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Students in context: Effects of psychological needs and environmental press on academic and life satisfaction

Sarah Fetter Anthonye
Iowa State University

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**Students in context: Effects of psychological needs and environmental press on
academic and life satisfaction**

by

Sarah Fetter Anthony

A dissertation submitted to the graduate faculty
in partial fulfillment of the requirements for the degree of
DOCTOR OF PHILOSOPHY

Major: Psychology (Counseling Psychology)

Program of Study Committee:
Patrick Armstrong, Major Professor
Lisa Larson
David Vogel
Douglas Bonett
Judy Vance

Iowa State University

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CHAPTER 1. INTRODUCTION

The college experience is a time of academic, vocational, emotional, and social development for emerging adults (Arnett, 2000). How do college students make educational choices related to a future professional identity from the array of academic majors? The role of interests, self-efficacy, and personality traits in college students' selection of majors has been studied (i.e., Holland, 1997; Larson et al., 2010; Lent, Brown, & Hackett, 1994). To what extent are educational choices also related to psychological needs? How do needs and support for one's needs relate to academic and life satisfaction? These questions of person-environment (PE) fit will be explored in the present study from the context of the measures of academic needs and press developed by Stern (1970).

Researchers from a variety of theoretical viewpoints have identified psychological needs as the most basic of the motivational constructs, the soil from which individual differences in values, interests, personality, and patterns of behavior grow (Murray, 1938; Hogan, 1983; Hogan & Roberts, 2000; Ryan & Deci, 2000). From a socioanalytic perspective, there are fundamental biological needs for affiliation, status, and order (Hogan, 1983). Individual differences in these needs play out in vocational behavior through the variation in the selection of work environments that support one's needs, leading to division of labor. From a humanistic perspective, fulfillment of basic psychological needs for competence, autonomy, and relatedness contribute to intrinsic motivation and well-being (Ryan & Deci, 2000). Similar dimensions have been identified across biological and psychological need taxonomies, and have been reduced to sex and affiliation, hunger and achievement, and aggression and power (Kuhl, 1994).

The field of vocational psychology is abundant with well-established theories and empirical research on factors influencing career choice and satisfaction. More than 50 years of research based on Holland's (1959, 1997) theory of vocational personalities and work environments has resulted in strong evidence for the role of interests in motivating career choice and satisfaction (Betz, 2008; Nauta, 2010). The six vocational personality types, known by the acronym RIASEC, describe characteristic work preferences, life goals and values, self-beliefs, and problem solving styles associated with each type. The body of literature examining the structural relationships among interests, self-efficacy, and personality traits (Armstrong, Day, McVay & Rounds, 2008; Larson, Rottinghaus, & Borgen, 2002; Rottinghaus, Larson, & Borgen, 2002), lends support for Holland's assertion that the RIASEC types describe broad work personalities. However, values, and the underlying psychological needs, associated with the RIASEC types have received less attention.

Person-environment (PE) fit models typically hypothesize that congruence between an individual's personality and the characteristics of the work or educational setting contributes to the outcomes of satisfaction, performance, and persistence (Parsons, 1909; Holland, 1997; Dawis & Lofquist, 1984; Kristof, 1996). The predominate PE theories in the vocational literature, Holland's theory and the Theory of Work Adjustment (TWA; Dawis & Lofquist, 1984), conceptualize individuals and work environments in corresponding terms, facilitating the career choice process. Much of the congruence research in vocational psychology operationalizes Holland's theory to examine the relationship between interest congruence and outcomes. Other conceptualizations of PE fit are needed to add to the understanding of this complex phenomenon. TWA thoroughly examines the interactive nature of a worker's needs and the environment's reinforcement of those needs in

contributing to occupational satisfaction and tenure. However, due to the nature of the assessments developed to test this theory, TWA research has focused primarily on the work environment, not the college environment.

Early in the study of needs, Murray (1938) and his colleagues developed a list of psychological needs based on their extensive assessment of 51 Harvard men. The list-based approach has been criticized due to the lack of structure in the information collected, which limits our understanding of the relationships between underlying traits (Hogan, 1983; Costa & McCrae, 1988). Using Murray's needs as a starting point, Stern (1970) developed the Activities Index (AI), a needs-based personality measure unique to the college setting. Following the interactional psychology tradition rooted in the ideas of Lewin (1936) and Murray, Stern also developed the College Characteristics Index (CCI), a corresponding measure of the environmental press to assess the support and reinforcement of each need provided by the college environment.

Parallel need-press measures may add to studies of person-environment fit and interaction in the college environment. However, the items comprising the Stern (1970) measures were developed in the 1960s and some of the content is now outdated. The AI and CCI are also long at 300 items each. Furthermore, a common set of college culture factors was found across the two measures in a between schools analysis of Stern's College Study, but different factor structures were found for each measure in a within-schools analysis of students' responses. These characteristics may limit the use of these measures by contemporary researchers. A literature review found that the Activities Index and the College Characteristics Index have not been used in the last 40 years. It appears that only a few subscales of the AI have been used since Stern's death in 1974. The Achievement Needs

Scale, derived from the Activities Index, was used most recently with college populations in the 1980s (Pascarella & Chapman, 1983).

The results of Stern's (1970) College Study reflect the historical and social context of the 1960s. In the last half of the 20th century, there were significant demographic changes in the United States, reflected in delays in the average age of marriage, onset of parenting, and an increase in the access to higher education (Arnett, 2000). Arnett argued these changes in the second half of the 20th century in industrialized societies have led to a new culturally constructed developmental stage of emerging adulthood, which occurs between adolescence and young adulthood. In light of evidence that many young people today engage in an extended period of identity exploration and development compared to 40 years ago, it may be that college students' needs and their view of the college environment have also changed since the 1960s when the Stern measures were developed.

Access to college has improved since 1970; 67% of recent high school graduates attended college in 2007, compared to 52% in 1970 (National Center for Education Statistics; NCES, 2007). In 1970, 49% of female high school graduates attended college. By 2007, the percentage of female high school graduates attending college grew to 68%. For male students, the growth has been slower, increasing from 55% to 66% between 1970 and 2007 (NCES, 2007). Additionally, the gender ratio on college campus has changed since 1970. Women were the minority on college campuses in 1970 and now are a clear majority, comprising 42% of undergraduates in 1970 and 56% of undergraduates in 2001 (Peter & Horn, 2005). As such, generational shifts in college students' needs may be particularly relevant for college women in the 21st century. When compared to previous generations, women now have access to a wider range of educational and occupational choices. Stern's

College Study results are from a time when college was male-dominated, and studies of need and press in the college environment need to be replicated with the current student population.

Classifying college students' psychological needs and the press from the university environment may contribute to further understanding the interactive identity development process. Stern's (1970) person-environment measures for college cultures based on Murray's (1938) needs have received little attention within vocational psychology. Interests, self-efficacy, and personality traits are predominately the focus of studies relating non-cognitive predictors to educational choices and outcomes. Investigating the validity of psychological needs and need reinforcement in the university environment in predicting educational choice and satisfaction would broaden the range of studied constructs, and would contribute to understanding the interrelationships among these motivational constructs.

The purpose of this study was to revisit the Stern (1970) measures of college students' needs and university environment press, and establish initial reliability and validity estimates for the updated and shortened Activities Index – Revised (AI-R) and College Characteristics – Revised (CCI-R). The content of the Activities Index and College Characteristics Index were updated for use with college students in the contemporary university setting. Initial construct validity of AI-R and CCI-R structures was explored through factor analyses. Convergent and discriminant validity was demonstrated by correlations with interest and personality measures, and differences between college majors. Criterion and incremental validity of needs and press were tested through the prediction of concurrent academic and life satisfaction.

CHAPTER 2. LITERATURE REVIEW

Personality theorists have long argued about what drives human behavior (Freud, 1938/1940; Lewin, 1936; Murray, 1938; Mischel, 2004), identifying a variety of constructs that may influence individual differences in behavior and adjustment to environments. Motives, in particular, have been conceptualized as drives, goals, and expectancies (Robbins et al., 2004). Expectancy-value theories of motivation outline how one's thoughts and feelings about different activities, and the rewards sought from activities, implicate action (Eccles & Wigfield, 2002).

Within the expectancy-value class of motivation theories, there are differences in the degree of focus on expectancy beliefs, reasons for engagement, and the interaction between expectancy and values. Thus, motivation theories examine the "relation of beliefs, values, and goals with action" (Eccles & Wigfield, 2002, p. 110).

Needs are identified in several models of motivation and personality as the most basic motivational construct, the foundation from which values, interests, and personality grow (Hogan, 1983; Hogan & Roberts, 2000; Wiggins, 2003). An individual difference approach to psychological needs assumes significant between-person variance in the strength of needs, while the basic psychological needs approach views each need as universally necessary (Gagné & Deci, 2005). Furthermore, highlighting the importance of the situational context, the social cognitive view of personality emphasizes that the within-person patterns of variability in behavior across situations must also be examined to fully understand personality dynamics (Mischel, 2004). For example, an individual may be conscientious in academic studies, but not be able to manage personal finances; a campus leader may be passive in romantic relationships. As such, individual differences in personality patterns that

emerge across different contexts can provide a more nuanced view of motivation, needs, and goals.

Person-Environment Psychology

Person-environment psychology emphasizes the interaction between an individual's personality and the surrounding situation or context in shaping behavior (Walsh, 2006). Many vocational psychology theories incorporate this approach, as the interactive nature of work behavior is not easily ignored. Social psychology theories of motivation and personality also describe the interactive nature of person and situation.

Murray (1938) and his colleagues have been credited with several groundbreaking contributions to modern psychology, and two are particularly important relative to person-environment psychology. Following Lewin (1936), Murray's theory was interactionist in nature, proposing that individual's needs and the press of the environment should be considered in tandem to explain behavior. Murray defined needs as forces motivating perception, cognition, affect, and action, and also as dispositional constructs organizing behavior. Press was defined as the "kind of effect an object or situation is exerting or could exert" on the individual, which can facilitate or inhibit the attainment of needs (Murray, 1938, p. 748).

A second outcome of the extensive assessment of 51 Harvard men was a list of psychological needs thought significant to understanding human behavior. Murray (1938) described 20 manifest needs, eight latent needs, four inner states, and 12 general traits related to motivational aspects of personality. Murray presented the needs as a descriptive list rather than a rationally or empirically derived taxonomy. This lack of structure has limited its use among personality researchers, because of a lack of information about relations between the

traits and potential underlying dimensions (Hogan, 1983; Buss & Finn, 1987). However, the needs proposed by Murray (1938) have been applied to various personality inventories, including Jackson's (1984) Personality Research Form and Stern's (1970) need-press measures.

Stern's College Study

Stern (1970) adapted Murray's (1938) needs to understanding person-environment interaction in the college setting. Murray's needs have been criticized due its alphabetical list format, lacking the organization of a factor or dimensional structure (Hogan, 1983; Costa & McCrae, 1988). Stern sought to understand the structure of needs and press in the college environment, with the intention of validating parallel measures that could be used to examine person-environment (PE) fit and interaction.

Stern (1970) developed items and scales (subsequently referred to as *the Stern measures*) based on the description of Murray's (1938) manifest needs, internal factors, and other general traits or attributes representing motivational aspects of personality. For the Stern measures, 30 scales were derived from the 20 manifest needs, two of the four internal factors, and eight of the 12 other traits. The Activities Index is a collection of scales rated for preferences resembling modern-day measures of personality traits, interests, goals, and needs. The College Characteristics Index is a parallel set of scales to measure the environmental press, based on individuals' perception of the university environment. Murray's (1938) nomenclature was used as the basis for naming the scales of the Activities Index and College Characteristics Index (see Table 1 for definitions of the 30 scales).

Development of the Stern Measures

The development of the Activities Index (AI; Stern, 1970) began in the early 1950's at the University of Chicago. An item pool of over 1,000 activity statements representing needs processes were developed based on the Murray needs. The items best reflecting the needs constructs were selected through a coding process by expert raters. The original format consisted of 400 items, and was reduced to 300 items with a like-dislike response format after a revision process. Additional revisions resulted in scales of equal length and eliminating overlapping items. The 1970 version of the Activities Index (Form 1158) has 300 activity statements, 30 scales with 10 items each.

The Activities Index was used as a prototype in the development of the College Characteristics Index (CCI; Stern, 1970). Press statements describing the college environment were formulated parallel to the needs items. When writing CCI items, the developers considered the characteristics of an environment that would support and encourage each need, such as order, autonomy, or play (Pace & Stern, 1958). Several components of college life were identified and items were written for each scale representing academic, administrative, and student characteristics. Academic elements included faculty characteristics, course content, classroom activities, and academic extracurricular activities. Administrative elements considered organizational structure, rules and regulations, physical facilities, and student personnel practices. The student component included student characteristics, community life, extracurricular activities, and study patterns. Similar to the AI, several revisions of the CCI were conducted, resulting in 30 scales of 10 items each with a true-false response format.

Stern's College Study was a large-scale research project to validate the Activities Index (AI) and College Characteristics Index (CCI). These measures were completed by over

10,000 students at 100 institutions of higher education in the United States during the 1960s. The purpose of the study was to establish the psychometric properties of the inventories, to explore the factor structure of the measures separately and conjointly, to establish construct validity of the measures by relating them to educational objectives, and to explore measures of person-environment fit. Factor analysis was conducted on a sample of 1,076 students, with approximately equal numbers of men and women, from 23 institutions.

Although the AI and CCI scales are designed to measure needs and press on 30 matched content areas, at the scale level the correlations between the AI and CCI were small. Stern (1970) reported the findings of a combined factor analysis of the AI and CCI scales using an iterative principal axis procedure with varimax rotation. This yielded 23 significant factors; 12 factors were distinct to the AI scales, and 11 factors represented the CCI scales. The 12 first-order AI factors were named Self-Assertion, Audacity-Timidity, Intellectual Interests, Motivation, Applied Interests, Orderliness, Submissiveness, Closeness, Sensuousness, Friendliness, Expressiveness-Constraint, and Egoism-Diffidence. Examination of the underlying structure of the personality factors resulted in three second-order factors. The factors were named Achievement Orientation, Dependency Needs, and Emotional Expression.

Stern (1970) named the 11 CCI factors Aspiration Level, Intellectual Climate, Student Dignity, Academic Climate, Academic Achievement, Self-Expression, Group Life, Academic Orientation, Social Form, Play-Work, and Vocational Climate. A second-order factor analysis of the press factors resulted in a bipolar contrast of press related to Intellectual Climate and Nonintellectual Climate. Stern concluded that the lack of parallel structure

between the needs and press measures at the scale level limited the usefulness for examining person-environment interactions, as needs and press could not be directly compared.

Although the factor analysis of student's responses to the AI and CCI produced distinct need and press structures, a parallel structure was found at the institutional level when conducting a factor analysis of the first-order factors across schools instead of individuals (Stern, 1970). Finding significant correlations between the AI and CCI factor scores at the institutional level but not the individual level, Stern concluded that "aggregates of students in particular locations tend to share common personality characteristics and a relevant environmental press" (p. 202). The *Expressive* culture was described as a "non-work-oriented, nonconforming climate, peopled by students with non-Applied Interests and disinclined toward Orderliness" and was high in Sensuousness, Friendliness, and Expressiveness (Stern, 1970, p. 206). In the *Intellectual* culture, students had high intellectual interests and motivation, and the environmental press supported high aspirational level, an intellectual and academic climate, self-expression and academic achievement. The *Protective* culture was described as being high in supervision. Students in this culture had needs for submissiveness, orderliness, closeness, and sensuousness. They were low on self-assertion and audacity. The press in the Protective culture supported group life, academic organization, social organization, and self-expression. In the *Vocational* culture, students were high in self-assertion and egoism, and the press was work-oriented. Students in the Collegiate culture were friendly and self-assertive, and the press was oriented toward play and socializing, and away from academic achievement and student dignity.

The factors of the Activities Index, College Characteristic Index, and the culture composites were effective in differentiating between colleges and students (Stern, 1970). For

the AI and CCI factors, validity evidence was first demonstrated by an ANOVA based on results from 23 schools. There was a significant difference detected for each factor. Further, the utility of the AI and CCI factors in differentiating among six types of undergraduate programs was studied. The program types were independent liberal arts, denominational, university-affiliated liberal arts, business administration, engineering, and teacher training programs. Regarding press, engineering programs and independent liberal arts schools had a more intellectual climate than the remaining four types of institutions. Specifically, students in these programs perceived a stronger press for academic achievement and level of aspiration. Most of the programs showed similar patterns of non-intellectual climate press, with the exception of independent liberal arts programs, which had low ratings on non-intellectual factors. This, Stern suggested, reflected a “generalized nonacademic or extracurricular environment that may be common to most large and complex educational institutions” (1970, p. 78).

Stern (1970) also reported institution-level differences on the on the college culture factors. Small, independent liberal arts women’s colleges were high on the Expressive factor, while engineering and technical schools were low. A variety of programs were high on the Intellectual factor, including co-ed and women’s liberal arts colleges, large universities, and engineering colleges. Some business colleges and technical schools were lower on the Intellectual culture. Denominational colleges and nursing and education departments were high on the Protective factor, while engineering, business, and university-affiliated liberal arts were low of this factor. The Vocational culture was descriptive of some business, engineering, and education programs, and uncharacteristic of independent liberal arts colleges. The Collegiate culture described some large universities, particularly Syracuse

University, while independent liberal arts colleges were least Collegiate. In a study of school subcultures, the college culture factors were related to academic areas at Syracuse University in 1968 (Stern, 1970). For male students, those in business administration, liberal arts, and architecture departments reflected a strong Collegiate culture. Men in engineering and forestry represented aspects of the Vocational and Collegiate cultures. Responses to need and press measures indicated most women at Syracuse in a variety of majors reflected a strong Collegiate culture, however women in nursing were consistent with the Vocational culture.

Based on the sample from the 1960s, large gender differences were found for each of the second-order factors (Stern, 1970). Within Achievement Orientation, two standard deviations separated men and women on self-assertion and audacity, with men reporting higher needs in these areas than women. Differences exceeding one standard deviation were also found for motivation and applied interests, again with higher scores for men. Regarding Dependency Needs and Emotional Expression, men and women were similar in their needs for egoism, orderliness, and friendliness. Gender differences exceeding one standard deviation were found in these areas with women indicating higher needs, specifically regarding closeness, sensuousness and expressiveness.

Person-Environment Theories in Vocational Psychology

The role of vocational interests, and work needs and values in career choice and satisfaction are well established in the vocational psychology literature. Holland's (1997) theory of vocational personality types and the Dawis and Lofquists' (1984) Theory of Work Adjustment will be described.

Holland's Theory

Holland's theory of vocational personalities and work environments (1959, 1997) has had an unquestionable impact on vocational psychology (Nauta, 2010). The RIASEC model has been applied broadly to the measurement of interests and occupations, and is the basis for many career counseling interventions. Holland described six types characterizing people's work-related interests, abilities, and values, and used this same typology to describe work environments. This common vocabulary across work personalities and work tasks facilitates matching people to occupations (Rayman & Atanasoff, 1999). Holland proposed that people seek educational and occupational environments that are consistent with their work personality in order to express their individual characteristics. The congruence hypothesis proposes that this person-environment fit contributes positively to satisfaction and performance.

Holland (1997) provided descriptions of six prototypical vocational personalities and corresponding work environments:

The *Realistic* type includes mechanical, technical, and outdoor vocational interests. Realistic activities involve practical and hands-on work with things, such as woodworking, machine repair, and farming. Holland described that people of the Realistic type value independence, self-control, and practicality.

The *Investigative* type involves theoretical and scientific interests. Investigative activities include analysis, problem solving, and innovation with things and ideas, such as research in the physical, life, social, and health sciences. According to Holland, Investigative people value scholarly achievements, independence, and intellectualizing.

The *Artistic* type involves creativity and self-expression. Artistic activities include writing, fine arts, music, and dance, as well as work tasks requiring dynamic, creative

approaches with ideas and people. Holland stated that Artistic people value aesthetic achievements, creative expression, and open mindedness.

The *Social* type involves interests in helping people. Social activities include serving and caring for people through teaching, counseling, advising, and other helping professions. Holland described that people of the Social type value serving others, equality for everyone, and relationships.

The *Enterprising* type includes influencing and persuading people. Enterprising activities include leadership, management, and sales, and other work tasks requiring persuasive and structured approaches with people and data. According to Holland, Enterprising people value economic and political achievements, being in control, and social status.

The *Conventional* type involves organizing and manipulating data and information. Conventional activities include working with data in a structured way, such as accounting, computer programming, and administrative tasks. Holland described that Conventional people value business and financial achievements, traditionalism, and obedience.

According to Holland (1997), each work environment reinforces and rewards the interests, abilities, values, and beliefs of the matching personality type. The six types are arranged in circular order, meeting the definition of a circumplex (Guttman, 1954). Holland's calculus hypothesis described that adjacent types share more in common than types opposite in the circumplex. Meta-analyses of RIASEC-based interest inventories provided support for the circumplex structure of the RIASEC model (Rounds & Tracey, 1993). The RIASEC order and calculus hypothesis also has received empirical support (Armstrong, Hubert, & Rounds, 2003). The fit of this structure is generally strong across gender, ethnicity, and

nationality (Armstrong et al., 2003; Darcy & Tracey, 2007; Rounds & Tracey, 1996; Ryan, Tracey, & Rounds, 1996), although there is some evidence that the RIASEC structure is more appropriate for use with those from Westernized countries (Yang, Stokes, & Hui, 2005).

Theory of Work Adjustment

Dawis and Lofquist (1984) brought work needs and values to center stage in their theory of work adjustment (TWA). TWA is also a person-environment (P-E) theory, in which needs support provided by the environment is considered to be a reinforcing system important to job satisfaction. Correspondence between one's abilities and the demands of work tasks determine the satisfactoriness of the individual's performance. Fit is assessed by the degree of correspondence between parallel dimensions of person and environment characteristics. Furthermore, it is a P-E interaction theory, stating that the combination of person and environment variables is most important for predicting behavioral outcomes (Dawis, 2005). These propositions have received strong empirical support (Dawis & Lofquist, 1984). However, studies of this theory have focused on the work environment, not the educational environment, thus TWA findings are based predominately on employed workers, not college students.

In TWA, needs facilitate survival and well-being, and have both a genetic and environmentally conditioned basis (Dawis, 2005). Values are beliefs, preferences, or aspects of work characterized as important or unimportant. Workers' values are conceptualized as second-order needs. For example, needs for advancement, recognition, authority, and social status comprise the work value of status. The six work values described in TWA and supported by factor analysis of the Minnesota Importance Questionnaire (MIQ; Rounds et al.,

1981) are achievement, comfort, status, altruism, safety, and autonomy. Conceptualizations of contrasts and groupings in these six values have been described (Dawis, 2001).

Achievement contrasts with comfort, altruism with status, and autonomy with safety. These values can also be grouped by similarity into three sets: internal or self reinforcers (achievement and autonomy), external or environmental reinforcers (comfort and safety), and social reinforcers that can be internal or external depending on the individual (altruism and status). Fulfillment of needs leads to satisfaction, whereas dissatisfaction results when needs are not met.

Perspectives from Social and Personality Psychology

In socioanalytic theory, Hogan (1983) proposed that individual differences in the master motives of acceptance, status, and predictability lead to the differential selection of environmental niches that can meet the needs for affiliation, power, and order. As a person-environment theory, Hogan and Roberts (2000) propose that the congruence between an individual's personality and the characteristics of the environment enhances outcomes. In comparison, self-determination theory (SDT; Ryan & Deci, 2000) describes that the basic psychological needs of competence, autonomy, and relatedness are innate and common to everyone. In this model intrinsic motivation, and in turn, well-being is enhanced when these needs are met, and thwarted when these needs are not satisfied.

Socioanalytic Theory

Hogan (1983) brought together the psychoanalytic ideas of Freud (1938/1940) and the social psychology of Mead (1934). Socioanalytic theory is based on evolutionary theory and the anthropological observation that hunter-gatherer societies live in social groups and are hierarchically organized. The theory also emphasizes the importance of childhood

experiences, specifically regarding interactions with parents (Freud, 1938), and peers (Mead, 1934). Three unconscious biological needs that promote reproduction and survival of the community are considered: (1) affiliation and social acceptance, (2) status and a social hierarchy, and (3) structure, predictability, and order. “People are deeply concerned with getting along and getting ahead (or not being shunned and not losing status), and they try to attain these outcomes during social interaction” (Hogan, 2004, p. 12).

It follows that if these needs are important for survival, the traits expressed by these underlying motives would be encoded into language. This lexical hypothesis is well supported in the empirical literature, and is the basis for the five-factor model of personality traits (Digman, 1990; Goldberg, 1993). Furthermore, not only are trait terms universal, but the structural organization of personality shows great similarity across various findings. Hogan (1983) observed a common underlying structure among personality traits in the work of Allport, Eysenck, Holland, and Stern, among others. The two bipolar dimensions labeled by Hogan as Sociability and Conformity organize these circumplex models of personality. He argued that regardless of the theoretical approach to personality, whether trait, type, or interpersonal, the resulting descriptions can be mapped onto these two dimensions.

According to socioanalytic theory a benefit of variation of these traits within a group is the potential for division of labor (Hogan, 1983). Individuals can specialize in work best suited to their personality, maximizing productivity and success of the community. Hogan and Roberts have incorporated Holland’s (1997) typology into socioanalytic theory (Hogan, 1983) and neo-socioanalytic theory (Roberts & Wood, 2006). While Holland’s theory is specific to vocational behavior, Hogan and Roberts propose a broader personality theory predicting human behavior in a variety of contexts, including work performance, relationship

satisfaction, and health outcomes. Hogan defines situations as interactions with the environment, which includes expectations of others and interactions based on adopted roles. Situations are defined by roles and agendas. In the case of a college student, possible situations include being a student in the classroom, a member of an extracurricular club, a leader of a student group, a worker at a part-time job, a volunteer for a service group, or an athlete on a sports team. The roles one selects are guided by the needs for affiliation, status, and order, and the personality traits of emotional stability, agreeableness, openness to experience, and conscientiousness are related to getting these needs met. Thus, behavior is viewed as an interactive function of personality traits, interests, and needs.

Hogan (2004) addressed the relationship of interests, needs and values. These three motivational terms are at various levels of abstraction in the pursuit of a goal. He viewed values at the highest level, referring to abstract goals and ideals. Needs are related to the concrete, instrumental goals in pursuit of values. Interests develop out of these needs. For example, individuals valuing achievement have a need to be competent, so they develop interests in areas they are willing to put in the work and have the ability to do so. Those valuing relationships have a need for self and other awareness, and in turn develop social interests.

Neo-socioanalytic theory (Roberts & Wood, 2006) extends these ideas and describes personality development as an interactive feedback process between person and situations, with a broad view of personality as having four primary units of analysis. The four proposed building blocks of personality summarizing individual differences categories are personality traits (such as the five factor model, but also attachment patterns and defense mechanisms), motivations (values, needs, interests, goals), abilities, and narratives. These four units

provide a road map for personality researchers to organize the known and unknown territory. There is hierarchical ordering within each group of individual difference constructs. Values are at the highest level of the motivational constructs, with interests, life goals, life tasks, and proximal goals successively becoming more specific displays of motivation.

Self-Determination Theory

Another view of human motivation is described in self-determination theory (SDT; Deci & Ryan, 1985; 2000). SDT proposes three basic psychological needs of autonomy, competency, and relatedness common to all people. They hypothesize that the extent to which these needs are met predict well-being and optimal functioning, or ill-being and non-optimal functioning. SDT also specifies that intrinsic motivation and internalized extrinsic motivation promote well-being, while extrinsic motivation is less associated with well-being. Furthermore, how well the social context supports the basic psychological needs impacts the type of motivation that develops. This is in contrast to person-environment fit theories, such as socioanalytic theory and Holland's theory, which emphasize the degree of congruence between specific personality types and environments in promoting well-being.

