capacities in problem-solving and decision-making (Peterson, Sampson, & Reardon, 1991). Dysfunctional career thinking characterized by misconceptions, self-defeating assumptions, behaviors, and statements, and irrational expectations and self-beliefs make career decision-making much more difficult (Sampson et al., 1996). According to Judge and Locke (1993), dysfunctional thought processes are related to subjective well-being, specific job dysfunctional thought processes, and job avoidance. In addition, dysfunctional cognitions such as perfectionism and overgeneralization decreased the chances for job and life satisfaction.

Within self-determination theory, psychological need satisfaction facilitates an individual's natural inclination toward integrated identity development in which identity engenders the best expression of the individual's own values and interests. This may be achieved by clarifying career goals through undergraduate courses devoted to career development and theory.

Career courses have been consistently shown to decrease dysfunctional career thinking in students (Folsom & Reardon, 2000; Johnson, Nicols, Buboltz, & Riedesel 2002) as well as racially and ethnically diverse freshmen (Osborn, Howard, & Leierer, 2007). When academic success in college is measured by graduation and satisfaction, career planning courses appear to be very beneficial for students. For example, Folsom, Peterson, Reardon, and Mann (2002) found that students who completed undergraduate career planning courses had higher graduation rates than peers who did not and that they graduated with fewer credit hours, saving the students time and money.

Since the late 1970s, desire for financial well-being and material prosperity has prompted students to have life goals that are more vocational in nature; as a result, they have become more interested in career concerns than broader intellectual issues (Donald, 1997). For example, it

may be that if students are in school to get a good job rather than for deeper understanding of theory, they are more likely to exert minimum effort to acquire the superficial vocabulary necessary to pass tests than to develop a sense of the discipline they are learning about (Donald). This lack of effort may negatively impact overall academic success. Some argue that college professors should be challenging the norms and helping students to find meaning in their chosen career paths (Case, 2008). Finally, to the extent that career decidedness contributes to a more complete and coherent sense of identity, students may be more likely to experience basic need satisfaction.

External Motivation/Future

This shift in student goals from desiring to learn about intellectual issues to focusing more on vocation is important because of the implication that students' motivation may be more tied to external motivators than to internal or intrinsic forces. Students may be more invested in academic success for future rewards than present gains. The connection between academic success and motivation is well-founded in theory and in the literature with respect to college students in particular.

Motivation in General. Motivation is a conceptually complex construct, loosely defined as the psychological feature that arouses one to act towards a desired goal. Models tying college success to motivation are numerous (Atkinson, 1958; Deci & Ryan, 1985; Locke & Latham, 2002; Ryan & Deci, 2000; Weiner, 1985).

Though it is evident that motivation is essential to academic success for college students, there is a distinction between intrinsic/internal motivation and extrinsic/external motivation in the current literature (Covington, 2000; Deci, Koestner, & Ryan, 1999; Lin et al., 2003; Robbins et al., 2004; Ryan, Deci & Grolnik, 1995; Zusho, 2003).

According to achievement goal theory, there are two types of goals: performance goals and mastery goals. Each serves different purposes in terms of motivation. According to Elliot (2005), the purpose of performance goals is to demonstrate competence and success (via task approach or avoidance) relative to others. The purpose of mastery goals, on the other hand, is to develop competence by acquiring new knowledge and skills, with success or failure tied to absolute standards or self-evaluation.

Self-determination theory suggests a relationship between motivation and academic success by focusing on human reactions to social environments that either enhance or thwart

motivation. For example, Shim and Ryan (2005) investigated the relationship between motivation and achievement goals. Their results indicated support for the distinction between approach and avoidance aspects of performance goals and for the idea that the effects of a performance-approach goal on changes in motivational constructs were moderated by grades. On the other hand, mastery goals were associated with enhanced motivation during the critical phase of processing evaluative information on an important task.

Extrinsic Motivators. The quality of student learning, as well as the will to continue learning, depends closely on an interaction between the kinds of goals, the motivational properties of these goals, and the prevailing reward structures or external motivators (Covington, 2000). External motivation is often referred to as one of the most important factors in academic success (Covington; Reeve, 1996; Robbins et al., 2004; Ryan & Deci, 2000). Factors which are external to the student that compel them to complete the tasks necessary for academic achievement include, but are not limited to, GPA, scholarships/financial support, parental expectations, grades, class standing, degree attainment, and future career. For example, commitment to attaining a degree is highly positively related to retention, while connectedness with the institution and financial support are moderately positively related to retention (Robbins et al.). These same external factors were also found to have some impact on GPA, but not as strong of an impact as other variables such as academic self-efficacy and achievement motivation.

Finally, social contextual conditions that support one's feelings of competence, autonomy, and relatedness are the basis for becoming more self-determined with respect to extrinsic motivation (Ryan & Deci; Ryan, Deci, & Grolnik, 1995).

External motivation also appears to be related to parental variables. Current research consistently finds that parents' educational background is significantly related to students' college GPA (Pritchard & Wilson, 2003) and highlights the contribution of parental involvement to the academic success of college students (Fuligni, 2001; Helsen, Vollebergh & Meeus, 2000; Ratelle, Larose, Guay, & Senecal, 2005). Helsen et al. indicated that lack of parental support was most strongly related to personal problems in adolescents, although the effect of lack of parental support is not the same under all conditions. For example, the importance of parental support weakens in adolescence and is stronger for girls than boys. In addition, Ratelle et al. reported that students' perceptions of their parents' involvement in the students' vocational

process predicted their persistence in a college program. They also indicated that students' competence and autonomy partially mediated the relation between their perceptions of parental support and their persistence in the program. Finally, perceived parental involvement directly predicted self-processes such as relatedness and autonomy and was indirectly related to persistence.

Internal Motivation/Interest

In general, internal motivation is defined as a personal incentive that incites or impels one to act. With regard to the academic success of college students, intrinsic motivation remains an important construct because it reflects the natural human propensity to learn and assimilate (Ryan & Deci, 2000). According to Robbins et al. (2004), internal achievement motivation is one of the best predictors of GPA for college students. For example, in a study by Zusho (2003), belief in task value was related positively with achievement in a college course. In fact, task-value beliefs were a significant predictor of academic performance in a college population. Students who reported higher levels of task value belief (intrinsic value) also reported using deeper processing cognitive strategies such as elaboration, a self-regulatory strategy that is significantly positively related to academic achievement (Heikkila & Lonka, 2006; Ruban & Reis, 2006).

Although it would appear that differentiating between external and internal motivation is fairly simple, situations exist that obscure the boundaries between these types of motivation for academic success when it comes to a postsecondary population. For instance, cultural norms regarding education may contribute to the motivation and academic success of students. Fuligni (2001) reported that motivation for long-term academic persistence might be tied to cultural norms of family obligation found in Asian and Latin American families such as respect for authority, obedience to parents, and financial support of the family. However, this long-term persistence is similar to the more individualistic, intrinsic motivation among European American youths (Fuligni). While family obligation would appear to be an external motivator for academic success, if the individual student has incorporated this sense of duty into his or her personal belief system, at that point the argument could be made that familial responsibility becomes an intrinsic value.

It appears that the type of goals college students hold predict their interest and success in college coursework, especially when students are struggling. For example, Harackiewicz,

Barron and Elliot (1998) found that mastery goals positively predicted subsequent interest in a college course, but performance goals did not. According to Shim and Ryan (2005), when students achieve high grades, a performance-approach goal was unrelated to intrinsic value, but when students received low grades, a performance-approach goal was related to decreased intrinsic value. Lin et al. (2003) found that students with mid-high levels of intrinsic motivation had lower test anxiety and higher self-efficacy. Furthermore, higher levels of intrinsic motivation were positively related to grades, and students with high levels of intrinsic motivation were characterized as using effective study strategies such as elaboration and organization. Conti (2000) found that the autonomy of students' goals predicted high intrinsic motivation. Furthermore, when academic conditions met the student's need for autonomy, competence, and relatedness, intrinsic motivation was maintained (Ryan & Deci, 2000).

According to self-regulation theory, underlying "forethought" processes are essential self-motivational beliefs which include academic self-confidence, outcome expectations, intrinsic value, and goal orientation. The current literature indicates a relationship between these self-motivational beliefs and achievement in college (Case, 2008; Davis, Winsler, & Middleton, 2006). According to Davis et al., college students' present motivation was related to the history of receiving tangible rewards for academic performance, but that relationship was stronger for males than females. Receiving greater amounts of external rewards for school performance in early schooling from both parents and teachers was associated with greater extrinsic and intrinsic motivation for males, but overall reward history was negatively related to motivation for females. It seems males internalized the extrinsic rewards as being related to their academic ability, while females did not. Overall, reward history related significantly to students' motivation orientation and performance in college (Davis et al.).

Case (2008) suggests that a student's lack of meaningful purpose in his or her studies negatively impacts general well-being. He argues that traditional utilitarian goals in higher education tend to work against a student's need to be creative and thwart the desire to learn. Given the current empirical support for the relationship between intrinsic motivation and academic success, it remains an important factor, contributing not only to traditional measures of academic success (e.g., GPA, grades), but also the general well-being of students while they are in college.

Confidence in Ability

Confidence in academic ability refers to the student's academic capacity as evidenced by previous grades or performance on nationally standardized tests as well as self-perceptions of likelihood to achieve academic success. A student's academic ability affects academic self-efficacy and self-confidence overall. Achievement goal theorists suggest that the emphasis on the dichotomy between mastery goals (focusing on learning and self-improvement) and performance goals (reflecting a more general concern of demonstrating one's ability compared with others) substantiates the importance of academic self-confidence as a factor related to academic success (Elliot, 2005).

Confidence also appears to be an important factor when it comes to the relationship between psychological need fulfillment, psychosocial development, and academic motivation for college students. Faye and Sharpe (2008) tested two models derived from developmental theories and self-determination theory. The comparison of the models indicated that stronger identity formation contributed to increased perceptions of autonomy and competence, defined as feelings of effectiveness. Results from a path analysis supported the model derived from self-determination theory over the model derived from developmental theory. Competence and identity were found to be the constructs most strongly associated with academic motivation. This suggests that competence-supportive environments may be of primary importance during emerging adulthood, possibly even more than autonomy-supportive environments.

Self-Efficacy. In the literature, self-efficacy is both a broad measure of self-concept and a narrow construct for specific academic areas (McKenzie & Schweitzer, 2001; Pajares, 1996; Robbins et al., 2004; Zusho, 2003). The more specific construct of academic self-efficacy was found to be one of the best predictors of college GPA (McKenzie & Schweitzer; Robbins et al.) and satisfaction (DeWitz & Walsh, 2002) and significantly related to retention (Pritchard & Wilson, 2003; Robbins et al.). However, there is less empirical evidence to support broader constructs of self-concept. For instance, Robbins et al. found a low estimated correlation among general self-concept, GPA, and retention. The authors speculated that this may have been due to the fact that college outcomes such as GPA and retention are narrow criteria that may be better predicted by the more specific construct of academic self-efficacy. This construct appears more relevant to students' behaviors in college settings that are applicable to a very specific period of their lives. DeWitz and Walsh found that academic self-efficacy was significantly associated

with college satisfaction, but measures of social self-efficacy and general self-efficacy did not account for any unique additional variance. Furthermore, Pajares found that particularized measures of self-efficacy (i.e., self-efficacy for something specific such as an academic subject or sport) that correspond to the specific critical task of comparison surpassed global measures of self-efficacy in the explanation and prediction of related outcomes.

A variety of other interesting findings have come out of recent research regarding self-efficacy. Shim and Ryan (2005) found that when college students in their study received low grades, a performance-approach goal was unrelated to changes in self-efficacy. However, self-efficacy was supported by mastery goals. In another study by Zusho (2003), results indicated that of all of the significant predictors of college academic performance, self-efficacy was the best predictor of course performance even after controlling for prior achievement and task-value beliefs. Furthermore, students with higher levels of self-efficacy reported using deeper processing cognitive strategies such as elaboration and metacognition. Finally, Pritchard and Wilson (2003) found that college students with a lower self-esteem indicated an increased intent to drop out of school compared to their peers with higher self-esteem. Along the same lines, Robbins et al. (2004) found that self-efficacy was a moderate predictor of retention.

Personal Adjustment

Case (2008) argues that a productive alternative to dominant perspectives on student learning in college involves focusing on the students' experiences of alienation and engagement as they enter the college community, attempt to "fit in" to the community, and remain in the college community until graduation. In addition to the importance of perceiving themselves as a part of the college community, healthy coping strategies for typical college stressors contribute to overall personal adjustment to the college experience. Personal adjustment is an essential component for satisfaction and success in college through healthy identity development and experiencing competence, autonomy, and relatedness according to self-determination theory (Luyckx et al., 2009). The satisfaction of these three basic psychological needs promotes optimal adjustment and an integrated process of identity development. When these needs are thwarted, students may regress to a state of passivity, a derailed process of identity development, and alienated functioning (Luyckx et al.).

Along the same lines, attachment theorists postulate that identity development and healthy adjustment are predicated on the internalization of family relationships characterized by

both autonomy and connection termed "differentiation of self" (Bowen, 1978). Differentiation of self involves the capacity to modulate affect, maintain a clear sense of self, and balance intimacy and autonomy in significant relationships. According to Skowron, Wester, and Razia (2004), differentiation of self partially mediated effects of academic and financial stress and had a direct influence on personal adjustment in college. Furthermore, students who over the first year college transition demonstrated and maintained a secure attachment style, defined as an internalized, positive model of self and lack of fear of abandonment or emotional intimacy, improved their ability to regulate negative emotion that interferes with effective coping, while loss of a secure attachment style coincided with a decline in that capacity (Bartholomew & Harowitz, 1991).

A significant number of students experience social and emotional problems (Pancer et al., 2000; Pritchard & Wilson, 2003) and health problems while in college, and as many as 30% to 40% will drop out of college without completing their degree as a result of difficulties they experience adjusting to university life (Pancer et al.). Pancer et al. found that students who were experiencing high levels of stress prior to beginning college tended to show much poorer levels of adjustment.

Andrews and Wilding (2004) confirmed empirically that personal relationship difficulties increased levels of anxiety, financial stress increased depression, and depression affected academic performance for college students. Furthermore, Pritchard and Wilson found that a student's emotional health was significantly related to GPA regardless of gender; students reporting higher stress levels were more likely to have a lower GPA, and students who indicated their intent to drop out of school reported more fatigue and fewer coping skills than their peers. In addition, poor mental health is associated with physical illness in the college population. For example, among a national sample of college students the prevalence of infectious illness ranged from 8% to 29%, and the prevalence of depression and anxiety ranged from 12% to 20%, with the association between depression, anxiety and exhaustion, and acute infectious disease having odds ratios ranging from .56 to .91 (Adams, Wharton, Quilter, & Hirsch, 2008).

Because many psychological disorders such as depression, bipolar disorder, and schizophrenia first manifest during late adolescence or early adulthood (American Psychiatric Association, 2000), it is necessary to examine the impact of mental and medical problems on the personal adjustment and academic success of college students. DeRoma, Leach, and Leverett

(2009) found that college students presenting with moderate to severe levels of depressive symptoms demonstrated lower performance in academic environments than students with normal to minimal levels of depression.

