July 2006

USING PERSONALITY VARIABLES TO PREDICT ACADEMIC SUCCESS IN PERSONALIZED SYSTEM OF INSTRUCTION

Kelly S. Petska

University of Nebraska - Lincoln, kelly.petska@med.va.gov

USING PERSONALITY VARIABLES TO PREDICT ACADEMIC SUCCESS
IN PERSONALIZED SYSTEM OF INSTRUCTION

By

Kelly S. Petska

A DISSERTATION

Presented to the Faculty of

The Graduate College at the University of Nebraska-Lincoln

In Partial Fulfillment of Requirements

For the Degree of Doctor of Philosophy

Major: Psychological and Cultural Studies

With Emphasis in Counseling Psychology

Under the supervision of Professor Roger Bruning, Ph.D.

& Michael Scheel, Ph.D

Lincoln, NE

August, 2006

USING PERSONALITY VARIABLES TO PREDICT ACADEMIC SUCCESS
IN PERSONALIZED SYSTEM OF INSTRUCTION

Kelly Petska, Ph.D.

University of Nebraska-Lincoln, 2006

Advisor: Roger Bruning, Ph.D. & Michael Scheel, Ph.D.

Abstract

Personality is a collection of emotional, thought and behavioral patterns that are unique to each person and relatively stable over time. *How* and *why* people differ from each other is a question that has been asked for centuries with various answers, hypotheses and theories. The five factor model (FFM) is the most-agreed upon personality model to date. The FFM consists of five factors that are used to globally describe personality: neuroticism, extraversion, openness, agreeableness, and conscientiousness. While personality has been studied fairly extensively in the traditional classroom; which typically involves face-to-face lectures, discussions, and in-classroom assessment of ability/comprehension, almost no research has been tied to newer methods of academic instruction. This study explored how personality variables contribute to academic success in a nontraditional environment.

Results suggest that while personality does have a relationship with academic success, as measured by final course grade, the relationships do not appear to be direct. The final model in the path analysis was deemed to "fit" and is said to be consistent with

the empirical data. The final path consists of indirect relationships between ACT scores and the personality variable, Conscientiousness. In the present study these two variables account for approximately 14% of the variance in GPA. GPA in turn, has a direct relationship with final course grade and accounts for approximately 22% of the variance in letter grade. Contrary to the hypothesis, but consistent with the mixed results regarding extraversion, the proposed model suggested that extraversion does not have a direct or indirect relationship with academic success, as measured by final course grade.

Additional analyses suggest that certain variables from the model can predict group membership, as successful or unsuccessful, in UNL's Introduction to Psychology-181 PSI course. The variables shown to correctly classify those students are Conscientiousness and Unit Completion, which is a measure of learning strategy. Implications for PSI, and other nontraditional courses, coupled with the use personality assessment for exploring academic success are discussed.

ACKNOWLEDGEMENTS

DEDICATION

For my family and friends—who lived through
this process by standing right beside me
and encouraging me through it all.
You know who you are
and I love you for it.

TABLE OF CONTENTS

LIST OF TABLES

x

LIST OF FIGURES

Figure   Page

CHAPTER 1

Introduction

Personality is a collection of emotional, thought and behavioral patterns that are unique to each person and relatively stable over time. *How* and *why* people differ from each other is a question that has been asked for centuries with various theories, hypotheses, and answers. Personality has intrigued scholars, researchers, and the general population alike. Personality has been studied in many contexts, many cultures and many different disciplines for years. An abundance of academic journals, books, college courses, programs, and tests have been created in order to assess and describe personality.

Personality has also been explored in the context of academic instruction and academic success. Researchers have been attempting to predict academic success through personality for nearly a century (cf. Binet & Simon, 1905), mostly with modest success. Now, however, the increasing use of computer-based instructional technologies, coupled with the capabilities of new software programs, has given new opportunities to researchers who want to address personality variables in an academic environment. Not only do new instructional technologies allow new avenues for researching personality, they also offer new approaches for academic instruction.