In particular, cognitive evaluation theory (CET; Deci & Ryan, 1985), a sub-theory within the larger SDT metatheory, discusses how intrinsic motivation is either enhanced or disrupted by social and environmental factors. CET focuses primarily on the basic needs for competence and autonomy in maintaining intrinsic motivation. Ryan and Deci (2000) outline social-contextual factors that facilitate competency and autonomy feelings, including positive feedback and optimal level of challenge, while the promise of tangible rewards based on performance hinders intrinsic motivation. Additionally, the extent to which the relatedness

need is supported also accounts for variability in intrinsic motivation, although less so than competence and autonomy (Ryan & Deci, 2000).

Extrinsic values, such as aspirations for financial success and fame, are thought to negatively impact well-being due to their connection with interpersonal comparisons and fragile self-esteem. Additionally, those with extrinsic orientations may have less time to pursue basic psychological needs (Ryan & Deci, 2000). Kasser and Ryan (1993, 1996) examined the relationship between well-being and intrinsic goals, such as affiliation and personal growth, as opposed to extrinsic goals, such as wealth and fame. These studies found positive correlations between intrinsic goals and well-being, and negative correlations between extrinsic goals and well-being in a sample of American college students and also in a community-based adult sample. This association has also been found in cross-cultural research, for students in Singapore (Kasser and Ahuvia, 2002), and Belgium (Vansteenkiste, Duriez, Simons, & Soenens, 2006). Additionally, studies of autonomy support (a measure of environmental press for this need) have been conducted in work environments. The relationship between autonomy orientation and perceived autonomy support with performance and adjustment outcomes, was found to be mediated by basic need satisfaction (Baard, Deci & Ryan, 2004).

Although socioanalytic theory and self-determination theory offer different perspectives on how to conceptualize psychological needs, it could be that both theories offer insight into the function of needs in the adjustment process. The SDT notion that there are basic, innate, universal needs for autonomy, competence, and relatedness, (Ryan & Deci, 2000), is not necessarily incompatible with the socioanalytic notion that there are also individual differences in the extent people seek to meet needs for status, order, and affiliation

(Hogan & Roberts, 2000). In an ideal nurturing environment, the basic psychological needs would be met, supporting growth and self-determination. However, realistically, not all people experience this idyllic environment. It may be that depending how well basic needs are met through early experience, family interactions, educational experiences, peer interactions, and the broader sociocultural environment, individual differences in needs develop. When basic needs are met, people are free to make intrinsically-driven choices leading to self-determination. The degree of basic need satisfaction may contribute to the differential pursuit of status, order, and affiliation through adult roles and vocational identity (Kasser & Ryan, 1993).

Structure of Motivational Constructs

Hogan (1983) proposed that two orthogonal dimensions, sociability and conformity, could be used to represent the structure underlying personality measures, including Holland's RIASEC model. Tests of the structure of RIASEC measures confirm this dimensional interpretation both among individuals' vocational personalities and work environments (e.g., Armstrong et al., 2008). High sociability is anchored between the Social and Enterprising types and low sociability is between the Realistic and Investigative types. Conformity is anchored by Conventional and Artistic, with Conventional representing high conformity. These dimensions can be seen as representing the needs for affiliation and order. Prediger (1982) labeled similar dimensions Things-People and Data-Ideas underlying RIASEC interests, at a 30° rotation from the Hogan dimensions. Things-People lines up with Realistic and Social, respectively, and Data-Ideas bisects C-E and I-A. Meta-analyses have also supported these structures (Rounds & Tracey, 1993; Tracey & Rounds, 1993). Drawing on these conceptualizations of the underlying dimensions of the RIASEC circumplex,

Armstrong et al. (2008) referred to the Conventional-Artistic contrast as Structured versus Dynamic preferences. A third dimension of cognitive complexity in the RIASEC types was proposed and was confirmed in a factor analysis of job characteristics (Gottfredson & Holland, 1996). The third dimension underlying the RIASEC structure has also been identified as prestige (Tracey & Rounds, 1996). Collectively, the three-dimensions of sociability, conformity, and prestige appear to represent Hogan's master motives of affiliation, order, and status as sought in the workplace through occupational choice.

Similar dimensions have been identified across various needs and goals taxonomies. Kuhl (1994) specified three basic biological and psychological needs of sex and affiliation, hunger and achievement, and aggression and power. Wicker, Lambert, Richardson, and Kahler (1984) examined goal taxonomies using factor and cluster analyses. Goals are desired end states motivated by needs and values. Goal constructs were found to be classified into the two broad areas of individual striving and harmony seeking. These empirical findings are consistent with Hogan's (2004) primary needs of getting ahead and getting along.

Within vocational psychology, work-related needs and values are the focus. Rounds and Armstrong (2005) reviewed needs and values taxonomies specific to the work domain. Two research programs have extensively focused on work needs, specifically Dawis and Lofquist (1984) and Ronen (1994). The 20 needs associated with the Dawis and Lofquist's theory of work adjustment (1984) can be reduced to six factors, or work values, including achievement, comfort, status, altruism, safety, and autonomy. These work values describe both individual's needs, and the rewards work environments can provide, with measures corresponding to each the person and the environment. In a cross-cultural study of work needs and values, Ronen (1994) identified a similar taxonomy. Four need factors were

derived from 14 work values, named security, social, ego/power, and self-actualization. Using multidimensional scaling and smallest space analysis, Ronen found two dimensions labeled individualism-collectivism and materialism-humanism. By comparing taxonomies of work needs, Rounds and Armstrong highlighted points of agreement and overlap. Each of the taxonomies includes needs related to achievement, autonomy, status, social, and security.

Integration of Murray's Needs with Other Measures of Individual Differences

Research using the Personality Research Form (PRF; Jackson, 1984) has remedied some of the previous critiques of the Murray needs, as its structural properties have been investigated. The PRF scales have been described as “the most promising measure of Murray’s needs” (Wiggins & Broughton, 1985, p. 18). The inventory measures 20 manifest needs from Murray’s (1938) list, reflecting trait-like motives shaping one’s personality. Although factor analysis was not used in the development of the PRF, the PRF scales have been identified in subsequent factor analysis of the inventory’s items (Helmes & Jackson, 1977). Five content factors of the PRF have been interpreted as Orientation Toward Work versus Play; Outgoing, Social Leadership; Dependence versus Autonomy; Self-Protective versus Submissive Orientation; and Aesthetic-Intellectual (Skinner, Jackson, & Rampton, 1976; Fowler, 1985). Facets of this scale have been used to predict college performance, but satisfaction was not investigated (Paunonen & Ashton, 2001). The PRF has been compared to other personality traits, including the Big Five (Costa & McCrae, 1988; Jackson, Paunonen, Fraboni, & Goffin, 1996).

Costa and McCrae (1988) examined the relationship between the PRF and the NEO Personality Inventory (NEO-PI; Costa & McCrae, 1985) to compare personality from a motivational perspective with the Big Five personality traits. In a study of 296 adults, there

were several medium to large correlations between the PRF and the Big Five. A joint factor analysis of the two inventories yielded five factors each consisting of one of the Big Five variables and at least three PRF scales (Costa & McCrae, 1988). The Neuroticism factor included PRF scales of Aggression, low Autonomy, Defence, Social Recognition, and Succorance. The highest loadings on the Extraversion factor were for Affiliation, Dominance, Exhibition, Play, Nurturance, and Succorance. The Openness factor included the PRF scales of Achievement, Autonomy, Change, Dominance, low Harmavoidance, Sentience, and Understanding. PRF scales that loaded on the Agreeableness factor were Abasement, low Aggression, low Defence, low Dominance, and Nurturance. The Conscientiousness factor included Achievement, Cognitive Structure, Endurance, low Impulsivity, Order, and low Play. Thus, there are many strong connections between the structures of the two inventories.

Costa and McCrae (1988) suggest the Murray needs can be viewed as “motivational traits” supplementing the “emotions, attitudes and styles” described by the Big Five (p. 264). However, a somewhat different perspective was offered by Jackson et al. (1996), who caution that the body of empirical research finding five personality factors tend to be based on measures designed with that structure in mind (see also Block, 1995), Therefore, the results of these studies should not be interpreted as providing the definitive answer about personality trait structure. Jackson and colleagues also note that in the Costa and McCrae (1988) analysis, two factors with eigenvalues greater than one that consisted of PRF variables were not interpreted. In the six-factor model identified by Jackson and colleagues, the Big Five factor of Conscientiousness is divided into Achievement and Methodicalness. The Achievement factor includes the Murray needs of Achievement, Endurance, and negative

Play, and the Methodicalness factor includes Cognitive Structure, Order, and negative Impulsivity. Further exploring conscientiousness and achievement orientation from a needs perspective could add to this discussion of trait structure.

The PRF was also included in a joint factor analysis with the Minnesota Personality Questionnaire (MPQ; Tellegen, 2000; Tellegen & Waller, 2008). A four-factor solution was interpreted. Highest loadings on the agentic positive emotionality factor included the Achievement and Social Potency scales of the MPQ, and the Achievement, Dominance, and Endurance scales of the PRF. The communal positive emotionality factor had highest loadings from the Social Closeness and Social Potency MPQ scales, and Affiliation, Exhibition, and Play PRF scales. The negative emotionality factor included the Aggression, Stress Reaction, and Alienation MPQ scales, and Aggression and Defence PRF scales. Finally, loadings on the Constraint factor were from the Control, Harmavoidance, and Traditionalism MPQ scales, and the Cognitive Structure, Harmavoidance, and Order PRF scales.

A meta-analysis of the MPQ and the Strong Interest Inventory will help connect these results to the vocational literature on interests. Staggs, Larson, and Borgen (2007) found a negative correlation between Harmavoidance and Realistic, a positive correlation between Achievement and Investigative, and positive correlation between Absorption and Artistic. Social interests were positively related to Wellbeing and negatively to Aggression, and Enterprising correlated with Social Potency.

The relationship among achievement needs, personality traits, and interests appears to be complex. In the factor analysis of the MPQ and PRF (Tellegen & Waller, 2008), achievement loaded on the agentic positive emotionality factor that also included

extraversion traits. In the meta-analysis of the MPQ and vocational interests (Staggs et al., 2007), the highest correlation with achievement was for Investigative interests ($r = .27$), which has been found to have little to no relationship with extraversion (Larson et al., 2002). MPQ Achievement also correlated with Social interest ($r = .17$) in the meta-analytic results (Staggs et al., 2007).

To add to these mixed findings, the Academic Achievement scale of the Jackson Vocational Interest Survey (JVIS; Jackson, 1977) and extraversion personality traits were linked with Enterprising and Social interests, based on the multidimensional technique of property vector fitting (Armstrong et al., 2008). The achievement-striving facet of conscientiousness was also linked to Social interest (Armstrong & Anthony, 2011). Conceptually, achievement includes striving for success, persistence, and enjoying challenging tasks (Stern, 1970; Tellegen & Waller, 2008). The JVIS Stamina scale, which can be compared to PRF Endurance scale, was linked with Investigative interests (Armstrong et al., 2008), so it may be that depending on the specific definition of the achievement scale, some aspects of achievement are more strongly related to the Social and Enterprising types, and others to Investigative.

Academic and Campus Environments

For measuring environments, Craik and Feimer (1987) made the distinction between observational and technical environmental assessments. The College Characteristic Index (Stern, 1970) is an example of an observational assessment that uses ratings by the inhabitants of the college environment. In comparison, the Environmental Assessment Technique (EAT; Astin & Holland, 1961) is a technical environmental assessment of college environments that aggregates institutional size, intelligence level of the student population,

and proportion of students in each of the RIASEC types classified by major. Although observational environmental assessments are sometimes referred to as subjective assessments and technical assessments are called objective, Craik and Feimer argued that for those measures with adequate psychometric properties, observational assessments compliment technical environmental assessment and can stand alone as an assessment approach.

The EAT measures the college environment at the institutional level, but was validated with data from National Merit Scholars at 36 institutions (Astin & Holland, 1961). The university press for Realistic majors (i.e., agriculture, engineering, forestry) was described as practical and concrete, indicated by positive correlations with Pragmatism (.73) and negative correlations with Humanism (-.81), Sentience (-.70), Reflectiveness (-.62), and Harmavoidance (-.50). Investigative majors (i.e., biology, mathematics, anthropology) viewed the university press as encouraging independence, achievement, and analysis, demonstrated by correlations with Deference (-.55), Objectivity (.46), Fantasied Achievement (.46), and Understanding (.46). The Artistic (A) majors (i.e., fine arts, literature, languages) and Enterprising (E) majors (i.e., political science, administration, industrial relations) were opposite from Realistic majors: Humanism (.64 for A and .79 for E), Pragmatism (-.66 and -.73), Sentience (.69 and .71), Reflectiveness (.54 and .64), Harmavoidance (.56 and .55), and Blameavoidance (.58 and .38). The Artistic and Enterprising orientations in this study were found to be quite similar, however, the classification of majors in these types likely contributed to the results. General business majors were classified as Conventional, even though this included sales and marketing. Additionally, the social science and humanities majors of political science and history were classified as Enterprising, reflecting an early version of Holland's (1959) theory. Social

majors (i.e., education, nursing, social work) viewed the strongest press for Narcissism (.59), Sex (.53), Exhibition (.43), and against Scientism (-.43). Conventional majors (i.e., accounting, general business, secretarial) perceived a university press for Passivity (.42) and Exhibition (.36). Achievement correlated with several areas: Investigative (.33), Artistic (.35), Enterprising (.42), Conventional (-.35).

Another approach to describing academic environments is assessing faculty attitudes and work orientations to provide evidence for the distinct academic environments faculty create. Supportive evidence for each of the RIASEC types has been found in faculty surveys of departmental goals (Smart & McLaughlin, 1974), teaching strategies and student-faculty interaction (Morstain & Smart, 1976), teaching goals (Smart, 1982), and students' skill development (Thompson & Smart, 1999). All departments, regardless of RIASEC type, shared an emphasis on intrinsic motivation for learning and intellectual curiosity (Morstain & Smart, 1976), and intellectual development (Smart, 1982).

Realistic and Investigative environments focused on research and graduate education, achievement (Smart & McLaughlin, 1974) and structured learning environments, with an emphasis on grades and exams (Morstain & Smart, 1976). There was also a focus in Realistic environment on students' vocational preparation (Smart, 1982). Investigative environments were low on both vocational preparation and character development (Smart, 1982), and focused instead on the development of math, science, and analytical skills (Thompson & Smart, 1999).

Faculty in departments classified as Artistic & Social emphasized collegial work environment (Smart & McLaughlin, 1974), unstructured learning environment, student-directed interactions (Morstain & Smart, 1976), and character and emotional development

(Smart, 1982). An emphasis on innovative, creativity and literary skills was found in Artistic academic environments, as well as encouragement of originality, expressive and intuitive problem solving (Thompson & Smart, 1999). Within Social environments, faculty focused on helping, teaching, and interpersonal skills, and encouraged their students to draw on self-understanding, empathy, and patience when addressing social problems (Thompson & Smart, 1999).

Enterprising environments had a less distinctive orientation than the other RIASEC types with regards to teaching strategies and student interaction (Morstain & Smart, 1976). Skill development deemed important by Enterprising faculty included leadership, assertiveness, and social influence through power and status (Thompson & Smart, 1999). Conventional environments had a goal for a collegial work environment (Smart & McLaughlin, 1974). There are fewer studies of Conventional academic environments because of the limited number of departments and faculty that fall into the Conventional area. Enterprising and Conventional departments also emphasized career development and vocational preparation (Smart, 1982).

Smart, Feldman, and Ethington (2000) studied patterns among faculty attitudes classified by Holland environment. Their sample of 2,775 faculty was drawn from national survey data by the Carnegie Foundation for the Advancement of Teaching (CFAT) study of 306 two-year and four-year institutions in 1989. A limitation of this study is that it focused on four of the six RIASEC environments, excluding Realistic and Conventional due to lack of data for faculty in these areas. A focus on intellectual development and faculty accessibility to students was common to all academic environments. Significant differences in faculty's ratings of the importance of five alternative goals for undergraduate education

were consistent with the Holland work environments (Smart et al., 2000). For example, the goal of providing an understanding of math and science was valued most by faculty in Investigative departments, and enhancing creative thinking was valued most by those in Artistic departments. Based on their findings and the extant literature, Smart and colleagues concluded that “faculty create distinctive academic environments” generally consistent with Holland’s RIASEC descriptions (p. 97).

Testing the Congruence Hypothesis

There are several approaches to testing the congruence hypothesis of person-environment fit theories that people choose environments that are aligned with their personal characteristics, and that congruence contributes to positive outcomes. That people make congruent choices has been demonstrated through correlations, MANOVA procedures, congruence indices, and by discriminate analysis. Research of the fit-outcome relationship has been tested by examining the relationship between interest, confidence and value congruence with outcomes such as satisfaction, performance, and persistence in work and educational environments.

Results from large-scale survey research provide support for Holland’s (1997) self-selection and congruence assumptions. Student data analyzed by Smart et al. (2000) from the 1986 and 1990 surveys of the Cooperative Institutional Research Program (CIRP; Higher Education Research Institute, 1986) included 4,408 students at 360 higher education institutions. Their results provided strong support for Holland’s self-selection hypothesis that students select academic majors that reinforce and reward their interests and abilities. Support for the congruence-outcome relationship was consistent with Holland’s theory for Investigative, Artistic, and Enterprising students, but weaker for Social students. Smart and

colleagues suggested that the press for Social academic environments is weaker than for the other academic environments. However, the scales used to represent the RIASEC types included self-rated items of confidence, ability, values, and goals, thereby confounding these constructs. Additionally, students were classified by a single Holland type, based on the highest scale score. Lastly, the Realistic and Conventional types were not included in this study.

Measures of Academic Fit

Person-environment fit is a broad term encompassing many types of fit attempting to quantify the extent and individual and environment are matched. Types of fit in work environments include person-vocation, person-job, person-organization, person-group, and person-supervisor (Kristof-Brown, Zimmerman, & Johnson, 2005). In the college context, person-major fit and person-university fit are also of interest, to assess an individual's compatibility with various aspects of the environment (Assouline & Meir, 1987).

Fit can be measured either directly or indirectly. Perceived fit is assessed by individuals' own assessment of their compatibility with the environment, using a measure such as Academic Fit (Schmitt, Oswald, Friede, Imus, & Merritt, 2008). Subjective fit is assessed indirectly by comparing the ratings of person and environment completed by the same person. Stern (1970) referred to this as beta fit. A third type of fit, objective fit, is also assessed indirectly, but compares ratings of person and environment completed by different sources. Objective fit has been calculated by technical ratings of the environment (Astin & Holland, 1961), and by the mean ratings of inhabitants of the environment, representing the consensus view of the environment (Harms, Roberts, & Winter, 2006). Objective fit measures have been found to have weaker relationships with outcomes than perceived and

subjective fit measures (Kristof-Brown et al., 2005), because perceived and subjective fit measures are subject to consistency biases.

Another approach has used discriminant analysis to predict college major based on individual characteristics, such as RIASEC interest and confidence. Personality traits have been examined in combination with interests and confidence in predicting college major choice. In the most recent of these studies, Larson et al. (2010) measured personality traits with the Multidimensional Personality Questionnaire (MPQ; Tellegen, 2000), interests with the SII, and confidence with the Skills Confidence Inventory (SCI; Betz, Borgen, & Harmon, 2005). They sought to discriminate among nine major families of 368 college students decided about their major. The jackknife hit rate for the set of personality traits alone was more than one and a half times greater than chance. Two of the discriminant functions were significant in differentiating among the majors. Education majors were discriminated from engineering majors by high social closeness, high harmavoidance, and low aggression. Business majors were discriminated from design majors by high aggression, and low absorption. Adding the interest and confidence scales to the personality traits almost doubled the jackknife hit rate compared to personality traits alone.

Congruence and Academic Satisfaction

One approach to testing the congruence hypothesis is with correlations between a congruence index and outcomes, such as satisfaction. The most recent meta-analysis on the subject of the relationship between interest congruence and satisfaction yielded a mean congruence-satisfaction correlation of .17 across 53 samples (Tsabari, Tziner, & Meir, 2005). Studies published between 1988 and 2002 were included in this meta-analysis, with most studies concerned with person-vocation fit and occupational satisfaction. Only one study was

included that considered the link between congruence and college major satisfaction, with a negligible congruence-satisfaction correlation of $-.03$. In comparison, earlier meta-analyses included more studies of college students. The meta-analysis by Assouline and Meir (1987) included six studies of interest congruence and college major satisfaction, with a mean correlation of $.098$. Tranberg, Slane, and Ekeberg (1993) found a similar mean correlation of $.095$ based on five studies of interests congruence and college major satisfaction. However, the reliability of the major satisfaction measures used in these studies is low or unknown, and was typically assessed using a single item (Nauta, 2007).

Spokane, Meir, and Catalano (2000) provided recommendations for improving interest congruence studies in on their review of 66 studies based on Holland's theory published between 1985 and 1999. One recommendation was to select multiple dependent measures of relevant outcomes to capture the complexity of person-environment interactions. They concluded that the correlation between interest congruence and satisfaction appears to be approximately $.25$, capturing 5% of the variance. However, they noted that detecting higher correlations in the range of $.30$ to $.40$ is possible based on studies with sound methodology. As can be seen, fit is not a unitary construct. Outcomes need to match what is relevant and important for that environment (Harackiewicz et al., 2002). Academic fit may be most relevant to academic satisfaction, while fit in the social environment may be relevant to overall life satisfaction.

Perhaps because of the difficulties with interest congruence research, recent studies have turned to the relationship of personality traits and college student satisfaction. Four of five personality traits in the five factor model, all but Openness, were related to life satisfaction for college students (Lounsbury, Saudargas, Gibson, and Leong, 2005). These

results were replicated by Cotter and Fouad (2011), reporting positive, medium-sized correlations between life satisfaction and extraversion, agreeableness, and conscientiousness, a negative correlation with neuroticism, and no correlation between life satisfaction and openness for college students. For major satisfaction, correlations with extraversion and conscientiousness were found in a sample of business majors (Logue, Lounsbury, Gupta, & Leong, 2007). Using stepwise multiple regression, Logue et al. (2007) found that 3.5% of the variance in major satisfaction could be accounted for by conscientiousness and an additional 3% by extraversion.

Directly assessing students' perceived academic fit is another approach to measuring the adjustment of college students. Rather than determining fit through congruence indices, Schmitt et al. (2008) argued that measuring fit through self-report can be appropriate when perceptions fit the research question. They noted that perceived fit and index derived person-environment fit measures are weakly correlated, and both are valuable. Using this approach, they found that academic fit led to academic satisfaction four months later, which then predicted academic performance and absenteeism seven months later. Wessel, Ryan, and Oswald (2007) also found that perceived fit was more highly correlated with affective major commitment and academic self-efficacy than was fit based on an objective congruence index.

Academic Fit and Other Outcomes

Social cognitive career theory (SCCT; Lent, Brown, & Hackett, 1994, 2000) has recently been extended to a satisfaction model (Lent & Brown, 2006). Although the SCCT model uses the term *work satisfaction*, this is meant broadly to also include academic or educational satisfaction as an outcome of the job as student. Job satisfaction is related to personality traits, and the SCCT model considers personality traits as a precursor of

satisfaction. A meta-analysis of the relationship between personality traits and job satisfaction reported correlations of .25 for extraversion, -.29 for neuroticism, and .26 for conscientiousness (Judge, Heller, & Mount, 2002). Together these three personality traits accounted for 17% of the variance in job satisfaction. Job satisfaction is also related to overall life satisfaction, and these are considered to have a bidirectional influence in the model. A meta-analysis reported a correlation of .44 between job satisfaction and life satisfaction (Tait, Padgett, & Baldwin, 1989). The SCCT satisfaction model also includes self-efficacy, perceived and objective work conditions, and environmental supports and barriers, as influencing goal pursuit and progress, which in turn predicts job satisfaction. Self-efficacy and environmental reinforcers are also assumed to directly influence job satisfaction (see Lent & Brown, 2006 for the full model). The SCCT satisfaction model has received initial support regarding the academic satisfaction of college students (Lent et al., 2005; Lent, Singley, Shue, Schmidt, & Schmidt, 2007).

In addition to satisfaction outcomes of PE fit, process-oriented variables of career decision making have also been studied in career assessment (Swanson & D'Achiardi, 2005). Fit is expected to relate positively to confidence in career-related decisions. Incongruence of interest and occupational aspirations was found to be a predictor of career indecision in a sample of psychology majors (Chartrand, Camp, & McFadden, 1992). A negative relationship between interest congruence and career indecision was also found for female undergraduates considering science and engineering majors (Lent, Brown & Larkin, 1987). Other studies have found no relationship between congruence and career decision making process variables (Luzzo & Ward, 1995). Career decision-making self-efficacy (CDMSE, Betz, Klein, & Taylor, 1996) refers to the beliefs one has in their ability to successfully

complete the tasks of making career-related choices. This includes tasks related to accurate self-appraisal, gathering career-related information, goal selection, future career plans, and problem-solving. Students with poor PE fit in their selected major may question their self-awareness, knowledge about the world of work, goals, and plans, and struggle with overcoming obstacles in the career decision making process. This construct comes from the social cognitive perspective, and has received little attention in the PE fit research.

A less common approach to congruence research has been to study the need-press relationship on college outcomes. Harms et al. (2006) tested PE fit with the Stern (1970) Activities Index and the College Characteristics Index. This study used archival data, with a sample of 191 college men from the early 1960s at Harvard. Beta fit was calculated by profile correlations between an individual's need scales with the 30 environmental press scales. The consensus rating of the environment (alpha press) consisted of an aggregate of the 30 environmental ratings. Alpha fit was determined by the profile correlations of the needs and the consensus press. This was done at the level of 30 needs and press scales, while Stern tried to assess PE fit at the factor level. Academic performance was assessed by grades and honors status. College satisfaction was measured with a three-item satisfaction survey. They found that PE fit was related to academic performance. Specifically, alpha and beta fit were both positively related to graduating with honors. Conversely, PE fit was not related to college satisfaction neither by alpha fit ($r = -.06$) nor beta fit ($r = .00$).

Robbins et al. (2004) conducted a meta-analysis specific to outcomes relevant to college students and the university environment, examining the relationship between several psychosocial factors and college retention and performance using data from 17 studies representing more than 9,000 participants. While this study considered person variables

independently, and not the person-environment interaction, it is interesting because of its meta-analytic nature and focus on predicting college student outcomes. Achievement motivation was found to be a strong predictor of college GPA, with a true-score correlation of .30, second only to academic self-efficacy (true-score correlation of .50). The strength of these motivational variables as predictors for college performance is in the range of traditional cognitive predictors, including high school GPA (true-score correlation of .45) and entrance exam scores (true-score correlation of .39). Achievement motivation added incremental validity to the prediction of GPA above the traditional predictors. Social support and social involvement had weaker relationships with GPA (.11 and .14 true-score correlations, respectively), and were more related to college retention (.26 and .22, respectively, for true-score correlations).

The congruence-satisfaction relationship has been found to be lower in college environments than in work environments (Assouline & Meir, 1987; Tranberg et al., 1993; Tsabari et al., 2005). Tracey (2010b) speculated that this is because of the greater variance in the college environment, classifying it as a weaker environment than the workplace. The university environment consists of much more than the academic department, including extracurricular activities, residential settings, and opportunities for socialization (Stern, 1970). Therefore, the press of a college major is just one type of press a student experiences when going to college. Using interest congruence as the predictor of outcomes considers only the effects of academic press, and does not examine the other types of press that may impact student's experiences. As such, it may be important to consider students' perceptions of support and lack of support in the campus setting for a wide range of psychological needs.