The effectiveness of newer medications has made it possible for many students with serious psychological and physical disabilities to attend college. In fact, 94 percent of directors of college counseling centers surveyed noted that an increased number of the students coming in for counseling were taking psychiatric medication (Kitzrow, 2003). In addition, according to a national survey of counseling center directors (Gallagher, Sysko, & Zhang, 2001), 85% of center directors reported an increase in severe psychological problems, including learning disabilities (71%), self-injury incidents (51%), eating disorders (38%), alcohol problems (45%), other illicit drug use (49%), sexual assault concerns (33%), problems related to earlier sexual abuse (34%), and severe psychological problems (16%). In a longitudinal study of psychological distress in college students, distress levels peaked during the freshman year, but a subset of students exhibited chronic, severe levels of distress that did not decrease over time (Sher, Wood, & Gotham, 1996).

Concentration and Self-Regulation

Recently, researchers driven by self-determination theory have investigated increasingly complex phenomena specific to regulatory style and academic success and presented conceptual distinctions of self-determination theory in predicting motivation to achieve, including adolescent autonomous self-regulation (Niemiec, Lynch, Vanstenskiste, Bernstein, Deci, & Ryan, 2006) and effects of future time perspective and instrumentality on motivation (Simons et al., 2004). Many of the processes involved in self-regulation, such as the "performance/volitional" control phase, are metacognitive skills (e.g., attention focusing, self-instruction, etc.) that increase concentration by helping individuals focus on the task at hand and optimize their academic performance. This type of self-discipline, which causes one to be motivated to finish tasks and resistant to distractions, has been a consistently strong predictor of academic performance at the post-secondary level (O'Connor & Paunonen, 2007).

Self-regulated learning includes not only cognitive but also motivational, affective, and contextual factors (Pintrich, 2000). An increasing number of researchers are providing a more descriptive theoretical conceptualization of self-regulation. In the current literature, self-regulation is consistently described as a student's ability to set task-related, reasonable goals,

take responsibility for his or her learning, and maintain concentration and motivation, and includes an ability to monitor strategy use and modify strategies if the task demands change (Zimmerman, 2000). According to Heikkila and Lonka (2006), a college student's self-regulation of learning is positively related to overall success, while lack of regulation is negatively related to success at college. For example, Frazier, Youngstrom, Glutting, and Watkins (2007) conducted a study with ADHD students who have significant problems with inattention and lack of concentration. They found that not only was there a moderate to large discrepancy in academic achievement between college students with and without symptoms of ADHD, but inattentiveness was positively correlated with academic probation status.

Self-Regulatory Strategies. The assumption underlying models of self-regulated learning is that students actively control their own cognitive processes and adapt their strategies and tactics to meet task demands, resulting in improved academic performance. Barnett (2000) surveyed students on their reading and studying of texts across the semester to ascertain whether empirically supported strategies were being used by college students and if these strategies were related to classroom outcomes.

Memory strategies were significantly related to achievement, but students did not increase their use of memory strategies throughout the semester even when they had low scores. Furthermore, other empirically supported strategies such as concept maps and question and answer sessions with peers were not implemented by the students. Barnett suggested that there is little evidence that the sophisticated models of self-regulation such as those described in the literature were being implemented in classrooms.

One factor measured in a study by Heikkila and Lonka (2006), "approach to learning," was significantly related to regulation of learning and student success in college. The results of their study indicated that GPA had low positive correlations with a deep approach to studying and self-regulation of learning and negative correlations with lack of regulation. Another interesting finding in their study linked the student's success expectation with a deep approach and self-regulation of learning. In other words, students who expected to be successful expressed a readiness to regulate their own learning processes. A college student's self-regulation of learning was positively related to that student's approaches to learning, cognitive strategies, and overall success, while lack of regulation was negatively related to students' success at college. Other researchers have examined both deep and surface approaches to self-

regulated learning strategies. For example, Ruban and Reis (2006) compared the self-regulated learning strategies of low and high achievers and found that many high achieving students reported using fairly complex, sophisticated kinds of strategies, while low achievers reported engaging in lower level strategies.

Socializing

Developmental theory includes social variables as important in the life of a college student. The importance of social support in college is also theoretically supported by the emphasis on the concept of "relatedness" in self-determination theory. As students enter the college community they may suffer identity confusion and personal discomfort because they are not fully engaged in their new environment, but are no longer fully at ease at home either (Case, 2008; Luyckx et al., 2009). Alienation or engagement may be experienced in the social context of desired or expected relationships with peers, instructors, family, or the college community as a whole.

It appears that socializing can be both a positive and negative influence on the academic success of college students. Socializing on campus and at jobs has been positively related to student success (Kulm & Cramer, 2006) but has also been linked to less time studying and more time skipping classes, which may negatively impact a student's GPA (Arria et al., 2008). In terms of peer social structures, findings have been mixed. Contrary to previous studies, Pritchard and Wilson (2003) found that membership in Greek organizations did not impact negatively upon student academic success. Depending on the culture and social class of the students, college may or may not be a time for seeking, building, and maintaining the relationship of a potential life-partner, which may also impact social goals. Overall, social factors did not predict intent to drop out and had less of an impact on student performance than emotional/health issues (Pritchard & Wilson).

Substance Use. Frequency of alcohol intake has been found to have a negative impact on GPA (Pritchard & Wilson, 2003). Alcohol and drug use and abuse have also been negatively associated with social and academic behaviors of college students (Hingson, Heeren, Winter, & Wechsler, 2005; Lanier, Nicholson, & Duncan, 2001). Arria et al. (2008) found that nonmedical use of prescription drugs add to the risk for academic problems in college. Students using these types of drugs skipped significantly more classes than nonusers, and past-year use independently predicted lower college GPA by the end of their first year of college (Aria et al.). Furthermore,

abuse of alcohol, drugs, or both makes college students vulnerable to severe problems such as legal issues, academic failure, emotional disorders, unwanted pregnancies, physical injury, and death (Hingson et al.).

Anxiety

In attachment theory, secure attachment to the parent is hypothesized to provide a secure base for an infant's exploratory behavior and engagement with the environment (Ainsworth, 1989). The secure base theory would suggest that late adolescents who have secure working models of relationships would adjust more successfully to the demands of school and work. The quality of the relationship with parents, as well as attachment cognitions, has been reported to be associated with the academic functioning and college adjustment of adolescents (Cotterrell, 1992). For instance, Hazan and Shaver (1990) found that "secure" adults have relatively few fears of failure, while insecure/anxious subjects fear rejection and failure, which leads to poor work performance.

Finally, in a longitudinal study by Burge et al. (1997), attachment cognitions were correlated with school strain, self-reported low satisfaction, stress, problems meeting deadlines, tendency to over-commit, and performance anxiety in academic settings.

Test Anxiety. Test anxiety, also known as evaluative stress and performance anxiety, is particularly important in academic settings. Test anxiety is defined as an overwhelming fear of the consequences of failure (Benjamin, McKeachie, Lin, & Holinger, 1981; Hancock, 2001). High levels of test anxiety are associated with lower self-esteem and self-efficacy, poor reading and math achievement, failing grades, pessimistic attitudes about school, and a profound fear of failure (Bryan, Sonnefeld, & Grabowski, 1983). In addition, it appears that the nature of the relationship between anxiety and performance, whether linked to a skill deficit or retrieval deficit, depends on the achievement goals of the individual learner (Covington, 2000). However, there are no effects in some studies on the relationship between anxiety and test performance, possibly due to the fact that worry often motivates students to use compensatory strategies to achieve (Andrews & Wilding, 2004).

Anxiety and Stress. The current literature regarding the relationship between anxiety and stress and academic success of college students offers conflicting data. Misra and McKean (2000) indicated that females experienced higher academic stress and anxiety, that anxiety was predictive of academic stress, and that freshman and sophomores had stronger reactions to stress

than juniors or seniors. In contrast, McKenzie and Schweitzer (2001) suggested that psychological health was not a significant predictor of academic achievement, although they felt that psychological health may influence academic performance indirectly through other predictors such as satisfaction and self-efficacy. Andrews and Wilding (2004) indicated that university life may have a beneficial effect for some students with pre-existing symptoms of depression and anxiety.

Summary

The evaluation of factors related to academic success of college students continues to be of great concern to educators and scholars alike (Cokely & Moore, 2007; Graunke, & Whoosley, 2005; Kirby, White, & Aruguete, 2007; O'Connor & Paunonen, 2007; Yan & Gaier, 1994). Theoretical postulates have identified important variables of academic success for college students.

An extensive review of the literature highlights significant key factors that contribute to the academic success of college students. These theories and empirical findings, combined with the results of a pilot study and preliminary empirical analysis with the ASICS, suggested ten key factors contributing to the academic success of college students: skills, quality of instruction, career decidedness, external motivation/future, confidence in abilities, personal adjustment, concentration and self-regulation, socializing, internal motivation/interest, and lack of anxiety.

Achievement goal theory dominates the literature with regard to college students, posing the idea that achievement goals refer to the purposes or reasons an individual is pursuing an achievement task. Achievement goal constructs such as mastery and performance goals are assumed to reflect the theory for approaching, engaging, and evaluating one's performance in an achievement context. This theory is generally linked to factors such as external and internal motivation, confidence in ability, and personal adjustment. Both self-regulation and self-determination theory also provide the foundation for many studies of external and internal motivation of college students and their ability to concentrate and self-regulate in an academic context. Fundamental to self-regulation theory are the basic volitional factors of goal setting, self-monitoring, activation and use of goals, discrepancy detection and implementation, self-evaluation, self-efficacy, meta-skills, and self-regulation failure.

Self-determination theory, which is focused on the satisfaction of the basic psychological needs of competence, autonomy, and relatedness, has been used by authors investigating many

factors of academic success in addition to the ones mentioned above, such as academic skills, students' relationships with their instructors, career decidedness (also substantiated by cognitive information processing theory), confidence in ability (specifically academic self-efficacy), personal adjustment, and socializing. In addition, confidence in one's academic ability has been empirically proven to be an important factor for the academic success of college students in student engagement theory, expectancy-value theory, and developmental theory. Specific to college students, factors such as personal adjustment, socializing, and quality of instruction have been studied using developmental and student engagement theories. Finally, anxiety appears to have less of a theoretical base, but may be tied to attachment theory, though empirical support for the link of early attachment experiences to a college student's anxiety is very limited at this time.

Next Steps: Standards for Evaluating Instrument Validity

Validity

Simply stated, validity is defined as the extent to which a test measures what it is designed to measure. Some argue that assessment instruments may have many different types of validity depending on the purpose of the test, the conditions of the test administration, and the target population for which the instrument is designed. Validity most often refers to the degree to which empirical evidence and theory support the appropriateness and adequacy of interpretations and actions based on measure results (Messick, 1989). As an accumulation of evidence to support a particular inference, validity applies the methods of science in that inferences are hypotheses and the validation of inferences is hypothesis testing. For this reason, instrument validation embodies the experimental, statistical, and philosophical idea that validity is scientific inquiry into score meaning. This section is a discussion of the literature related to modern validity theory and widely used methods for evaluating instrument validity.

Content Validity. Content validity is determined by whether the content of the test elicits responses that are representative of the domains being measured. It is presumed that responses to the sample of items on a particular measure will be indicative of "what the responses would be to the entire universe of behaviors of interest" (Aiken, 2003, p. 95). Content validity is often based on expert judgments about the relevance of test content to that particular behavior and about the accuracy with which item content covers that domain. Content validity is

most often analyzed in association with achievement tests because it is not concerned with performance differences, test structure, response processes, or social consequences.

Criterion-Related Validity. This type of validity refers to the extent the instrument is related to performance criteria external to the test itself (Fishman & Galguera, 2003). In other words, tests are evaluated against outside criteria such as ratings or other measures of performance (e.g., supervisor evaluations, dollar amount in sales, GPA, grades, etc.). Criterion-related validity is not concerned with any other sort of evidence except specific test-criterion correlations, or the regression system linking criterion to predictor scores (Messick, 1989). It is based on the degree of empirical correlation between test scores and criterion scores.

When the criterion measure is available simultaneously with (or very close to) the time of testing, the concurrent validity of the test can be determined. Criterion-related validity is analyzed when a test is being administered to people in different categories to ascertain whether scores from one category of people are significantly different from people in other categories. If scores on the criterion measure are not available until sometime after the assessment has been taken, predictive validity can be determined. Predictive validity focuses on the correlation between the instrument (predictor) and the criterion of future performance. The magnitude of predictive validity is limited by the reliabilities of both predictor and criterion variables; therefore, assertions concerning the predictability of psychosocial types of measures on performance criteria must be made cautiously (Aiken, 2003). Furthermore, the criterion-related validity of a measure may be influenced by a number of factors including test length, group differences, and base rate. Finally, the contributions of the instrument above and beyond that of other variables, or incremental validity, should be considered when analyzing test utility (Fishman & Galguera, 2003).

Construct Validity. This type of validity refers to the extent to which the instrument measures a particular construct or concept (in this case, academic success). Furthermore, construct validity contributes to confidence in predicting behaviors in situations where the measured construct is operating. Construct validity is based on an integration of evidence that bears on the meaning interpreted by test scores or results. In construct validity, the measure itself is just one of an extensive set of indicators of the construct. Modern validity theory is a unified concept comprehending both the scientific and ethical underpinnings of instrument interpretation and use (AERA, APA, & NCME, 1999; Messick, 1989). This unitary view

integrates considerations of content, criteria, and consequences into a constructive framework rendering inseparable the appropriateness, meaningfulness, and usefulness of score-based inferences. Within this theoretical framework, all validation is fundamentally construct validation in that all validity evidence contributes to the empirical grounding or trustworthiness of score interpretation (Messick).

Although a unitary view of validity is the most widely articulated in theory, it does not appear to be embraced in current test validation (Cizek, Rosenberg, & Koons, 2008). Cizek et al. used the current edition of *Mental Measurements Yearbook* as the data source to investigate aspects of validity represented by a large and diverse sample of published measures used in educational and psychological testing. The results revealed that validity information is not routinely provided in terms of modern validity theory, some sources of validity evidence are ignored in validity reports, and the favorability of judgments about a test is more strongly related to the number of validity sources provided than to perspective on validity taken or other factors. Only 2.5% of the reviews in the study described a unitary view of validity. The most common validity perspective taken was that there are differing kinds of validity, and in the greatest percentage of cases (45.2%), no clear indication of validity perspective could be discerned.

The meaningfulness of test scores, which is the goal of construct validity, sustains the unitary theory of validity. Construct validity is the essential condition in the validation of test interpretation and test use because the relevance, utility, and appropriateness of test use depend on score meaning (Messick, 1989). The current study evaluates the construct validity of the ASICS. Current research suggests that a variety of information sources assist in establishing the construct validity of an instrument (Joint Committee on Standards for Educational and Psychological Testing, 1999). Examples of sources of evidence for construct validity include expert judgment, analysis of internal consistency, focus groups with examinees or raters, and factor analysis.