While personality has been studied fairly extensively in the traditional classroom; which typically involves face-to-face lectures, discussions, and in-classroom assessment of ability/comprehension, almost no research has been tied to newer methods of academic instruction. These newer, nontraditional approaches include distance education courses, correspondence courses, online courses, and personalized system of instruction (PSI) or "Keller Plan" (Keller, 1968) courses. Distance education is characterized by three factors:

communication between educators and students is influenced by geographical distance, communication is two-way and interactive, and technology is used to facilitate learning (Mills & Suter, 1997). Online courses are typically self-paced, but interaction is a vital component with numerous exercises, interactive simulations, and online discussion forums typically available. Correspondence courses typically refer to a traditional lecture being delivered in other geographic areas via a variety of different forms of technology. In PSI courses students proceed through course material at their own pace by completing unit assignments on study questions or problems designed to initiate student inquiry (Keller, 1968), while other students who typically are enrolled in more advanced courses, act as reviewers or tutors by evaluating and giving feedback on the unit assignments. PSI is a mastery-based system of instruction since students must demonstrate mastery on a given unit before they can proceed to the next.

The present study focuses on a course at the University of Nebraska-Lincoln (UNL) containing both PSI and online course features. Very little research currently is available regarding the relationship between personality and either PSI or online courses. In contrast to a traditional course which typically involves face-to-face interaction, attendance-taking, reminders from instructors or teaching assistants (TAs) to complete homework, weekly lectures, and instructors/TAs readily available for assistance, for example, PSI courses offer considerably less structure. Typically PSI courses will consist of five major components (1) go at your own pace, (2) unit mastery, (3) lectures for motivation only, (4) stress upon written word, and (5) use of proctors.   In PSI as well as in many online courses, there are no scheduled class meeting times, flexibility in

completion of assignments, no unsolicited student-to-student interaction, and limited student-to-instructor interaction.

Jenkins and Downs (2003) posited that the differences between online courses and traditional courses may also lead to unique differences in those students that choose one or the other. Roblyer (1999), on the other hand, has suggested that there are few personality differences between those students who choose traditional versus nontraditional courses. Due to jobs, families, or distance from the university and tied to the growing availability of online/distance learning courses and PSI courses, however, traditional students increasingly are participating in courses that formerly were utilized only by non-traditional students. While Roblyer may be correct in arguing that there may be relatively few important personality differences at this point among those who choose to take PSI, online, or traditional courses there may be differences in those who *succeed* in the non-traditional PSI or online course environment. This study aims to utilize personality assessment, particularly the NEO-Five Factor Inventory (NEO-FFI) Form S (Costa & McCrae, 1992), to predict academic success in a nontraditional instructional environment involving both PSI and online characteristics.

The current study utilized data previously collected from the UNL's Introduction to Psychology PSI course (PSYC 181) during the fall of 2004. UNL's Intro to Psychology 181- PSI course is unique because it is not, strictly speaking, a contemporary online course, nor is it a traditional Keller/PSI course, but rather a combination of the two. Thus the results of the present study have the potential to provide a greater understanding of the relationship between personality and academic success (including

both academic success as well as failure) not just in nontraditional courses but also within a more general academic framework.

This study is important for several reasons. The first is the possibility of detecting variables that predict student success or failure not only in UNL's Intro to Psychology 181- PSI environment, but that can also be generalized to PSI courses, online courses, and distance learning courses. The second reason is the dearth of recent research regarding PSI and PSI-type courses. Lamal (1984) assessed the development of PSI across 16 years, and reported that PSI research peaked in the early-to-mid seventies but had since steadily declined. Lamal was quick to point out, however that decline in research regarding PSI did not equate to a decline in PSI usage. Lloyd and Lloyd (1986) reported that while there was a decline in PSI-related research, the documentation of a parallel decline in the number of PSI classrooms did not exist.

UNL's Intro to Psychology 181- PSI has the potential to provide a unique environment for each student participating in a personalized system of instruction, which makes this setting an attractive area of study for educators and researchers alike. In Intro to Psychology 181- PSI there is neither a physical classroom nor is there a virtual classroom, but a combination of both technology and the traditional trip to campus. Rapidly changing technology and changes in educational systems have forced universities and colleges to make better use of their limited resources. Because it remains an efficient and generally effective approach to teaching, PSI and PSI-type courses have made large inroads in educational institutions across the country. Universities have continued to use these courses due to economic factors, budget cuts, and pressure to reform teaching methods (Roblyer, 1999). While the use of online instruction and PSI

courses in the classroom may be maintained, or even increasing, the empirical data to support its use and judgments about its effectiveness are still lagging.