The Present Study

Research on personality and college student satisfaction has come from the interest congruence perspective (Assouline & Meir, 1987; Tranberg et al., 1993), and has more recently focused on personality traits (Logue et al., 2007; Lounsbury et al., 2005). The interest congruence-satisfaction relationship has been found to be small (Assouline & Meir, 1987; Tranberg et al., 1993; Tsabari et al., 2005), and the personality-satisfaction relationship moderate (Lounsbury et al., 2005), however, research on personality traits rarely accounts for the contribution of the environment side of the PE fit equation. The purpose of the present study is to examine college student satisfaction from the need-press perspective. This view includes the contributions of needs shaping personality, and the individuals' perceptions of the college environment, as they relate to satisfaction. In order to accomplish this goal, the Stern scales were revised, and initial reliability and validity estimates established. The following research questions were addressed:

1. What are the psychometric properties and factor structure of the Activities Index – Revised (AI-R)?

2. What are the psychometric properties and factor structure of the College Characteristic Index – Revised (CCI-R)?

Based on Stern (1970) and the structure of other personality measures (Costa & McCrae, 1992; Hogan, 1983; Holland, 1997; Stern, 1970), it was expected that three to six factors would emerge in the factor analyses of the need and press measures, and scales could be developed with acceptable psychometric properties.

3. How do the needs and press identified in the factor analyses relate to interests and personality traits?

Convergent and discriminant validity was demonstrated by correlations with interest and personality measures. It was hypothesized that the need and press scales will moderately relate to, yet be distinct from these individual differences measures. Based on previous research (Astin & Holland, 1961; Costa & McCrae, 1988; Stern, 1970; Tellegen & Waller, 2008) it was predicted that interpersonal needs and press (i.e., closeness, self-assertion) would have positive correlations with Social and Enterprising interests and Extraversion, and nonsignificant or negative correlations with Realistic and Investigative interests. Intellectual need and press were expected to correlate with Investigative interests and Openness. Order need and press were expected to correlate positively with Conventional interests and Conscientiousness, and have low or negative correlations with Artistic interests. Because of the mixed results for achievement personality traits in the existing literature (Armstrong et al., 2008; Staggs et al., 2007), no hypothesis for links between achievement and interests were made. A summary of the empirical relationships among measures is presented in Table 2, along with the predicted relationships between the Stern measures, interests, and personality traits.

4. Are there significant differences in need and press by college major?

The concurrent validity of these measures was examined by testing for differences by college major. Based on Holland (1997), Larson et al. (2010), and Stern (1970), it was expected that need and press differences would emerge between majors, but the analysis was approach as exploratory since the exact scales that would emerge in the Stern measures were unknown. Larson et al. (2010) found that affiliation needs were significantly higher for education majors than engineering majors, and self-assertion needs were significantly higher

for business majors as compared to design majors, so similar differences may emerge along these dimensions.

5. Are needs and press related to satisfaction?

This is an exploratory research question, because it was unknown exactly what need and press scales would be developed, and how they would relate with established constructs. Based on previous research with personality traits (Logue et al., 2007; Lounsbury et al., 2005), it is tentatively proposed that need and press scales positively correlated with extraversion, agreeableness and conscientiousness will relate positively to academic and life satisfaction.

6. To what extent do need and press make independent and joint contributions to predicting satisfaction?

This is an exploratory research question due to the preliminary nature of the revised need and press scales. However, since personality traits have been shown to add unique variance beyond interests to the prediction of satisfaction (Logue et al., 2007), it was expected that needs and press would add to the prediction of satisfaction beyond the contribution of interests.

Table 1

Activities Index and College Characteristic Index Scales (Stern, 1970)

Scale Name	Scale Definitions (Stern, 1970, p. 16)	AI Sample Item	CCI Sample Item
Abasement-Assurance (ABA)	Self-depreciation versus self-confidence	Accepting criticism without talking back.	Students are encouraged to criticize administrative policies and teaching practices.
Achievement (ACH)	Striving for success through personal effort	Setting difficult goals for myself.	Students set high standards of achievement for themselves.
Adaptability-Defensiveness (ADA)	Acceptance of criticism versus resistance to suggestion	Admitting when I'm in the wrong.	In most classes every student can expect to be called on to recite.
Affiliation (AFF)	Group-centered social orientation	Meeting a lot of people.	There are many opportunities for students to get together in extracurricular activities.
Aggression-Blame Avoidance (AGG)	Hostility versus its inhibition	Teasing someone who is too conceited.	Students pay little attention to rules and regulations.
Change-Sameness (CHA)	Flexibility versus routine	Avoiding any kind of routine or regularity.	The history and traditions of the college are strongly emphasized.
Conjunctivity-Disjunctivity (CNJ)	Planfulness versus disorganization	Scheduling time for work and play during the day.	Most students follow a regular plan for studying and recreation.
Counteraction (CTR)	Restriving after failure	Returning to a task which I have previously failed.	People here thrive on difficulty – the tougher things get, the harder everyone works.
Deference-Restiveness (DFR)	Respect for authority versus rebelliousness	Doing what most people tell me to do, to the best of my ability.	Students almost always wait to be called on before speaking in class.
Dominance-Tolerance (DOM)	Ascendancy versus forbearance	Persuading a group to do something my way.	The student leaders here really have lots of special privileges.
Ego Achievement (EA)	Striving for power through social action	Taking an active part in social and political reform.	Students are actively concerned about national and international affairs.

Table 1, continued

Scale Name	Scale Definitions (Stern, 1970, p. 16)	AI Sample Item	CCI Sample Item
Emotionality-Placidity (EMO)	Expressiveness versus stolidness	Letting loose and having a good cry sometimes.	Students tend to hide their deeper feelings from each other.
Energy-Passivity (ENY)	Effort versus inertia	Giving all of my energy to whatever I happen to be doing.	Students put a lot of energy into everything they do – in class and out.
Exhibitionism-Inferiority Avoidance (EXH)	Attention-seeking versus shyness	Doing things which will attract attention to me.	Student parties are colorful and lively here.
Fantasied Achievement (FA)	Daydreams extraordinary public recognition	Imagining how it would feel to be rich and famous.	The faculty encourage students to think about exciting and unusual careers.
Harm Avoidance-Risktaking (HAR)	Fearfulness, versus thrill-seeking	Driving fast.	Students rarely get drunk and disorderly.
Humanities, Social Science (HUM)	Interests in the humanities and the social sciences	Learning about the causes of some of our social and political problems.	The school offers many opportunities for students to understand important works of art, music, and drama.
Impulsiveness-Deliberation (IMP)	Impetuousness versus reflection	Doing things on the spur of the moment.	People frequently do things on the spur of the moment.
Narcissism (NAR)	Vanity	Pausing to look at myself in a mirror each time I pass one.	Students take a great deal of pride in their personal appearance.
Nurturance (NUR)	Helping others	Having people come to me with their problems.	Many upperclassman play an active role in helping new students adjust to campus life.
Objectivity-Projectivity (OBJ)	Objective detachment versus superstition or suspicion	Avoiding things that might bring bad luck.	No one needs to be afraid of expressing extreme or unpopular viewpoints in this school.
Order-Disorder (ORD)	Compulsive organization of details versus carelessness	Keep my room in perfect order.	Campus architecture and landscaping stress symmetry and order.

Table 1, continued

Scale Name	Scale Definitions (Stern, 1970, p. 16)	AI Sample Item	CCI Sample Item
Play-Work (PLY)	Pleasure seeking versus purposefulness	Getting as much fun as I can out of life, even if it means sometimes neglecting more	There isn't much to do here except go to classes and study.
Practicalness-Impracticalness (PRA)	Interest in practical activity versus indifference to tangible personal gain	Being efficient and successful in practical affairs.	The academic atmosphere is practical, emphasizing efficiency and usefulness.
Reflectiveness (REF)	Introspective contemplation	Understanding myself better.	There are many facilities and opportunities for individual creative activity.
Science (SCI)	Interests in the natural sciences	Doing experiments in physics, chemistry, or biology in order to test a theory.	Course offerings and faculty in the natural sciences are outstanding.
Sensuality-Puritanism (SEN)	Interest in sensory and aesthetic experiences versus austerity or self-denial	Listening to the rain fall on the roof, or the wind blow through the trees.	Concerts and art exhibits always draw big crowds of students.
Sexuality-Prudishness (SEX)	Sexual interests versus asceticism	Being romantic with someone I love.	Students here spend a lot of time talking about their boyfriends or girlfriends.
Supplication-Autonomy (SUP)	Dependency versus self-reliance	Being a loner, free of family and friends.	Students commonly share problems.
Understanding (UND)	Intellectuality	Concentrating intently on a problem.	Careful reasoning and clear logic are valued most highly in grading student papers, reports, or discussions.

Table 2

Inter-relationships of the AI and CCI with Interest and Personality Traits

RIASEC dimensions	Trait complexes	RIASEC & Big Five	NEO-PI & PRF	MPQ & SII	CCI & EAT	Predicted relationships for Stern (1970) factors
Hogan & Prediger	Ackerman & Heggestad (1997)	Armstrong et al. (2008), Larson et al. (2002)	Costa & McCrae (1988)	Staggs et al. (2007)	Astin & Holland (1961)	
R Things, low sociability	Science/math			Harmavoidance (-)	Pragmatism, Puritanism, Risktaking	Applied interests (Ord, Pra, Sci)
I Ideas, low sociability	Science/math, Intellectual/Cultural (absorption)	Openness to Experience	Understanding & Openness to Ideas	Achievement	Objectivity, Understanding, Fantasied Achievement	Audacity (Agg, F/A, Sci); Intellectual (Hum, Ref, Sci, Und)
A Dynamic, Ideas, low conformity	Intellectual/Cultural (openness)	Openness to Experience, Neuroticism (men)	Change, Sentience, Understanding & Openness to Aesthetics	Absorption	Humanism, Sensuality, Reflectiveness, Harm & blame avoidance	Sensuousness (Nar, Sen, Sex); Expressiveness (Emo, Imp, Sex)
S People, Sociability	Social (extraversion, social potency, well-being)	Extraversion, Agreeableness	Affiliation, Nurturance, Play	Wellbeing, Aggression (-)	Narcissism, Sexuality, Exhibition	Closeness (Dfr, Nur, Sex, Sup) Friendliness (Aff, Ply)
E Sociability, Data	Social (extraversion, social potency, well-being)	Extraversion, Achievement (Armstrong)	Dominance, Exhibition	Social Potency	E majors not correctly classified	Self-assertion (Dom, E/A, Exh, F/A)
C Conformity, Structured, Data	Clerical (control, conscientiousness, traditionalism)	Conscientious-ness (Armstrong)	Order, Endurance, Cognitive Structure, low Impulsivity		Passivity	Orderliness (Sam, Cnj, Del, Ord)
		Neuroticism	Aggression, Defence, Impulsivity, Succorance			Submissiveness (Aba, Ada, Dfr, Nur) Egoism (F/A, Nar, Pro)

CHAPTER 3: METHOD

Participants

In Sample 1, 681 participants were recruited at a large, Midwestern university. The sample included 573 students recruited in undergraduate psychology classes, and 108 students recruited in introductory undergraduate engineering classes. After data screening was conducted and cases eliminated due to incomplete surveys, missing data, or outliers, Sample 1 included 504 participants, with 287 (57%) being female and 217 (43%) being male. Participants' mean age was 19.3 ($SD = 2.3$). The sample included participants identifying with the following racial/ethnic identities: 87.9% Caucasian American, 5% Asian or Asian American, 2.8% African American, 1.8% Hispanic/Latino, and 1.6% Biracial/Multiracial individuals. Five participants (<1%) indicated their race/ethnicity as "other." Many participants were first-year students (63%), 23% were in their sophomore year in college, 8% were juniors, and 6% were seniors.

In Sample 2, 550 participants were recruited from introductory undergraduate psychology classes, and 143 engineering students recruited from introductory engineering classes, for a total of 693 students who agreed to participate in the study. After data screening was conducted and cases eliminated due to incomplete surveys, missing data, or outliers, Sample 2 included 505 participants, with 284 (56%) being female, 220 (44%) being male, and one participant did not report their sex. Participants' mean age was 19.2 ($SD = 1.6$). The sample included participants identifying with the following racial/ethnic identities: 87.7% Caucasian American, 5.3% Asian or Asian American, 2.8% African American, 1% Hispanic/Latino, .2% Native American, and 1.6% Biracial/Multiracial individuals. Seven participants (1.4%) did not report their race/ethnicity. Half of the participants were first-year

students (50%), 30% were in their sophomore year in college, 15% were juniors, and 5% were seniors.

Measures under Revision

Activities Index (AI; Stern, 1970). The AI assesses psychological needs through preference ratings of activities. Five items were selected from each of 30 scales based on judges' ratings, as described in the item selection section. This 150-item pool selected from the original Activities Index was administered using a 5-point, Likert-type response format (1 = *strongly dislike*; 5 = *strongly like*). Participants were asked to indicate how much they would like or dislike each activity. Participants were instructed to "try to describe yourself as you generally are now, not as you wish to be in the future. Describe yourself as you honestly see yourself, in relation to other people you know of the same sex you are, and roughly your same age." See Table 1 for scale definitions and sample items. Thirty-one items are reverse coded. Moderate reliability has been reported, with mean internal consistency for the original 30 scales ranging from .66 to .72 in college samples (Stern, 1970; Harm et al., 2006). Factors derived from the AI have been effective in differentiating between college majors, among university type, and discriminating among occupational membership.

College Characteristics Index (CCI, Stern, 1970). The CCI assesses students' perceptions of educational environments, or the environmental press. Five items were selected from each of 30 scales based on judges' ratings, as described in the item selection section. This 150-item pool selected from the original CCI was administered using a 5-point, Likert-type response format (1 = *strongly disagree*; 5 = *strongly agree*). Participants were asked to indicate how much they agree with each statement regarding their experiences at their university. See Table 1 for scale definitions and sample items. Thirty-nine items are

reverse coded. Moderate reliability has been reported, with mean internal consistency for the original 30 scales ranging from .54 to .66 in college samples (Stern, 1970; Harm et al., 2006). Factors derived from the CCI have been effective in differentiating between academic environments. Convergent validity was demonstrated based on correlations with the EAT (Astin & Holland, 1961).

Interest and Personality Trait Measures

Alternate Forms Public Domain (AFPD) RIASEC Markers (Armstrong, Allison, & Rounds, 2008). The AFPD RIASEC markers were developed for research purposes as an alternative to commercial interest measures. The AFPD RIASEC interest markers have six scales, one for each of the RIASEC types, with 8-items each. Participants were asked to rate the 48 activity items on a Likert-type scale from 1 (*strongly dislike*) to 5 (*strongly like*) based on how much they would like to perform the work activity. Scores were computed based on the mean for each of the RIASEC scales. A sample item from the Realistic scale is “Fix a broken faucet.” Internal consistency reliabilities for Set A range from .80 to .93 in a college sample, with a mean of .88 (Armstrong et al., 2008). Convergent validity has been demonstrated by correlations in the range of .72 to .87 with occupation-based interest ratings and by correlations with the General Occupational Themes of the Strong Interest Inventory ranging from .56 to .67. Structural analyses supported that the arrangement of the RIASEC types based on the AFPD scales was consistent with Holland’s model.

International Personality Item Pool NEO-PI-R Domains (IPIP NEO; Goldberg et al., 2006). This is a 50-item IPIP measure representing the Goldberg (1992) markers for the five-factor structure of personality traits. There are 10 items each for the factors of Neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness. Participants rated the items

on a Likert-type scale from 1 (*very inaccurate*) to 5 (*very accurate*) how much each statement describes them. A sample item from the Extraversion scale is “Am the life of the party.” Goldberg et al. reported the internal consistency reliabilities range from .77 to .86, with a mean of .82. Convergent validity was established by correlations with Goldberg’s five-factor markers ranging from .85 to .92, with a mean of .90.

International Personality Item Pool MPQ (IPIP MPQ; Goldberg et al., 2006). This is a 110-item IPIP measure corresponding to 11 scales in Tellegen’s (2000) Multidimensional Personality Questionnaire. Each IPIP scale (10 items each) measures a similar construct as a MPQ scale: Joyfulness/Wellbeing, Power-Seeking/Social Potency, Achievement-Seeking/Achievement, Friendliness/Social Closeness, Emotional Instability/Stress Reaction, Belligerence/Aggression, Distrust/Alieation, Planfulness/Control, Risk-avoidance/Harmavoidance, Conservatism/Traditionalism, Imagination/Absorption. Participants rate the items on a Likert-type scale from 1 (*very inaccurate*) to 5 (*very accurate*) how much each statement describes them. A sample item from the Power-Seeking/Social Potency scale is “Have a natural talent for influencing people.” Goldberg et al. reported internal consistency reliabilities range from .77 to .85, with a mean of .81. Convergent validity was established by correlations with the MPQ, with a mean of .79.

Outcome measures

Academic Major Satisfaction Scale (AMSS; Nauta, 2007). The AMSS is a measure of global college major satisfaction. This is a unidimensional measure with six items rated on a 5-point Likert-type scale from 1 (*strongly disagree*) to 5 (*strongly agree*) regarding one’s thoughts and feelings about a current academic major. Four items are reverse scored. A sample item is “I often wish I hadn’t gotten into this major.” Internal consistency reliabilities

range from .90 to .94 in a college sample. The scale has been shown to predict changes in major during 1- and 2-year periods. Convergent validity has been demonstrated by positive correlations with career decision self-efficacy and negative correlations with career choice anxiety and generalized indecisiveness (Nauta, 2007).

Academic Fit (AF; Schmitt et al., 2008). The Academic Fit measure is a direct measure of students' perceptions of their person-environment fit in the academic context, developed as an alternative to fit indices. This is a six-item measure, rated on a 5-point Likert-type scale from 1 (*strongly disagree*) to 5 (*strongly agree*). One item is reverse coded. A sample item is "I feel that my academic goals and needs are met by the faculty at this school." Internal consistency reliability was .75 in a college sample (Schmitt et al., 2008). Validity evidence demonstrated by Schmitt et al. included positive correlations of this measure with academic satisfaction and negative correlations with students' intent to drop out or transfer colleges. The scale has been shown to predict academic satisfaction four months later (Schmitt et al., 2008).

Academic Satisfaction (AS; Schmitt et al., 2008). The Academic Satisfaction measure assesses satisfaction with academics at the students' institution. This is a five-item measure, rated on a 5-point Likert-type scale from 1 (*strongly disagree*) to 5 (*strongly agree*). A sample item is "All in all, I am satisfied with the education I can get in this school." Internal consistency reliability was .81 in a college sample (Schmitt et al., 2008). Convergent validity was demonstrated by positive correlations with academic fit and negative correlations with students' intent to drop out or transfer colleges. The scale has been shown to predict absenteeism rates four months later (Schmitt et al., 2008).

University Commitment Scale (UCS; Rothwell, Herbert, & Rothwell, 2008). The University Commitment Scale is a seven-item measure assessing the affective commitment to one's university. Participants rate the items on a 5-point Likert-type scale from 1 (*strongly disagree*) to 5 (*strongly agree*). A sample item is "I am proud to tell others I am at this university." Internal consistency reliability was .87 in a sample of British business students. Discriminant validity was demonstrated from measures of employability and ambition.

Career Decision-Making Self-Efficacy Scale - Short Form (CDMSE-SF; Betz et al., 1996). The CDMSE-SF is a 25-item measure of an individual's self-efficacy for completing career decision-making tasks. Five subscales with five items represent the career decision-making behaviors of accurate self-appraisal, gathering occupational information, goal selection, making plans for the future, and problem solving. Participants rate on a 5-point Likert-type scale from 1 (*very low confidence*) to 10 (*very high confidence*) the extent to which they believe they can successfully complete career decision-making tasks. A sample item is "Choose a career that will fit your preferred lifestyle." Internal consistency for the subscales ranged from .73 to .83, and was .94 for the total scale in a college sample (Betz et al., 1996). Convergent validity has been demonstrated by positive correlations with vocational decidedness and vocational identity (Betz et al., 1996). The five factors of the CDMSE-SF have also been supported empirically (Miller, Roy, Brown, Thomas, & McDaniel, 2009).

Basic Needs Satisfaction in Life Scale (BNS; Gagné, 2003). The Basic Need Satisfaction in Life measure has three subscales with 21 total items assessing the extent to which the basic psychological needs of autonomy, competence, and relatedness are generally satisfied in one's life. This scale is one of a family of scales measuring basic psychological

need satisfaction, and was a modification of the Basic Need Satisfaction at Work Scale (Ilardi, Leone, Kasser, & Ryan, 1993). Participants rate on a 5-point Likert-type scale from 1 (*not true at all*) to 5 (*definitely true*) the extent of need satisfaction for seven autonomy items, eight competence items, and six relatedness items. A sample item on the autonomy scale is “I feel like I can decide for myself how to live my life.” Internal consistency for the three separate subscales ranged from .69 to .86 in college samples, and was .89 for the total scale (Gagné, 2003). The total mean has been used to form a general need satisfaction index (Deci et al., 2001). Convergent validity has been demonstrated by large positive correlations with autonomy orientation and support.

Satisfaction With Life Scale (SWLS; Diener, Emmons, Larsen, & Griffin, 1985). The SWLS is a 5-item scale designed to measure the life satisfaction component of subjective well-being. This is a unidimensional measure rated on a 5-point Likert-type scale from 1 (*strongly disagree*) to 5 (*strongly agree*) regarding one’s thoughts and judgments about life satisfaction. A sample item is “In most ways my life is close to my ideal.” Initial internal consistency was reported as .87 in a college sample, and adequate reliability has been demonstrated during the 25 years this measure has been used. Initial two-month test-retest reliability was reported as .82. Convergent validity has been demonstrated by moderate to high correlations with other subjective well-being measures and expected correlations with personality traits (Diener et al., 1985). Discriminant validity has been demonstrated by comparisons with emotional well-being measures (Pavot & Diener, 1993).

Procedures

Data was collected with college students at a large Midwestern university. Each sample contained two subsets, one set of participants recruited through introductory

psychology classes, and another set of participants recruited through introductory engineering classes.

For Sample 1, engineering students were contacted in October 2006. Project researchers visited introductory engineering classes and asked students to volunteer for the study. Interested students completed informed consent documents, and received a survey packet. Researchers visited the engineering classes one week later to collect completed packets. Participants were also e-mailed a link to an online survey to complete additional measures. The survey packet included a demographic survey, the RIASEC interests, and other measures not used in this study. The online survey included the Activities Index and College Characteristics Index. Consent was obtained from 241 engineering students. The survey packet was completed by 123 participants, and 103 participants also completed the online survey. As an incentive, one participant received an mp3 player in a drawing of all participants' names.

Participants were also contacted through introductory psychology classes in spring semester 2009 for Sample 1. The study was posted on the Psychology Department's web-based Sona System that students use to register for experiments. Participants who selected this study received an e-mail from the researcher with a link to Survey Monkey, an online data collection website. Informed consent was obtained before participants completed the study questions. The surveys were again completed in two parts. Part 1 included demographics, College Characteristics Index, the interest measure, and the satisfaction measures (AMSS, AF, AS, UCS, SWLS). Within one week of completing the first part of the survey, participants received an e-mail with a link to the second half of the survey. Part 2 included the Activities Index, RIASEC confidence, and CDMSE-SF. After completing the

online survey, participants received a debriefing document. Total time to complete both parts of the survey was 90 minutes or less. They received two research credits in their psychology class for participation.

For Sample 2, engineering students were contacted in September 2007. The same recruiting procedure used with engineering students for Sample 1 was repeated, however this time all surveys were completed online. The online survey included demographics, AI, CCI, and the interest measure. As an incentive, a drawing was held for five \$20 gift certificates to the university bookstore.

Participants were recruited from introductory psychology classes for Sample 2 in Fall 2010. The Sample 1 procedure for recruiting participants from psychology classes was repeated. The same measures were used as were used in the Study 1 psychology sample, with the addition of Big Five personality traits (IPIP NEO), IPIP MPQ, and basic needs satisfaction scale (BNS). Total time to complete the survey was 90 minutes or less, presented in two parts. They received two research credits for participation.

Item Selection

The Activities Index and College Characteristics Index in their original form each have 30 scales with 10 items for a total of 300 items per index (Stern, 1970). The first step of the revision process was to reduce the length of the measures by selecting the best 150 items from each index. Undergraduate research assistants were instructed to rate the content validity of the items. Raters were given the scale names and constructs defined by Stern, and asked to rank how well the item content represented the scale. In ranking the item from best to worst for how well it described the construct, raters were asked to consider how central the item was to the definition, how relevant or dated the item was, gender and racial insensitive

wording, and confounding ideas within an item. Seven undergraduate researchers and this author provided item ratings. Next, descriptive statistics for each item were analyzed, and the top five ranked items per scale were selected. Lastly, minor revisions and updates were made to some of the selected items to reflect contemporary language (i.e., changed “typewriting” to “typing”, and “snack bars and taverns” to “coffee shops and bars”).

Data Preparation

The data screening and data cleaning procedures recommended by Tabachnick and Fidell (2007) were followed in the preparation of these data sets. This included reverse coding negatively worded items, removing cases with an incomplete data set, addressing missing data, detecting outliers, and examining data for adherence to assumptions of the analyses. Missing data was estimated with mean substitution for cases and variables with minimal random missing data points, otherwise cases were deleted. Possible univariate outliers were identified using descriptive statistics and examining standardized scores, and multivariate outliers were identified using Mahalanobis distance. Normality, linearity, homoscedasticity, and multicollinearity were assessed with graphical and statistical methods. Examination of the distribution plot for major satisfaction suggested positive skewness, however, the statistical value of skewness of major satisfaction data was within an appropriate range given the sample size, so major satisfaction was not transformed for ease of results interpretation. Criteria to assess multicollinearity were also within appropriate ranges. After completing these steps, the development sample had 504 participants, and the replication sample had 505 participants.

CHAPTER 4. RESULTS

The results of this study are organized into three parts. The first part of the results chapter presents the factor analyses, descriptive statistics, and reliability estimates of the AI-R and CCI-R to evaluate their psychometric properties using the responses of participants in Sample 1. The second part of the results chapter presents the correlations between the AI-R and CCI-R scales and measures of vocational interests, analyses of group differences, and results of hierarchical multiple regression examining relations of the need and press variables with several outcome variables. In this section the convergent, discriminant, criterion, and incremental validity of the AI-R and CCI-R will be evaluated using the responses of sample 1. The third part of the results chapter presents results obtained using a replication sample (i.e., Sample 2) thereby providing additional reliability and validity evidence for the AI-R and the CCI-R.

Part I: Factor Analysis and Initial Reliability Estimates

Research Question 1: Psychometric Properties of the AI-R

Item Selection. The first step in the revision of the Activities Index (AI) was the selection of 150 items that best represented the constructs out of the original 300 items, as described in the item selection procedure. These 150 items were then administered to participants in Sample 1 and their responses were analyzed to construct revised scales.