Discriminant Validity and Measurement Invariance

Multivariate Analysis of Variance (MANOVA)

To establish evidence that a measure discriminates between groups, multivariate analysis of variance (MANOVA) is a technique commonly used to describe the differences in dependent variable means among multiple populations (Tabachnick & Fidell, 1996; Richard Tate, personal communication, 2005). According to Tate (2005), MANOVA is recommended over multiple

two-group *t*-tests to control for the inflation of the family-wise error rate, which is the probability of one or more false rejections of the null hypotheses when all of the nulls are true (Tabachnick & Fidell). In addition, MANOVA is protective against deflation of the family-wise confidence level, defined as the probability that all of the intervals associated with the family mean differences capture their respective true values.

Tate (2005) contends that this desired control of family-wise error rate and confidence level is established by protected testing (involving an initial test of an overall relationship) and simultaneous inference (a method directly setting the family-wise error rate and confidence level in multiple comparison testing) .

Confirmatory Factor Analysis Methods with Multiple Group (MG-CFA)

To provide evidence for construct validity, confirmatory factor analysis (CFA) has been recommended as an effective tool in the development and validation of measurement instruments (Brown & Cudek, 1993; Byrne, 2006; Vandenberg & Lance, 2000; Y. Zhang, personal communication, 2/15/2007). Interpretation based on scores of psychosocial instruments evokes measurement models that provide descriptions of the numerical and theoretical relationships between observed scores and constructs (Bowden, Lange, Weiss, & Saklofske, 2008). When the hypothesized factor model is based on strong prior beliefs about the domain structure based on literature and experience, the model may be tested by implementing a CFA. CFA with multiple groups (MG-CFA) extends the CFA by allowing for comparisons of factor structures across observed groups. Without scale equivalence across groups, observed score-based inferences may not reflect equivalent levels of the latent variable or construct (Brown et al., 2008).

In the current literature regarding MG-CFA, several criteria are recommended for determining the goodness of fit to the data for a hypothesized structure (Byrne, 2006; Chen, Sousa, & West, 2005; Cheung & Rensvold, 2002). Some examples include a root mean square error of approximation (RMSEA) value ranging from less than .05 (Brown & Cudek, 1993) to less than .08 (Vandenberg & Lance, 2000), a comparative fit index (CFI) value close to .95 (Byrne), goodness of fit index (GFI) value close to 1.00, and a Tucker Lewis Index (TLI) > .90. Furthermore, in the case of MG-CFA, it is recommended that tests for factor invariance be conducted across groups at several increasingly stringent levels (Byrne; Chen et al.). These tests may include configural invariance, factor loading invariance, and latent factor mean variance. Evidence of invariance is substantiated if the multiple group model exhibits adequate fit to the

data, and if the ΔCFI values between models are negligible or less than or equal to .01 (Byrne; Chen et al.; Cheung & Rensvold).

Conclusion

The identification and examination of the factors that contribute to the academic success of college students is of societal concern and professional significance for psychologists in college settings and would be beneficial to students and universities alike. Measures of academic ability such as SAT and ACT scores and previous GPA are widely used by researchers to predict college academic success. Nevertheless, while there are a number of valid measures of academic achievement, there is no published, multifaceted instrument that globally evaluates academic success beyond academic achievement. Instruments used to assess factors other than academic achievement tend to be highly specific and neglect to take into account many variables that have been empirically substantiated as important contributors to academic success in this population of students, such as self-regulatory strategies and interpersonal variables related to academic success.

Theory and a critical analysis of the literature revealed empirical evidence of the contributions of the ten factors on the ASICS to academic success for college students. The current study is an evaluation of the construct validity of the ASICS. Based on the current literature about widely used methods of evaluating instrument validity and modern validity theory, there is a variety of information sources that will assist in establishing the construct validity of an instrument (Joint Committee on Standards for Educational and Psychological Testing, 1999). Furthermore, Messick's (1989) unitary view of validity integrates consideration of internal reliability and sub-validities such as face, content, discriminant, and factoral in providing evidence of the overall construct validity of a measure.

MANOVA and MG-CFA are appropriate methods of analysis for establishing the validity of an instrument such as the ASICS. These analyses will be used to answer the following research questions:

1. Does the ASICS discriminate between the honors and at-risk groups of college students?
2. Are the group differences due to true response differences or to different psychometric responses to the scale items?

CHAPTER THREE

METHODOLOGY

Introduction

The introduction discussed significant problems with regard to retention and success for college students, including a lack of multifaceted measures of academic success for college students. Chapter Two provided a critical review of the theoretical basis for the factors related to academic success and discussed standards and procedures for evaluating the validity of psychosocial measures. This chapter describes the Academic Success Inventory for College Students (ASICS) and the methods used to evaluate the factor structure of the ASICS. Please see Figure A1. for a visual representation of the development of the scales comprising the ASICS and Table A5 for the actual items.

Background on the ASICS

Description

The Academic Success Inventory for College Students (ASICS) is a newly developed self-report instrument designed to measure academic success in college students. The 50-item instrument has 10 scales intended to measure general academic skills, career decidedness, quality of instruction, internal motivation/interest, external motivation/future, confidence, lack of anxiety, concentration/self-regulation, socializing, and personal adjustment. The ASICS is a time efficient, internet-based survey that evaluates many constructs previously obtained only by administering numerous individual measures. The ASICS can be used to provide early remediation for at-risk college students by identifying specific areas of functioning in need of intervention.

Pilot Study

The initial 72 items on the ASICS were developed by a research team based on theory, empirical precedent, and interviews with experts in the field of academic success. Items were reviewed by a panel of experts who rated each item on content, clarity, and appropriateness to category. A seven point Likert-scale was used with items rated from 1 (Strongly Disagree) to 7 (Strongly Agree). Descriptors were provided for all seven anchor points.

Items were originally selected to fall into 14 different categories or subscales: Anxiety, Career Decidedness, Concentration, Self-Regulation, Confidence, Effort, Interest, Internal

Approach Motivation, External Approach Motivation, External Avoidance Motivation, Study Skills, Personal and Interpersonal Issues, Ability, and Quality of Instruction. Subscales ranged from 4 to 6 items. Prior to responding to the items, participants were prompted to "*Select one class that has been the hardest or most difficult for you within the past year*." They were then instructed to answer the Likert-scale questions based on that particular class (e.g. I got anxious when taking tests in this class, This class will be useful to me in my career, I felt confident that I could understand even the most difficult material in this class). They also answered two open-ended questions (List the top two things that kept you from doing well in this class, and List the top two things that motivated you to do well in this class). In addition, the ASICS queried for demographic information such as gender, ethnicity, number of hours worked outside of school, and current GPA. This paper and pencil measure was administered during one semester to 315 undergraduates in general education classes at Florida State University, a large public university in the southeastern United States.

Initial analyses revealed that ten of the fourteen scales had good evidence of reliability (coefficient alpha > .80). One scale, Study Skills, had lower α (r = .72), but was retained due to strong theoretical support. The scale measuring External Avoidance Motivation had poor evidence of reliability (α < .65) and the entire scale was dropped. One to two items were dropped from each of the remaining scales, based on low item-to-total correlations. When resulting scales contained fewer than four items, additional items were added. Based on feedback from course instructors of the pilot participants, a scale was added to measure self organizational skills. Furthermore, based on the responses to open ended questions, a scale was added that measured the efficacy of the instructor.

While this scale does not measure student characteristics, the large number of respondents that listed the instructor variable as important prompted inclusion of this variable. The resulting measure had 62 items that were intended to measure the following twelve areas: Anxiety, Career Decidedness, Concentration and Self-Regulation, Confidence, Effectiveness of the Instructor, Effort, Interest, Internal Motivation, External Motivation, Self-Organization, Study skills, and Personal and Interpersonal Issues. Negatively worded items were reverse scored so that higher scores on items reflected more positive functioning. This new measure was put into an on-line format and participants accessed the inventory by typing in the web address.

Initial Validation

A validation study was conducted consisting of 929 students enrolled at a large public university in the southeastern United States. Data were collected over the course of two semesters from undergraduate classes in education, sociology, communications, and career development. Characteristics of the sample were as follows: mean GPA =2.66(SD=.99) on a 4-point scale; mean age = 19.44(SD = 2.17); age range = 17-49; females = 58%. Ethnicity was Anglo (68%), African American (13%), Hispanic (11%), Asian (3%) and Other (6%). An exploratory factor analysis and confirmatory factor analysis (Prevatt, Drehar, Welles, Yelland, & Li, 2009) indicated a ten-factor structure (see Appendix Table A2 for interfactor coefficients) explaining 64% of the variance. Given the large number of potential subscales, and the fact that some items could conceivably be related to more than one scale, EFA was conducted first on half the sample (n= 469), using SPSS, version 16. The number of factors to extract was determined using three methods: eigenvalues greater than 1.0, examination of the scree plot, and parallel analysis (Brown, 2006). All three methods suggested that 10 factors should be extracted. A maximum likelihood method was used, with oblimin rotation. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy (.92) and the Bartlett's test of sphericity ($X^2$1891, n = 469 = 19676.03, $p < .00$) indicated that there was sampling adequacy and that the strength of association among variables was appropriate for such an analysis. The ten-factor solution explained 64% of the variance. Items were dropped if (a) they had low item-total correlations (b) if they had factor structure coefficients of less than .30, (c) they had communalities of less than .30 or (d) they had equal item factor structure coefficients on two or more factors (Tabachnick & Fidell, 2001).

Based on these criteria, 12 items were deleted. The factor pattern and structure loadings of the remaining 50 items are presented in Table A1, along with the communalities of the measured variables.

The ten factors were consistent with original expectations, with four modifications: (1) the items measuring effort, study skills and self organization loaded onto a single factor, rather than the three different factors, (2) the items intended to measure personal and interpersonal issues loaded onto two separate factors, one made up of socializing items, the other made up of items measuring personal difficulties, (3) the items measuring external motivation loaded onto a factor that included any items mentioning future relevance of the class to a job or career, and (4)

the items measuring internal motivation and the items measuring interest in the subject matter loaded onto a single factor. The new scale contained 50 items falling into ten factors that were given the following preliminary scale names and defining characteristics.

- **Skills** – a combination of effort expended, study skills, and self organization strategies
- **Quality of the Instruction** – the ability of the instructor to hold the attention of the student, organize, teach, and assess the progress of the student
- **Career Decidedness** – progress towards and certainty of one's decision about a career goal
- **External Motivation/Future** – an external incentive to perform, with an emphasis on the future relevance of the class
- **Self Confidence** – belief in one's abilities to perform well academically
- **Personal Adjustment** – personal issues that detracted from one's ability to perform academically
- **Concentration and Self Regulation** – ability to concentrate and pay close mental attention
- **Socializing**- partying, drinking or lack of class attendance to the detriment of one's academic performance
- **Internal Motivation/Interest** – internal motivation to perform, with an emphasis on a personal interest in the subject
- **Lack of Anxiety** – lack of anxiety or nervousness with regard to studying or test taking

In addition, Mplus (Muthen & Muthen, 2004) was used for a confirmatory factor analysis of the 50-item, 10-factor solution, suggested by the EFA. Fit analyses focused on close-fit indices and followed guidelines by Muthen and Muthen (2004) and Abell, Spring and Kamata (2009). Several indices were examined to determine the adequacy of overall model fit, including goodness of fit (X^2), the comparative fit index (CFI), the root mean square error of approximation (RMSEA), and the standardized root mean square residual (SRMR). The 10-

factor model was associated with X^2 (1130) = 5219, $p < .00$, and fit indices as follows: RMSEA = .063 (.062, .065; 90% confidence interval), CFI = .87, SRMR = .07. The RMSEA is considered an acceptable fit given that it is below .80. The SRMR is considered a good fit given that it is below .10. The CFI is slightly below the acceptable cutoff of .90. Fully standardized factor loadings can be seen in Table A1. Inter-factor correlations are presented in Table 2, and range from .00 to .63. The factor representing Concentration/Self-Regulation had the largest number of high correlations with other factors, showing correlations greater than .30 with factors representing Skills, Efficacy of the Instructor, External Motivation/Future, Self Confidence, and Socializing.

Internal Structure. The internal consistency of the 50-item measure was also examined. Cronbach alpha for the total ASICS was .93, lending support for the internal consistency of the total questionnaire. The Cronbach alphas for the individual scales and the 95% confidence intervals (Fan and Thompson, 2001) were as follows: Skills, .93(.92-94); Efficacy of Instructor, .92(.92-93); Career Decidedness, 87(.86-89); External Motivation/Future, .88(.86-89); Confidence, .87(.85-88); Personal Adjustment, .86(.84-87); Concentration/Self-Regulation, .86(.85-88); Socializing, .84(.82-86); Internal Motivation/Interest, .89(.88-90), Lack of Anxiety, .77(.74-80).

Data Collection for the Current Study

Participants

Approximately 531 honors and academically "at risk" college students were the participants in this study. Students in these two groups represented most majors at the university and may likely be representative of a fairly typical population of college students at a large public institution in the southeast region of the United States of America. Demographic information was also collected from students participating in this study, including gender, ethnicity, age, semesters completed, hours of work outside of school, and level of involvement in a serious romantic relationship.

Honors Students. About half of the sample consisted of FSU students who were enrolled in the honor's program at FSU. In the spring of 2008, these students received an email offering them the opportunity to complete the ASICS. Their incentive for completing the survey was individualized feedback about how they responded compared to other FSU students and recommendations for intervention in areas where they scored much lower than other students.

Students were selected to be part of the honor's program by invitation, based on an evaluation of the entire record they submitted to the university during the general admissions process. Letters of invitation were sent out within two weeks of admission to the university to students who generally met the following minimum criteria:

- 3.9 or higher FSU-weighted high school GPA, AND
- 1910 or higher SAT score (combined critical reading, math, writing) OR
- 29 or higher ACT score

Others met at least TWO of the following three requirements:

- 3.7 or higher FSU-weighted high school GPA
- A qualifying test score, which may be either 1850 on the SAT (combined critical reading, math, writing) or 28 on the ACT
- Class rank in the top ten percent of their high school graduating class

Academically "At-Risk" Students. The second half of the sample included approximately 300 students who were taking a class focused on improving study skills due to the fact that they were on academic probation, which meant that their GPA fell below 2.0. This class was developed to contribute to meeting the university's student retention goals. Completion of the survey was part of the class requirements. These students also completed the current on-line version of the ASICS in the fall of 2008 and spring of 2009, after giving informed consent.

Administration of the ASICS. The students accessed the ASICS via the school website, using an assigned link. The first section of the survey consisted of demographic questions such as gender, ethnicity, number of hours worked outside of school, and current GPA. The second section consisted of the 50 items that make up the ten-scale ASICS. Prior to responding to the items, participants were prompted to "*Select one class that has been the hardest or most difficult for you within the past year*." They were then instructed to answer the items based on that particular class (e.g. I studied a lot for this class, I need to do well in this class to get a good job later, I got behind because I spent too much time partying and hanging out with my friends). A seven point Likert-scale was used with items rated from 1 (Strongly Disagree) to 7 (Strongly Agree). Descriptors were provided for all seven anchor points. Subscales ranged from 3 to 9

items. The survey tool prompted students if questions were missed, and did not allow progression unless all items were complete; therefore, there was no missing data.