The current study focused on extraversion and conscientiousness, two of the personality variables in the Five Factor Model (FFM). Conscientiousness has empirically shown to be most related to academic engagement and course outcomes (cf. Chamarro-Premuzic & Furham, 2003; Digman & Takemoto-Chock, 1981). Extraversion has been less consistent in its relationship with academic engagement and course outcomes (cf. Kline & Gale, 1971; Savage, 1964). Currently, the FFM is the most-agreed upon personality model of personality to date. Its five factors- neuroticism, extraversion, openness, agreeableness, and conscientiousness- are used to globally describe personality. Each can be briefly described as follows: (1) *Neuroticism*, calm, and not easily upset; (2) *Extraversion*, talkative, assertive, and energetic; (3) *Openness*, active imagination, preference for variety, and attentive to inner feelings; (4) *Agreeableness*, good-natured, cooperative, and trustful; and (5) *Conscientiousness*, orderly, responsible, and dependable.

Consistent evidence exists of a relationship between conscientiousness and academic success (e.g., De Fruyt, & Mervielde, 1996; Digman, 1989; Dollinger & Orf, 1991), while extraversion has shown much less consistency as a predictor of academic success. In their study, Phillips, Abraham, and Bond (2003) confirmed that fewer studies have examined the relationship between extraversion and academic achievement than conscientiousness.

Research Questions

This study addressed two main questions. The first research question: Is the model-which describes the causal effects among the variables "E" (extraversion), "C" (conscientiousness), "ACT" (score on the American College Test), "PROC" (procrastination), "GPA" (grade point average), "exgra" (expected grade), and "letgra" (letter grade) in a nontraditional PSI-type course –consistent with our observed correlations among these variables? As previously mentioned there is consistent evidence of a relationship between conscientiousness and academic success in traditional classrooms (e.g., De Fruyt, & Mervielde, 1996; Digman, 1989; Dollinger & Orf, 1991). Conversely, however, there is very little research regarding conscientiousness in a PSI-type or nontraditional environment. Extraversion, in contrast, has shown little consistency in its ability to maintain a relationship between academic successes in the traditional classroom, but due to the nature of the PSI environment, its role may become more prominent. Thus it is explored in the current study.

From the general research question above a more specific question was generated regarding the relationship between students' expectation about their course grades prior to starting the course and their final grade. Previous studies have shown that students' internal motivation, or their own expectation (PytlikZillig, personal communication, 2005) may be a better predictor of academic success, or final grade, than any other variable.), "GPA" (grade point average), "exgra" (expected grade), and "letgra" (letter grade)?

 Because the primary investigator was also interested in academic failure another model was created that examined whether aspects of personality, particularly

extraversion, or other aspects of the PSI-type course suggest a causal relationship with withdrawal from UNL's Intro to Psychology 181- PSI course. Therefore, the question posed: Can a student's standing as "withdrawn" be reliably predicted from knowledge of "E" (extraversion), "C" (conscientiousness), "GPA" (grade point average), "PROC" (procrastination), "#qa" (number of quiz attempts), and "Unit Comp" (the number of days between the last attempted quiz and the pull date for each unit or chapter averaged over all chapters) in a nontraditional PSI-type course?

Jenkins and Downs (2003) reported differences in the social context of traditional classroom versus online instruction, pointing out that immediate face-to-face interaction is not a component of online courses. Given the relatively impoverished social context of a PSI classroom, including limited peer, as well as instructor, interaction, extraverts may have an increased propensity to withdraw or drop out of a PSI course. Conversely, those who score low on the extraversion may excel in this environment.

This model examined the relationship between conscientiousness, extraversion, grade point average, as well as factors unique to this course, including the number of times a student attempts a quiz. Because students have the ability to test on future chapters as well as having the option to test on more than one chapter each day in the Psychology 181-PSI course, it may be an important variable in whether or not a person withdraws from this course. Several meta-analysis articles (e.g., Kulik, Kulik, & Cohen, 1979; Kulik, Kulik, & Cohen, 1980) have suggested that PSI's effectiveness comes from its emphasis on frequent testing of student performance, immediate feedback to students regarding performance, and the requirement that students re-do work until evaluation shows that they have reached a high standard of performance (Kulik et al.,

1979; Kulik et al., 1980). Semb, Glick and Spencer (1979), for instance, found that delayed work is correlated with both inferior academic performance and eventual course withdraw.