Factor Analyses. An exploratory factor analysis (EFA) with principal axis factor extraction and orthogonal (varimax) rotation was used to answer the first research question: What are the psychometric properties and factor structure of the Activities Index-Revised (AI-R)? An EFA was conducted to examine the factor structure and identify possible subscales within the 150 items for a sample of 504 college students, as described in

guidelines for scale construction recommended by Dawis (1987). The principal factors analysis yielded 20 factors with eigenvalues greater than 1.00, accounting for 48.8% of the total variance. Examination of the eigenvalues and scree plot indicated the presence of seven to nine conceptually significant factors, and the seven-factor solution appeared to be the most interpretable. Items were removed that did not meet a 0.32 cutoff for inclusion of a variable in interpretation of a factor, as well as items that cross loaded on more than one factor at 0.35 or above. This process was repeated until a stable factor solution was established (Tabachnick & Fidell, 2007).

The seven-factor solution included five factors with primary loadings in the very good range (.60 to .68), and two small factors with primary loadings in the fair to good range (.45 to .55) (Tabachnick & Fidell, 2007). Reliability analysis indicated that the internal consistency for the two small factors did not meet a .70 cutoff for adequate reliability, so the 16 items loading on these two factors were also eliminated. In total, 46 items were removed, retaining 104 items in a final five factor solution. In the final rotated factor structure, loadings for 10 items fell below the 0.32 cutoff for inclusion of a variable in interpretation of a factor, but these items were retained as they did not reduce the reliability of their respective scales. In one case (item 104), the item loaded more strongly on Factor 2 than Factor 5, but the item was included in the scale based on Factor 5 based on the reliability analysis. The five-factor solution accounted for 32.7% of the total variance and had 22, 19, 28, 19, and 16 items, respectively. The rotated-factor matrix, communalities, and item-total correlations are shown in Table 3. Scale mean, standard deviations, and reliabilities are reported in Table 6.

In the process of interpreting factors, Stern's (1970) scales and factor names were taken into consideration to maintain consistency with the original measures whenever

possible. However, accuracy and clarity of factor interpretation were also priorities in naming factors. Thus, factor names were selected considering the terminology of the original scale, as well as terminology in contemporary personality research. The five factors on the AI-R were labeled Closeness (e.g., emotional support and emotional expression), Intellectual (e.g., physical science, social science, and humanities interests), Social Power (e.g., sociability, attention-seeking, and dominance), Achievement (e.g., challenge and effort), and Orderliness (e.g., organization and time management). The intercorrelations among the AI-R scales ranged from small to medium, with an mean correlation of $r = .25$. The lowest correlation was between the Closeness and Intellectual need scales ($r = .15$), and the highest correlation was between the Achievement and Intellectual need scales ($r = .40$) (see Table 7).

The first factor, with a proposed label of *Closeness*, had 22 items with factor loadings ranging from .33 to .66, and accounted for 12.5% of the variance. This factor reflects needs related to emotional support and expression in interpersonal relationships. The item content refers to giving and receiving comfort, understanding self and others, intimacy in friend and family relationships, and emotional expression. The Closeness label was selected to reflect the similarity with the original AI Closeness factor, which consisted of the Nurturance, Supplication, Sexuality, and Deference scales. Items that loaded on the AI-R Closeness factor were from a number of Stern's (1970) original AI scales: Nurturance (5 items), Supplication (4 items), Sexuality (4 items), Reflectiveness (3 items), Emotionality (3 items), Sensuality (2 items), and Ego Achievement (1 item).

The second factor, with a proposed label of *Intellectual*, had 19 items with factor loadings ranging from .28 to .67, and accounted for 12.5% of the variance. The focus of the item content is on social science, humanities, and physical science interests, deep thought,

concentration, and imagination. The Intellectual label was selected to reflect the similarity with the original AI Intellectual Interests factor, which consisted of the Reflectiveness, Humanities and Social Science, Understanding, and Science scales. Items from a number of Stern's original scales were included in this factor: Science (5 items), Humanities and Social Science (5 items), Ego Achievement (3 items), Understanding (2 items), Reflectiveness (2 items), Fantasied Achievement (1 item), and Practicalness (1 item).

The third factor, with a proposed label of *Social Power*, had 28 items with factor loadings ranging from .28 to .67, and accounted for 5.6% of the variance. The items on this factor seem to reflect sociability, attention-seeking, and dominance dynamics in interpersonal relationships. Item content related to sociability refers to going to parties, leading an active social life, and acting spontaneously. The content of items reflecting attention-seeking focuses on being the center of attention, and attracting attention. Focus of the item content regarding dominance describes persuading and influencing others. The Social Power factor is similar to the higher order Emotional Expression factor described by Stern (1970) that included the Friendliness, Egoism, and Self-Assertion factors. The Social Power label was selected to clarify the theme of the item content. Items from a number of Stern's original scales were included on the AI-R Social Power factor, including: Exhibitionism (5 items), Dominance (5 items), Fantasied Achievement (4 items), Affiliation (3 items), Narcissism (3 items), Play (2 items), Impulsiveness (2 items), Practicalness (2 items), Ego Achievement (1 item), and Sexuality (1 item).

The fourth factor, with a proposed label of *Achievement*, had 19 items with factor loadings ranging from .27 to .58, and accounted for 4.5% of the variance. The focus of the item content on this factor is on achievement motivation, persistence, and mental effort. The

items that loaded on this factor are consistent with the original AI Motivation factor. The Achievement label was selected for the AI-R to clarify that the items reflect achievement motivation specifically. A number of Stern's (1970) original scales were included on the AI-R Achievement factor: Achievement (5 items), Counteraction (4 items), Understanding (3 items), Energy (3 items), Practicalness (1 item), Objectivity (1 item), Aggression (1 item), and Deference (1 item).

The fifth factor, with a proposed label of *Orderliness*, had 16 items with factor loadings ranging from .30 to .65, and accounted for 3.5% of the variance. The content of items refer to organization and time management. The Orderliness label was selected to be consistent with the original AI Orderliness factor identified in Stern (1970), on which the Conjunctivity, Change-Sameness, Order, and Impulsivity-Deliberation scales loaded. Consistent with Stern's original Orderliness factor, there were positive loadings for items from the Order (5 items) and Conjunctivity (5 items) scales. The scale also included one item from the Narcissism scale, and negative loadings for items from the Play (3 items) and Change (2 items) scales.

Almost one-third of the AI items (46 items) did not load at a significant level on one of these factors. The correlations among these items were low and did not form reliable scales. Items that loaded on the two small factors that were eliminated due to weak internal consistency were from the Abasement and Adaptability scales. A summary of the number of unused items from each AI scale are presented in Table 5.

Initial Reliability Estimates. The internal consistency for scales based on the five factors were examined. The results indicated internal consistency coefficient alphas of .88 for the Closeness scale, .86 for the Intellect scale, .87 for the Social Power scale, .84 for the

Achievement scale, and .83 for the Orderliness scale. The average internal consistency of the AI-R scales based on the developmental sample was $\alpha = .86$.

Research Question 2: Psychometric Properties of the CCI-R

Item Selection. The 150 items that best represented the constructs of the College Characteristics Index (CCI) were selected from the original 300 items, as described in the item selection procedure. The 150 items were then used as the item pool to construct revised scales.

Factor Analyses. An exploratory factor analysis (EFA) with principal axis factor extraction and orthogonal (varimax) rotation was used to answer the second research question: What are the psychometric properties and factor structure of the College Characteristic Index-Revised (CCI-R)? An EFA was conducted to examine the factor structure and identify possible subscales within the 150 CCI-R items for a sample of 504 college students. The principal factors analysis yielded 23 factors with eigenvalues greater than 1.00, accounting for 45.6% of the total variance. Examination of the eigenvalues and scree plot indicated the presence of four to seven conceptually significant factors. The four-factor and six-factor solutions appeared to be the most interpretable, and ultimately the four-factor solution was selected as the four factors had primary loadings in the good range (.53-.59), whereas the six-factor solution had three factors in the good range, and three factors with loadings in the poor range (Tabachnick & Fidell, 2007). Items were removed that did not meet a 0.30 cutoff for inclusion of a variable in interpretation of a factor, as well as items that cross loaded on more than one factor at 0.35 or above. This process was repeated until a stable factor solution was established.

In total, 55 items were removed, retaining 95 items in a final four-factor solution. In the final rotated factor structure, loadings for one item fell below the 0.30 cutoff for inclusion of a variable in interpretation of a factor, but this item was retained as it did not reduce the scale reliability. The four-factor solution accounted for 26.4% of the total variance and had 34, 28, 18, and 15 items, respectively. The rotated-factor matrix, communalities, and item-total correlations for the CCI-R are shown in Table 4. Scale means, standard deviations and reliabilities are reported in Table 6.

The four factors on the CCI-R for this sample of college students were labeled Student Engagement (e.g., environmental press for intellectual development, achievement, and leadership), Respectful Environment (e.g., environmental press for respect, dignity, and involvement), Peer Interaction (e.g., environmental press for social life and group life), and Faculty Quality (e.g., environmental press for excellence in teaching, research, and academic facilities). The intercorrelations among the CCI-R scales ranged from small to large, with a mean correlation of $r = .38$. The lowest correlation was between the Engagement and Respect scales ($r = .11$), and the highest correlation was between the Engagement and Academic scales ($r = .59$) (see Table 7).

The first factor, with a proposed label of *Student Engagement*, had 34 items with factor loadings ranging from .30 to .57, and accounted for 13.7% of the variance. This factor reflects environmental press related to intellectual development, achievement, conscientiousness, social action, and leadership. The item content refers to developing intellectual skills and values and putting these values into action, describing engagement with the university environment and the process of higher education. The Student Engagement factor is similar to the CCI higher order Intellectual Climate factor. Items from a number of

Stern's original scales were included on the CCI-R Student Engagement factor, including: Achievement (3 items), Ego Achievement (3 items), Nurturance (3 items), Counteraction (2 items), Energy (2 items), Exhibitionism (2 items), Fantasied Achievement (2 items), Reflectiveness (2 items), Sensuality (2 items), Understanding (2 items), one item from each of the Abasement, Affiliation, Aggression, Conjectivity, Dominance, Emotionality, Harm Avoidance, Narcissism, Objectivity, Play, and Supplication.

The second factor, with a proposed label of *Respectful Environment*, had 28 items with factor loadings ranging from .34 to .59, and accounted for 6.8% of the variance. The focus of the item content describes an environment that supports respect, involvement, and dignity. The Respect factor included items related to the original CCI Student Dignity factor, but the item content was broader describing relationships among students and faculty that promote respect and dignity. Items from a number of Stern's original scales were included on the CCI-R Respectful Environment: Abasement (4 items), the Dominance-Tolerance scale reflecting tolerance (3 items), the Aggression-Blame Avoidance scale referring to blame avoidance (2 items), Change (2 items), Emotionality (2 items), Reflectiveness (2 items), Sensuality (2 items), and one item each from Achievement, Counteraction, Deference, Ego Achievement, Energy, Fantasied Achievement, Objectivity, Order, Narcissism, Play, and Sexuality.

The third factor, with a proposed label of *Peer Interaction*, had 18 items with factor loadings ranging from .30 to .57, and accounted for 3.3% of the variance. The items on this factor reflect social life and group life on a college campus. Item content refers to going to parties, informal social gatherings, and involvement with extracurricular activities. The CCI-R Peer Interaction label was selected based on the similarity with the original CCI factors

named Group Life, Social Form, and Play. Items that loaded on the CCI-R Peer Interaction factor were from the Impulsivity (3 items), Affiliation (2 items), Change (2 items), Nurturance (2 items), and Play (2 items) scales, and one item each from Energy, Exhibitionism, Fantasied Achievement, Practicalness, Reflectiveness, Sexuality, and Supplication.

The fourth factor, with a proposed label of *Faculty Quality*, had 15 items with factor loadings ranging from .29 to .53, and accounted for 2.6% of the variance. The focus of the item content on this factor is on teaching practices, faculty support, and academic facilities, particularly in the sciences. Items that loaded on the CCI-R Faculty Quality factor were from the following Stern scales: Science (3 items), Conjunctivity (3 items), Humanities and Social Sciences (2 items), and Understanding (2 items), and one item each from the Affiliation, Change, Energy, Order, and Supplication.

For the 55 items that did not load at a significant level on one of these factors, the correlations among these items were low and reliable scales could not be formed with the eliminated items. A summary of the number of unused items from each AI scale are presented in Table 5.

Initial Reliability Estimates. The internal consistency for scales based on the four factors were examined. The results indicated internal consistency coefficient alphas of .89 for the Student Engagement scale, .87 for the Respectful Environment scale, .82 for the Peer Interaction scale, and .81 for the Faculty Quality scale. The average internal consistency of the CCI-R scales based on the developmental sample was $\alpha = .85$.

Part II – Initial Validity Evidence

Research Question 3: Convergent and Discriminant Validity

To evaluate the convergent and discriminant validity of the AI-R and CCI-R, a correlation analysis was conducted between the revised measures and RIASEC interests (see Table 7). Correlations between the AI-R, CCI-R and additional personality trait measures were conducted on the replication sample and presented in part three.

Mean correlations for AI-R with interests ranged from .08 to .23, indicating small to medium effect sizes for the relation between needs and interests. The mean correlation between Closeness and RIASEC interests was $r = .23$, ranging from -.30 with Realistic, .03 with Investigative, and .59 with Social. The mean correlation between Intellectual need and RIASEC interests was $r = .23$, ranging from .08 with Enterprising to .41 with Investigative. The mean correlation between Social Power and RIASEC interests was $r = .17$, ranging from -.05 with Realistic to .42 with Enterprising. The mean correlation between Achievement and RIASEC interests was $r = .08$, ranging from .00 with Realistic and Enterprising to .21 with Investigative and .23 with Social. The mean correlation between Orderliness and RIASEC interests was $r = .11$, ranging from -.08 with Artistic to .25 with Social.

Mean correlations for CCI-R with interests ranged from .08 for Faculty Quality to .11 for Student Engagement and Peer Interaction, indicating small effect sizes for the relationship between interests and press. The mean correlation between Student Engagement and RIASEC interests was $r = .11$, ranging from -.04 with Realistic to .27 with Social. The mean correlation between Respectful Environment and RIASEC interests was $r = -.10$, ranging from .14 with Social to -.32 with Realistic. The mean correlation between Peer Interaction and RIASEC interests was $r = .11$, ranging from .00 with Artistic, -.21 with Realistic, and .29 with Social. The mean correlation between Faculty Quality and RIASEC interests was $r = .08$, ranging from -.05 with Realistic to .27 with Social.

Research Question 4: Differences in Need and Press by College Major

Multivariate analysis of variance (MANOVA) was conducted to determine need and press differences by gender, and among ten college major groups. College major groups were selected based on the ACT Map of College Majors (MCM; ACT, n.d.): business, science and math, communications, engineering and technology, education, arts, community services, medicine and allied health, social sciences, and open option majors. Due to small sample size of majors classified in the ACT MCM category computer information systems, these majors were included in the engineering and technology group. Means and standard deviations for the AI-R and CCI-R by gender and college major group are displayed in Table 8 and 9, respectively.

MANOVA results indicated significant main effects for gender, Wilks' $\Lambda = .81$, $F(9, 474) = 12.03$, $p < .001$, and college major, Wilks' $\Lambda = .73$, $F(81, 3072) = 1.87$, $p < .001$, but the interaction effect was not statistically significant, Wilks' $\Lambda = .84$, $F(81, 3072) = 1.06$, $p > .05$. Gender difference was a large effect (multivariate $\eta^2 = .19$), and a small effect size was found for differences need and press differences by college major (multivariate $\eta^2 = .03$).

A Bonferroni adjustment was used to control for multiple tests ($.05/9 = p < .006$). Gender differences were statistically significant for three of the five needs with small to medium effect sizes: Closeness, $F(1, 482) = 47.29$, $p < .001$, partial $\eta^2 = .09$; Intellectual, $F(1, 482) = 17.03$, $p < .001$, partial $\eta^2 = .03$; and Orderliness, $F(1, 482) = 9.23$, $p < .005$, partial $\eta^2 = .02$. Women expressed higher Closeness and Orderliness needs than men, and men expressed higher Intellectual needs than women. Gender differences were statistically significant for two of the four press scales with small effect sizes: Respectful Environment,

$F(1, 482) = 18.74, p < .001$, partial $\eta^2 = .04$; and Peer Interaction, $F(1, 482) = 13.79, p < .001$, partial $\eta^2 = .03$. Women reported higher perceptions of respectful environment and peer interaction in the university environment than reported by men. College major group differences were statistically significant for Achievement need with a medium effect size: $F(9, 482) = 2.83, p < .005$, partial $\eta^2 = .05$. Engineering majors expressed higher achievement needs than business majors. Differences for the other needs and for press among college major groups were not statistically significant after controlling for multiple tests.

Research Question 5 and 6: Concurrent and Incremental Validity of AI-R and CCI-R

Hierarchical multiple regressions were conducted to determine if measures of needs and press improved the prediction of college student outcomes beyond measures of interests. Multiple outcome measures were selected, including academic fit, academic satisfaction, university commitment, major satisfaction, career decision self-efficacy, and satisfaction with life. Correlation analysis between the outcome variables and AI-R and CCI-R are presented in Table 10. First, dimensional scores for Things-People and Data-Ideas were entered in Step 1 because of the well-established role of RIASEC interests in the career assessment literature (Nauta, 2010; Rayman & Atansoff, 1999). Next, scale scores for the five AI-R need scales were entered in Step 2 to examine concurrent validity of these needs related to college student outcomes, and to test the incremental validity of the AI-R scales above and beyond the interest dimensions. Finally, scale scores for the four CCI-R scales were entered into Step 3 to examine concurrent and incremental validity of press in the prediction of college student outcomes beyond that accounted for by interests and needs. Thus, there were a total of 11 predictor variables entered stepwise into the model.

Academic Fit. Results of hierarchical regression predicting academic fit are presented in Table 11. The overall model at Step 1 was statistically significant, $R^2 = .04$, $F(2, 416) = 10.03$, $p < .001$. The Things-People dimension ($\beta = -.20$, $p < .001$) accounted for 4% of the variance in academic fit. According to these results, as people-related interests increase and things-related interests decrease, level of academic fit increases. The Data-Ideas dimension did not predict academic fit.

At Step 2, the overall model predicting Academic Fit was statistically significant, $R^2 = .19$, $F(7, 411) = 13.99$, $p < .001$, as was the change in R^2 , $\Delta R^2 = .15$, $\Delta F(5, 411) = 14.90$, $p < .001$. Achievement ($\beta = .37$, $p < .001$) and intellectual ($\beta = -.20$, $p < .001$) needs were statistically significant predictors at the second step. Closeness, social power, and order needs did not predict academic fit. These findings suggest that as achievement needs increase and intellectual needs decrease, academic fit increases. With the addition of needs, however, the measure of things-people interests was not a significant predictor of Academic Fit.

At Step 3, the overall model predicting Academic Fit was statistically significant, $R^2 = .33$, $F(11, 407) = 18.52$, $p < .001$, as was the change in R^2 , $\Delta R^2 = .14$, $\Delta F(4, 407) = 21.56$, $p < .001$. Achievement needs ($\beta = .22$, $p < .001$), faculty quality press ($\beta = .28$, $p < .001$) and peer interaction press ($\beta = .19$, $p < .005$) were statistically significant predictors at the third step. Intellectual need was no longer a predictor. According to these results, those reporting achievement needs, and positive perceptions of peer interaction and faculty quality reported greater academic fit. This pattern of results suggests that a third of the variability in academic fit is predicted by achievement needs, peer interaction, and faculty quality. The interest and remaining needs and press measures added no further prediction of academic fit.

Academic Satisfaction. Results of hierarchical regression predicting academic satisfaction are presented in Table 12. The overall model at Step 1 was statistically significant, $R^2 = .03$, $F(2, 416) = 7.28$, $p < .01$. The Things-People dimension ($\beta = -.18$, $p < .001$) accounted for 3% of the variance in academic satisfaction. According to these results, as people-related interests increase and things-related interests decrease, level of academic satisfaction increases. The Data-Ideas dimension did not predict academic satisfaction.

At Step 2, the overall model predicting Academic Satisfaction was statistically significant, $R^2 = .19$, $F(7, 411) = 13.97$, $p < .001$, as was the change in R^2 , $\Delta R^2 = .16$, $\Delta F(5, 411) = 16.12$, $p < .001$. Achievement ($\beta = .33$, $p < .001$) and intellectual ($\beta = -.22$, $p < .001$) needs were statistically significant predictors at the second step. These findings suggest that as achievement needs increase and intellectual needs decrease, academic satisfaction increases. With the addition of needs, however, the measure of things-people interests was not a significant predictor of Academic Fit.

At Step 3, the overall model predicting Academic Satisfaction was statistically significant, $R^2 = .44$, $F(11, 407) = 29.32$, $p < .001$, as was the change in R^2 , $\Delta R^2 = .25$, $\Delta F(4, 407) = 45.58$, $p < .001$. Faculty quality press ($\beta = .38$, $p < .001$), peer interaction press ($\beta = .23$, $p < .001$), and respectful environment ($\beta = .15$, $p < .005$) were statistically significant predictors at the third step. With the addition of press, needs were no longer predictors. According to these results, those reporting positive perceptions of faculty quality and peer interactions, and a respectful environment reported greater academic satisfaction. This pattern of results suggests that 44% of the variability in academic satisfaction is predicted foremost by faculty quality press, with peer interaction and respectful environment contributing more modestly to that prediction.

University Commitment. Results of hierarchical regression predicting university commitment are presented in Table 13. The overall model at Step 1 was statistically significant, $R^2 = .02$, $F(2, 415) = 4.27$, $p < .05$. The Data-Ideas dimension ($\beta = .11$, $p < .025$) accounted for 2% of the variance in university commitment. According to these results, as data-related interests increase and ideas-related interests decrease, level of university commitment increases. The Things-People dimension did not predict university commitment at Step 1.

At Step 2, the overall model predicting University Commitment was statistically significant, $R^2 = .16$, $F(7, 410) = 11.39$, $p < .001$, as was the change in R^2 , $\Delta R^2 = .14$, $\Delta F(5, 410) = 13.97$, $p < .001$. Closeness ($\beta = .23$, $p < .001$), order ($\beta = .20$, $p < .001$), social power ($\beta = .17$, $p < .005$), and intellectual ($\beta = -.15$, $p < .007$) needs were statistically significant predictors at the second step. Achievement needs did not predict university commitment. These findings suggest that as closeness, order, and social power needs increase, and intellectual needs decrease, university commitment increases. With the addition of needs, however, the measure of data-ideas interests was not a significant predictor of University Commitment.

At Step 3, the overall model predicting University Commitment was statistically significant, $R^2 = .41$, $F(11, 406) = 26.18$, $p < .001$, as was the change in R^2 , $\Delta R^2 = .25$, $\Delta F(4, 406) = 43.75$, $p < .001$. Things-related interests ($\beta = .15$, $p < .005$), order needs ($\beta = .16$, $p < .001$), academic engagement press ($\beta = .39$, $p < .001$), and peer interaction press ($\beta = .23$, $p < .001$) were statistically significant predictors at the third step. Interestingly, with the addition of the press measures, the people-things interest measure contributed to the prediction of university commitment, despite not being a significant predictor at steps 1 or 2 of this

analysis. Order needs were statistically significant, but closeness, intellectual, and social power needs were no longer significant. According to these results, those reporting things-related interests, order needs, and positive perceptions of press for student engagement and peer interaction reported greater university commitment. This pattern of results suggests that 41% of the variability in university commitment is predicted foremost by perceptions of student engagement press, with things-related interests, order needs, and peer interaction contributing more modestly to that prediction.

Major Satisfaction. Results of hierarchical regression predicting major satisfaction are presented in Table 14. The overall model at Step 1 was statistically significant, $R^2 = .02$, $F(2, 413) = 4.62$, $p < .05$. The Data-Ideas dimension ($\beta = -.11$, $p < .025$) accounted for 2% of the variance in major satisfaction. According to these results, as idea-related interests increase and data-related interests decrease, level of major satisfaction increases. The Things-People dimension did not predict major satisfaction at Step 1.

At Step 2, the overall model predicting Major Satisfaction was statistically significant, $R^2 = .12$, $F(7, 408) = 8.26$, $p < .001$, as was the change in R^2 , $\Delta R^2 = .10$, $\Delta F(5, 408) = 9.52$, $p < .001$. Achievement ($\beta = .33$, $p < .001$) and intellectual ($\beta = -.24$, $p < .001$) needs were statistically significant predictors at the second step. These findings suggest that as achievement needs increase and intellectual needs decrease, major satisfaction increases. With the addition of needs, however, data-ideas interests were not a significant predictor of Major Satisfaction.

At Step 3, the overall model was statistically significant, $R^2 = .14$, $F(11, 404) = 6.41$, $p < .001$, as was the change in R^2 , $\Delta R^2 = .02$, $\Delta F(4, 404) = 2.90$, $p < .05$. Achievement needs ($\beta = .24$, $p < .001$) remained a significant predictor at the third step, however, none of the

individual press variables were statistically significant predictors. With the addition of press, intellectual needs no longer added to the prediction of major satisfaction. According to these results, those reporting achievement needs reported greater major satisfaction.

Career Decision-Making Self-Efficacy (CDMSE). Results of hierarchical regression predicting CDMSE are presented in Table 15. The overall model at Step 1 was not statistically significant, $R^2 = .01$, $F(2, 413) = 2.00$, $p > .05$. These results suggest that interests are not a statistically significant predictor of student's career decision-making self-efficacy.

At Step 2, the overall model predicting Major Satisfaction was statistically significant, $R^2 = .22$, $F(7, 408) = 16.81$, $p < .001$, as was the change in R^2 , $\Delta R^2 = .21$, $\Delta F(5, 408) = 22.53$, $p < .001$. Achievement need ($\beta = .40$, $p < .001$) was a significant predictor at the second step. These findings suggest that as achievement needs increase, career decision self-efficacy also increases.

At Step 3, the overall model predicting Major Satisfaction was statistically significant, $R^2 = .24$, $F(11, 404) = 11.59$, $p < .001$, however, the change in R^2 , $\Delta R^2 = .02$, $\Delta F(4, 404) = 2.13$, $p > .05$ was not statistically significant. Achievement need ($\beta = .34$, $p < .001$) remained a significant predictor at the third step, and the press variables did not significantly add to the prediction of career decision self-efficacy above and beyond that of needs. This pattern of results suggests that 24% of the variability in career decision-making self-efficacy is predicted by achievement need.

Life Satisfaction. Results of hierarchical regression predicting life satisfaction are presented in Table 16. The overall model at Step 1 was statistically significant, $R^2 = .02$, $F(2, 415) = 3.08$, $p < .05$, however, neither of the interest dimensions alone were a significant predictor of life satisfaction.

At Step 2, the overall model predicting Life Satisfaction was statistically significant, $R^2 = .12$, $F(7, 410) = 7.82$, $p < .001$, as was the change in R^2 , $\Delta R^2 = .10$, $\Delta F(5, 410) = 9.58$, $p < .001$. Closeness ($\beta = .18$, $p < .01$), intellectual ($\beta = -.18$, $p < .01$), and achievement ($\beta = .17$, $p < .01$) needs were statistically significant predictors at the second step. These findings suggest that as closeness and achievement needs increase, and intellectual needs decrease, life satisfaction increases.

At Step 3, the overall model predicting Life Satisfaction was statistically significant, $R^2 = .22$, $F(11, 406) = 10.09$, $p < .001$, as was the change in R^2 , $\Delta R^2 = .10$, $\Delta F(4, 406) = 12.53$, $p < .001$. Peer interaction ($\beta = .21$, $p < .05$) was a significant predictor at the third step. With the addition of press, measures of closeness and achievement needs were no longer statistically significant predictors of life satisfaction. According to these results, as press for peer interaction in the university environment increases, life satisfaction of college students increases.

Part III: Replication of Reliability and Validity Evidence

Analyses were repeated on a replication sample to investigate the robustness of the findings based on the development sample. Means, standard deviations, and reliabilities for the scales in the replication sample are reported in Table 17.