Research Questions

Ultimately, this study was concerned with whether the factors measured by the ASICS discriminated between honors and at-risk college students, as well as whether these factors meant the same thing to members of the two different groups of students mentioned above. Therefore, the research questions were as follows:

1. Does the ASI discriminate between honors and at-risk groups of college students?
2. Are the group differences due to true response differences or to different psychometric responses to the scale items?

Hypotheses and Data Analysis

In order to examine the research questions, null hypotheses were posited. Hypotheses were tested using the covariance matrices from the ten factor scores of the ASICS across the two groups. To answer research question one, a MANOVA was implemented. To answer question two, Multiple Group CFA was used.

MANOVA (Question 1)

Comparison Across Groups. To answer question one, ascertaining differences between honors and at-risk college students on the subscales measured by the ASICS, a MANOVA was implemented due to the fact that the study proposes that academic success is truly multi-dimensional in nature, with multivariate indicators. Therefore, summing is inappropriate since both groups are affected by the different factors on the ASICS (Tabachnick & Fidell, 1996). Scale scores were created for the 10 scales by summing the item score (1-7) within each scale, dividing by the number of items in that scale, and then multiplying by 14.27 (so that each scale score would range from 0-100). The Honors students (n = 265) were compared to the academically “at risk” group (n = 266).

A multivariate analysis of variance (MANOVA) was used to test differences in the ten mean scale scores across the two groups. A multivariate *F* value was obtained based on a comparison of the error variance/covariance matrix and the effect variance/covariance matrix. The "covariance" here is included because the subscales are probably correlated and this correlation is taken into account when performing the significance tests.

Preliminary Analysis. MANOVA assumes the observations in each group are independently sampled from a multivariate normal distribution, with equal covariance matrices over the groups (Tabachnick & Fidell, 1996). In other words, it is assumed that the $p \times 1$ vector of dependent variables χ_{ij} is distributed multivariate normal and independently with $p \times 1$ mean vector u_j and a $p \times p$ constant variance-covariance matrix $\sum$:

$$\chi ij \sim MNID\left(uj, \sum\right)$$

A number of procedures to detect violations of these assumptions were implemented. Type I error for MANOVA is robust to moderate violations of this assumption. Due to the fact that MANOVA is not robust to violations of the independence assumption, a logical analysis of sampling and study circumstances to identify possible sources of lack of independence was conducted.

To detect possible violations of the assumption of multivariate normality there was an inspection of frequency distributions for each dependent variable and group. . With regard to the violation of the assumption of homogeneity of covariance, the Box's M and p-tests were used to test the null of constant variance-covariance matrices. In addition, Lavene's test was utilized to evaluate homogeneity of variance.

Statistical Inferences and Effect Sizes. In MANOVA, the null hypothesis is: all the population mean vectors are equal. **H0: μ1 = μ2…= μκ .** As mentioned in the review of key literature (Chapter One), Tate (2005), contends that control of family-wise error rate and confidence level is established by protected testing. In the first stage of protected testing the null hypothesis of equality of means over both groups were be tested using Pillai's Trace statistic and the associated p value to establish confidence in the presence of true mean differences. The above mentioned multivariate test criteria provides an associated multivariate strength of association.

In a second stage of protected testing, univariate *F* tests (ANOVA) were examined for each subscale to interpret the respective effect. In other words, an analysis would identify the specific subscales that contributed to the significant overall effect. Conducting univariate ANOVA for each of the subscales shed light on the specific subscales that appear different

between these two groups of college students, and controlled further for the inflation of family-wise error rate.

Multiple Group Confirmatory Factor Analysis (Question 2)

To answer question two, a Multiple Group-Confirmatory Factor Analysis (MG-CFA) was implemented to examine the proposed factor structure (see Figure 1.) and test for invariance of the ASICS across groups. This method is recommended due to its framework modeling and controlling for measurement error (Hancock, 2004). While the traditional CFA model assumes data comes from a single population, the MG-CFA extends the CFA by allowing for comparisons of factor structures across observed groups. The MG-CFA assessed an existing, pre-specified factor structure (Prevatt, Dehrer, Welles, Yellen, Li, 2009). The most frequent approach is to use the X^2 statistic to determine whether the underlying structure of the actual data is explained by the proposed model. Due to the limitation of the X^2 that it is sample size dependent, as mentioned in the literature review; other procedures have been proposed to assess degree of fit and significance of the model.

Therefore, in this study, hypothesis testing began with an assessment of the overall model fit using not only the X^2 likelihood ratio test., the comparative fit index (CFI), Tucker Lewis Index (TLI), and root-mean-square residual to determine if the degree of fit between the covariance matrix implied by the model, and the covariance matrix produced by the data was sufficient and regarded as a fair representation of the observed relationships between latent variables and observed indicators.

The MG-CFA was conducted using the M plus (Muthen & Muthen, 2007) program. Statistical analysis included missing data estimation; latent variable interactions and non-linear factor analysis using maximum likelihood; non-linear parameter constraints; a multiple group analysis; and bootstrap standard errors and confidence intervals (Shrout, P. & Bolger, N, 2002). According to Effron and Tibshirani (1993) the bootstrap is "a computer-based method for assigning measures of accuracy to statistical estimates" (p.10). This method involves having a computer program generate a series of data sets that are designed to resemble the ones that would be observed if the estimation study were repeated many times. Each bootstrap data set is obtained by randomly sampling (with replacement) from the original data. Such data sets are referred to as bootstrap samples. Efron and Tibshirani (1998) found that when the distribution of

the bootstrap estimates is normal, the bias-corrected interval and the percentile intervals are virtually the same.

MG-CFA Hypotheses Tests. MG-CFA hypothesis tests implemented were an omnibus test and configural invariance for overall fit. The configural invariance hypothesis postulates that participants belonging to different groups conceptualize the constructs in the same way. In other words, the data from each group fall into the same number of factors, with the same items associated with each factor. Testing measurement invariance under MG-CFA involved estimation of a series of models, and invariance is tested by comparing the GFI statistics of particular models with between-group constraints. Model fit differences were determined using the likelihood ratio test (LR) also known as the chi-square difference test, which is calculated as

$$\Delta \chi^2 = \chi^2_c - \chi^2_{uc}$$

where χ^2_c and χ^2_{uc} are the values for the constrained model and the less constrained model, respectively (Byrne et al., 1989).

Significance was evaluated with Δdf, where

$$\Delta df = df_c - df_{uc}$$

As recommended by a more recent study (Cheung & Rensvold, 2002), a Comparative Fit Index, with a value smaller than or equal to -0.01 was evaluated to indicate the null hypothesis of invariance should not be rejected. In addition, the chi-square test statistic was analyzed, and other indexes of fit were examined including the Tucker Lewis Index (TLI), and the Root Mean Square of Error Approximation (RMSEA).

CHAPTER FOUR

RESULTS

This study evaluated whether the factors measured by the ASICS discriminate between two groups of college students: honors and academically at-risk. In addition, factorial invariance was analyzed to determine if these factors mean the same thing to members of those two different groups of students. This was accomplished using MANOVA and MG-CFA across the groups. The purpose of the MANOVA was to compare means for multiple dependent variables, controlling for the inflation of the family wise error rate. To this end, preliminary analysis and protected testing (using overall and individual ANOVAs) were conducted. According to Byrne, et al., (1989) measurement invariance tests of the relationships between observed variables and latent constructs, and it was these relationships that were examined in this study. Using MG-CFA, different aspects of measurement invariance were investigated. The ten-factor model established in the pilot study was used as the base-line model. A chi-square difference test was performed, which uses an iterative procedure assuming the data has a multivariate normal distribution, to help evaluate aspects of the ASICS structure and scoring for equivalence across groups. While this is a highly sensitive statistical test and the most commonly used goodness of fit index (GFI), problems arise because of its functional dependence on *N* (Cheung & Rensvold, 2002). This is a particular concern for MG-CFA, given the large *N*s usually associated with multiple groups. Therefore other GFIs have been proposed for MG-CFA (Byrne, Shavelson, & Muthen, 1989, Cheung & Rensvold, 2002) and some were used in this study, such as the CFI, TLI, and RMSR. A series of increasingly stringent nested invariance tests were conducted to examine multiple aspects of invariance. First, an omnibus test evaluated the equality of covariance matrices across groups.

Next, covariance matrices and mean vectors were assessed. Third, configural invariance evaluated the ten-factor structure. Finally, modification indices were examined.

Demographic Variables and Statistics

Table 2 presents characteristics of the 531 participants (Honor $N = 265$, At-Risk $N = 266$) used in the MANOVA and MG-CFA. The two student groups differed overall on some demographic measures. In the honors student group, 26.8% were male, whereas 49.6% of at-risk students were male. Ethnicity of the honors group was Anglo (82.9%), , Hispanic (8.4%), Other

(4.6%), Asian (2.3%), and African American (1.9%). The at-risk group had a fairly different ethnic make-up of Anglo (60.9%), Hispanic (17.3%), African American (13.5%), Other (4.5%), and Asian (3.8%). In the honors group 53.6% of the sample was 19 or younger, compared to 95.9% of the at-risk students who were 19 or younger. The honors student group had a mean age of 19.54 (SD=1.16), whereas the at-risk group had a mean age of 18.5 (SD=1.41).

Other interesting descriptive differences are noted. For example, students with 2 or more semesters in college exceeded 70% in the honors group, but only 4.6% of the at-risk group had completed more than 2 semesters of college. In fact, 87.2 % of the at-risk students had completed only one semester of college. In addition, the honors group reported a mean of 5.87 hours of paid work outside of school and the at-risk students reported 3.78 hours of work outside of school. Finally, 21.7% of the honors students reported being involved in a serious dating relationship, while 9.4% of the at-risk students reported being in a serious relationship.

Table 2. Descriptive Demographic Statistics Based on Group Membership

Demographic Descriptors	**Honors Students (N=265)**	**At-Risk Students (N=266)**
Male	26.8	49.6
Female	72.5	50.4
Caucasian	82.9	60.9
African American	1.9	13.5
Hispanic	8.4	17.3
Asian	2.3	3.8
Other	4.6	4.5

Note. Numbers represent the percentage of each group sample (gender and ethnic identity)

Research Question 1:

Does the ASICS discriminate between honors and at-risk groups of college students?

Multivariate Analysis of Variance (MANOVA)

MANOVA assumes the observations in each group are independently sampled from a multivariate normal distribution with equal covariance matrices across the groups. None of the study circumstances suggested concern about the possible violation of the independence assumption. Inspection of the frequency distributions for each dependent variable and group did not indicate violation of the multivariate normality assumption. Due to the fact that the groups are approximately equal in size (Honors, $N = 265$; At-risk, $N = 266$), demonstrating that the design is balanced by an approximately equal number of observations in each cell, the robustness to modest violations of the constant covariance variance-covariance matrix assumption of the MANOVA tests is supported.

Scale scores were created for the 10 scales by summing the item score (1-7) within each scale, dividing by the number of items in that scale, and then multiplying by 14.27 (so that each scale score would range from 0-100). The group of students participating in the University Honors Program was compared to the At-Risk group testing differences in the ten mean scale scores across the two groups. The multivariate null hypothesis of equality of the means over both groups for all of the dependent variables was rejected at the 0.01 level. A significant multivariate effect with the use of Pillai's Trace criterion = .504, was observed for group status, F (10, 520) = 52.90, $p < .001$. The very small p value resulting from the overall test supports confidence in the presence of true mean differences between the groups. The value of the multivariate strength of association of .504 indicates a moderate to high overall relationship.

To identify the dependent variables that contributed to the rejection of the multivariate null hypothesis, univariate ANOVAs were conducted for each of the dependent variables. Most of the ANOVA null hypotheses were rejected at the 0.01 level with p-values less than 0.001. These univariate tests comparing the ASICS scale scores based upon group status yielded significant differences on all scales except Lack of Anxiety and External Motivation/Future (see Table A4.). Statistically, Lack of Anxiety and External Motivation accounted for little to none of the variance between groups. For all other scale scores, as expected, honors students had scores indicating more positive functioning than the at-risk students. The computed values of strength of association (η^2) for the dependent variables (F[1, 529]) were Skills = .285, Quality of

Instruction = .031, Career decidedness = .072, External Motivation/Future = .003, Self Confidence = .248, Personal Adjustment = .221, Concentration/Self-regulation = .080, Socializing = .248, Internal Motivation/Interest = .193, and Lack of Anxiety = <.000.

Analysis of these results suggest that these groups differ most significantly in the area representative of a combination of a student's effort expended, study skills, and self organization strategies. Furthermore, highly significant differences were also noted in areas measuring a student's belief in their abilities to perform well academically; time spent partying, drinking, or lack of class attendance; and personal issues that detracted from the student's ability to perform academically. Moderate to small differences were noted in areas assessing students' internal motivation to perform, with an emphasis on a personal interest in the subject; ability to concentrate and pay close mental attention; ability to progress towards and certainty of one's decision about a career goal; and the perception that the instructor was able to hold the attention of the student, organize, teach, and assess the progress of the student.

Research Question 2:

Are the group differences due to true response differences or to different psychometric responses to the scale items?

Multiple Group – Confirmatory Factor Analysis (MG – CFA)

MG-CFA, as an extension of confirmatory factor analysis, tests the invariance of estimated parameters of two nested models across groups. The measurement invariance is established by examining changes in the goodness of fit index when cross-group constraints are imposed on a measurement model. The analysis consisted of testing the main null hypothesis (Ho2: There is no significant difference across groups with respect to factorial invariance) by examining three increasingly stringent sub-hypotheses:

1. Sub-hypothesis 1: there is equality of covariance structures and mean vectors of the observed variables across the two groups,

2. Sub-hypothesis 2: there is equality in the number of common factors across groups,

3. Sub-hypothesis 3: in both groups, no items have factor loadings on factors with which they are not supposed to be correlated

When comparing groups, as in this study, measurement invariance is beneficial because the finding of a between group difference may only be ambiguously interpreted because one does not know if the response difference is due to a true attitudinal difference or different psychometric responses to the scale items. Unlike the CFA test for overall fit, there are no generally accepted criteria in MG-CFA for determining if changes in the goodness of fit indexes (GFI) are meaningful when measurement invariance constraints are added (Cheung & Rensvold, 2002). However, as mentioned earlier, the current literature recommends examining changes in specific GFI's, such as the Tucker-Lewis Index (TLI), Root Mean Square Residual (RMSR) and the Comparative Fit Index (CFI) to evaluate measurement invariance (Byrne, 2006; Chen, Sousa, & West, 2005).

Model specification. The specification of the proposed factor model is accomplished by freeing, fixing, or constraining elements in three matrices; 1) the factor loading matrix (lambda), 2) the factor variance-covariance matrix (phi), and 3) a diagonal matrix of error uniqueness parameters for each subtest (theta delta). A model that matched the organization of the previous studies was specified. This was a ten-factor model using the subscales (skills, quality of instruction, career decidedness, external motivation/future, internal motivation/interest, socializing, personal adjustment, concentration/self-regulation, self-confidence, and lack of anxiety) as the continuous latent variables and the 50 items as the dependent variables.