Ross and McBean (1995) have discovered that in order to maintain test-taking behavior in PSI courses, testing taking contingencies must be imposed throughout time-limited courses. Therefore, imposing structured "pull dates" into a course (a date in which each particular chapter requirements are no longer available created in an effort to keep students on a semi-consistent track to completion) can help students avoid that initial delayed work by setting performance boundaries so students do not fall too far behind. By assessing when students begin their coursework we can see whether in fact an initial delay has an impact on course withdraw. Also, tracking the number of times a student attempts each chapter quiz and chapter assignment will provide the opportunity to determine whether number of attempts plays a role in academic success or failure. It is hypothesized that conscientiousness can help predict this because those students who reported higher conscientiousness scores are more likely to plan, organize, and exhibit more goal-directed behaviors, which presumably would be associated with completing all required tasks before due dates and keeping on track with scheduled pull dates.

To summarize two separate analyses will be done to answer the two main research questions regarding the relationship between several variables and academic success as well as failure. The researcher would like to know whether or not the model is consistent.

Research Hypotheses

It was hypothesized that conscientiousness will have a positive impact, while extraversion will have a negative impact on academic success (final grade) in this PSI-type environment. Wolfe and Johnson (1995) addressed personality as a predictor of college performance and found that approximately 1/3 of all variance in college GPA is accounted for by these factors respectively: (1) high school GPA, (2) self-control variable (conscientiousness, as measured by the NEO-PI-R was one of the self-control variables assessed), and (3) SAT score. Other self-control variables, taken from Tellegen's Big 3 model, included control, organization, and general self efficacy. Wolfe and Johnson (1995) reported intercorrelation among the self control variables (conscientiousness, organization, and control) indicating that they have much in common, with *rs* ranging from .68-.73 further supporting the need to assess conscientiousness in the PSI-type or nontraditional classroom.

Second, it was hypothesized that extraverts will be more likely to drop out or withdraw due to the unique environment of UNL's Intro to Psychology 181- PSI. Previous studies (e.g., Entwistle & Entwistle, 1970; Savage, 1964) suggest that introverts perform better than extraverts and attributed this difference to their ability to consolidate learning, as well as having better study habits. Kline and Gale (1971) suggested that there may be developmental differences in the role of extraversion, finding that extraverts do well at the primary level, whereas at the university level introverts are more successful.

Third, it was expected that students' expectations of their final grade will have an impact on their final grade (PytlikZillig, personal communication, 2005). In a study investigating college students on academic probation, those who estimated their grades

more accurately prior to taking the courses, were more likely to get off probation than those who overestimated their course grade (Smith & Winterbottom, 1970).

In addition to personality variables, other factors were analyzed in each model to see if they alone, or in combination with personality, affected course performance. These included variables that historically have been shown to be related to course grades, student GPA (Chapman, Holloway, & Kelly, 1977), and ACT (Gifford, Briceno-Perriott, & Mianzo, 2006). While these variables have historically been shown to be related to performance, this study analyzed them in combination with personality factors to see what portion of the variance is attributable to personality, what portion to other factors, or a combination of these variables.

CHAPTER 2

Literature Review

This chapter consists of five major sections. The first section is a review of both

historical and recent research regarding personality and the five factor model (FFM). The

second section is a review of the different types of college courses, with primary focus on

personalized system of instruction (PSI). Third, the researcher reviews how these courses

have been applied at the University of Nebraska-Lincoln, especially in the environment

of instruction in introductory psychology, Psychology 181. Following that description the

role of withdrawals and dropouts in this course environment is discussed. Finally, the

researcher ends with a description of academic success and specific predictions for the

current study.

Personality Research and the FFM

Kahn, Nauta, Gailbreath, Tipps, and Chartrand (2002) suggest that early

identification of students who are at risk for poor academic performance could be

facilitated by the use of assessment instruments that focus on relatively stable aspects

(e.g. personality) of the student. Goldberg (1972) suggested three goals when assessing

personality: (1) identifying the important personality characteristics that ought to be

measured, (2) developing measures that best assess these characteristics, and (3)

establishing procedures for effectively using those assessment results in research and

practice. Therefore this study combines both suggestions from above, by using

personality to identify those at risk and by using the three goals for assessing personality.

Personality is typically studied in terms of a taxonomy, which is a systematic

framework for distinguishing, ordering, and naming types and groups within a subject

field. Looking at personality psychology as taxonomy permits researchers to study specified domains of personality characteristics, rather than separately examining thousands of particular attributes that make each human being individual and unique. Historically, personality attributes have been studied through lexical approaches, suggesting that individual differences that are most salient and socially relevant in people's lives will eventually become encoded into their language; the more important such a difference, the more likely it is to become expressed as a single word.