Reliability Estimates. Internal consistency reliability analysis was replicated on the second data set. For the AI-R scales, the results indicated internal consistency coefficient alphas of .84 for the Closeness scale, .78 for the Intellectual scale, .87 for the Social Power scale, .84 for the Achievement scale, and .82 for the Orderliness scale, indicating acceptable reliability. The average internal consistency of the AI-R scales based on the replication sample was $\alpha = 0.84$, compared to $\alpha = 0.86$ based on the development sample, demonstrating

replication across the two samples. For the CCI-R scales, results indicated internal consistency coefficient alphas of .89 for the Student Engagement scale, .86 for the Respectful Environment scale, .86 for the Peer Interaction scale, and .81 for the Faculty Quality scale, indicating acceptable reliability in this sample. The average internal consistency of the CCI-R scales based on the replication sample was $\alpha = .86$, similar to the average reliability of $\alpha = .85$ for scales based on the development sample, demonstrating replication across the two samples.

Intercorrelations. The correlation matrix based on the replication sample is presented in Table 18. The intercorrelations among the AI-R scales ranged from small to medium, with a mean correlation of $r = .21$. The lowest correlation was between Intellectual and Orderliness needs ($r = .03$), and the highest correlation was between Achievement and Intellectual needs ($r = .44$). The intercorrelations among the CCI-R scales ranged from small to large, with a mean correlation of $r = .43$. The lowest correlation was between Student Engagement and Respectful Environment ($r = .15$), and the highest correlation was between Student Engagement and Faculty Quality ($r = .66$).

Convergent Validity

Mean correlations between AI-R needs and RIASEC interests ranged from .09 for Orderliness to .27 for Intellectual, indicating small to medium effect sizes for the relationship between needs and interests. The mean correlation between Closeness and RIASEC interests was $r = .22$, ranging from -.34 with Realistic to .51 with Social. The mean correlation between Intellectual and RIASEC interests was $r = .27$, ranging from .10 with Enterprising to .41 with Realistic and Investigative. The mean correlation between Social Power and RIASEC interests was $r = .15$, ranging from .00 with Realistic and Investigative to .43 with

Enterprising. The mean correlation between Achievement and RIASEC interests was $r = .13$, ranging from .05 with Enterprising to .23 with Investigative. The mean correlation between Orderliness and RIASEC interests was $r = .09$, ranging from -.02 with Artistic to .20 with Social.

Mean correlations for between CCI-R and interests ranged from -.15 to .10, indicating small effect sizes for the relationship between interests and press. The mean correlation between Student Engagement and RIASEC interests was $r = .10$, ranging from .00 with Realistic to .25 with Social. The mean correlation between Respectful Environment and RIASEC interests was $r = -.15$, ranging from .08 with Social to -.34 with Realistic. The mean correlation between Peer Interaction and RIASEC interests was $r = .10$, ranging from -.15 with Realistic, .00 with Conventional, and .29 with Social. The mean correlation between Faculty Quality and RIASEC interests was $r = .10$, ranging from -.01 with Realistic, to .22 with Investigative and .23 with Social.

Correlations between the AI-R, CCI-R and personality trait measures were conducted on the replication sample (see Table 19). Mean correlations between the AI-R and a public domain version of the NEO-PI-R ranged from .05 with Intellectual needs and .28 with Achievement needs, indicating small to medium effect sizes for the relationship between needs and the Big Five. For Closeness, the smallest correlation was with neuroticism ($r = .07$), and the largest correlation was with agreeableness ($r = .36$). For Intellectual, the smallest correlation was with extraversion ($r = -.01$), and the largest correlation was with openness ($r = .32$). For Social Power, the smallest correlation was with neuroticism ($r = .04$), and the largest correlation was with extraversion ($r = .55$). For Achievement, the smallest correlation was with neuroticism ($r = -.23$), and the largest correlation was with

conscientiousness ($r = .43$). For Orderliness, the smallest correlation was with neuroticism ($r = .00$), and the largest correlation was with conscientiousness ($r = .48$).

Mean correlations between the CCI-R and a public domain version of the NEO-PI-R ranged from .10 with Student Engagement to .16 with Peer Interaction, indicating small effect sizes for the relationship between press and the Big Five. For Student Engagement, the smallest correlation was with openness ($r = -.02$), and the largest correlation was with conscientiousness ($r = .24$). For Respectful Environment, the smallest correlation was with extraversion ($r = .13$), and the largest correlation was with agreeableness ($r = .31$). For Peer Interaction, the smallest correlation was with openness ($r = .15$), and the largest correlation was with agreeableness ($r = .30$). For Faculty Quality, the smallest correlation was with neuroticism ($r = -.13$), and the largest correlation was with agreeableness ($r = .23$).

Mean correlations between the AI-R and a public domain version of the MPQ (IPIP MPQ) ranged from $-.02$ with Intellectual needs to $.14$ with Closeness needs, indicating small effect sizes for the overall relationship. However, there were large effects for correlations between specific needs and personality traits. For Closeness need, there were strong positive relationships with Friendliness ($r = .40$) and Imaginative ($r = .40$), and a negative relationship with Belligerence ($r = -.18$). For Intellectual need, there was a positive relationship with Imaginative ($r = .27$), and a negative relationship with Conservatism ($r = -.23$). For Social Power, there was a strong positive relationship with Power ($r = .54$), and a strong negative relationship with Risk Avoidance ($r = -.40$). For Achievement, there was a strong positive relationship with Achievement Seeking ($r = .49$), and negative relationships with Emotional Instability ($r = -.24$) and Risk Avoidance ($r = -.26$). For Orderliness, there were strong positive relationships with Planfulness ($r = .50$) and Achievement Seeking ($r = .38$).

Mean correlations between the CCI-R and a public domain version of the MPQ (IPIP MPQ) ranged from .06 with Respectful Environment to .12 with Peer Interaction, indicating small effect sizes for the overall relationship. However, there were large effects for correlations between specific personality traits and press. For Student Engagement, there were strong positive relationships with Joy ($r = .31$) and Achievement Seeking ($r = .31$), and a negative relationship with Distrust ($r = -.22$). For Respectful Environment, there was a strong positive relationship with Friendliness ($r = .36$), and strong negative relationships with Belligerence ($r = -.35$) and Distrust ($r = -.45$). For Peer Interaction, there was a strong positive relationship with Friendliness ($r = .47$), and a strong negative relationship with Distrust ($r = -.35$). For Faculty Quality, there was a strong positive relationship with Joy ($r = .31$), and a negative relationship with Distrust ($r = -.35$).

Group Differences

Multivariate analysis of variance (MANOVA) was conducted on the replication sample to test need and press differences by gender and among nine college major groups. Medicine and applied health majors were not included as a separate category in this analysis due to small sample size of those majors within the replication sample. Means and standard deviations for the AI-R and CCI-R by gender and college major are presented in Tables 20 and 21, respectively.

MANOVA results indicated significant main effects for gender, Wilks' $\Lambda = .81$, $F(9, 474) = 12.66$, $p < .001$, and college major, Wilks' $\Lambda = .68$, $F(72, 2891) = 2.65$, $p < .001$, but the interaction effect was not statistically significant, Wilks' $\Lambda = .86$, $F(72, 2891) = .86$, $p = .48$. Gender difference was a large effect (multivariate $\eta^2 = .19$), and a medium effect size was found for college major (multivariate $\eta^2 = .05$).

A Bonferroni adjustment was used to control for multiple tests ($.05/9 = p < .006$). Gender differences were statistically significant for two of the five needs with medium effect sizes: Closeness, $F(1, 482) = 52.66, p < .001$, partial $\eta^2 = .10$; and Intellectual, $F(1, 482) = 5.61, p < .001$, partial $\eta^2 = .04$. Women expressed higher Closeness needs than men, and men expressed higher Intellectual needs than women. Gender differences were statistically significant for one press scale with a small effect size: Respectful Environment, $F(1, 482) = 12.32, p < .001$, partial $\eta^2 = .03$, with women reporting higher ratings of respect than did men.

College major group differences were statistically significant for three of the five needs with medium effect sizes: Closeness, $F(8, 482) = 3.09, p < .005$, partial $\eta^2 = .05$; Intellectual, $F(8, 482) = 3.50, p < .001$, partial $\eta^2 = .06$; and Achievement, $F(8, 482) = 3.37, p < .001$, partial $\eta^2 = .05$. Business majors had lower closeness needs than participants in education and open option majors, and engineering majors had lower closeness needs than communications, education, arts, community services, social sciences, and open option majors. Engineering, science and math majors had higher intellectual needs than community services majors, and engineering majors had higher intellectual needs than communications majors. Engineering majors reported higher achievement needs than business and community services majors. Differences for the other needs and for press were not statistically significant.

Concurrent and Incremental Validity

Hierarchical multiple regressions were conducted to determine if the addition of needs and then press improved prediction of college student outcomes beyond that of

RIASEC interests. Multiple outcome measures were selected, including academic fit, academic satisfaction, university commitment, major satisfaction, life satisfaction, and basic need satisfaction. Correlation analysis between the outcome variables and AI-R and CCI-R are presented in Table 23.

Academic Fit. Results of hierarchical regression predicting academic fit are presented in Table 24. Consistent with results obtained with the development sample, for the replication sample the overall model at Step 1 was statistically significant, $R^2 = .02$, $F(2, 436) = 4.11$, $p < .05$. The Things-People dimension ($\beta = -.14$, $p < .001$) accounted for 2% of the variance in academic fit. According to these results, as people-related interests increase and things-related interests decrease, level of academic fit increases. The Data-Ideas dimension did not predict academic fit.

At Step 2, the overall model predicting academic fit was statistically significant, $R^2 = .17$, $F(7, 431) = 12.57$, $p < .001$, as was the change in R^2 , $\Delta R^2 = .15$, $\Delta F(5, 431) = 15.68$, $p < .001$. Consistent with results obtained with the development sample, Achievement ($\beta = .43$, $p < .001$) and intellectual needs ($\beta = -.17$, $p < .01$) were statistically significant predictors at step 2 with the replication sample. Interests were not statistically significant predictors with the addition of needs. These findings suggest that as achievement needs increase and intellectual needs decrease, academic fit increases.

At Step 3, the overall model was statistically significant, $R^2 = .33$, $F(11, 427) = 19.42$, $p < .001$, as was the change in R^2 , $\Delta R^2 = .16$, $\Delta F(4, 427) = 26.24$, $p < .001$. Consistent with results obtained with the development sample, Achievement need ($\beta = .28$, $p < .001$) was a significant predictor at the third step. Contrary to results in the development sample, student engagement press ($\beta = .22$, $p < .001$) was a statistically significant predictor at the third step,

instead of peer interaction and faculty quality. Intellectual needs were no longer a predictor in Step 3.

Academic Satisfaction. Results of hierarchical regression predicting academic satisfaction are presented in Table 25. Consistent with results obtained with the development sample, for the replication sample the overall model at Step 1 was statistically significant, $R^2 = .02$, $F(2, 439) = 3.59$, $p < .05$. The Things-People dimension ($\beta = -.13$, $p < .01$) accounted for 2% of the variance in academic satisfaction. According to these results, as people-related interests increase, level of academic satisfaction increases. The Data-Ideas dimension did not predict academic satisfaction.

At Step 2, the overall model was statistically significant, $R^2 = .15$, $F(7, 434) = 11.19$, $p < .001$, as was the change in R^2 , $\Delta R^2 = .13$, $\Delta F(5, 434) = 11.19$, $p < .001$. Consistent with results obtained with the development sample, Achievement ($\beta = .37$, $p < .001$) and intellectual ($\beta = -.20$, $p < .001$) needs were statistically significant predictors at the second step. With the addition of needs, interests were no longer predictors. These findings suggest that as achievement needs increase and intellectual needs decrease, the level of academic satisfaction reported by students increases.

At Step 3, the overall model was statistically significant, $R^2 = .37$, $F(11, 430) = 23.64$, $p < .001$, as was the change in R^2 , $\Delta R^2 = .22$, $\Delta F(4, 430) = 38.62$, $p < .001$. Achievement needs ($\beta = .18$, $p < .001$), faculty quality press ($\beta = .26$, $p < .001$), and student engagement press ($\beta = .18$, $p < .005$) were statistically significant predictors at the third step. According to these results, those reporting achievement needs and positive perceptions of press for student engagement and faculty quality reported greater academic satisfaction. This pattern of results suggests that 37% of the variability in academic satisfaction is predicted by

foremost by faculty quality press, with achievement needs and student engagement press contributing modestly to that prediction. This diverges from the results obtained in the development sample, which found respectful environment, peer interaction, and faculty quality press to be significant predictors in the third step.

University Commitment. Results of hierarchical regression predicting university commitment are presented in Table 26. Contrary to results obtained with the development sample, the overall model at Step 1 was not statistically significant, $R^2 = .01$, $F(2, 437) = 2.36$, $p > .05$.

At Step 2, the overall model was statistically significant, $R^2 = .09$, $F(7, 432) = 6.39$, $p < .001$, as was the change in R^2 , $\Delta R^2 = .08$, $\Delta F(5, 432) = 7.93$, $p < .001$. Achievement ($\beta = .21$, $p < .001$) and intellectual ($\beta = -.17$, $p < .01$) needs were statistically significant predictors at the second step. These findings suggest that as achievement needs increase, and intellectual needs decrease, university commitment increases. This contrasts with results from the development sample, which found that closeness, intellectual, social power, and orderliness needs predicted university commitment at the second step.

At Step 3, the overall model was statistically significant, $R^2 = .32$, $F(11, 428) = 18.28$, $p < .001$, as was the change in R^2 , $\Delta R^2 = .23$, $\Delta F(4, 428) = 35.40$, $p < .001$. Student engagement press ($\beta = .36$, $p < .001$) and peer interaction press ($\beta = .19$, $p < .01$) were statistically significant predictors at the third step. Needs were no longer predictors.

According to these results, those reporting positive perceptions of student engagement and peer interaction reported greater university commitment. This pattern of results suggests that 32% of the variability in university commitment is predicted foremost by perceptions of press for student engagement, with peer interaction contributing modestly to that prediction.

The press predictors are consistent with the results based on the development sample, however, things-related interests and orderliness need were also found to predict university commitment in the third step in Sample 1.

Major Satisfaction. Results of hierarchical regression predicting major satisfaction are presented in Table 27. Contrary to results obtained with the development sample, the overall model at Step 1 was not statistically significant, $R^2 = .00$, $F(2, 426) = .89$, $p > .05$.

At Step 2, the overall model was statistically significant, $R^2 = .11$, $F(7, 421) = 7.53$, $p < .001$, as was the change in R^2 , $\Delta R^2 = .11$, $\Delta F(5, 421) = 10.14$, $p < .001$. Consistent with results obtained with the development sample, Achievement ($\beta = .37$, $p < .001$) and intellectual ($\beta = -.17$, $p < .005$) needs were statistically significant predictors at the second step. These findings suggest that as achievement needs increase and intellectual needs decrease, major satisfaction increases.

At Step 3, the overall model was statistically significant, $R^2 = .14$, $F(11, 417) = 6.40$, $p < .001$, as was the change in R^2 , $\Delta R^2 = .03$, $\Delta F(4, 417) = 4.04$, $p < .01$. Consistent with results obtained with the development sample, achievement needs ($\beta = .30$, $p < .001$) remained a predictor, and intellectual need was no longer a significant predictor. Although the change in R^2 was statistically significant with the addition of the press variables, none of the press terms were statistically significant after correcting for multiple tests.

Life Satisfaction. Results of hierarchical regression predicting life satisfaction are presented in Table 28. Consistent with results obtained with the development sample, the overall model at Step 1 was statistically significant, $R^2 = .01$, $F(2, 439) = 3.28$, $p < .05$. However, neither of the interest dimensions was statistically significant after correcting for multiple tests.

At Step 2, the overall model was statistically significant, $R^2 = .10$, $F(7, 434) = 7.31$, $p < .001$, as was the change in R^2 , $\Delta R^2 = .09$, $\Delta F(5, 434) = 8.80$, $p < .001$. Achievement ($\beta = .31$, $p < .001$) need was a significant predictor at the second step. With the addition of needs, interests no longer predicted life satisfaction. These findings suggest that as achievement need increases, life satisfaction increases. Results based on the development sample also found closeness and intellectual needs to predict life satisfaction at the second step.

At Step 3, the overall model was statistically significant, $R^2 = .16$, $F(11, 430) = 7.47$, $p < .001$, as was the change in R^2 , $\Delta R^2 = .06$, $\Delta F(4, 430) = 7.05$, $p < .001$. Contrary to results based on the development sample, Achievement need ($\beta = .22$, $p < .001$) remained a significant predictor at the third step, compared to Peer Interaction that was a predictor in Sample 1. Although the change in R^2 was statistically significant with the addition of the press variables, none of the press terms were statistically significant after correcting for multiple tests.

Autonomy Basic Need Satisfaction. Results of hierarchical regression predicting autonomy need satisfaction are presented in Table 29. The overall model at Step 1 was statistically significant, $R^2 = .03$, $F(2, 438) = 7.12$, $p < .01$. The Things-People dimension ($\beta = -.17$, $p < .001$) accounted for the 3% variance in autonomy need satisfaction. According to these results, as people-related interests increase and things-related interests decrease, level of autonomy need satisfaction increases.

At Step 2, the overall model was statistically significant, $R^2 = .17$, $F(7, 433) = 12.87$, $p < .001$, as was the change in R^2 , $\Delta R^2 = .14$, $\Delta F(5, 433) = 14.72$, $p < .001$. Achievement ($\beta = .38$, $p < .001$) and intellectual ($\beta = -.23$, $p < .001$) needs were statistically significant predictors at the second step. With the addition of needs, interests were no longer a predictor

of autonomy need satisfaction. These findings suggest that as achievement needs increase and intellectual needs decrease, autonomy need satisfaction increases.

At Step 3, the overall model was statistically significant, $R^2 = .26$, $F(11, 429) = 13.50$, $p < .001$, as was the change in R^2 , $\Delta R^2 = .09$, $\Delta F(4, 429) = 12.26$, $p < .001$. Achievement needs ($\beta = .26$, $p < .001$) and respectful environment ($\beta = .22$, $p < .001$) were statistically significant predictors at the third step. With the addition of press, intellectual need was no longer a significant predictor. According to these results, those reporting higher achievement needs and perceptions of a respectful environment reported greater autonomy need satisfaction.

Competency Basic Need Satisfaction. Results of hierarchical regression predicting competency need satisfaction are presented in Table 30. The overall model at Step 1 was statistically significant, $R^2 = .02$, $F(2, 439) = 4.90$, $p < .01$. The Things-People dimension ($\beta = -.15$, $p < .025$) accounted for the 2% variance in competency need satisfaction. According to these results, as people-related interests increase and things-related interests decrease, level of competency need satisfaction increases.

At Step 2, the overall model was statistically significant, $R^2 = .21$, $F(7, 434) = 16.67$, $p < .001$, as was the change in R^2 , $\Delta R^2 = .19$, $\Delta F(5, 434) = 20.94$, $p < .001$. Achievement ($\beta = .45$, $p < .001$) and intellectual ($\beta = -.16$, $p < .005$) needs were statistically significant predictors at the second step. With the addition of needs, interests were no longer a predictor of competency need satisfaction. These findings suggest that achievement needs increase and intellectual needs decrease, competency need satisfaction increases.

At Step 3, the overall model was statistically significant, $R^2 = .30$, $F(11, 430) = 16.71$, $p < .001$, as was the change in R^2 , $\Delta R^2 = .09$, $\Delta F(4, 430) = 13.44$, $p < .001$. Achievement

needs ($\beta = .33, p < .001$), respectful environment ($\beta = .20, p < .001$), and student engagement press ($\beta = .18, p < .005$) were statistically significant predictors at the third step. With the addition of press, intellectual need was no longer a significant predictor. According to these results, those reporting higher achievement need and perceptions of press for student engagement and respectful environment reported greater competency need satisfaction.

Relatedness Basic Need Satisfaction. Results of hierarchical regression predicting relatedness need satisfaction are presented in Table 31. The overall model at Step 1 was statistically significant, $R^2 = .06, F(2, 437) = 14.39, p < .001$. The Things-People dimension ($\beta = -.25, p < .001$) accounted for 6% of the variance in relatedness need satisfaction. According to these results, as people-related interests increase and things-related interests decrease, level of relatedness need satisfaction increases.

At Step 2, the overall model was statistically significant, $R^2 = .28, F(7, 432) = 24.26, p < .001$, as was the change in $R^2, \Delta R^2 = .22, \Delta F(5, 432) = 26.53, p < .001$. Achievement ($\beta = .35, p < .001$), intellectual ($\beta = -.33, p < .01$), and closeness ($\beta = .31, p < .001$) needs were statistically significant predictors at the second step. With the addition of needs, interests were no longer a predictor of relatedness need satisfaction. These findings suggest that closeness and achievement needs increase and intellectual needs decrease, relatedness need satisfaction increases.

At Step 3, the overall model was statistically significant, $R^2 = .41, F(11, 428) = 27.07, p < .001$, as was the change in $R^2, \Delta R^2 = .13, \Delta F(4, 428) = 23.25, p < .001$. Closeness ($\beta = .20, p < .001$), intellectual ($\beta = -.20, p < .001$), and achievement needs ($\beta = .19, p < .001$), peer interaction ($\beta = .25, p < .001$) and respectful environment ($\beta = .19, p < .001$) were statistically significant predictors at the third step. According to these results, those reporting

higher closeness and achievement needs, lower intellectual needs, and perceptions of press for a respectful environment and peer interaction reported greater relatedness need satisfaction.

Table 3

Rotated Factor Loadings, Communalities (h^2), and Item Total Correlations for the AI-R

AI-R factor/item	I	II	III	IV	V	h^2	Item r
Factor I: Closeness							
1. Comforting someone who is feeling low.	.66	-.03	.01	.19	.00	.48	.62
2. Talking over personal problems with someone who is feeling unhappy.	.59	.11	.02	.14	-.01	.38	.57
3. Talking about how it feels to be in love.	.59	-.03	.20	.00	.13	.41	.62
4. Seeing love stories in the movies.	.59	-.17	.24	-.04	.12	.45	.57
5. Having people come to me with their problems.	.56	.08	.15	.12	.09	.36	.57
6. Reading stories that try to show what people really think and feel inside themselves.	.51	.19	.06	.08	.06	.31	.48
7. Letting loose and having a good cry sometimes.	.51	-.05	.15	-.16	.14	.33	.48
8. Holding something very soft and warm against my skin.	.48	-.05	.06	.21	-.03	.28	.47
9. Knowing an older person who likes to give me guidance and direction.	.47	-.01	.03	.34	.08	.34	.47
10. Listening to my friends talk about their love-life.	.47	.05	.14	-.11	.03	.25	.42
11. Trying to figure out why the people I know behave the way they do.	.45	.23	.04	.14	-.09	.29	.41
12. Belonging to a close family group that expects me to bring my problems to them.	.45	-.10	.11	.18	.14	.28	.49
13. Being romantic with someone I love.	.45	-.04	.10	.15	.03	.23	.45
14. Being with someone who always tries to be sympathetic and understanding.	.43	.01	.01	.19	.11	.23	.44
15. Being unrestrained and open about my feelings and emotions.	.43	.11	.20	.09	.03	.24	.44
16. Understanding myself better.	.41	-.02	.06	.38	.07	.32	.42
17. Providing companionship and personal care for a very old helpless person.	.40	.04	.02	-.01	.17	.19	.39
18. Taking care of someone who is ill.	.39	.14	-.02	-.03	.13	.19	.39
19. Listening to the rain fall on the roof, or the wind blow through the trees.	.38	.08	-.01	.33	-.05	.26	.35
20. Having others offer their opinions when I have to make a decision.	.36	-.13	.05	.27	.07	.23	.39
21. Playing an active part in community affairs.	.34	.11	.11	.09	.26	.21	.36
22. Crying at a funeral, wedding, graduation, or similar ceremony.	.33	.09	.26	-.22	.04	.23	.32

Note. The h^2 value is the communality of each item. Rotated factor loadings in boldface represent items that loaded on that particular factor or cross loaded on another factor.