All coefficients with the values of 0 or 1 were fixed according to *a priori* theoretical considerations. The factor loadings were restricted so that each subscale loaded only on the factor that it was hypothesized to represent. All other factor loadings were constrained at zero. The error components of the subscales were set free. But off diagonal elements were fixed at zero because of the assumption of no relationship among errors. Other assumptions implied that measurement errors were independent from the factors and that observed indicators (subscales) were assumed to have a multi-normal distribution. Under these assumptions, covariance matrices were used to evaluate the parameters in the model through the maximum likelihood procedure. There were a total of 1325 free parameters estimated for the ten-factor model across two groups.

Statistical analysis. As mentioned above, due to limitations of the X^2 other procedures have been proposed to assess degree of fit and significance of the model. Therefore, in this study, hypothesis testing began with an assessment of the overall model fit using not only the X^2

likelihood ratio test, but also the TLI , CFI and RMSR to determine if the degree of fit between the covariance matrix implied by the model, and the covariance matrix produced by the data was sufficient and regarded as a fair representation of the observed relationships between latent variables and observed indicators. Next, configural invariance was analyzed by imposing the general pattern of fixed and free loadings specified in the baseline ten-factor structure across honors and at-risk college student participants. Finally, the modification indices (MIs) and their associated standardized expected parameter change (EPC) values for the factor model, and residual variances, were examined to investigate any possible existence of shared variance among items.

Omnibus invariance test of covariance matrices and mean vectors. An omnibus test of equality of covariance matrices and mean vectors across two groups was highly significant X^2 (N=531) = 10744.06, p<.00; CFI = .972, TLI = .963, RMSEA = .107, indicating support of sub-hypothesis 1 that the covariances matrices and mean vectors are equivalent across groups (see Table 3.). The results also necessitated further investigation of how the groups differ in terms of measurement and structural parameters, starting with a test of configural invariance where the same pattern of free and fixed factor loadings is specified across groups (Byrne, Shavelson & Muthen, 1989). Byrne (2001) suggests that this global test can produce inconsistent results, which lends support for the idea that the omnibus test is not definitive and that testing should proceed even in cases when the null hypothesis has been retained. Therefore, configural invariance tests were implemented.

Table 3. Tests for Invariance of the ASICS: Summary of Goodness of Fit Statistics

Model Description	χ^2	*df*	CFI	RMSEA	TLI	*p*
Final Model Invariance Tests	10744.06	129	0.972	.107	.963	<0.000

Note N = 531, n =265 for Honors Students; n = 266 for At-Risk students; ASICS = Academic Success Inventory for College Students; CFI = Comparative Fit Index; RMSEA = root mean square error of approximation; TLI = Tucker Lewis index; $p < .05$

Configural Invariace Tests. A ten-factor model (including 9 items relating to the latent factor Skills, 5 items related to the latent factor Quality of Instruction, 4 items related to the latent factor Career Decidedness, 4 items related to the latent factor external motivation/future, 6 items related to the latent factor Confidence in Abilities, 3 items related to the latent factor Personal Adjustment, 5 items related to the latent factor concentration/self-regulation, 5 items related to the latent factor Socializing, 6 items related to the latent factor Internal Motivation/Interest, and 3 items related to the latent factor Lack of Anxiety) was tested across the two groups. Configural invariance was analyzed by imposing the general pattern of fixed and free loadings specified in the baseline ten-factor structure across honors and at-risk college student participants. The simultaneous solution of an uncorrelated 10-factor model with 50 items across the two groups did not provide a good fit to the data X^2 (N=531) = 5,006.08, $p<.001$; CFI = .84, TLI = .82, RMSEA = .07; SRMR = .09, indicating the general pattern of fixed and free factor loadings in the ten-factor model does not hold across groups (Table A6), not substantiating sub-hypothesis 2. In the configural invariance test, the factor loadings of the first item of each factor was fixed to 1 (see Table A6.). Due to the fact that configural invariance was not established for this measure, no further test of measurement invariance that are more restrictive than configural invariance was conducted.

Identifying the Sources of Configural Non-Invariance Across the Two Groups. In order to identify the source of configural non-invariance and test sub-hypothesis 3, modification indices (MIs) in the output were examined (Byrne, Shavelson & Muthen, 1989). MIs are computed for each fixed and constrained parameter in the model. The MIs represent the values of expected decrease in chi-square if particular parameters were freely estimated (Byrne, 2001).

An EPC index denotes an expected value of a fixed parameter if it is freely estimated (Byrne, 2001, Muthen & Muthen, 1998-2006). The values of 85 MIs in the honors group were over 10, the default cutoff set by Mplus, and those of 74 MIs in the at-risk group were over 10.

An examination of the MIs revealed that in both groups most items have small to moderate factor loadings on subscales with which they are not supposed to be correlated, disproving sub-hypothesis three stating that in both groups, no items have factor loadings on subscales with which they are not supposed to be correlated. For example in the honors group standardized EPC value for the factor loadings of CA1 (confidence in ability item 1), *I was able to pick out the main ideas in lectures and on tests,* on the Concentration/Self-Regulation, Internal Motivation/Interest, and Quality of Instruction subscales were .41, .39, and .34 respectively (see Table A7.). Another moderate factor loading was II3 (Internal Motivation, Interest, item 3), *I worked hard because I wanted to understand the material,* on the SK (Skills) subscale of .36.

The MI values for the at-risk group also suggest items that have relatively high standardized EPC values (i.e., factor loadings) on different factors (see Table A8.). For example the estimated factor loadings of CS1 (Concentration/Self-regulation, item 3), *I paid attention in class* and II3 (Internal Motivation/Interest, item 3) *I worked hard because I wanted to understand the material,* on the SK (Skills) subscale were considered moderate at .56 and .59, respectively. Other problematic EPC values include, CA1 (Confidence in Ability, item 1) *I was able to pick out the main ideas in lectures and on tests,* on the Skills subscale was .42; SO5 (Socializing, item 5) *I skipped this class a lot,* on the Skills subscale was -.41, II3 (Internal Motivation/Interest, item 3), *I worked hard in this class because I wanted to understand the material,* on the Quality of Instruction subscale was -.43, the CA1 (Confidence in Ability, item 1) *I was able to pick out the main ideas in lectures and on test,* on subscale Internal Motivation/Interest was .42, and CS3 (Concentration/Self Regulation item 3), *I paid attention in class,* on the subscale Lack of Anxiety was -.41.

Smaller factor loadings were the EPC values of QI1 (Quality of Instruction, item 1) *The instructor really motivated me to do well,* on the Internal Motivation/Interest factor of .37., II5 and II6 (Internal Motivation/Interest, item 5 & 6) *I enjoyed attending lectures in this class* and *This class was very boring to me,* on the subscale Quality of Instruction of .35, and QI1 (Quality of Instruction, item 1) *The instructor really motivated me to do well,* on subscale Internal Motivation/Interest of .37.

Next, the MIs and their associated standardized EPC values of 86 residual variances were examined to investigate any possible existence of shared variance among items (see Tables A9 and A10). Their MI values were greater than 10 and their associated standardized EPC values ranged from 10.115 (-0.110) to 82.291 (0.240) in the honor's group and 10.202(-0.145) to 69.349(0.250) in the at-risk group. Moderate MI values and their associated EPC values were identified for the following items: Career Decidedness, item 2 - *I know what I want to do after I graduate* with Career Decidedness, item 1 - *I am certain about what occupation I want after I graduate* (EPC = .419); Internal Motivation/Interest, item 3 - *I worked hard because I wanted to understand the material* with Concentration/Self-regulation, item 3 - *I paid attention in this class* (EPC = .332); Career Decidedness, item 4 - *I'm having a hard time choosing a major* with Career Decidedness, item 3 - *I am certain that my major is a good fit for me* (EPC = .260); and Skills, item 8, - *I was well-organized* with Skills, item 7 – *I was good at setting specific homework goals*. In summary, these moderate MI values and their associated standardized EPC values suggest the possibility of the existence of a new, better-fitting factor model of the data.

CHAPTER FIVE

DISCUSSION

The purpose of the present study was to examine the psychometric properties of the Academic Success Inventory for College Students (ASICS) and provide evidence for construct validity. Given the lack of multifaceted instruments that globally evaluate academic success in college, this study makes a significant contribution to the research by evaluating the quality of an instrument with the potential for use in higher education. The ASICS is a 50-item scale developed to measure multiple factors related to academic success for college students. A critical analysis of the literature and theoretical basis of the ASICS suggested that ten factors contribute to the overall academic success of college students. A pilot study and initial validity analyses revealed empirical evidence for the internal reliability, face validity, and content validity of the ASICS. In the current study, the discriminant and factorial validities of this instrument across two groups of college students (honors and at-risk) was analyzed.

This chapter presents the findings and overall conclusions with regard to the purpose of the study and the research questions. Demographic descriptives, discriminant validity, and factoral validity were examined to provide evidence for the construct validity of the ASICS as a multi-faceted measure of academic success for college students. A discussion of the interpretable findings is organized with regard to the research questions and hypotheses introduced in this study. Implications for practice by various professionals in higher education are highlighted. Finally, the limitations of the current study and suggestions for future research are discussed.

Demographic Descriptors

One of the two groups in this study consisted of 265 students in the university honors program, and the other group consisted of 266 students who were at risk of failing out of college because they were on academic probation. Overall, more than half of the participants were Caucasian females, and 80% were in their first two semesters of college. The groups differed significantly on some demographic measures. Areas where significant differences were noted include gender, ethnicity (White, African American, and Hispanic), and age. Year in school and involvement in a serious dating relationship were also different among these two groups. For example, participants in the honors group were mostly White, females with two or more

semesters of college, and were more likely to be in a serious dating relationship than the at-risk students. The majority of at-risk students were White males, but this group included a much larger percentage of ethnic minorities than the honors group. They were also mostly first-year students and were less likely to be in a serious dating relationship than the students in the honors group.

Evidence of Discriminant Validity

The following research question was posited to examine the discriminant validity of the ASICS: "Does the ASICS discriminate between honors and at-risk groups of college students?" The multivariate null hypothesis (Ho1) is: There is no significant difference between the means of all of the dependent variables across groups. Multivariate analysis of variance (MANOVA) was used to compare a group of students participating in the University Honors Program to an "at-risk" group of college students on academic probation. The results were obtained by testing differences in the ten mean scale scores across the two groups. The multivariate null hypothesis was rejected at the 0.01 level, indicating a significant overall difference between these two groups. To identify the dependent variables that contributed to the rejection of the multivariate null hypothesis, univariate ANOVAs were conducted for each of the dependent variables (the ten subscale scores). These univariate tests comparing the ASICS scale scores based upon group status yielded significant differences in the expected direction of more positive functioning from the honors group on all scales except for Lack of Anxiety and External Motivation/Future (see table A4). Further analysis of the results indicated that honors students differed most significantly from at-risk students on the following subscales: skills, self-confidence, socializing and personal adjustment. Moderate to small differences were noted on subscales including internal motivation/interest, concentration/self-regulation, career decidedness, and quality of instruction.

Areas of Most Significant Difference Between Honors and At-risk College Students: Skills, Confidence, Socializing, and Personal Adjustment. The significant difference on 8 of the 10 scales of the ASICS provides support for discriminant validity. Intuitively, it makes sense that honors students reported engaging in behaviors related to effort, study skills, and self-organizational strategies significantly more than students who were at risk for failing out of college. This finding is consistent with the research linking retention with effort and study skills. For example, Robbins et al. (2006) found that academic discipline, defined as the amount of

effort a student puts into schoolwork and the degree to which he or she sees himself or herself as hardworking and conscientious, was incrementally predictive of academic performance and retention of first-year college students, controlling for institutional effects and traditional predictors. In addition, given the fact that honors students have a better developed ability to competently employ study skills that have allowed them to succeed at academic tasks and attain desired academic outcomes (Robbins et al.), it is not surprising that the results indicated a higher level of self-confidence in that group. Expectancy-value theory suggests that individuals' affective memories and their own interpretations of their previous achievement outcomes influence their expectations of future performance (Eccles & Wigfield, 2002). Therefore, given the fact that students in the honors program are more likely to have more positive past achievement outcomes than the at-risk students, it is not surprising that confidence in future performance was higher for honors students.

Theories emphasize that students' experiences of relatedness (Luyckx et al., 2009) and engagement in the college community (Case, 2008) are important for their academic success. The ASICS scales socializing and personal adjustment were developed to help measure students' subjective experiences in these areas. The need for relatedness may be related to students' decisions to socialize and build peer relationships. While there are a number of positive behaviors related to socializing, the items on the socializing scale of the ASICS are reflective of the negative behaviors associated with socializing (e.g., alcohol and substance use, going out instead of studying, skipping class, etc.). The pressure to maintain an exceptionally high GPA to remain in the honors program may be related to the honor students' reports of engaging in negative socializing behaviors less than the at-risk students.

With regard to the students' experiences of engagement (vs. alienation), the difference between the honors group and the at-risk group may be due to the structured nature of the honors students' experience at the college. In other words, the fact that the honors students are part of a program with structured activities to provide support for an engaging experience that allows them to perceive themselves as an important part of the college community may explain why honors students scored more positively in the areas of socializing and personal adjustment to college. In summary, the results of the MANOVA provide evidence of construct validity because the scales differentiate the two groups of college students as expected, given theoretical and empirical foundation outlined in previous chapters.

Honors and At-Risk Student Similarities in the Areas of Anxiety and External Motivation. The non-significant difference on the subscale lack of anxiety may be due to specific characteristics of the participant sample. While most of the factors measured by the ASICS are based on a strong theoretical foundation, anxiety had less theoretical and empirical support that may have been reflected in the results of the MANOVA. Anxiety is a complex theoretical construct that has contradictory findings in the research. With regard to anxiety and academic success for college students, the current literature substantiates both negative and positive impact on academic performance due to the fact that both complete lack of anxiety and too much anxiety may negatively impact academic performance, and an optimal level of anxiety may positively impact academic performance (Andrews & Wilding, 2004). The lack of anxiety scale does not differentiate between positive and negative effects of anxiety (i.e., anxiety as a motivator vs. anxiety as a debilitating variable). Furthermore, honors and at-risk students may have similar levels of anxiety for different reasons. For example, honors students may have anxiety related to the competitive nature of the honors program, while at-risk students may have anxiety due to risk of failing out of college.

The fact that 80% of the participants in this study were in their first year of college also may have impacted the results with regard to anxiety and external motivation/future. For example, the research on younger adults, including traditional first-year college students, suggests a vulnerability to significant levels of anxiety and depression and an inability to cope with increased levels of stress (Jackson & Finney, 2002; Misra & McKean, 2000). Younger students in general lack the psychological resources of maturity and experience and have ineffective coping strategies when faced with stressful situations (Jackson & Finney; Misra & McKean). Therefore, the level of anxiety experienced as a traditional first-year college student may not differ depending on what type of academic program they are enrolled in (i.e., honors vs. non-honors programs). In terms of the non-significant difference on the external motivation/future scale, all of the items on this scale required the participants to reflect on the usefulness of the class to their future. It may be that because the majority of students in both groups were first-year students, their ability to connect the class to future importance did not differ because most members in both groups were three or more years away from connecting current learning to future outcomes and importance. On the other hand, it may be that relevance to future outcomes is equally important to both groups of students.