Table 3, continued

AI-R factor/item	I	II	III	IV	V	h^2	Item r
Factor II: Intellectual							
23. Reading scientific theories about the origin of the earth and other planets.	-.15	.67	-.04	.14	-.06	.49	.63
24. Studying different types of government, such as American, English, Russian, and German.	.04	.62	.03	-.10	.09	.40	.56
25. Collecting data and attempting to arrive at general laws about the physical universe.	-.14	.62	.03	.10	.08	.42	.59
26. Finding out how different languages have developed, changed, and influenced one another.	.14	.59	.05	.00	.11	.39	.57
27. Reading articles which tell about new scientific developments, discoveries, or inventions.	-.18	.58	-.07	.23	.00	.42	.55
28. Learning about the causes of some of our social and political problems.	.27	.55	-.06	.06	.05	.39	.53
29. Studying wind conditions and changes in atmospheric pressure in order to better understand and predict the weather.	-.17	.53	.07	-.10	.07	.32	.46
30. Taking an active part in social and political reform.	.22	.52	.12	.01	.13	.35	.51
31. Doing experiments in physics, chemistry, or biology in order to test a theory.	-.17	.52	.01	.21	-.05	.35	.49
32. Reading editorials or feature articles on major social issues.	.26	.51	.02	.00	.06	.33	.49
33. Spending my time thinking about and discussing complex problems.	-.01	.48	.04	.30	.09	.33	.49
34. Comparing the problems and conditions of today with those of various times in the past.	.21	.47	.02	.09	.10	.28	.46
35. Imagining myself president of the United States.	-.05	.44	.22	-.10	.10	.27	.38
36. Losing myself in hard thought.	.12	.42	.08	.24	-.10	.27	.42
37. Thinking about the meaning of eternity.	.20	.38	.04	.18	-.02	.22	.35
38. Actively supporting a movement to correct a social injustice.	.33	.35	.05	.05	.10	.25	.37
39. Concentrating so hard on a work of art or music that I don't know what's going on around me.	.10	.32	.06	.00	-.06	.12	.28
40. Converting or changing the views of others.	-.05	.31	.24	.13	.06	.18	.30
41. Fixing light sockets, making curtains, painting things around the house.	-.16	.28	-.02	.11	.00	.11	.26
Factor III: Social Power							
42. Being the center of attention at a party.	.08	.04	.67	-.04	-.05	.46	.62
43. Doing things which will attract attention to me.	.04	.17	.64	.01	-.06	.44	.59

Table 3, continued

AI-R factor/item	I	II	III	IV	V	h^2	Item r
44. Wearing clothes that will attract a lot of attention.	.10	.09	.55	-.12	.03	.34	.49
45. Pretending I am a famous movie star.	.04	.23	.52	-.22	.08	.37	.47
46. Imagining how it would feel to be rich and famous.	.05	-.02	.51	-.01	.08	.27	.48
47. Going to parties where I'm expected to mix with the whole crowd.	.14	-.08	.50	.07	-.05	.28	.48
48. Leading an active social life.	.28	-.10	.49	.19	.00	.36	.52
49. Thinking about what I could do that would make me famous.	-.06	.32	.47	.02	.11	.34	.44
50. Persuading a group to do something my way.	.00	.14	.46	.18	.16	.29	.44
51. Influencing or controlling the actions of others.	-.06	.10	.46	.11	.18	.26	.42
52. Telling jokes or doing tricks to entertain others at a large gathering.	.14	.15	.44	.13	-.07	.26	.45
53. Flirting.	.24	-.15	.41	.13	-.10	.27	.42
54. Pausing to look at myself in a mirror each time I pass one.	.14	-.01	.41	.12	.11	.21	.37
55. Getting my friends to do what I want to do.	.01	.03	.41	.12	.11	.20	.39
56. Getting as much fun as I can out of life, even if it means sometimes neglecting more serious things.	.12	.04	.40	-.04	-.28	.26	.35
57. Managing a store or business enterprise.	.01	.00	.40	.06	.18	.20	.38
58. Giving up whatever I'm doing rather than miss a party or other opportunity for a good time.	.01	-.06	.39	-.15	-.28	.26	.30
59. Catching a reflection of myself in a mirror or window.	.13	.02	.38	-.01	-.05	.16	.36
60. Directing other people's work.	.10	.06	.37	.24	.26	.27	.39
61. Meeting a lot of people.	.33	-.12	.35	.25	.04	.31	.42
62. Speaking or acting spontaneously.	.26	.03	.34	.21	-.15	.25	.36
63. Having lots of time to take care of my hair, hands, face, clothing.	.34	-.06	.34	-.21	.19	.32	.33
64. Keeping in the background when I'm with a group of wild, fun-loving, noisy people. (-)	.08	-.27	.33	.22	-.13	.25	.32
65. Talking someone into doing something I think ought to be done.	.12	.04	.31	.29	.11	.21	.34
66. Trying to improve my community by persuading others to do certain things.	.16	.27	.30	.05	.24	.25	.35
67. Doing things on the spur of the moment.	.23	-.04	.29	.31	-.23	.28	.31
68. Imagining situations in which I am a great hero.	.08	.26	.28	.11	-.01	.17	.30
69. Being treasurer or business manager for a club or organization.	.02	.21	.28	.01	.31	.22	.28

Table 3, continued

AI-R factor/item	I	II	III	IV	V	h^2	Item r
Factor IV: Achievement							
70. Exerting myself to the utmost for something unusually important or enjoyable.	.17	.17	.09	.58	-.08	.40	.52
71. Doing something very difficult in order to prove I can do it.	.06	.20	.11	.57	.03	.38	.55
72. Picking out some hard task for myself and doing it.	.04	.28	.16	.56	.13	.43	.59
73. Giving all of my energy to whatever I happen to be doing.	.21	.09	.11	.54	.14	.37	.55
74. Quitting a project that seems too difficult for me. (-)	-.04	-.14	-.16	.53	.02	.33	.40
75. Setting higher standards for myself than anyone else would, and working hard to achieve them.	.10	.08	.12	.48	.37	.40	.52
76. Concentrating intently on a problem.	.22	.31	.03	.46	.09	.37	.51
77. Setting difficult goals for myself.	.14	.08	.08	.44	.23	.28	.50
78. Choosing difficult tasks in preference to easy ones.	.00	.32	.01	.42	.25	.34	.52
79. Returning to a task which I have previously failed.	.05	.20	.07	.42	.08	.23	.47
80. Engaging in mental activity.	.09	.39	-.03	.41	.01	.33	.45
81. Going ahead with something important even though I've just accidentally walked under a ladder, broken a mirror, etc.	.19	.03	.00	.37	-.01	.18	.31
82. Giving up on a problem rather than doing it in a way that may be wrong. (-)	.08	-.09	-.21	.35	.01	.18	.30
83. Being efficient and successful in practical affairs.	.25	.02	.04	.35	.15	.21	.33
84. Doing things that are fun but require lots of physical exertion.	.00	.19	.04	.35	-.04	.16	.34
85. Getting what is coming to me even if I have to fight for it.	.19	.09	.21	.33	.04	.20	.36
86. Avoiding something at which I have once failed. (-)	-.07	-.04	-.21	.29	.01	.13	.25
87. Working out solutions to complicated problems, even though the answers may have no apparent, immediate usefulness.	-.02	.27	.02	.28	.13	.17	.33
88. Listening to a successful people talk about their experiences.	.23	.20	.16	.27	.13	.21	.33
Factor V: Orderliness							
89. Keeping my room in perfect order.	.16	.07	.10	.02	.65	.46	.68
90. Making my bed and putting things away every day before I leave the house.	.15	.13	.04	-.06	.60	.40	.61
91. Keeping to a regular schedule, even if this sometimes means working when I don't really feel like it.	.08	-.02	-.03	.21	.59	.41	.56
92. Having a special place for everything and seeing that each thing is in its place.	.18	.08	.16	.07	.56	.38	.59

Table 3, continued

AI-R factor/item	I	II	III	IV	V	h^2	Item r
93. Arranging my clothes neatly before going to bed.	.14	.12	.13	-.13	.54	.37	.56
94. Organizing my work in order to use time efficiently.	.28	-.09	.04	.24	.54	.43	.54
95. Leading a well-ordered life with regular hours and an established routine.	.15	.05	.00	.13	.51	.30	.50
96. Keeping a calendar or notebook of the things I have done or plan to do.	.33	-.08	.12	.01	.42	.31	.45
97. Finishing some work even though it means missing a party or dance.	-.01	.20	-.19	.17	.41	.28	.33
98. Scheduling time for work and play during the day.	.30	-.17	.08	.26	.39	.34	.42
99. Putting off something I don't feel like doing, even though I know it has to be done. (-)	-.01	-.05	-.03	.13	.38	.17	.35
100. Doing something serious with my leisure time instead of just playing around with the crowd. (-)	.02	.36	.00	.10	.37	.28	.36
101. Limiting my pleasures so that I can spend all of my time usefully.	-.04	.17	.00	-.04	.36	.16	.29
102. Dressing carefully, being sure that the colors match and the various details are exactly right.	.23	-.02	.34	-.11	.36	.31	.33
103. Doing things according to my mood, without following any plan. (-)	-.20	-.05	-.26	-.12	.35	.25	.20
104. Avoiding any kind of routine or regularity. (-)	.10	-.36	-.24	.13	.30	.30	.26

Table 4

Rotated Factor Loadings, Communalities (h^2), and Item Total Correlations for the CCI-R

CCI-R factor/item	I	II	III	IV	h^2	Item r
Factor I: Student Engagement						
1. Many students here develop a strong sense of responsibility about their role in contemporary social and political life.	.57	-.04	.07	.01	.33	.50
2. Students set high standards of achievement for themselves.	.51	.13	.09	.15	.30	.49
3. People here thrive on difficulty - the tougher things get, the harder everyone works.	.49	-.02	.02	.09	.25	.46
4. There is a lot of emphasis on preparing for graduate work.	.48	.00	.11	.05	.25	.46
5. Students are conscientious about taking good care of school property.	.47	.03	.00	.25	.29	.47
6. When students do not like an administrative decision, they work to get it changed.	.46	.08	.17	.15	.27	.49
7. Most students take an active part in social reforms and political parties.	.46	-.06	.05	.08	.22	.43
8. Students here learn that they are not only expected to develop ideals but also to express them in action.	.46	.02	.27	.11	.30	.50
9. Class discussions are typically vigorous and intense.	.46	-.12	-.08	.09	.24	.40
10. There is considerable interest in the analysis of value systems and the relativity of societies and ethics.	.45	-.06	.16	.14	.25	.46
11. Students are very serious and purposeful about their work.	.44	.17	.20	.23	.31	.50
12. There is a recognized group of student leaders on this campus.	.41	-.04	.19	.05	.21	.41
13. There are a number of prominent professors who play a significant role in national or local politics.	.41	.02	.12	.17	.21	.43
14. Poise and sophistication are highly respected by both students and faculty.	.41	.07	.23	.20	.26	.47
15. Many upper-level students play an active role in helping new students adjust to campus life.	.41	.00	.05	.17	.20	.42
16. Students put a lot of energy into everything they do, in class and out.	.40	.08	-.02	.15	.19	.38
17. Public debates are held frequently.	.40	-.12	.05	.00	.17	.36
18. There is a lot of interest here in poetry, music, painting, sculpture, architecture.	.40	.01	.10	.08	.18	.39
19. Students here are encouraged to be independent and individualistic.	.40	.13	.31	.22	.32	.48

Note. The h^2 value is the communality of each item; Rotated factor loadings in boldface represent items that loaded on that factor.

Table 4, continued

CCI-R factor/item	I	II	III	IV	h^2	Item r
20. Many students here expect to achieve future recognition.	.39	-.08	.15	.17	.21	.42
21. The values most stressed here are open-mindedness and objectivity.	.38	-.02	.19	.18	.21	.42
22. Concerts and art exhibits always draw big crowds of students.	.38	.04	.06	.08	.15	.35
23. Students are encouraged to criticize administrative policies and teaching practices.	.38	-.20	-.02	.14	.19	.34
24. Most students follow a regular plan for studying and recreation.	.37	.01	.16	-.02	.16	.35
25. The faculty encourage students to think about exciting and unusual careers.	.37	.13	.21	.25	.26	.45
26. Most courses require intensive study and preparation out of class.	.36	.08	.19	.14	.20	.41
27. The school helps everyone get acquainted.	.36	.07	.21	.20	.21	.43
28. Students are frequently reminded to take preventative measures against illness.	.36	-.08	-.03	.09	.15	.32
29. The college regards training people for service to the community as one of its major responsibilities.	.36	.05	.17	.13	.18	.41
30. Students really support fund drives such as the March of Dimes, United Way, Red Cross, etc.	.35	.11	.29	.00	.21	.37
31. Long, serious discussions are common among the students.	.35	.02	.26	.12	.21	.40
32. This school is outstanding for the emphasis and support it gives to pure scholarship and basic research.	.33	.04	.28	.29	.27	.44
33. Most courses are a real intellectual challenge.	.32	.04	.19	.16	.17	.37
34. It is easy to obtain student speakers for clubs or meetings.	.30	-.01	.14	.04	.11	.31
Factor II: Respectful Environment						
35. The faculty tend to be suspicious of student's motives and often make the worst interpretation of even trivial incidents. (-)	-.01	.59	.13	.22	.41	.58
36. People who are concerned with developing their own personal and private systems of values are likely to be regarded as odd. (-)	.04	.59	.12	.09	.36	.56
37. Students usually make fun of faculty or the school. (-)	.13	.57	.11	.13	.37	.54
38. The campus and buildings always look a little unkept. (-)	-.11	.52	.21	.21	.37	.51
39. If students want help they usually have to answer embarrassing questions. (-)	-.09	.52	.05	.17	.31	.50
40. Very few things here arouse much excitement or feelings. (-)	.12	.48	.31	.04	.35	.49
41. The college administration has little tolerance for student complaints and protests. (-)	-.10	.47	.06	.12	.25	.46

Table 4, continued

CCI-R factor/item	I	II	III	IV	h^2	Item r
42. Students don't argue with the teacher; they just admit that they are wrong. (-)	-.11	.47	.24	.13	.30	.47
43. There is little sympathy here for ambitious daydreams about the future. (-)	.01	.47	.13	.08	.24	.46
44. Students who are not properly groomed are likely to have this called to their attention. (-)	-.20	.46	.05	.03	.25	.42
45. Everyone here has pretty much the same attitudes, opinions, and beliefs. (-)	-.06	.46	.24	-.09	.28	.45
46. There are practically no students actively involved in campus or community reforms. (-)	.08	.46	.25	.01	.28	.46
47. Few students here would ever work or play to the point of exhaustion. (-)	-.06	.43	.27	-.01	.26	.43
48. Many students seem to expect other people to adapt to them rather than trying to adapt themselves to others. (-)	.07	.43	-.15	.09	.22	.38
49. Students pay little attention to rules and regulations. (-)	.20	.43	-.08	.18	.27	.39
50. Faculty members are impatient with students who interrupt their work. (-)	-.04	.42	-.04	.17	.21	.39
51. People here are always trying to win an argument. (-)	-.03	.40	-.18	.04	.19	.34
52. Students here spend a lot of time talking about their boyfriends or girlfriends. (-)	-.04	.39	-.20	.03	.20	.32
53. Most students dress and act pretty much alike. (-)	.24	.38	.10	-.17	.24	.35
54. Anyone who knows the right faculty or administration can get a better break here. (-)	-.01	.38	-.05	.03	.15	.35
55. There is very little studying here over the weekends. (-)	.16	.38	-.02	.07	.17	.35
56. The college has invested very little in drama and dance. (-)	.13	.37	.03	.08	.16	.37
57. If a student fails a course he can usually substitute another one for it rather than take it over. (-)	-.13	.37	.12	-.14	.18	.33
58. Students tend to hide their deeper feelings from each other. (-)	.10	.36	-.01	.12	.15	.34
59. It is fairly easy to pass most courses without working very hard. (-)	.10	.35	.12	-.16	.17	.32
60. The student leaders here really have lots of special privileges. (-)	-.17	.35	-.11	.05	.16	.31
61. To most students here art is something to be studied rather than felt. (-)	.00	.34	.05	-.05	.12	.32
62. The student newspaper rarely carries articles intended to stimulate discussion of philosophical or ethical matters. (-)	-.01	.34	.24	-.06	.18	.34
Factor III: Peer Interaction						
63. There are a lot of parties, events, and other social activities.	.01	.07	.57	.10	.33	.51

Table 4, continued

CCI-R factor/item	I	II	III	IV	h^2	Item r
64. Students spend a lot of time together at coffee shops, bars, and in one another's rooms.	.03	-.02	.54	.07	.30	.47
65. There are many opportunities for students to get together in extracurricular activities.	.16	.28	.50	.19	.39	.54
66. There are frequent informal social gatherings.	.01	.08	.48	.12	.25	.43
67. It's easy to get a group together for games, going to movies, etc.	.23	.12	.47	.08	.30	.51
68. There are several popular spots where a crowd of men and women can always be found.	.09	-.01	.40	.11	.18	.36
69. There are so many things to do here that students are busy all the time.	.23	.11	.39	.05	.22	.43
70. The future goals for most students emphasize job security, family happiness and good citizenship.	.31	.12	.37	.20	.28	.46
71. There are many facilities and opportunities for individual creative activity.	.20	.06	.36	.23	.23	.40
72. Students commonly share problems.	.16	.11	.36	.09	.17	.38
73. There are many students from widely different geographic regions.	.17	.13	.35	.06	.17	.34
74. Many religious and social organizations are especially interested in charities and community service.	.12	.05	.35	.09	.15	.35
75. The history and traditions of the college are strongly emphasized.	.20	.04	.34	.08	.16	.32
76. Student parties are colorful and lively here.	.20	.06	.34	.05	.16	.37
77. Many informal student activities are unplanned and spontaneous.	.05	-.02	.34	.08	.13	.35
78. New fads and phrases are continually springing up among the students.	.18	-.12	.33	.05	.16	.30
79. The academic atmosphere is practical, emphasizing efficiency and usefulness.	.20	.12	.33	.26	.23	.40
80. This school has a reputation for being very friendly.	.27	.13	.30	.19	.21	.39
Factor IV: Faculty Quality						
81. Faculty members put a lot of energy and enthusiasm into their teaching.	.28	.05	.24	.53	.42	.56
82. Most of the professors are very thorough teachers and really probe into the fundamentals of their subjects.	.29	.02	.10	.52	.36	.54
83. Instructors clearly explain the goals and purposes of their courses.	.23	.16	.22	.50	.37	.53
84. The professors really talk with the students, not just at them.	.20	.11	-.03	.47	.27	.43
85. Assignments are usually clear and specific, making it easy for students to plan their studies effectively.	.18	.06	.18	.47	.29	.45

Table 4, continued

CCI-R factor/item	I	II	III	IV	h^2	Item r
86. The professors go out of their way to help you.	.20	.15	-.08	.45	.27	.43
87. Most classes are very well organized and progress systematically from week to week.	.14	.09	.23	.42	.25	.43
88. Classrooms are kept very clean and tidy.	.04	.15	.19	.41	.23	.38
89. Course offerings and faculty in the social sciences are outstanding.	.15	.03	.28	.40	.27	.45
90. Courses, examinations, and readings are frequently revised by professors.	.20	-.01	.13	.34	.18	.36
91. Course offerings and faculty in the natural sciences are outstanding.	.20	.11	.05	.34	.17	.37
92. In class discussions, papers, and exams, the main emphasis is on breadth of understanding, preparation, and critical judgment.	.11	.06	.16	.34	.16	.35
93. Many of the natural science professors are actively engaged in research.	.19	.07	.17	.33	.18	.41
94. Laboratory facilities in the natural sciences are excellent.	.22	.07	.02	.30	.14	.34
95. Many of the social science professors are actively engaged in research.	.14	.05	.19	.29	.14	.35

Table 5

Summary of Stern (1970) Items Not Included in Revised Factor Measures

Scale Name	Number of Items not Included	
	Activities	College Characteristics
Abasement-Assurance (ABA)	5	0
Achievement (ACH)	0	1
Adaptability-Defensiveness (ADA)	5	5
Affiliation (AFF)	2	1
Aggression-Blame Avoidance (AGG)	4	2
Change-Sameness (CHA)	3	0
Conjunctivity-Disjunctivity (CNJ)	0	1
Counteraction (CTR)	1	2
Deference-Restiveness (DFR)	4	4
Dominance-Tolerance (DOM)	0	1
Ego Achievement (EA)	0	1
Emotionality-Placidity (EMO)	2	2
Energy-Passivity (ENY)	2	0
Exhibitionism-Inferiority Avoidance (EXH)	0	2
Fantasied Achievement (FA)	0	1
Harm Avoidance-Risktaking (HAR)	5	4
Humanities, Social Science (HUM)	0	3
Impulsiveness-Deliberation (IMP)	3	2
Narcissism (NAR)	1	3
Nurturance (NUR)	0	0
Objectivity-Projectivity (OBJ)	4	3
Order-Disorder (ORD)	0	3
Play-Work (PLY)	0	1
Practicalness-Impracticalness (PRA)	1	4
Reflectiveness (REF)	0	0
Science (SCI)	0	2
Sensuality-Puritanism (SEN)	3	1
Sexuality-Prudishness (SEX)	0	3
Supplication-Autonomy (SUP)	1	2
Understanding (UND)	0	1

Table 6

Means, Standard Deviations, and Reliabilities for Scales in the Development Sample

	<i>n</i>	<i>M</i>	<i>SD</i>	<i>α</i>		<i>n</i>	<i>M</i>	<i>SD</i>	<i>α</i>
AI-R					Outcome Variables				
Closeness	504	3.63	.47	.88	Academic Fit	419	3.79	.47	.69
Intellectual	504	2.96	.54	.86	Academic Satisfaction	419	3.91	.47	.74
Social Power	504	3.30	.43	.87	University Commitment	418	3.52	.54	.82
Achievement	504	3.60	.42	.84	Major Satisfaction	416	3.72	.86	.92
Orderliness	504	3.19	.51	.83	CDMSE	416	3.53	.58	.94
CCI-R					Life Satisfaction	418	3.58	.63	.78
Student Engagement	504	3.38	.38	.89					
Respectful Climate	504	3.24	.42	.87					
Peer Interaction	504	3.84	.37	.82					
Faculty Interaction	504	3.57	.40	.81					
Interests									
Realistic	419	1.99	.81	.93					
Investigative	419	2.79	1.00	.92					
Artistic	419	2.80	.91	.87					
Social	419	3.37	.77	.85					
Enterprising	419	2.84	.80	.86					
Conventional	419	2.41	.85	.92					
Things-People	419	-3.18	3.09	--					
Data-Ideas	419	-.60	3.24	--					

Note. Scale reliabilities reported are Cronbach's alpha (α); CDMSE = Career decision-making self-efficacy

Table 7

Correlation Matrix for Development Sample

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
<u>AI-R Needs</u>																	
1. Closeness	--																
2. Intellectual	.15	--															
3. Social Power	.40	.20	--														
4. Achievement	.36	.40	.22	--													
5. Orderliness	.32	.16	.15	.27	--												
<u>CCI-R Press</u>																	
6. Engagement	.39	.10	.32	.24	.21	--											
7. Respectful Env.	.14	-.23	-.11	.23	-.01	.11	--										
8. Peer Interaction	.42	-.04	.27	.35	.15	.55	.28	--									
9. Faculty Quality	.34	.11	.12	.34	.18	.59	.26	.49	--								
<u>Interests</u>																	
10. Realistic	-.30	.36	-.05	.00	-.04	-.04	-.32	-.21	-.05	--							
11. Investigative	.03	.41	-.03	.21	-.02	.06	.05	.01	.07	.31	--						
12. Artistic	.19	.24	.20	.05	-.08	.05	-.07	.00	.04	.23	.28	--					
13. Social	.59	.11	.23	.23	.25	.27	.14	.29	.27	-.06	.18	.29	--				
14. Enterprising	.17	.08	.42	.00	.17	.18	-.17	.11	.00	.26	.00	.32	.34	--			
15. Conventional	-.10	.20	.09	-.01	.10	.04	-.22	-.05	-.02	.50	.16	.10	.14	.58	--		
16. Things-People	-.57	.23	-.30	-.07	-.15	-.19	-.22	-.29	-.15	.66	.36	-.29	-.61	-.23	.34	--	
17. Data-Ideas	-.08	-.21	.14	-.14	.16	.04	-.16	.02	-.07	.06	-.59	-.45	-.03	.53	.57	.00	--

Note. $r > .15$ significant at $p < .001$; Variables 1 – 9: $n = 504$; Variables 10-17 $n = 419$;

Env. = Environment; Things-People = Things-People Dimension, positive correlations indicate a positive relationship with Things-related interests and negative correlations indicate a positive relationship with People-related interests; Data-Ideas = Data-Ideas Dimension, positive correlations indicate a positive relationship with Data-related interests and negative correlations indicate a positive relationship with Ideas-related interests

Table 8

Means and Standard Deviations by Gender and College Major Group in Development Sample for AI-R Needs

	<i>n</i>	Closeness		Intellectual		Social Power		Achievement		Order	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Gender											
Men	215	3.41	.44	3.11*	.51	3.25	.44	3.62	.42	3.07	.47
Women	287	3.81*	.41	2.84	.53	3.33	.43	3.58	.42	3.27*	.52
College Major											
Business	61	3.50	.39	2.87	.53	3.37	.38	3.49 ^a	.38	3.20	.33
Science & Math	44	3.62	.46	3.07	.55	3.18	.50	3.62	.42	3.06	.54
Communications	44	3.82	.42	2.75	.49	3.50	.38	3.51	.38	3.13	.56
Engineering	111	3.44	.52	3.13	.53	3.20	.43	3.72 ^a	.43	3.12	.54
Education	31	3.75	.38	2.85	.57	3.31	.41	3.60	.41	3.37	.43
Art	52	3.65	.45	2.93	.50	3.36	.42	3.50	.46	3.24	.53
Comm. Services	42	3.77	.37	2.66	.49	3.30	.39	3.52	.32	3.38	.55
Med. & Health	19	3.88	.46	2.95	.53	3.37	.45	3.77	.43	3.34	.55
Social Sciences	63	3.74	.45	3.10	.51	3.22	.43	3.64	.44	3.18	.53
Open Option	35	3.71	.47	2.89	.56	3.36	.47	3.54	.34	3.07	.42

Note. Engineering = Engineering & Technology; Comm. = Community; Med. = Medicine; Superscript indicates significant differences between college major groups after Bonferroni correction at $p < .005$.

* $p < .001$

Table 9

Means and Standard Deviations by Gender and College Major Group in Development Sample for CCI-R Press

	<i>n</i>	Student Engagement		Respectful Environment		Peer Interaction		Faculty Quality	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Gender									
Men	217	3.32	.37	3.16	.41	3.76	.37	3.54	.39
Women	287	3.42	.38	3.30*	.40	3.91*	.36	3.60	.40
College Major									
Business	61	3.42	.33	3.18	.39	3.81	.35	3.58	.37
Science & Math	44	3.31	.35	3.35	.32	3.79	.43	3.55	.36
Communications	44	3.46	.35	3.35	.47	3.97	.34	3.63	.35
Engineering	111	3.31	.43	3.24	.43	3.80	.40	3.52	.48
Education	31	3.44	.37	3.10	.53	3.98	.32	3.56	.41
Arts	52	3.37	.37	3.10	.36	3.77	.35	3.54	.33
Comm. Services	42	3.42	.38	3.35	.31	3.95	.36	3.60	.44
Med. & Health	19	3.51	.40	3.30	.40	4.02	.34	3.66	.36
Social Sciences	63	3.36	.36	3.22	.34	3.80	.32	3.65	.36
Open Option	35	3.34	.39	3.33	.47	3.78	.38	3.48	.36

Note. Engineering = Engineering & Technology; Comm. = Community; Med. = Medicine.

* $p < .001$

Table 10

Correlations with Outcome Variables for Development Sample

	Academic Fit <i>n</i> = 419	Academic Satisfaction <i>n</i> = 419	University Commitment <i>n</i> = 418	Major Satisfaction <i>n</i> = 416	CDMSE <i>n</i> = 416	Life Satisfaction <i>n</i> = 418
Academic Fit	--					
Academic Satisfaction	.64*	--				
University Commitment	.38*	.53*	--			
Major Satisfaction	.67*	.37*	.13*	--		
CDSE	.41*	.41*	.24*	.42*	--	
Life Satisfaction	.40*	.39*	.45*	.32*	.30*	--
<u>AI-R Needs</u>						
Closeness	.24*	.29*	.27*	.08	.25*	.24*
Intellectual	-.03	-.02	.02	-.09	.18*	-.02
Social Power	.07	.16	.24*	-.01	.22*	.16
Achievement	.35*	.34*	.18*	.25*	.45*	.21*
Orderliness	.18*	.20*	.28*	.09	.20*	.21*
<u>CCI-R Press</u>						
Student Engagement	.34*	.43*	.58*	.08	.19*	.36*
Respectful Environment	.26*	.31*	.14	.23*	.11	.07
Peer Interaction	.42*	.51*	.49*	.21*	.30*	.38*
Faculty Quality	.46*	.57*	.38*	.18*	.21*	.30*
<u>Interests</u>						
Realistic	-.12	-.17	-.01	-.08	.00	-.01
Investigative	.03	.03	.04	.00	.11	.01
Artistic	.04	-.03	-.05	.00	.07	-.07
Social	.23*	.21*	.20*	.08	.21*	.18*
Enterprising	-.03	.00	.16	-.11	.12	.10
Conventional	-.09	-.03	.09	-.15	.09	.01
Things-People Dimension	-.20*	-.18*	-.09	-.09	-.10	-.10
Data-Ideas Dimension	-.08	-.01	.11	-.11	-.01	.07

Note. CDMSE = Career Decision-Making Self-Efficacy; Things-People = Things-People Dimension, positive correlations indicate a positive relationship with Things-related interests and negative correlations indicate a positive relationship with People-related interests; Data-Ideas = Data-Ideas Dimension, positive correlations indicate a positive relationship with Data-related interests and negative correlations indicate a positive relationship with Ideas-related interests

* $p < .001$

Table 11

Results of Hierarchical Linear Regression Predicting Academic Fit (Development Sample)

	β	t	R^2	df	F	ΔR^2	ΔF
<i>Step 1</i>			.04	2, 416	10.03**		
Things-People	-.20	-4.16**					
Data-Ideas	-.08	-1.64					
<i>Step 2</i>			.19	7, 411	13.99**	.15	14.90**
Things-People	-.09	-1.54					
Data-Ideas	-.08	-1.62					
Closeness	.05	.80					
Intellectual	-.20	-3.59**					
Social Power	-.02	-.47					
Achievement	.37	7.17**					
Orderliness	.11	2.19					
<i>Step 3</i>			.33	11, 407	18.52**	.14	21.56**
Things-People	-.09	-1.64					
Data-Ideas	-.06	-1.32					
Closeness	-.08	-1.34					
Intellectual	-.10	-1.84					
Social Power	-.04	-.87					
Achievement	.22	4.21**					
Orderliness	.09	1.95					
Student Engagement	.02	.43					
Respectful Environment	.06	1.22					
Peer Interaction	.19	3.50*					
Faculty Quality	.28	5.40**					

* $p < .005$, ** $p < .001$

Table 12

Results of Hierarchical Linear Regression Predicting Academic Satisfaction (Development Sample)

	β	t	R^2	df	F	ΔR^2	ΔF
<i>Step 1</i>			.03	2, 416	7.28*		
Things-People	-.18	-3.81**					
Data-Ideas	-.01	-.23					
<i>Step 2</i>			.19	7, 411	13.97**	.16	16.12**
Things-People	.01	.15					
Data-Ideas	-.02	-.50					
Closeness	.15	2.42					
Intellectual	-.22	-3.95**					
Social Power	.07	1.37					
Achievement	.33	6.39**					
Orderliness	.10	1.97					
<i>Step 3</i>			.44	11, 407	29.32**	.25	45.58**
Things-People	.02	.37					
Data-Ideas	.01	.32					
Closeness	-.02	-.35					
Intellectual	-.07	-1.33					
Social Power	.06	1.36					
Achievement	.11	2.39					
Orderliness	.07	1.80					
Student Engagement	.02	.45					
Respectful Environment	.15	3.37*					
Peer Interaction	.23	4.65**					
Faculty Quality	.38	7.78**					

* $p < .005$, ** $p < .001$

Table 13

Results of Hierarchical Linear Regression Predicting University Commitment (Development Sample)

	β	t	R^2	df	F	ΔR^2	ΔF
<i>Step 1</i>			.02	2, 415	4.27*		
Things-People	-.09	-1.88					
Data-Ideas	.11	2.24*					
<i>Step 2</i>			.16	7, 410	11.39***	.14	13.97***
Things-People	.16	2.68					
Data-Ideas	.05	1.03					
Closeness	.23	3.70***					
Intellectual	-.15	-2.74**					
Social Power	.17	3.28**					
Achievement	.09	1.66					
Orderliness	.20	3.93***					
<i>Step 3</i>			.41	11, 406	26.18***	.25	43.75***
Things-People	.15	2.92**					
Data-Ideas	.06	1.30					
Closeness	.05	.93					
Intellectual	-.05	-.91					
Social Power	.07	1.56					
Achievement	-.05	-.97					
Orderliness	.16	3.66***					
Student Engagement	.39	7.31***					
Respectful Environment	.06	1.42					
Peer Interaction	.23	4.54***					
Faculty Quality	.03	.51					

* $p < .025$, ** $p < .005$, *** $p < .001$

Table 14

Results of Hierarchical Linear Regression Predicting Major Satisfaction (Development Sample)

	β	t	R^2	df	F	ΔR^2	ΔF
<i>Step 1</i>			.02	2, 413	4.62*		
Things-People	-.09	-1.93					
Data-Ideas	-.11	-2.34*					
<i>Step 2</i>			.12	7, 408	8.26***	.10	9.52***
Things-People	-.05	-.72					
Data-Ideas	-.14	-2.67					
Closeness	-.07	-1.00					
Intellectual	-.24	-4.22***					
Social Power	-.01	-.18					
Achievement	.33	6.01***					
Orderliness	.08	1.52					
<i>Step 3</i>			.14	11, 404	6.41***	.02	2.90*
Things-People	-.03	-.54					
Data-Ideas	-.12	-2.28					
Closeness	-.11	-1.63					
Intellectual	-.17	-2.75					
Social Power	.01	.09					
Achievement	.24	4.10***					
Orderliness	.08	1.59					
Student Engagement	-.08	-1.28					
Respectful Environment	.09	1.67					
Peer Interaction	.12	1.95					
Faculty Quality	.10	1.63					

* $p < .025$, ** $p < .005$, *** $p < .001$

Table 15

Results of Hierarchical Linear Regression Predicting Career Decision-Making Self-Efficacy (Development Sample)

	β	t	R^2	df	F	ΔR^2	ΔF
<i>Step 1</i>			.01	2, 413	2.00		
Things-People	-.10	-2.00					
Data-Ideas	-.01	-.10					
<i>Step 2</i>			.22	7, 408	16.81*	.21	22.53*
Things-People	.00	.07					
Data-Ideas	.03	.64					
Closeness	.07	1.08					
Intellectual	-.02	-.35					
Social Power	.10	1.97					
Achievement	.40	7.82*					
Orderliness	.05	.99					
<i>Step 3</i>			.24	11, 404	11.59*	.02	2.13
Things-People	.01	.18					
Data-Ideas	.04	.76					
Closeness	.02	.38					
Intellectual	.03	.57					
Social Power	.09	1.76					
Achievement	.34	6.00*					
Orderliness	.05	1.03					
Student Engagement	-.04	-.72					
Respectful Environment	.03	.62					
Peer Interaction	.15	2.51					
Faculty Quality	.03	.57					

* $p < .001$

Table 16

Results of Hierarchical Linear Regression Predicting Life Satisfaction (Development Sample)

	β	t	R^2	df	F	ΔR^2	ΔF
<i>Step 1</i>			.02	2, 415	3.08*		
Things-People	-.10	-2.04					
Data-Ideas	.07	1.42					
<i>Step 2</i>			.12	7, 410	7.82***	.10	9.58***
Things-People	.11	1.74					
Data-Ideas	.03	.63					
Closeness	.18	2.84**					
Intellectual	-.18	-3.16**					
Social Power	.10	1.91					
Achievement	.17	3.04**					
Orderliness	.14	2.63					
<i>Step 3</i>			.22	11, 406	10.09***	.10	12.53***
Things-People	.10	1.62					
Data-Ideas	.02	.47					
Closeness	.07	1.11					
Intellectual	-.14	-2.26					
Social Power	.04	.69					
Achievement	.08	1.47					
Orderliness	.11	2.27					
Student Engagement	.15	2.46					
Respectful Environment	-.05	-.98					
Peer Interaction	.21	3.51**					
Faculty Quality	.08	1.44					

* $p < .05$, ** $p < .005$, *** $p < .001$

Table 17

Means, Standard Deviations, and Reliabilities for Scales in the Replication Data Set

	<i>n</i>	<i>M</i>	<i>SD</i>	<i>α</i>		<i>n</i>	<i>M</i>	<i>SD</i>	<i>α</i>
AI-R					Outcome Variables				
Closeness	505	3.69	.44	.84	Academic Fit	439	3.72	.60	.75
Intellectual	505	2.95	.54	.85	Academic Satisfaction	442	3.91	.64	.83
Social Power	505	3.34	.44	.87	University Commitment	440	3.63	.67	.88
Achievement	505	3.60	.43	.84	Major Satisfaction	429	3.65	.92	.92
Orderliness	505	3.14	.50	.82	Life Satisfaction	442	3.52	.76	.85
CCI-R					IPIP NEO-PI-R				
Student Engagement	505	3.36	.36	.89	Neuroticism	439	2.57	.70	.85
Respectful Environ.	505	3.23	.39	.86	Extraversion	441	3.43	.63	.85
Peer Interaction	505	3.78	.40	.86	Openness	405	3.43	.59	.76
Faculty Quality	505	3.52	.39	.81	Agreeableness	441	3.70	.49	.78
Interests					Conscientiousness	439	3.50	.57	.83
Realistic	442	2.23	.88	.93	IPIP MPQ				
Investigative	442	2.88	.92	.91	Joy (WB)	441	3.69	.60	.84
Artistic	442	2.84	.85	.86	Power (SP)	440	3.29	.55	.80
Social	442	3.37	.73	.84	Ach. Seek. (AC)	441	3.56	.56	.83
Enterprising	442	2.97	.74	.86	Friendliness (SC)	441	3.65	.59	.84
Conventional	442	2.64	.87	.93	Emo. Instab. (SR)	441	2.92	.62	.81
Things-People	442	-2.58	3.32	--	Belligerence (AG)	441	2.60	.56	.76
Data-Ideas	442	-.18	3.16	--	Distrust (AL)	441	2.56	.53	.79
Basic Need Satisfaction					Planfulness (CO)	441	3.30	.50	.74
Autonomy	441	3.50	.48	.66	Risk Avoid. (HA)	441	2.90	.63	.85
Competence	442	3.49	.56	.69	Conservatism (TR)	398	3.19	.56	.71
Relatedness	440	3.98	.57	.84	Imaginative (AB)	441	3.55	.57	.79

Note. Scale reliabilities reported are Cronbach's alpha (α); Acad. = Academic; Environ. = Environment; CDSE = Career decision self-efficacy; Things-People = Things-People Dimension, negative score indicates People-related interests; Data-Ideas = Data-Ideas Dimension,

negative score indicates Ideas-related interests; IPIP = International Personality Item Pool; MPQ = Minnesota Personality Questionnaire; Original MPQ scale names included in parentheses; WB = Wellbeing; SP = Social Potency; Ach. Seek. = Achievement Seeking; AC = Achievement; SC = Social Closeness; Emo. Instab. = Emotional Instability; SR = Stress Reaction; AG = Aggression; AL = Alienation; CO = Control; Avoid. = Avoidance; HA = Harmavoidance; TR = Traditionalism; AB = Absorption

Table 18

Correlation Matrix for Replication Sample

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
<u>AI-R Needs</u>																	
1. Closeness	--																
2. Intellectual	.08	--															
3. Social Power	.29	.23	--														
4. Achievement	.26	.44	.22	--													
5. Orderliness	.24	.03	-.07	.22	--												
<u>CCI-R Press</u>																	
6. Engagement	.25	.00	.13	.28	.16	--											
7. Respectful Env.	.15	-.23	-.11	.10	-.05	.15	--										
8. Peer Interaction	.32	.03	.17	.40	.10	.63	.35	--									
9. Faculty Quality	.21	.19	.10	.35	.04	.66	.17	.60	--								
<u>Interests</u>																	
10. Realistic	-.34	.41	.00	.08	-.01	.00	-.34	-.15	-.01	--							
11. Investigative	-.04	.41	.00	.23	-.01	.08	-.08	.09	.22	.30	--						
12. Artistic	.19	.37	.26	.10	-.02	-.05	-.12	.01	.04	.16	.22	--					
13. Social	.51	.11	.11	.20	.20	.25	.08	.29	.23	-.11	.11	.35	--				
14. Enterprising	.17	.10	.43	.05	.13	.10	-.20	.07	.05	.20	-.04	.30	.33	--			
15. Conventional	-.09	.20	.09	.11	.17	.09	-.24	.00	.06	.49	.11	-.08	.05	.50	--		
16. Things-People	-.52	.22	-.19	.01	-.07	-.07	-.23	-.20	-.05	.70	.37	-.35	-.62	-.22	.44	--	
17. Data-Ideas	-.05	-.24	.10	-.10	.15	.07	-.10	-.02	-.08	.08	-.56	-.48	-.06	.51	.64	.10	--

Note. $r > .15$ significant at $p < .001$; Variables 1 – 9 $n = 505$; Variables 10 – 17 $n = 442$

Engagement = Student Engagement; Env. = Environment; Things-People = Things-People Dimension, positive correlations indicate a positive relationship with Things-related interests and negative correlations indicate a positive relationship with People-related interests; Data-Ideas = Data-Ideas Dimension, positive correlations indicate a positive relationship with Data-related interests and negative correlations indicate a positive relationship with Ideas-related interests

Table 19

Convergent Validity with Personality Trait Measures for Replication Sample

	AI-R Needs					CCI-R Press			
	Closeness	Intellectual	Social Power	Achievement	Order	Engagement	Respect	Peer	Faculty
<u>IPIP NEO-PI-R</u>									
Neuroticism	.07	-.02	.04	-.23*	.00	-.14	-.19*	-.19*	-.13
Extraversion	.31*	-.01	.55*	.27*	-.04	.21*	.13	.29*	.18*
Openness	.27*	.32*	.17	.25*	-.05	-.02	.15	.15	.18*
Agreeableness	.36*	-.05	-.10	.24*	.11	.22*	.31*	.30*	.23*
Conscientiousness	.19*	.01	-.12	.43*	.48*	.24*	.19*	.26*	.18*
<u>IPIP MPQ</u>									
Joy (WB)	.22*	-.09	.10	.29*	.11	.31*	.34*	.44*	.31*
Power (SP)	.20*	.15	.54*	.31*	-.02	.13	.10	.27*	.18*
Ach. Seek. (AC)	.26*	-.01	-.03	.49*	.38*	.31*	.25*	.38*	.29*
Friendliness (SC)	.40*	-.10	.24*	.21*	.09	.28*	.36*	.47*	.28*
Emo. Instab. (SR)	.13	-.16	.02	-.24*	.04	-.09	-.13	-.16	-.16
Belligerence (AG)	-.18*	-.04	.23*	-.22*	-.08	-.09	-.35*	-.23*	-.18*
Distrust (AL)	-.15	.11	.07	-.14	-.04	-.22*	-.45*	-.35*	-.25*
Planfulness (CO)	.11	.00	-.32*	.20*	.50*	.10	.20*	.17*	.17*
Risk Avoid. (HA)	.05	-.16	-.40*	-.26*	.18*	-.08	.14	-.07	-.01
Conservatism (TR)	.05	-.23*	-.08	.04	.19*	.19*	.11	.18*	.08
Imaginative (AB)	.40*	.27*	.16	.24*	-.08	.05	.14	.23*	.17*

Note. IPIP = International Personality Item Pool; MPQ = Minnesota Personality Questionnaire; Original MPQ scale names included in parentheses; WB = Wellbeing; SP = Social Potency; Ach. Seek. = Achievement Seeking; AC = Achievement; SC = Social Closeness; Emo. Instab. = Emotional Instability; SR = Stress Reaction; AG = Aggression; AL = Alienation; CO = Control; Avoid. = Avoidance; HA = Harmavoidance; TR = Traditionalism; AB = Absorption; Engagement = Student Engagement; Respect = Respectful Environment; Peer = Peer Interaction; Faculty = Faculty Quality

* $p < .001$

Table 20

Means and Standard Deviations by Gender and College Major Group in Replication Sample for AI-R Needs

	<i>n</i>	Closeness		Intellectual		Social Power		Achievement		Order	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Gender											
Men	217	3.45	.40	3.10*	.51	3.33	.44	3.57	.44	3.05	.53
Women	283	3.87*	.37	2.83	.53	3.35	.43	3.64	.41	3.20	.47
College Major											
Business	70	3.55 ^{a,b}	.43	2.91	.52	3.37	.38	3.49 ^c	.37	3.13	.43
Science & Math	52	3.64	.46	3.07 ^d	.52	3.23	.46	3.66	.42	3.09	.57
Communications	40	3.75 ^e	.42	2.82 ^f	.56	3.54	.51	3.56	.41	2.95	.47
Engineering	98	3.48 ^{e,g,h,i,j,k}	.46	3.15 ^{f,l}	.52	3.28	.47	3.76 ^{c,m}	.44	3.06	.57
Education	24	3.91 ^{a,g}	.38	2.81	.49	3.24	.33	3.60	.47	3.19	.44
Arts	29	3.80 ^h	.33	3.06	.54	3.37	.47	3.73	.38	3.26	.63
Comm. Services	68	3.77 ⁱ	.37	2.73 ^{d,l}	.50	3.36	.39	3.50 ^m	.43	3.26	.44
Social Sciences	52	3.77 ^j	.42	2.94	.61	3.26	.39	3.55	.38	3.09	.45
Open Option	67	3.87 ^{b,k}	.36	2.91	.48	3.42	.45	3.55	.42	3.27	.45

Note. Engineering = Engineering & Technology; Comm. = Community; Superscripts of the same letter indicate significant differences between college major groups after Bonferroni correction

* $p < .001$

Table 21

Means and Standard Deviations by Gender and College Major Group in Replication Sample for CCI-R Press

	<i>n</i>	Student Engagement		Respectful Environment		Peer Interaction		Faculty Quality	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Gender									
Men	220	3.36	.38	3.15	.39	3.72	.41	3.51	.41
Women	284	3.43	.35	3.31*	.37	3.83	.38	3.53	.37
College Major									
Business	70	3.32	.36	3.07	.42	3.64	.43	3.43	.35
Science & Math	53	3.35	.35	3.29	.29	3.79	.34	3.63	.37
Communications	40	3.33	.38	3.17	.36	3.80	.37	3.53	.37
Engineering	98	3.33	.33	3.28	.34	3.85	.43	3.54	.39
Education	24	3.58	.26	3.38	.49	4.00	.21	3.60	.35
Art & Design	29	3.43	.28	3.31	.39	3.82	.38	3.54	.30
Comm. Services	68	3.41	.36	3.24	.42	3.77	.38	3.51	.40
Social Sciences	52	3.23	.43	3.24	.36	3.72	.43	3.47	.47
Open Option	67	3.44	.36	3.27	.37	3.78	.41	3.56	.41

Note. Engineering = Engineering & Technology; Comm. = Community

* $p < .001$

Table 22

Correlation Matrix of Dependent Variables for Replication Sample

	<i>n</i>	1	2	3	4	5	6	7	8
1. Academic Fit	439	--							
2. Academic Satisfaction	442	.75	--						
3. Major Satisfaction	440	.68	.46	--					
4. University Commitment	429	.57	.67	.31	--				
5. Life Satisfaction	442	.46	.45	.49	.33	--			
6. Autonomy BNS	441	.42	.44	.41	.28	.56	--		
7. Competence BNS	442	.57	.53	.46	.44	.59	.65	--	
8. Relatedness BNS	440	.44	.49	.48	.31	.53	.64	.64	--

Note. All correlations are significant at $p < .001$; BNS = Basic Need Satisfaction

Table 23

Correlations with Outcome Variables for Replication Sample

	Academic Fit <i>n</i> = 439	Academic Satisfaction <i>n</i> = 442	Major Satisfaction <i>n</i> = 429	University Commitment <i>n</i> = 440	Life Satisfaction <i>n</i> = 442	Autonomy BNS <i>n</i> = 441	Competency BNS <i>n</i> = 442	Relatedness BNS <i>n</i> = 440
<u>AI-R Needs</u>								
Closeness	.15	.21*	.04	.20*	.15	.23*	.22*	.39*
Intellectual	-.03	-.06	-.06	-.04	-.03	-.10	.01	-.14
Social Power	.02	.03	-.04	.12	.03	.07	.09	.14
Achievement	.35*	.32*	.26*	.21*	.26*	.30*	.41*	.31*
Orderliness	.11	.11	.05	.13	.12	.03	.16	.07
<u>CCI-R Press</u>								
Engagement	.46*	.50*	.20*	.53*	.31*	.31*	.35*	.39*
Respectful Env.	.23*	.27*	.15	.15	.11	.33*	.29*	.38*
Peer Interaction	.45*	.50*	.24*	.48*	.29*	.37*	.40*	.53*
Faculty Quality	.43*	.51*	.23*	.39*	.27*	.27*	.29*	.33*
<u>Interests</u>								
Realistic	-.13	-.16	-.08	-.06	.02	-.18*	-.10	-.23*
Investigative	.05	.06	.01	.06	-.05	-.04	.04	.01
Artistic	-.06	-.08	-.04	-.03	-.03	-.06	.02	-.05
Social	.19*	.14	.09	.19*	.18*	.17*	.20*	.25*
Enterprising	.01	.01	-.03	.06	.07	.00	.06	.03
Conventional	-.02	-.04	-.02	.05	.05	-.02	.00	-.10
Things-People	-.14	-.13	-.06	-.09	-.07	-.17*	-.15	-.25*
Data-Ideas	-.01	-.01	-.01	.04	.09	.04	-.01	-.02

Note. BNS = Basic need satisfaction; Engagement = Student Engagement; Env. = Environment; Things-People = Things-People Dimension, positive correlations indicate a positive relationship with Things-related interests and negative correlations indicate a positive relationship with People-related interests; Data-Ideas = Data-Ideas Dimension, positive correlations indicate a positive relationship with Data-related interests and negative correlations indicate a positive relationship with Ideas-related interests

* $p < .001$

Table 24

Results of Hierarchical Linear Regression Predicting Academic Fit (Replication Sample)

	β	t	R^2	df	F	ΔR^2	ΔF
<i>Step 1</i>			.02	2, 436	4.11*		
Things-People	-.14	-2.87**					
Data-Ideas	.01	.17					
<i>Step 2</i>			.17	7, 431	12.57***	.15	15.68***
Things-People	-.12	-2.18					
Data-Ideas	.01	.15					
Closeness	-.03	-.45					
Intellectual	-.17	-3.17**					
Social Power	-.03	-.64					
Achievement	.43	8.40***					
Orderliness	.01	.23					
<i>Step 3</i>			.33	11, 427	19.42***	.16	26.24***
Things-People	-.13	-2.58					
Data-Ideas	.02	.36					
Closeness	-.14	-2.57					
Intellectual	-.09	-1.81					
Social Power	-.04	-.81					
Achievement	.28	5.56***					
Orderliness	.00	.07					
Student Engagement	.22	3.61***					
Respectful Environment	.08	1.63					
Peer Interaction	.12	1.98					
Faculty Quality	.15	2.58					

* $p < .025$, ** $p < .005$, *** $p < .001$

Table 25

Results of Hierarchical Linear Regression Predicting Academic Satisfaction (Replication Sample)

	β	t	R^2	df	F	ΔR^2	ΔF
<i>Step 1</i>			.02	2, 439	3.59*		
Things-People	-.13	-2.68**					
Data-Ideas	.01	.13					
<i>Step 2</i>			.15	7, 411	11.19***	.13	11.19***
Things-People	-.04	-.71					
Data-Ideas	-.01	-.27					
Closeness	.09	1.60					
Intellectual	-.20	-3.82***					
Social Power	-.02	-.35					
Achievement	.37	7.16***					
Orderliness	.01	.24					
<i>Step 3</i>			.37	11, 430	23.64***	.22	38.62***
Things-People	-.05	-.95					
Data-Ideas	.00	.09					
Closeness	-.04	-.70					
Intellectual	-.13	-2.59					
Social Power	-.02	-.34					
Achievement	.18	3.80***					
Orderliness	.02	.43					
Student Engagement	.18	3.06***					
Respectful Environment	.10	2.32					
Peer Interaction	.13	2.23					
Faculty Quality	.26	4.57***					

* $p < .05$, ** $p < .01$, *** $p < .005$

Table 26

Results of Hierarchical Linear Regression Predicting University Commitment (Replication Sample)

	β	t	R^2	df	F	ΔR^2	ΔF
<i>Step 1</i>			.01	2, 437	2.36		
Things-People	-.10	-2.04					
Data-Ideas	.05	.94					
<i>Step 2</i>			.09	7, 432	6.39**	.08	7.93**
Things-People	.03	.44					
Data-Ideas	.00	-.04					
Closeness	.12	1.97					
Intellectual	-.17	-2.99*					
Social Power	.10	2.00					
Achievement	.21	3.96**					
Orderliness	.07	1.37					
<i>Step 3</i>			.32	11, 428	18.28**	.23	35.40**
Things-People	.01	.09					
Data-Ideas	-.01	-.11					
Closeness	-.01	-.20					
Intellectual	-.07	-1.27					
Social Power	.07	1.56					
Achievement	.05	.91					
Orderliness	.04	.87					
Student Engagement	.36	5.87**					
Respectful Environment	.03	.72					
Peer Interaction	.19	3.09*					
Faculty Quality	.02	.38					

* $p < .005$, ** $p < .001$

Table 27

Results of Hierarchical Linear Regression Predicting Major Satisfaction (Replication Sample)

	β	t	R^2	df	F	ΔR^2	ΔF
<i>Step 1</i>			.00	2, 426	.89		
Things-People	-.06	-1.32					
Data-Ideas	.00	-.02					
<i>Step 2</i>			.11	7, 421	7.53**	.11	10.14**
Things-People	-.09	-1.47					
Data-Ideas	.00	.05					
Closeness	-.08	-1.32					
Intellectual	-.17	-2.94*					
Social Power	-.07	-1.38					
Achievement	.37	6.91**					
Orderliness	-.02	-.39					
<i>Step 3</i>			.14	11, 417	6.40**	.03	4.04*
Things-People	-.08	-1.44					
Data-Ideas	.01	.25					
Closeness	-.13	-2.12					
Intellectual	-.14	-2.38					
Social Power	-.07	-1.32					
Achievement	.30	5.26**					
Orderliness	-.01	-.26					
Student Engagement	.03	.35					
Respectful Environment	.04	.65					
Peer Interaction	.08	1.10					
Faculty Quality	.12	1.79					

* $p < .005$, ** $p < .001$

Table 28

Results of Hierarchical Linear Regression Predicting Life Satisfaction (Replication Sample)

	β	t	R^2	df	F	ΔR^2	ΔF
<i>Step 1</i>			.01	2, 439	3.28*		
Things-People	-.08	-1.73					
Data-Ideas	.10	2.05					
<i>Step 2</i>			.10	7, 434	7.31**	.09	8.80**
Things-People	-.03	-.56					
Data-Ideas	.09	1.87					
Closeness	.06	.93					
Intellectual	-.13	-2.32					
Social Power	-.03	-.55					
Achievement	.31	5.78**					
Orderliness	.02	.43					
<i>Step 3</i>			.16	11, 430	7.47**	.06	7.05**
Things-People	-.04	-.78					
Data-Ideas	.09	1.91					
Closeness	-.01	-.10					
Intellectual	-.10	-1.65					
Social Power	-.04	-.77					
Achievement	.22	4.03**					
Orderliness	.01	.26					
Student Engagement	.15	2.11					
Respectful Environment	.01	.14					
Peer Interaction	.06	.94					
Faculty Quality	.08	1.29					

* $p < .05$, ** $p < .001$

Table 29

Results of Hierarchical Linear Regression Predicting Autonomy Basic Need Satisfaction (Replication Sample)

	β	t	R^2	df	F	ΔR^2	ΔF
<i>Step 1</i>			.03	2, 438	7.12*		
Things-People	-.17	-3.69*					
Data-Ideas	.06	1.16					
<i>Step 2</i>			.17	7, 433	12.87*	.14	14.72*
Things-People	-.07	-1.24					
Data-Ideas	.04	.90					
Closeness	.12	2.09					
Intellectual	-.23	-4.36*					
Social Power	-.01	-.09					
Achievement	.38	7.42*					
Orderliness	-.09	-1.77					
<i>Step 3</i>			.26	11, 429	13.50*	.09	12.26*
Things-People	-.05	-1.01					
Data-Ideas	.06	1.40					
Closeness	.04	.77					
Intellectual	-.13	-2.35					
Social Power	.02	.40					
Achievement	.26	5.02*					
Orderliness	-.08	-1.67					
Student Engagement	.14	2.21					
Respectful Environment	.22	4.32*					
Peer Interaction	.07	1.11					
Faculty Quality	.03	.49					

* $p < .001$

Table 30

Results of Hierarchical Linear Regression Predicting Competency Basic Need Satisfaction (Replication Sample)

	β	t	R^2	df	F	ΔR^2	ΔF
<i>Step 1</i>			.02	2, 439	4.90*		
Things-People	-.15	-3.13**					
Data-Ideas	.01	.17					
<i>Step 2</i>			.21	7, 434	16.67***	.19	20.94***
Things-People	-.09	-1.72					
Data-Ideas	.00	-.07					
Closeness	.03	.53					
Intellectual	-.16	-3.16**					
Social Power	.03	.53					
Achievement	.45	9.02***					
Orderliness	.05	1.08					
<i>Step 3</i>			.30	11, 430	16.71***	.09	13.44***
Things-People	-.08	-1.58					
Data-Ideas	.01	.32					
Closeness	-.05	-.93					
Intellectual	-.05	-.99					
Social Power	.04	.91					
Achievement	.33	6.56***					
Orderliness	.05	1.12					
Student Engagement	.18	2.93**					
Respectful Environment	.20	4.16***					
Peer Interaction	.09	1.47					
Faculty Quality	-.02	-.36					

* $p < .01$, ** $p < .005$, *** $p < .001$

Table 31

Results of Hierarchical Linear Regression Predicting Relatedness Basic Need Satisfaction (Replication Sample)

	β	t	R^2	df	F	ΔR^2	ΔF
<i>Step 1</i>			.06	2, 437	14.39*		
Things-People	-.25	-5.35*					
Data-Ideas	.01	.16					
<i>Step 2</i>			.28	7, 432	24.26*	.22	26.53*
Things-People	-.01	-.15					
Data-Ideas	-.05	-1.07					
Closeness	.31	5.74					
Intellectual	-.33	-6.63*					
Social Power	.06	1.41*					
Achievement	.35	7.32*					
Orderliness	-.06	-1.38					
<i>Step 3</i>			.41	11, 428	27.07*	.13	23.25*
Things-People	.01	.24					
Data-Ideas	-.03	-.60					
Closeness	.20	4.04*					
Intellectual	-.20	-4.22*					
Social Power	.08	1.79					
Achievement	.19	4.05*					
Orderliness	-.05	-1.25					
Student Engagement	.10	1.71					
Respectful Environment	.19	4.26*					
Peer Interaction	.25	4.33*					
Faculty Quality	.01	.13					

* $p < .001$

CHAPTER 5: DISCUSSION

The purpose of the present study was to examine college student satisfaction from the need-press perspective (Murray, 1938) by revisiting the Stern (1970) measures. The obtained results indicate that needs and press relate in meaningful ways to interests and personality traits, and also to several types of college student satisfaction. Across 14 hierarchical regression models, the mean incremental contribution of needs beyond that of interests in the prediction of satisfaction outcomes was 14%. The mean incremental criterion validity for press was 13% of the variance accounted for in satisfaction outcomes. There was a large effect (Cohen, 1992) of interests, needs, and press, in the prediction of satisfaction outcomes, accounting for a mean of 29% of the variance in the outcome measures. The primary findings that replicated across the two data sets will be summarized and interpreted in light of the hypotheses and existing literature. Overall, the use of need-press measures to examine student adjustment to academic environments may offer additional insight into the complex picture of person-environment fit that has emerged in previous research. Implications for research and practice, limitations, and directions for future research will also be addressed.