Evidence of Factorial Validity

To examine the factorial validity of the ASICS, the following research question was posited: "Are the scale differences due to true response differences or to different psychometric responses to the scale items?" The corresponding null hypothesis (Ho2) was: There is no significant difference across the honors and at-risk groups of college students with respect to factorial invariance. Multiple group confirmatory factor analysis (MG-CFA) made it possible to examine the factor structure across the two groups to test increasingly stringent hypotheses about how well the factor structure was replicated across the two groups.

An omnibus test of equality of covariance matrices and mean vectors across two groups was highly significant, providing evidence for the factorial validity of the ASICS. Additional configural invariance testing indicated that the general pattern of fixed and free factor loadings in the ten-factor model did not hold across groups. In other words, although sub-hypothesis 1 was substantiated by the results indicating invariance among the covariance structures and mean vectors of the observed variables across groups, sub-hypothesis 2 was unsupported by the results when the general pattern of fixed and free loadings specified in the baseline ten-factor structure across honors and at-risk college student participants was imposed. An examination of the Modification Indices (MIs) revealed that in both groups many items had small to moderate factor loadings on factors with which they are not supposed to be correlated. This finding was contradictory to the assertion in sub-hypothesis 3 that no items have factor loadings on factors with which they are not supposed to be correlated.

Given the information gleaned by examining the modification indices, certain factors may collapse into each other, there may be other factor structures that provide a better fit than the model reported here, or both. Many of the items correlated with multiple factors. For example, CA1 (confidence in ability item 1), *I was able to pick out the main ideas in lectures and on tests,* and II3 (Internal Motivation, Interest, item 3), *I worked hard because I wanted to understand the material* had moderate factor loadings on factors they were not intended to in both the honors and at-risk groups. For both groups, II3 had a moderate factor loading on the Skills scale, suggesting the students' responses may have been more reflective of effort expended than personal interest in the subject. CA1 also had moderate loadings for both groups on the subscale Skills, suggesting the students' responses may have been more representative of the actual skill of picking out the main ideas than their confidence that they were able to use that skill. It is also

possible that these items may load on both scales because these scales are non-independent by nature, and individual items assessing these scales fail to conform to models such as the one in this study that required that they load on only one factor and take on zero loadings for the other factors. Finally, existence of shared variance was noted on the following items: Career Decidedness, item 2, *I know what I want to do after I graduate*, with Career Decidedness, item 1, *I am certain about what occupation I want after I graduate* (EPC = .419); Internal Motivation/Interest, item 3, *I worked hard because I wanted to understand the material*, with Concentration/Self-regulation, item 3, *I paid attention in this class* (EPC = .332); Career Decidedness, item 4, *I'm having a hard time choosing a major*, with Career Decidedness, item 3, *I am certain that my major is a good fit for me* (EPC = .260); and Skills, item 8, *I was well-organized*, with Skills, item 7, *I was good at setting specific homework goals*. The shared variance suggests that items may not be distinct enough in the behavior they are trying to assess.

As noted in the initial validation studies, the scales on the ASICS are highly related and a criterion of high item-total correlations was used for retaining items on this scale. Some of the factors accounted for most of the variance and others much less of the variance, which may mean that the shared variance of some of the weaker scales may be independent of the variance they have in common with other scales and items.

Furthermore, although the MANOVA substantiated that the ten factors explained 50.4 % of variance, which meets the recommendation of factors explaining at least 50% of the variance, Floyd and Widamen (1995) suggest it is more reasonable to expect that a set of factors explain 80% of the variance to insure higher communality estimates. With regard to sample size, it is recommended in confirmatory factor analysis that there be a 5:1 subject to factor ratio (Guadagnoli & Velicer, 1988). Analyzing the data across two groups decreased that ratio, which may have affected the amount of factors implied by the scale because of low power to detect practically significant levels of residual covariance. Another possible explanation for factor variability could be that four of the scales (career decidedness, external motivation, future, personal adjustment, and lack of anxiety) had less than the recommended five items (Floyd & Widaman). Lack of anxiety, the weakest scale, only had three items. Due to the fact that increasing the number of indicators improves factor stability (Guadagnoli & Velicer), it may be necessary to find additional items to define weaker factors.

Often, empirical emphasis on the interpersonal world of students is a separate line of inquiry from research that focuses on academic outcomes. The results of this study suggest that variables related to personal adjustment and socializing, belief in one's ability to perform academically, and a combination of effort expended, study skills, and self-organizational strategies explain the majority of the variance between college honors and at-risk students. In addition, there were significant differences between honors and at-risk college students in variables related to quality of instruction, career decidedness, concentration/self-regulation, and internal motivation/interest. Both the results of this study and theoretical postulates linking academic success for college students to experiences of engagement in the college community suggest that the factor of personal adjustment may be improved by increasing the number of items and including items specific to emotional, medical, and interpersonal difficulties, given that a significant number of students experience social, emotional, and health problems while at university. In addition, items related to personality may strengthen this factor given the empirical support for the idea that a student's experience in the college community may be influenced by the student's individual personality. O'Connor and Paunonen (2007) indicated that recent empirical studies have rendered some consistent findings about Big Five personality predictors of college academic performance.

Conscientiousness is the trait most strongly and consistently associated with academic success, and Openness to Experience was somewhat positively related to scholastic achievement (O'Connor & Paunonen). The facets of achievement striving and self-discipline, in particular, have been strong and consistent predictors of academic performance in the literature, while impulsivity and anxiety have been found to be negatively associated with academic achievement in college students (O'Connor & Paunonen). It may be that items tapping into prosocial behaviors, academic wholism, and personality traits contribute to strengthening the validity of the ASICS and provide practical information for universities.

Implications for Practice

An instrument such as the ASICS may be pragmatically useful to a number of professionals who work with college students. For example, academic advisors, professors, and counselors may use it as a screening instrument for students who are struggling; the results may be used to make decisions about referring the students to campus resources or choosing interventions that would address specific areas of concern. For example, an academic advisor

could have a student who not achieving the expected grades complete the ASICS and make referrals depending on the results. If the results indicated a low score in the area of motivation, confidence in ability, socializing, or personal adjustment, the student could be referred to the college counseling center. A low score in the area of career decidedness could lead to a referral to the career center. A low score in the area of skills may warrant a referral for tutoring.

In addition, the ASICS could be used programmatically for individual students and for intervention and research. Many colleges have programs designed to bridge the gap between high school and college. These programs could use the ASICS to screen the entire group of participating students to identify those who may be at risk for facing challenges in the different areas measured by the ASICS. For example, Giuliano and Sullivan (2007) describe an empirically supported program developed to address the challenges met by students transitioning from high school to college by increasing the students' self-awareness, self-motivation, and internalization of the demands of academic maturity. Programs such as this often have first-year students begin college in the summer to give them a chance to adjust to campus, being away from home, and so forth. Directors of these types of programs could recommend that students take the ASICS at the end of that summer so the results may be analyzed and the students offered specific recommendations and interventions depending on areas of weakness on the scale. This would allow first-year students to access supports and interventions before they are failing academically. If the students were to take the ASICS when they first enter the program, directors could also use the results to make programmatic changes if necessary. Finally, it may be beneficial to develop a professional training manual for professionals using the ASICS to assist college students.

Limitations

There were several threats to internal and external validity that may impact the results of this study and their potential utility. The selection of the participants may affect the internal validity of the study as the subjects were all undergraduate college students who volunteered to participate. Moreover, the sample was made up of criterion participants (e.g., honors and at-risk students), which could influence the pattern of responding and the relationship of correlations. Environmental factors might have been a threat to internal validity because 50% of the participants were participating in an academic success course focusing on study skills and time-management that may have influenced their knowledge and practice of these types of skills.

However, the highly significant difference in favor of the honors group on the subscale measuring these types of skills suggests that the at-risk students appear to have lower functioning in this area even after receiving instruction. In addition, the honors students participate in various seminars throughout the year related to being a successful honors student and may therefore have more knowledge in the areas measured by this scale. Finally, internal validity may have been compromised due to the fact that all of the "at-risk" students were first-year college students, whereas the majority of honors students had completed their first year, which may mean that results are reflecting behaviors related to overall college adjustment.

The population may also influence the external validity since the data were collected from a criterion sample of undergraduate college students from a large southeastern research university. This limits the generalizability of the study results to a college student population. Given the fact that the average age for a participant in this study was 18.9, the results may not generalize to nontraditional (older) undergrads or graduate students. In fact, a large majority (about 80%) of the population was in their first year of college, which may affect generalizability beyond the first year of college.

Furthermore, ecological validity may influence the external validity as the study results are only generalizable to a university setting and not settings outside of college campuses. However, this is a minor concern because this scale was developed to be used specifically with college students.

Psychometric properties may also influence the internal validity. The reported alpha coefficients of the ASICS were strong, but the study was limited by the small number of items included on some of the scales (i.e., lack of anxiety, personal adjustment, external motivation/future, career decidedness). There may be other academic success mechanisms on those scales that were not integrated into the instrument. Furthermore, there is some debate in the literature about the use of the chi-square statistic in MG-CFA because it seems to represent a "double standard" to the common argument for the use of other GFIs rather than the chi-square statistic in CFA because of chi-square's dependence on sample size for model fit (Cheung & Rensvold, 2002). Nevertheless, this practice appears to be parsimonious and continues to be fairly common among researchers, and this study did not have a particularly large *N* for a multiple group confirmatory analysis. In fact, in order to cross-validate the ASICS on two groups of participants, the sample size was reduced, which may have been a disadvantage for

statistical analysis. Nonetheless, as a caution other GFIs were used in addition to the chi-square statistic in this study.

Suggestions for Future Research

Pintrich (2004) proposed that research in educational psychology related to college students should pursue two goals simultaneously, one focused on providing useful information that can help solve practical problems and the other focused on scientific understanding. Ideas for the practical utility of the ASICs were presented earlier; the following section offers suggestions for future research.

Further study is necessary to provide additional evidence of the construct validity of the model and structure of the ASICS. Without a strong theoretical framework that gives clear conceptual definitions of the constructs and adequate empirical evidence, it is difficult to interpret analysis regarding the reliability and validity of an instrument (Messick, 1989; Pintrich, et al., 2004). In future studies, other models should be considered.

To provide additional evidence for construct validity, studies focusing on convergent validity would be especially beneficial (Messick), and further research is necessary to clarify the pattern of non-invariance that did not allow for testing of metric and scalar invariance across groups. More comprehensive analysis of individual items on the scale using item response theory may help identify the most problematic items. Finally, to control for identified descriptive characteristics that may be covariates, such as year in school, gender, and ethnicity, Multivariate Analysis of Covariance (MACOVA) may be implemented.

It is recommended that the ASICS be evaluated with samples from different populations such as college students with disabilities or other mental health issues such as ADHD, anxiety, or depression as well as graduate students and ethnic minorities with different cultural backgrounds. If the ASICS is to be translated into languages other than English, it is also recommended that cross-cultural comparisons of the ASICS be examined to see if psychometric properties occur across various cultures.

Given the fact that the majority of the subjects were first-year college students, it would be beneficial to complete an analysis controlling for year in college. In addition, given the fact that the MANOVA in the current study indicated significant differences on the personal adjustment scale, and the MG-CFA suggested that this factor may need to be strengthened, a useful replication of this study may include items tapping mental health disorders, medical

diagnosis and interpersonal problems. All of the efforts suggested above may provide additional empirical support for responsible use of the ASICS and the valid interpretation of the results obtained while working with a wide variety of college students from diverse backgrounds and life experiences.

Summary

According to ASHE Higher Education Report (2008), the definition of student success emphasizes certain outcomes such as enrollment in college and completing advanced degree programs. Those who fail to attain a college degree have fewer career opportunities, earn less money on average, and achieve lower financial stability than their peers who graduate from college (Kane & Rouse, 1995). Approximately 40% of college students will leave higher education without getting a degree (Newby, 2002; Porter, 1990). For those who remain in college, many factors interfere with their quality of life that put them at risk for academic failure. The identification and examination of the factors that contribute to the academic success of college students is of societal concern and professional significance for advisors, professors, and counselors in college settings, and would be beneficial to students and universities alike. While there are a number of valid measures of academic achievement, there is not a currently a published, multifaceted instrument that globally evaluates academic success beyond academic achievement. An empirically supported instrument that assesses both academic and nonacademic factors related to college success could be used in research to broadly contribute to an understanding of the complexities of college success. Furthermore, such an instrument would be a pragmatic tool for university professionals who work with individual college students.

Many different theories are used to study factors of academic success. Construct validity is the essential condition in the validation of test interpretation and test use because the relevance, utility and appropriateness of test use depend on score meaning (Messick, 1989). In the current study, I evaluated the construct validity of the ASICS using MANOVA and MG-CFA to determine discriminant validity and factor scale invariance. The results show the ability of the ASICS to discriminate between honors students and at-risk students on eight of the ten factors. Furthermore, the multiple group confirmatory factor analysis provided evidence for the factorial validity of the ASICS when the omnibus test of equality of covariance matrices and mean vectors across two groups was highly significant. Additional, more stringent configural invariance testing indicated that the ten-factor model did not hold across groups. This may be

due to the fact that many items had factor loadings on factors with which they were not supposed to be correlated.

The results of this study suggest that the strongest factors on the ASICS may fit best in the framework of self-determination theory. For example, the results of the MANOVA indicate that honors students had significantly higher functioning than at-risk students on the factors skills, confidence in academic ability, socializing, and personal adjustment. Those scales had sufficient specificities to warrant interpretation. One of the three psychological needs emphasized in self-determination theory, "competence," links variables such as study skills and academic self-confidence to academic success for college students. The ability to competently employ study skills meets a student's need to succeed at tasks to attain desired outcomes. In addition, resulting perceptions of competence and personal success increase academic self-confidence.

Self-determination theory also describes autonomy as the individual's need to experience choice in the initiation, maintenance, and regulation of behavior that is related to motivation of individuals to expend effort on given tasks (Ryan & Deci, 2000).

Confidence also appears to be an important factor when it comes to the relationship between psychological need fulfillment, psychosocial development, and academic motivation for college students. Faye and Sharpe (2008) tested two models derived from developmental theories and self-determination theory. The comparison of the models indicated that stronger identity formation led to increased perceptions of autonomy and competence, defined as feelings of effectiveness. Competence and identity were found to be the constructs most strongly associated with academic motivation. Implications of these findings suggest that competence-supportive environments may be of primary importance during emerging adulthood. The fact that college students are at the developmental stage of emerging adulthood gives additional support to using self-determination theory as the framework for the ASICS.

Given the statistical support for the factor of personal adjustment, self-determination theory takes into consideration the developmental stage of college students. Personal adjustment is an essential component for experiencing satisfaction and success in college through healthy identity development and experiencing competence, autonomy, and relatedness as identified in self-determination theory (Luyckx et al., 2009). The satisfaction of these three basic psychological needs promotes optimal adjustment and an integrated process of identity

development; when these needs are thwarted, students regress to a state of passivity, a derailed process of identity development, and alienated functioning (Luyckx et al.). Along the same lines, the importance of social support in college was statistically supported in this study and theoretically supported by the emphasis on the concept of "relatedness" highlighted by self-determination theory. As students enter the college community they may suffer identity confusion and personal discomfort as they are not fully engaged in their new environment, but are no longer fully at ease at home either (Case, 2008; Luyckx et al.). Alienation rather than engagement may be experienced in the social context of desired or expected relationships with peers, instructors, family, or the college community as a whole (Tinto, 1997).

The findings in this study provide evidence for the construct validity of the ASICS. According to Messick's (1975) Construct Validity Hierarchy, construct validity is established by proving reliability and the following subvalidities: face, content, factor, convergent, discriminant, and criterion. Previous pilot and validation studies established evidence for the face, content, and factoral validity of a ten-factor model of the ASICS. Given the current findings, it appears that the scale discriminates and is partially factorally invariant among honors and at-risk college students. Additional research would be beneficial to further evaluate the validity of the ASICS.

APPENDIX

Table A1
Initial Validation EFA Pattern and Structure Coefficients and Communalities, and CFA Standardized Factor Loadings for the ASICS

Factor/ Item[a]	EFA Pattern Coeffs	EFA Structure Coeffs	EFA h^2	CFA Factor Loadings
1 Skills				
Studied a lot	.47	.73	.74	.81
Tried everything	.43	.73	.74	.82
Worked hard	.39	.74	.78	.84
Kept a good study schedule	.60	.60	.74	.81
Used good study skills	.71	.76	.67	.82
Made good use of tools	.81	.74	.62	.65
Used a goal setting strategy	.86	.79	.70	.70
Set homework goals	.84	.81	.74	.74
Was well organized	.73	.80	.75	.78
2 Efficacy of the Instructor				
Instructor motivated me	.61	.70	.68	.69
Disappointed in quality of the instructor R	.93	.92	.84	.92
Instructor was ineffective R	.94	.92	.84	.93
What I learned I learned on my own R	.80	.80	.68	.80
Would have done better if instructor were better R	.89	.87	.74	.87
3 Career Decidedness				
Certain about my occupation	.95	.92	.84	.93
Sure of what I want to do after I graduate	.97	.95	.85	.96

Table A1—continued

Factor/ Item[a]	EFA Pattern Coeffs	EFA Structure Coeffs	EFA h^2	CFA Factor Loadings
My major is a good fit	.62	.65	.51	.64
I'm having a hard time choosing a major R	.61	.65	.52	.62
4 External Motivation Future				
I need to do well to get a good job	.74	.76	.63	.73
This class is important to my future success	.88	.88	.70	.87
In the future I will use this material	.87	.75	.64	.76
This class will be useful in my career	.71	.86	.72	.88
5 Confidence				
I can pick out the main ideas	.38	.52	.55	.59
I understand the material	.64	.73	.60	.76
I'm going to get an A or a B	.78	.80	.61	.81
If I work hard I can do well	.56	.57	.49	.56
I will get a good grade	.79	.79	.65	.79
I'm confident in my skills and abilities	.79	.82	.68	.84
6 Personal Adjustment				
Personal problems kept me from doing well R	.73	.71	.48	.71
Would have done better without other problems R	.87	.84	.63	.85
Personal difficulties affected my performance R	.91	.89	.68	.89
7 Self Regulation				
Easy to keep my mind from wandering	.75	.77	.64	.79
Easy time concentrating	.76	.82	.71	.87
I paid attention	.42	.58	.63	.61
I had a hard time concentrating R	.77	.77	.60	.72

Table A1—continued

Factor/ Item[a]	EFA Pattern Coeffs	EFA Structure Coeffs	EFA h^2	CFA Factor Loadings
I was distracted R	.80	.81	.64	.76
8 Socializing				
Partied when should have been studying R	.74	.72	.58	.70
Grades suffered because of social life R	.75	.81	.68	.82
Too much time partying or hanging out with friends R	.83	.85	.69	.86

Table A1—continued

Drinking affected by studying R	.67	.62	.45	.61
I skipped class a lot R	.40	.59	.57	.61
9 Internal Motivation/ Interest				
Got satisfaction from learning new things	.56	.67	.63	.71
Enjoyed the challenge of learning	.48	.54	.63	.77
I wanted to understand the material	.37	.64	.70	.71
This class was interesting	.59	.71	.71	.84
I enjoyed the lectures	.42	.59	.66	.77
This class was boring R	.33	.47	.59	.66
10 Lack of Anxiety				
I was nervous for tests even when well prepared R	.39	.50	.45	.67
Studying made me anxious R	.30	.46	.49	.69
I got anxious when taking tests R	.37	.53	.59	.85

[a] item stems in this table are shortened version of the actual item.

R = reverse scored item

Table A2
Initial Validation Interfactor Correlation Coefficients

Factor	1	2	3	4	5	6	7	8	9
1									
2	.08**								
3	.26**	.00							
4	.19**	.19**	.09**						
5	.32**	.32**	.16**	.23**					
6	.22**	.09**	.08**	.04	.17**				
7	.43**	.39**	.16**	.18**	.44**	.22**			
8	.54**	.09**	.23**	.03	.18**	.28**	.38**		
9	.51**	.49**	.16**	.41**	.56**	.15**	.63**	.35**	
10	.29**	.11**	.05	.17**	.20**	.19**	.09**	.07*	.04

Note: 1 = Skills, 2 = Efficacy of the Instructor, 3 = Career Decidedness, 4 = External Motivation/Future, 5 = Confidence, 6 = Adjustment, 7 = Concentration and Self Regulation, 8 = Socializing, 9 = Internal Motivation/Interest, 10 = Lack of Anxiety.

*p<.05, **p<.01

Table A3
Mean Scores on ASICS Scales by Group and Gender

	Group				Gender*			
Scale	Honors Students *M(SD)*	Academic Probation *M(SD)*	*p*	*(d)*	Male *M(SD)*	Female *M(SD)*	*p*	*(d)*
Sk	69.83(17.95)	44.23(19.69)	.00	1.35	49.28(22.33	63.10(22.17)	.00	-.65
In	67.48(29.32)	57.59(23.87)	.00	.37	59.75(25.57)	61.79(26.69)	.80	-.07
Ca	80.66(21.15	66.26(25.80)	.00	.61	67.75(24.21)	74.91(24.29)	.00	-.29
Ex	59.50(26.95)	54.60(24.72)	.02	.19	53.43(24.82)	56.27(25.78)	.19	-.12
Co	78.51(17.33)	57.84(19.21)	.00	1.13	63.60(19.83)	64.82(21.36)	.06	-.05
Pr	78.89(22.38)	53.18(25.14)	.00	1.08	63.49(24.31)	66.10(27.27)	.12	-.10
Co	63.36(23.31)	49.03(19.99)	.00	.66	53.61(20.90)	54.07(22.51)	.16	-.02
So	85.58(14.88)	63.37(23.05)	.00	1.14	68.53(21.89)	77.85(20.82)	.00	-.44
In	67.25(23.70)	44.93(18.90)	.00	1.04	51.04(22.31)	55.62(23.44)	.72	-.20
An	48.46(22.42)	50.20(23.66)	.36	-.07	54.95(21.59)	42.78(22.60)	.00	.55

*For the analysis by gender, GPA was used as a covariate

Note: Sk = Skills, In = Efficacy of the Instructor, Ca = Career Decidedness, Ex = External Motivation/Future, Co = Confidence, Pr = Personal Adjustment, Co = Concentration/Self Regulation, So = Socializing, In = Internal Motivation/Interest, An = Lack of Anxiety.

Table A4
ANOVA Results and Mean scores by Group

Scale	Mean				
	Overall Mean (N = 531)	Honors (N = 265)	At-Risk (N = 266)	F	*P*	η^2
Skills	57.712	69.831	45.638	210.83	.000	.285
Quality of Instruction	62.659	67.488	57.850	17.010	.000	.031
Career Decidedness	73.982	80.669	67.320	41.282	.000	.072
Ext. Motivation/Future	58.108	59.505	56.717	1.540	.215	.003
Self-Confidence	66.138	78.890	57.702	174.280	.000	.248
Personal Adjustment	66.138	78.890	53.434	149.964	.000	.221
Con./Self Regulation	56.905	63.360	50.474	45.947	.000	.080
Socializing	74.342	85.583	63.143	174.015	.000	.248
Int. Motiv./Interest	56.757	67.260	46.294	174.015	.000	.193
Lack of Anxiety	48.174	48.462	47.886	.086	.770	.000

Table A5
ASICS Subscales and Item Examples

1 **Skills**	**2** **Instructor**	**3** **Career Decidedness**	**4** **External Motivation Future**	**5** **Confidence in Abilities**	**6** **Personal Adjustment**	**7** **Concentration and Self Regulation**	**8** **Socializing**	**9** **Internal Motivation Interest**	**10** **Lack of Anxiety**
I studied a lot for this class I tried everything I could to do well in this class I worked really hard in this class I kept on a good study schedule in this class I made good use of tools, such as planners, calendars, and or organizers I used a goal setting as a strategy in this class I was good at setting specific homework goals I was organized	The instructor really motivated me to do well I was disappointed in the quality of the instructor I did poorly because the instructor was not effective What I learned I learned on my own I would have done better if the instructor were better	I am certain about what occupation I want after I graduate I know what I want to do after I graduate I am certain that my major is a good fit for me I'm having a hard time choosing a major	I need to do well to get a good job later on This class is important to my future success In the future I will use the material I learned in this class This class will be very useful to me in my career	I was able to pick out the main, important ideas in lectures and on tests I felt confident I could understand even the most difficult material I was pretty sure I could make an A or a B I knew that if I worked hard I could do well I was pretty sure I would l get a good grade I felt pretty confident in my skills and abilities	Personal problems kept me from doing well I would have done much better if I didn't have to deal with other problems in my life I had some personal difficulties that affected my performance	It was easy to keep my mind from wandering I had an easy time concentrating I paid attention in this class I had a hard time concentrating I got easily distracted in this class	Sometimes I partied when I should have been studying My grades suffered because of my active social life I got behind because I spent too much time partying or hanging out with friends Sometimes my drinking behavior interfered with my studying I skipped this class a lot	I got satisfaction from learning new material I enjoyed the challenge of just learning for learning's sake I worked hard because I wanted to understand the material This class was very interesting to me I enjoyed attending lectures in this class This class was very boring to me	I was nervous for tests even when I was well prepared Studying for this class made me anxious I got anxious when taking tests in this class

Table A6
Parameter & Factor Loading Estimates of the 50-item ASICS Baseline Model Across Groups

Scale	ASICS Item	Descriptor	Unstandardized (Standardized) Factor Loadings	
			Honors Students	At-risk Students
Skills	14	Tried	1.00(.69)	1.00(.76)
	16	everything	1.09(.78)	1.09(.76)
	28	Worked hard	1.07(.80)	1.07(.81)
	39	Study schedule	0.93(.65)	0.93(.81)
	41	Studied a lot	1.05(.75)	1.05(.83)
	55	Good study	0.86(.45)	0.86(.63)
	56	skills	0.88(.52)	0.95(.72)
	57	Planning tools	0.95(.61)	0.95(.74)
	58	Goal setting	1.01(.69)	1.01(.72)
		Homework goals		
		Well organized		
Instruction	26	Disappointed	1.00(.80)	1.00(.67)
	29	Not effective	1.36(.93)	1.36(.89)
	33	Wish better	1.37(.96)	1.37(.91)
	42	Motivated me	1.14(.87)	1.14(.80)
	44	Learned on own	1.29(.90)	1.29(.86)
Career Decidedness	59	Certain about	1.00(.90)	1.00(.94)
	60	job	1.49(.96)	1.01(.96)
	61	After grad	0.53(.62)	0.53(.59)
	62	plans	0.59(.68)	0.59(.62)
		Major is good fit		
		Difficult choosing		
External Motivation/ Future	9	Good job later	1.00(.72)	1.00(.66)
	23	Useful for	1.23(.89)	1.23(.83)
	46	career	1.12(.80)	1.12(.74)
		Important for future	1.39(.94)	1.39(.92)
		Will use learning		

Table A6—continued

Scale	ASICS Item	Descriptor	Unstandardized (Standardized) Factor Loadings Honors Students	At-risk Students
Confidence in Ability	12	Most difficult work	1.00(.56)	1.00(.49)
	13		1.49(.70)	1.49(.68)
	22	Sure of "A" or "B"	1.64(.85)	1.64(.73)
	34		0.91(.56)	0.91(.48)
	35	Could do well	1.46(.79)	1.46(.69)
	40	Sure of good grade	1.43(.78)	1.43(.70)
		Confident in skills		
		Pick out main ideas		
Personal Adjustment	2	Personal problems	1.00(.73)	1.00(.58)
	30		1.29(.82)	1.29(.79)
	50	Dealing with problems	1.42(.92)	1.42(.84)
		Personal affected grade		
Concentration/ Self Regulation	12	Most difficult work	1.00(.56)	1.00(.49)
	13		1.49(.70)	1.49(.68)
	22	Sure of "A" or "B"	1.64(.85)	1.64(.73)
	34		0.91(.56)	0.91(.48)
	35	Could do well	1.46(.79)	1.46(.69)
	40	Sure of good grade	1.43(.78)	1.43(.70)
		Confident in skills		
		Pick out main ideas		

Table A6—continued

Scale	ASICS Item	Descriptor	Unstandardized (Standardized) Factor Loadings Honors Students	At-risk Students
Socializing	15	Partied vs.	1.00(.52)	1.00(.74)
	20	studying	1.12(.71)	1.12(.85)
	45	Active social	1.14(.76)	1.14(.85)
	48	life	0.64(.53)	0.64(.56)
	54	Out with	0.91(.59)	0.91(.53)
		friends		
		Drinking		
		interfered		
		Skipped class		
Internal	8	Satisfaction	1.00(.83)	1.00(.65)
motivation/Intere	11	Enjoyed	0.97(.79)	0.97(.64)
st	17	learning	0.82(.73)	0.82(.06)
	36	Interesting	1.14(.90)	1.14(.69)
	43	Wanted to	1.02(.80)	1.02(.71)
	47	understand	0.98(.76)	0.98(.60)
		Enjoyed		
		lectures		
		Boring		
Lack of Anxiety	5	Nervous even	1.00(.74)	1.00(.65)
	18	prepared	0.98(.69)	0.98(.63)
	37	Anxious	1.28(.86)	1.28(.86)
		studying		
		Anxious		
		taking tests		

Note. SK = Skills, IN = Quality of Instruction, CD = Career Decidedness, EM = external Motivation/Future, CA = Confidence in Ability, CS = Concentration/Self-regulation, SO = socializing, II = Internal Motivation/Interest, and LA = Lack of anxiety. MIs are the values of expected decrease in chi-square if parameters were freely estimated. EPC index denotes an expected value of a fixed parameter is freely estimated. Only MIS over 10 are reported (the default cutoff by Mplus.

Table A7
Modification Indices (MI) and Expected Parameter change (EPC) indexes of the 50-Item ASICS Factor Loading Model, Honors Group.