Measuring Needs and Press

Stern (1970) rationally developed need and press scales based on Murray's typology, and compressed these scales into factors, which were then used to examine culture differences within and between colleges. There has been a dearth of studies using Stern's measures in the past 40 years, likely due to the 600 items in total between the AI and CCI, lack of commercial availability, and the now outdated item content. By approaching the factor analysis at the item level in the present study, revised scales were constructed that were shorter in length, with acceptable psychometric properties. With this approach, the AI-

R and CCI-R scales reflected Stern's second-order dimensions. The reliability of the AI-R and CCI-R scales were stable across two samples, with mean coefficient alphas ranging from .84 to .87. For the AI-R, 104 items were retained from the original 300-item AI, reducing the length of the original measure by 65%. Similarly, 95 items of the CCI were retained for the CCI-R, a 68% reduction in the length of the original measure.

It was originally planned to use canonical correlation analysis at the item level to identify sets of parallel scales across the need and press measures. As this technique was investigated, it became clear that, given the sample size, there was not adequate power in the present study to appropriately use canonical correlation analysis. Instead, factor analysis at the item level was conducted with the AI and CCI items separately. Using these procedures, five AI-R scales were developed from the factor analysis of the AI items, and four CCI-R scales were developed from the CCI items. Based on the properties of personality measures (e.g., Costa & McCrae, 1992; Hogan, 1983) and Holland's (1997) RIASEC model of individuals and environments, it was expected that three to six factors would emerge in the data reduction of the need and press measures. This hypothesis was partially supported, as five need scales and four press scales were identified. Although parallel need-press factors were not identified in the current analyses, evidence was obtained that both need and press scales relate to student adjustment to and satisfaction in academic environments.

Factor-Based Measures of Student Needs

Closeness. One of the needs that emerged in the factor analysis of the AI items reflects interpersonal closeness, referring to emotional support, emotional expression, intimacy, and giving and receiving care. Stern (1970) considered closeness a dependency need. Closeness is conceptually similar to the socioanalytic need for affiliation (Hogan,

1983), and the basic psychological need of relatedness (Ryan & Deci, 2000). As predicted, closeness was linked with Social interests, Agreeableness, Extraversion, and Friendliness. There was a negative relationship between closeness and Realistic interest. Unexpectedly, closeness had the highest correlation with the IPIP MPQ scale of Imaginative, likely due to a few items that reflected enjoyment in sensory stimuli. Consistent with Stern's findings, women expressed higher closeness needs.

Intellectual. Preference for academic activities in the sciences and humanities are captured in the intellectual need. Stern (1970) grouped intellectual need with achievement orientation, but in the present study, intellectual need was differentiated from achievement need. As expected, intellectual need was linked with Investigative interest and Openness, and was also related to Realistic interest. Similar to gender differences found by Stern, men expressed higher intellectual need, which may be related to gender differences in Realistic and Investigative self-efficacy (Lindley, 2005; Lindley & Borgen, 2002; Betz & Gwilliam, 2002). This need also includes items consistent with the absorption trait. Intellectual need appears to be conceptually similar to the Intellectual/Cultural trait complex (Ackerman & Heggestad, 1997).

Social Power. This need reflects strategies of social influence, including attention-seeking, extraversion, and dominance. Conceptually, social power is related to the socioanalytic need for status (Hogan, 1983), which is also reflected in work need taxonomies (Rounds & Armstrong, 2005). As predicted, social power was linked with Enterprising interest and extraversion. There was also a strong, positive relationship with Power, and negative relationships with Planfulness and Risk Avoidance. No gender differences were found for this need.

Achievement. Persistence, effort, and hard work are reflected in achievement need. This is conceptually similar to the higher order AI achievement orientation factor (Stern, 1970), and related to the basic psychological need of competence (Ryan & Deci, 2000). Contrary to Stern's findings from the mid-20th century, there were no gender differences in achievement need found in the present samples. This likely reflects advances in women's access to higher education and career opportunities that have occurred in the last 50 years. Achievement was linked with Investigative and Social interests, as well as conscientiousness, which helps explain the divergent findings in previous research. As would be expected in a college population, need for achievement was not limited to a single vocational personality type.

Orderliness. A preference for organization, time management, and structure describes orderliness need. Need for order is reflected in most personality models, including by Stern (1970), in the socioanalytic model (Hogan, 1983), and by Holland (1997) in the Conventional type. Orderliness was linked with conscientiousness, but the relation with Conventional interest was weak. Social interest was related to orderliness in both samples.

Factor-Based Measures of Academic Environment Press

Student Engagement. One of the press factors that emerged in the analysis of the CCI items reflects an achievement-oriented university environment where students are active in their academic and intellectual development, in and out of the classroom. Stern conceptualized this as part of the intellectual climate. Social and Enterprising interests were linked with student engagement, highlighting an extraverted academic engagement style.

Respectful Environment. This press factor reflects a trusting, accepting university environment that supports student dignity, expression, equality, and tolerates differences.

Realistic interests were negative related to respectful environment, which is consistent with Holland's description of people in a Realistic environment being "less open to new ideas," having a "closed belief system," and being "less adept at coping with others" (Holland, 1997, p. 44). Enterprising and Conventional interests were also negatively related to respectful environment, reflecting Enterprising and Conventional environments as facilitating a view of the world in "stereotyped, constricted, and simple terms" (p. 47).

Peer Interaction. Casual socializing and extracurricular activities typical of college life are captured in peer interaction press. Peer interaction is consistent with Stern's nonintellectual climate, reflecting both the informal socialization and organized group activities in students' lives. Social interests were related to peer interaction, as well as academic engagement, consistent with a description of a Social environment that "stimulates people to engage in social activities" (Holland, 1997, p. 46). On the other hand, Realistic interests had a negative association with press for peer interaction.

Faculty Quality. Student's perceptions of faculty's engagement in teaching and research are captured in the faculty quality press. This factor is a part of Stern's intellectual climate, reflecting teaching practices. Similarly to peer interaction, there was a significant relation between Social interest and faculty quality. Investigative interest correlated with faculty quality in the second sample only.

Convergent and Discriminant Validity

As described throughout the interpretation of the need factors, the hypothesis that needs will relate moderately to interests and personality traits, yet be distinct from these individual differences measures, was supported. Convergent validity results interpreted in the need and press descriptions were replicated across the two samples for interests, and

correlations with personality traits were investigated in the second sample only.

There were consistent correlations between perceived press and interests, supporting Holland's (1997) hypothesis of the presence of distinct educational environments, and providing partial support for Holland's specific environmental types. However, these results were not as strongly characteristic of the RIASEC environments originally found by Astin and Holland (1961). Furthermore, Investigative and Artistic interests were not consistently related to any press. Smart (1982) found that Investigative environments were low on vocational preparation and character development, which is consistent with the finding that there was no relationship between Investigative interest and perception of academic engagement, respectful environment, and peer interaction. However, Smart also found that Investigative environments focus on the development of math, science, and analytical skills, which may be somewhat inconsistent with the lack of relationship between Investigative interest and press for student engagement or faculty quality in the present study.

The previous literature regarding the presence of press for creativity, originality, and expression in Artistic environments is mixed. A study by Thompson and Smart (1999) supported this hypothesis, but research by Richards, Seligman and Jones (1970) did not. Defining features of Artistic environments were not identified in the present study, as Artistic interest did not relate to any of the press scales. However, it is possible that creativity-supportive press characteristic of Artistic environments may not have been adequately covered in the CCI-R item content. Not identifying a factor in the CCI-R related to artistic expression or aesthetics leaves the possibility that the press construct space was not fully covered by the CCI-R.

Emphasis in the Social environment on helping, teaching, interpersonal skills, and

addressing social problems was found in this study, as evidenced by positive correlations with press for student engagement, peer interaction, and faculty quality. The focus in Enterprising and Conventional environments on vocational preparation and social influence through power and status is replicated in this study by positive correlations with student engagement and negative correlations with respectful environment.

There were fewer significant correlations between press and interests as compared to needs and interests, but there were a greater number of significant correlations with basic need satisfaction for press than needs. This provides an example of the importance of including perceptions of environmental supports in understanding these relationships. In a previous study, the link between autonomy need-press and outcomes was mediated by basic need satisfaction (Baard, Deci & Ryan, 2004). In this study, medium to large correlations were found between each press and all three types of basic need satisfaction (autonomy, competence, relatedness). This is not surprising in a college environment, where academic and social activities are closely linked. Closeness and achievement needs both were related with press for student engagement, peer interaction, and faculty quality. This also reflects the close relationship between students' academic and social lives in the university environment.

The hypothesis that need and press factors would vary between college majors was partially supported for needs, but was not supported for press. The most robust finding when comparing need and press factor scores between academic major groups was that engineering majors expressed higher achievement needs than business majors, a difference that replicated across the two samples. In Stern's (1970) sample, engineering majors also reported the highest achievement motivation, and business majors reported the lowest achievement motivation. Differences by college major were found in the replication sample for closeness

and intellectual needs, but not in the development sample. The univariate tests for press were not statistically significant in either sample. Similarly, Stern found a generalized non-intellectual climate within large, complex institutions. The high correlations among press for academic engagement, peer interaction, and faculty interaction may help explain this finding.

Concurrent and Incremental Validity

Several findings replicated across the two samples in the hierarchical regression analyses predicting concurrent student outcomes by the AI-R and CCI-R. The need and press measures added to the prediction of outcomes above and beyond that of RIASEC interests, providing support for concurrent and incremental validity of the scales. Five outcome variables were included in both the development and replication analyses: academic fit, academic satisfaction, university commitment, major satisfaction, and life satisfaction. Career decision-making self-efficacy was included only in the developmental sample. Autonomy, competency, and relatedness need satisfaction were included only in the replication sample.

The average variance in the outcomes accounted for by interests in these analyses was 2%, the incremental predictive validity of needs was 14% on average, and press contributed an additional 13% to the variance accounted for in the outcomes. Thus, in the full model, an average of 29% of the variance in the outcomes was accounted for by interests, need, and press, a large effect size. There was a clear pattern that the effect of interests was small, a medium effect was achieved with the addition of needs, and a large effect was achieved with the addition of press.

Each need and press measure was a significant predictor of at least one outcome variable, supporting the validity of each AI-R and CCI-R scale. However, intellectual and

achievement needs were the most consistent predictors. For the five outcome variables that were included in both the development and replication analyses, intellectual and achievement needs were statistically significant predictors for both samples in four out of five regression analyses. With the addition of needs in the second step in the hierarchical regression, intellectual and achievement needs were statistically significant predictors of academic fit, academic satisfaction, and major satisfaction in both samples. Intellectual need was also a predictor in both samples for university commitment, as was achievement need for life satisfaction. The beta weight across these analyses was positive for achievement need and negative for intellectual need. This means that as expressed achievement need increased and intellectual need decreased, reported academic fit, academic satisfaction, and major satisfaction increased. Achievement need remained a significant predictor in the complete model for academic fit, academic satisfaction, and major satisfaction.

The negative relationship between intellectual need and several outcomes in the second step of the hierarchical regression is a potentially counterintuitive finding. Intellectual needs was a negative predictor of academic fit, academic satisfaction, major satisfaction, and basic need satisfaction, and was not a significant predictor for career decision-making self-efficacy or life satisfaction. Intellectual need correlated with Realistic ($r = .36$ to $.41$) and Investigative ($r = .41$), and correlations with Social and Enterprising interests were not statistically significant. Thus, it appears that intellectual need is associated with low sociability (Hogan, 1983). Extraversion, particularly sociability facets, has been linked with subjective well-being (Diener et al. 2003; Emmons & Diener, 1983). The relationship between low sociability, the Investigative type, and negative or no relationship with satisfaction may explain this finding. Having higher intellectual needs may also lead

students to choose more challenging courses, which may reduce satisfaction through unmet competency needs if challenges are difficult to overcome, and unmet relatedness needs if academic work interferes with socialization.

The complex relationship between intellectual and achievement needs is also highlighted by these results. In previous research, achievement has been linked with Investigative interest (Staggs et al., 2007), Social interest (Armstrong & Anthony, 2009), and Enterprising interest (Armstrong et al., 2008). Armstrong et al. (2008) also found that stamina is related to Investigative. Comparison of the achievement item content across the MPQ, PRF, JVIS, and AI-R scales item content, and direct tests of achievement facets will be needed to further clarify these findings. For instance, it may be that endurance and persistence for intellectual challenge are related to the Investigative type, while striving for success is related to the Enterprising type. Motivation type, whether the achievement need is based in intrinsic motivation, internalized extrinsic motivation, or extrinsic motivation, may be a moderator of this relationship (Deci & Ryan, 2000). Future research included an examination of moderators may help account for the finding in the present study that high achievement need and low intellectual need predicted concurrent academic and major satisfaction.

The present findings extend those of prior studies by demonstrating the relation of achievement need with academic fit, and academic and major satisfaction. In a meta-analysis of psychosocial factors and academic performance and retention, achievement motivation was the strongest predictor for GPA, and also a predictor of persistence (Robbins et al., 2004), findings consistent with educational (Pascarella & Chapman, 1983; Tinto, 1993) and motivational theories (Eccles & Wigfield, 2002). The present study adds to this literature

providing support for the relation between achievement need and satisfaction outcomes. These results also suggest that achievement need may be a useful addition as a personality predictor within the SCCT satisfaction model (Lent & Brown, 2006; Lent et al., 2005), if it were found to add incremental validity beyond that of conscientiousness.

That needs explained substantial amounts of variance in satisfaction beyond interests also suggests boundaries to Holland's theory. Meta-analyses (Tranberg et al., 1993; Tsabari et al., 2005) have found the relationship between interest congruence and college major satisfaction to be $r = .10$, or 1% of the variance in college major satisfaction is explained by interest congruence. Although it was the contribution of RIASEC interests that was investigated in this study, and not interest congruence, interests accounted for 2% of the variance in outcomes, while the addition of needs accounted for an average of 14% of the variance in outcomes. Furthermore, achievement need was not specific limited to one RIASEC type. Achievement need was correlated with Investigative and Social needs, but was not with other types, potentially suggesting greater variability in achievement needs for those with Realistic, Artistic, Enterprising and Conventional interests.

For measures of environmental press, perceptions of a university environment supporting student engagement and peer interaction were predictive of university commitment for both samples. Student engagement refers to an environment that promotes achievement, intellectual development, leadership, and social justice activities, while peer interaction included informal and formal opportunities for socialization. Students with high university commitment perceived the university environment to be supportive of intellectual, civic, and social development. This suggests that commitment to a university is promoted by attending to the broad needs of the person, and not only academic needs of the student.

Beyond the findings that were replicated across two samples, the following results suggest need and press that need further study to determine the robustness of their validity as predictors. Closeness, social power, and orderliness predicted university commitment in the development sample only. Similarly, closeness and intellectual needs predicted life satisfaction in the development sample, but were not replicated. Press for student engagement, peer interaction, and faculty quality predicted academic fit in one of the samples. Similarly, student engagement, respectful environment, and peer interaction each predicted academic satisfaction in one sample or the other, but the results were not replicated. Peer interaction predicted life satisfaction in only one sample. Thus, closeness, social power, orderliness, and the press variables were promising, but not robust, predictors. The two samples were similar along most demographic variables (i.e., gender, age, race/ethnicity), but had different distributions of year in college, which may be a factor in these mixed findings. There were more first-year students in the development sample than the replication sample. Year in college could be explored as a potential moderator.

For major satisfaction and career-making decision self-efficacy, the addition of press accounted for a mean of 2% of the variance in these outcomes, demonstrating weak incremental validity of press compared to other outcomes. Furthermore, there was not a significant press variable in the final model for major satisfaction and career decision self-efficacy. Additionally, the concurrent validity of interests for these variables was also the lowest of the outcomes examined, with a mean of 1%. The poor concurrent validity of interests and press in predicting major satisfaction may help explain the weak relationship between interest congruence and major satisfaction found in previous studies (Assouline & Meir, 1987; Tranberg et al., 1993; Tsabari et al., 2005). Needs explained moderate amounts

of variance in major satisfaction, while interests and press explained small amounts. In the present study, achievement need was more relevant than interests and press in understanding major satisfaction.

Although only examined in the replication sample, the pattern of the predictors for autonomy, competency, and relatedness basic need satisfaction (Ryan & Deci, 2000) supports the discriminant validity of needs and press. For press, respectful environment was a predictor for the satisfaction of each basic psychological need, suggesting the importance of a respectful environment for supporting the satisfaction of basic psychological needs. Closeness need and peer interaction press were predictors of relatedness need satisfaction, but not for autonomy or competency, demonstrating that social-oriented need and press were related particularly to a social domain-specific psychological need.

Implications

The present study suggests several implications for vocational psychology research and counseling psychology practice. The incremental validity of needs above and beyond that of interests supports the inclusion of needs in studies of the relationship between non-cognitive predictors and satisfaction. Within vocational psychology, needs have received less attention as the literature has been centered more on interests, self-efficacy, and personality traits. The AI-R offers reliable need scales with increased practicality due to the reduced item number. Within the needs examined, achievement need was the strongest predictor, and should be included in future studies of psychosocial factors impacting college student satisfaction. In light of previous research, the present study suggests that achievement is a complex, multidimensional construct, and additional research is needed to understand achievement facets and their relationship with satisfaction. Perceptions of the university

environment, particularly academic engagement and peer interaction, were statistically significant predictors of university commitment, highlighting the importance of including press variables when examining a domain-specific outcome focused on the environment.

When working with college student clients, it is recommended that needs be considered in addition to interests and personality traits when selecting interventions to facilitate career exploration, and student adjustment. For example, a counselor could help a client explore how need satisfaction and possible unmet needs are contributing to college major choices, and to satisfaction across several domains, including academic fit, major satisfaction, university commitment, and life satisfaction. It may be particularly helpful to focus on interventions promoting intrinsic achievement motivation. According to the cognitive evaluation sub-theory of self-determination theory (Deci & Ryan, 1985), basic needs for competence, autonomy, and relatedness play a vital role in maintaining intrinsic motivation. Positive feedback and working at a level of optimal challenge are two ways of enhancing intrinsic motivation.

In career counseling, assessment of actual ability, in addition to interests and self-efficacy, should be included so that clients can be encouraged to consider academic and career choices that are going to provide sufficient, but not overwhelming, challenge (Gottfredson, 2003). Both college major dissatisfaction and general life dissatisfaction are precursors to leaving college (Feldman & Newcomb, 1970; Lounsbury & Gibson, 2006), therefore, when working with students who are at risk of dropping out of college, barriers to achievement motivation should be identified, and psychological need satisfaction promoted. Additionally, for students who appear to be primarily motivated by external rewards, such as

pursuing extrinsic goals of wealth and fame in making career choices, it may be helpful to challenge clients to consider their level of intrinsic motivation for their career plans.

Limitations

There are several limitations to the present study. The size of the developmental sample was not adequate to conduct canonical correlation analysis at the item level as initially planned. Factor analysis was employed, and the factor structure in the data was such that the AI-R and CCI-R are not parallel measures. This precluded the pairing of parallel needs and press, limiting direct need-press congruence analyses, and tests of their interactions. In each the development sample and the replication sample, the sample size was enhanced by combining data from participants recruited from psychology and engineering classes. However, data were collected in psychology and engineering classes two to three years apart, adding a temporal confound to the design. It is possible there is a cohort effect inflating error by combining data collected in 2006 and 2007 from engineering students with data collected in 2009 and 2010 in psychology classes. Convenience samples were also used, which may violate assumptions of statistical methods based on characteristics of random samples.

The scale revision could be improved through another iteration of factor analysis. Scales could be improved by reducing item number, including only items with the highest loadings, and setting stricter criteria in the item selection process. Much of the scale revision was conducted developing facet-level constructs, but in the present analysis, factor-level scales were used to reduce the number of predictors and increase power. Thus, there are a few items that should have been discarded in the development of factor-level scales.

Additionally, the intercorrelations among the Student Engagement, Peer Interaction, and

Faculty Quality press scales were higher than desired, possibly contributing to the lack of replication of their criterion validity. The scales were identified through principle axis factoring with orthogonal rotation. Principle components analysis or oblique rotation may improve these scales.

Using only one-third of the original AI and CCI items has the benefit of a shorter measure, however, there are parts of the construct space that are not included in these revised measures. It appears that needs associated with negative emotionality were eliminated. A previous study of the NEO-PI and the PRF found that neuroticism correlated with aggression, deference, and impulsivity (Costa & McCrae, 1988). Only four items from these three AI scales were included in the AI-R factors. In the factor analysis of the AI items, items referring to negative emotionality and avoidance loaded on a small factor that had poor reliability as a scale, so those items were eliminated.

The approach to establishing the incremental validity of needs and press beyond interests has limitations. The two Things-People and Data-Ideas dimensional scores were used instead of the six RIASEC scores in order to decrease the number of predictors in the regression analysis. Interests, not interest congruence, were included as predictors in hierarchical regression, due to barriers to calculating a congruence index. The Euclidean distance of the Things-People and Data-Ideas dimensional scores based on RIASEC interests and the ACT Map of College Majors (ACT, n.d.) could be used as a congruence index. However, the ACT college major scores are proprietary, and permission has been requested, but not yet granted. If access to the college major dimensional scores is gained, interest congruence could be pursued further. Using interests is a fair comparison to testing the incremental validity of needs above and beyond interests, but is not a fair comparison once

press are added as predictors. Interest congruence would be an appropriate comparison to the full need-press model.

In the regression equations, need and press were studied as predictors, but causation should not be interpreted from these results. In particular, autonomy, competency, and relatedness basic need satisfaction could be used as predictors or moderators instead of outcome variables, since they are conceptualized as basic psychological needs underlying other motivational factors. These results are correlational in nature, and bidirectional paths were not analyzed.

Although many of the results were replicated across two samples, the results may not generalize beyond the sampled population, which were college students at a large, public, Midwestern university. Particularly regarding press, these results may not apply to different types of higher education institutions, such as small private colleges or community colleges. Furthermore, caution should be taken in generalizing the results to diverse populations and to other universities, as the sample included predominantly Caucasian American traditional-age college students at a large, Midwestern university.

Future Directions

Future research can address the limitations of the present study, and further test the validity of the AI-R and CCI-R. Since achievement need was the strongest predictor, the construct and convergent validity of the scale should be examined in comparison to the PRF Achievement Scale (Jackson, 1984) and other achievement measures. The incremental validity of the AI-R scales should also be tested against similar predictors (i.e., MPQ Achievement Scale) to see if unique variance can be attributed to the AI-R. Examining the factors of the AI-R and CCI-R suggests possible facets within each scale. For example,

achievement need appeared to have two facets representing challenge and effort. For personality traits, facet level analysis has been demonstrated to provide better prediction of college majors and outcomes in many studies (Larson et al., 2010; Paunonen & Ashton, 2001), and facet needs may also provide incremental validity. Satisfaction measures used in the study focused on academic and life satisfaction. It will be important to test the validity of need and press based on other domain-specific criterion measures. For example, closeness need and press for peer interaction were not robust predictors of academic satisfaction, but they may be useful in predicting interpersonal or relationship satisfaction.

Future research should also examine moderators and mediators in the relationship of needs and press to outcomes. Promising ideas for moderators of need and press can be found in the literature investigating the interest congruence-satisfaction relationship (Darcy & Tracey, 2003; Tracey, 2010a, 2010b; Tracey & Robbins, 2006). Possible moderators include need flexibility, assessed by mean level across needs, and situation strength (Cooper & Withey, 2009) assessed by variance in needs and press. Large sample sizes are needed to have adequate power in analyses involving these moderators, as typically they add only small incremental validity. A meta-analysis of moderators of investigating situation strength found that the average variance accounted for in the prediction of an outcome with the addition of a moderator was 1%.

Previous research also suggests that basic need satisfaction could mediate the need-press relationship. For example, a test of self-determination theory found that the relationship of autonomy orientation and perceived autonomy support with adjustment-related outcomes was mediated by basic need satisfaction (Baard, Deci & Ryan, 2004). Therefore, to extend the current research, the need and press variables identified in this study could be tested

within complete theoretical models, such as the social cognitive career theory satisfaction model, to understand the role of needs as personality precursors, and press as environmental supports and barriers.

Summary and Conclusions

Stern (1970) developed need and press scales reflecting a broad range of psychological needs and environmental supports to understand person-environment dynamics in the university setting, measures that have not received much attention since their publication. In the present study, initial reliability and validity evidence was provided for revised need and press scales, reviving an alternative conceptualization of PE fit.

Relationships of the AI-R and CCI-R with interests and personality traits were explored to understand their convergent validity. Concurrent and incremental validity were established with hierarchical regression and replicated on a second sample to identify robust predictors.

Interests accounted for a small effect in the prediction of satisfaction variables, needs added to the prediction with medium effect size, and the effect size was large with the addition of press. Achievement and intellectual needs were robust predictors, while other needs and press were statistically significant predictors for either only one outcome, or in one sample.

Overall, need and press measures added to the concurrent prediction of satisfaction outcomes beyond that of interests, supporting their criterion and incremental validity. Gender and college major differences in need and press were also demonstrated. In summary, the present study supports initial reliability and validity of the AI-R and CCI-R measures. The AI-R and CCI-R are promising measures that will extend the understanding of person-environment fit in the university environment.

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