50-Item ASICS Sub-Scale	Factor Loadings	MIs	E.P.C. (Standardized)
Skills	IN1	12.219	0.131
	CA1	23.500	0.282
	CS3	30.505	0.282
	CS4	12.602	-0.171
	SO4	10.893	0.219
	S05	11.106	-0.241
	II3	44.680	0.357
	LA3	10.499	0.159
Instructor	EM3	11.008	0.135
	CA1	32.262	0.343
	CA4	25.017	0.280
	II3	17.704	-0.265
	II5	38.824	0.317
Ext. Motivation/Future	IN1	12.040	0.131
	II3	17.704	-0.265
Confidence in Abilities	SK1	13.898	-0.188
	SK5	21.434	0.219
	EM3	12.454	0.148
	SO1	10.398	0.182
Concentration/Self-Regulation	SK5	10.515	0.169
	SK6	12.429	-0.231
	CA1	42.040	0.411
	CA5	14.574	-0.186
Socializing	SK1	24.350	0.300
	II3	15.928	-0.208

Note. SK = Skills, IN = Quality of Instruction, CD = Career Decidedness, EM = external Motivation/Future, CA = Confidence in Ability, CS = Concentration/Self-regulation, SO = socializing, II = Internal Motivation/Interest, and LA = Lack of anxiety. MIs are the values of expected decrease in chi-square if parameters were freely estimated. EPC index denotes an expected value of a fixed parameter is freely estimated. Only MIS over 10 are reported (the default cutoff by Mplus).

Table A7—continued

50-Item ASICS Sub-Scale	Factor Loadings	MIs	E.P.C. (Standardized)
Ext. Motivation/Future	IN1 II3	12.040 17.704	0.131 -0.265
Confidence in Abilities	SK1 SK5 EM3 SO1	13.898 21.434 12.454 10.398	-0.188 0.219 0.148 0.182
Internal Motivation/ Interest	IN1 EM1 EM2 EM3 CA1 CA2 CA5	37.763 14.729 15.498 29.580 34.413 11.551 22.727	0.296 -0.209 -0.160 0.254 0.390 0.194 -0.244
Lack of Anxiety	SK1 SK9	25.653 10.582	-0.252 0.160

Note. SK = Skills, IN = Quality of Instruction, CD = Career Decidedness, EM = external Motivation/Future, CA = Confidence in Ability, CS = Concentration/Self-regulation, SO = socializing, II = Internal Motivation/Interest, and LA = Lack of anxiety. MIs are the values of expected decrease in chi-square if parameters were freely estimated. EPC index denotes an expected value of a fixed parameter is freely estimated. Only MIS over 10 are reported (the default cutoff by Mplus.

Table A8
Modification Indices (MI) and Expected Parameter change (EPC) indexes of the 50-Item ASICS Factor Loading Model, At-Risk Group.

50-Item ASICS Sub-Scale	Factor Loadings	MIs	E.P.C. (Standardized)
Skills	IN1	22.914	0.273
	CA1	47.078	- 0.418
	CS3	84.356	0.563
	CS4	11.729	-0.178
	IN5	22.723	-0.175
	S05	40.087	-0.407
	II3	89.310	0.592
	II4	11.996	-0.205
Instructor	II2	11.462	-0.180
	II3	58.484	-0.430
	II5	39.646	0.345
	II6	36.898	0.348
Ext. Motivation/Future	CA4	13.059	0.214
Confidence in Abilities	CS5	13.427	-0.193
Concentration/Self-Regulation	CA1	12.410	0.232
	CA2	12.429	0.261
	II6	42.040	0.305
Socializing	CA1	13.018	-0.224
	CA4	15.758	0.231
	CS3	19.666	-0.292
Internal Motiv./Interest	IN1	39.275	0.370
	EM2	10.462	-0.150
	CA1	35.593	0.416
	CA2	14.038	0.223
	CA3	14.096	-0.215
	CS3	21.849	0.332
	CS5	13.824	-0.219
Lack of Anxiety	CS3	42.742	-0.408
	CS4	13.966	0.197
	SO5	12.730	0.215
	II3	19.961	-0.267
	II6	10.503	0.197

Note. SK = Skills, IN = Quality of Instruction, CD = Career Decidedness, EM = external Motivation/Future, CA = Confidence in Ability, CS = Concentration/Self-regulation, SO = socializing, II = Internal Motivation/Interest, and LA = Lack of anxiety. MIs are the values of expected decrease in chi-square if parameters were freely estimated. EPC index denotes an expected value of a fixed parameter is freely estimated. Only MIS over 10 are reported (the default cutoff by Mplus).

Table A9
Modification Indices (MI) and Expected Parameter change (EPC) indexes of the 50-Item ASICS Residual Correlations Model, Honors Group.

50-Item ASICS Sub-Scale & Item #		**Residual Correlations**	**MIs**	**E.P.C. (Standardized)**
Skills	3	SK1	31.656	0.196
	3	SK2	61.023	0.262
	6	SK1	13.056	-0.154
	6	SK3	13.471	-0.149
	7	SK2	17.898	-0.157
	7	SK3	16.481	-0.150
	7	SK6	32.315	0.258
	8	SK2	10.115	-0.110
	8	SK3	10.657	-0.112
	8	SK5	12.975	-0.123
	8	SK6	23.370	0.203
	8	SK7	39.310	0.239
	9	SK1	25.898	-0.184
	9	SK2	12.194	-0.121
	9	SK3	14.395	-0.131
	9	SK6	51.298	0.302
	9	SK8	34.089	0.208
Instruction	2	IN1	11.017	-0.052
	3	IN2	12.499	0.049
	4	IN1	12.061	0.065
Career Decidedness	2	CD1	60.577	0.720
	4	CD3	61.476	0.322
Ext. Motivation/Future	1	SK9	13.059	0.214
	2	EM1	10.774	-0.110
	3	EM1	82.291	0.240
	3	EM2	11.104	-0.152
	4	EM1	27.728	-0.087
	4	EM3	25.188	0.146

Note. SK = Skills, IN = Quality of Instruction, CD = Career Decidedness, EM = external Motivation/Future, CA = Confidence in Ability, CS = Concentration/Self-regulation, SO = socializing, II = Internal Motivation/Interest, and LA = Lack of anxiety. MIs are the values of expected decrease in chi-square if parameters were freely estimated. EPC index denotes an expected value of a fixed parameter is freely estimated. Only MIS over 10 are reported (the default cutoff by Mplus).

Table A9—continued

50-Item ASICS Sub-Scale & Item #		Residual Correlations	MIs	E.P.C. (Standardized)
Confidence in Abilities	1	SK5	23.392	0.186
	5	SK1	11.950	-0.106
	5	CA2	39.133	-0.209
	5	CA3	61.838	0.255
	6	CA2	20.601	0.150
		CA3	12.319	-0.114
Concentration/Self-Regulation	3	IN4	17.340	0.092
	4	CS3	12.988	-0.102
	5	CS2	10.532	-0.074
	5	CS4	49.076	0.182
Socializing	3	SK1	16.058	0.131
	3	CA5	12.605	-0.101
	4	SO1	14.770	0.178
	5	SK3	15.692	-0.164
	5	IN4	14.790	-0.116
Internal Motiv./Interest	3	EM2	10.507	0.079
	3	EM2	11.359	-0.055
	4	EM3	10.314	0.061
	5	IN1	12.868	0.074
	5	IN4	10.223	0.061
	5	II3	13.083	-0.101
	6	CS4	16.411	0.105
Lack of Anxiety	2	LA1	10.148	-0.188

Note. SK = Skills, IN = Quality of Instruction, CD = Career Decidedness, EM = external Motivation/Future, CA = Confidence in Ability, CS = Concentration/Self-regulation, SO = socializing, II = Internal Motivation/Interest, and LA = Lack of anxiety. MIs are the values of expected decrease in chi-square if parameters were freely estimated. EPC index denotes an expected value of a fixed parameter is freely estimated. Only MIS over 10 are reported (the default cutoff by Mplus).

Table A10
Modification Indices (MI) and Expected Parameter change (EPC) indexes of the 50-Item ASICS Residual Correlations Model, At-Risk Group.

50-Item ASICS Sub-Scale & Item #		**Residual Correlations**	**MIs**	**E.P.C. (Standardized)**
Skills	3	SK1	13.678	0.099
	3	SK2	53.430	0.207
	5	SK1	13.691	0.098
	6	SK3	13.812	- 0.114
	6	SK5	12.568	- 0.108
	7	SK3	30.497	- 0.156
	7	SK6	29.645	0.183
	8	SK3	21.325	- 0.128
	8	SK6	14.912	0.127
	8	SK7	69.349	0.250
	9	SK1	10.688	- 0.098
	9	SK6	34.332	0.205
	9	SK7	14.209	0.120
	9	SK8	25.008	0.156
Career	2	CD1	37.400	0.419
Decidedness	4	CD3	52.373	0.260
Ext. Motivation/Future	3	IN1	10.501	0.124
Confidence in Abilities	1	SK5	12.232	0.128
	5	CA2	20.511	- 0.194
	5	CA4	10.909	- 0.148
	5	CA5	29.478	0.231
Socializing	5	CS3	18.939	- 0.212

Note. SK = Skills, IN = Quality of Instruction, CD = Career Decidedness, EM = external Motivation/Future, CA = Confidence in Ability, CS = Concentration/Self-regulation, SO = socializing, II = Internal Motivation/Interest, and LA = Lack of anxiety. MIs are the values of expected decrease in chi-square if parameters were freely estimated. EPC index denotes an expected value of a fixed parameter is freely estimated. Only MIS over 10 are reported (the default cutoff by Mplus).

Table A10—continued

50-Item ASICS Sub-Scale & Item #		Residual Correlations	MIs	E.P.C. (Standardized)
Concentration/Self-Regulation	2	CS1	24.025	0.189
	3	IN1	14.993	0.184
	3	CA1	16.811	0.215
	4	IN1	16.903	- 0.162
	4	CS3	17.823	- 0.181
	5	CS4	32.246	0. 218
Internal Motiv./ Interest	2	CA2	14.505	0.144
	3	CA4	10.202	- 0.145
	3	CS3	50.525	0.332
	3	SO5	13.637	- 0.168
	4	CS3	16.714	- 0.177
	5	IN1	22.435	0.204
	6	II3	11.981	- 0.158

Note. SK = Skills, IN = Quality of Instruction, CD = Career Decidedness, EM = external Motivation/Future, CA = Confidence in Ability, CS = Concentration/Self-regulation, SO = socializing, II = Internal Motivation/Interest, and LA = Lack of anxiety. MIs are the values of expected decrease in chi-square if parameters were freely estimated. EPC index denotes an expected value of a fixed parameter is freely estimated. Only MIS over 10 are reported (the default cutoff by Mplus).

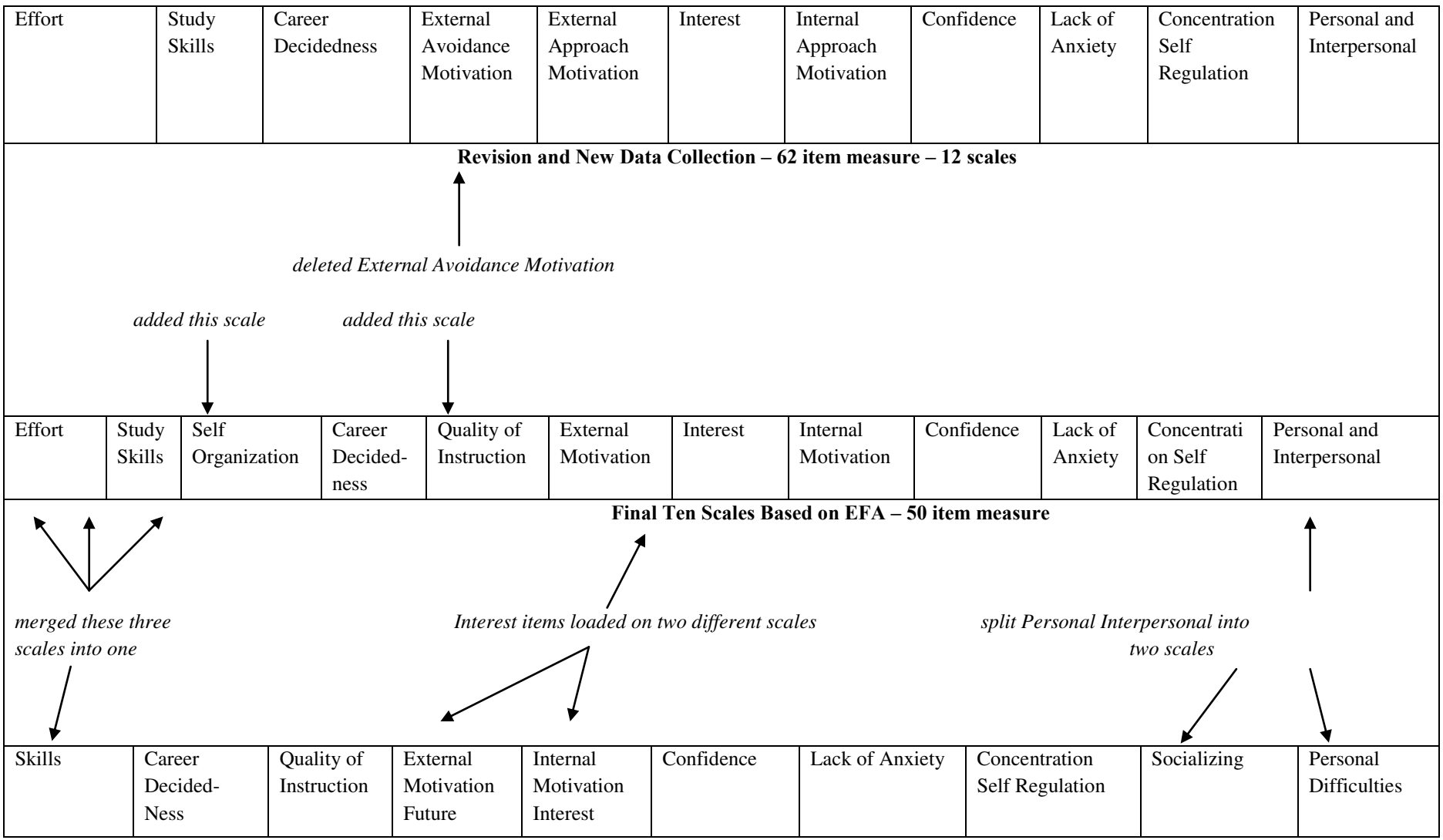

Figure A1.
Development of the Scales Comprising the ASICS

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BIOGRAPHICAL SKETCH

Theresa Lopez Welles grew up in the Tampa Bay area and got her Bachelor's degree from the University of South Florida in 1992. She went on to get her Masters and Specialist degrees in School Psychology from Florida State University in 1995 and practiced as a school psychologist in Tampa for nine years before returning to Florida State to complete her PhD in Counseling Psychology and School Psychology. Theresa's research interests include Attention Deficit Hyperactivity Disorder, Learning disabilities, Anxiety and other mental health disorders and how these factors affect academic success for college students. She has completed an APA accredited internship and has recently accepted a post-doctoral fellowship at Georgia State University in Atlanta, Georgia.