This idea was first articulated by Klages (1926/1932), and then elaborated by Allport and Odbert (1936), Allport (1937), Cattell (1943), Tupes and Christal (1961), Norman (1963), and Goldberg (1981). In 1961 Tupes and Christal reported finding "…five relatively strong and recurrent factors and nothing more of any consequence" (1961, p. 14). This so-called five-factor structure was replicated by Norman (1963), Borgotta (1964), and Goldberg (1981). Despite some convergence on five factors, there still remained considerable disagreement about how many factors are required to adequately *describe* personality.

For example, Wiggins (1968) stated there are two main personality factors: extraversion vs. introversion and anxiety, while Digman and Takemoto-Chock (1981) suggest there are six: extraversion vs. introversion, friendly compliance vs. hostile noncompliance, ego strength vs. emotional disorganization, will to achieve, active intellect, and culture or social class as the final factor. Hogan (1982) suggests a six-construct model consisting of: ascendancy, socialability, agreeableness, dependability, emotional stability, and intellectance.

The greatest degree of convergence, however, has been around the FFM (Costa & McCrae, 1980; Goldberg, 1981). Goldberg termed elements of the model "Big Five," in order to describe the personality factors we commonly refer today as Neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness. According to Goldberg, the choice of the description "Big Five" was "…a title chosen not to reflect their intrinsic greatness but to emphasize that each of these factors is extremely broad" (John & Sriuvastava, 1999, p. 105). Goldberg (1981) reported that the FFM is robust, not only across different studies and languages in the rating field but across languages and different inventories as well.

McCrae and Costa (1986) reported that after decades of debate on the number and nature of major dimensions in personality a consensus was emerging that the original five factors determined by Tupes and Christal (1961) and Norman (1963) were both necessary and reasonably sufficient for describing the major features of personality at a global level. In a re-analysis of six major studies involving the determination of the number of personality factors, Digman (1990) found the FFM to be very robust. John and Sriuvastava (1999) suggest that the Big Five are fairly independent dimensions that can be measured with convergent and discriminant validity. Salgado (2002) stated that FFM has been consolidated as the most investigated and empirically supported model of personality.

The Big Five framework is a measure of personality traits within five broad factors that represent personality at the broadest level of abstraction. Each polar factor (e.g., extraversion vs. introversion) summarizes more specific facets (e.g., sociability), which in turn subsume a large number of even more specific traits (e.g., talkative,

outgoing). The Big Five framework suggests that most individual differences in human personality can be classified empirically into five broad empirically derived domains (Gosling, Rentfrow, & Swann, 2003).

There are several important characteristics of the FFM. First, each of the five factors is a dimension, not a type. Therefore, individuals tend to vary along a continuum, with most people falling in the middle. Second, the factors are stable over many years beginning in young adulthood (cf. Allik, Laidra, Realo, & Pullmann, 2004; Soldz & Vaillant, 1999). Third, the facets and their specific facets are at least partially heritable; (Jang, McCrae, Agletiner, Riemann, & Livesley, 1998) which means that there appears to be some component in personality that is passed down through family members independent of shared environment. The factors are considered universal, having been recovered in languages as diverse as German and Chinese (McCrae & Costa, 1997). Finally, knowing one's place on the factors is useful for insight and improvement through therapy (Costa & McCrae, 1992c).

Each of the FFM's five dimensions- Neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness- has a short definition (cf. Costa & McCrae, 1992b; John, 1990; Tellegen, 1985) and six facets that define it. For example, extraversion implies an energetic approach to the social and material world and includes traits such as socialability, activity, assertiveness, and positive emotionality. Extraversion's facets can be described as gregarious, assertiveness, activity, excitement-seeking, positive emotions, and warmth along with characteristic adaptations such as social skills, numerous friendships, enterprising vocational interests, participations in sports, and club memberships.

According to the NEO manual (1992b) characteristics of the extravert are easier to portray than those of the introvert. Authors suggest that introversion is not the opposite of extraversion but rather the absence of extraversion, citing examples such as the following: introverts are reserved rather than unfriendly, independent rather than followers, even-paced rather than sluggish, and while they are not the exuberant high spirits of extraverts, introverts are not unhappy or pessimistic (NEO Manual, 1992b p. 15).

Agreeableness contrasts a pro-social and communal orientation toward others and includes traits such as altruism, tender-mindedness, trust, and modesty. The facets of agreeableness can be described as trust, straightforwardness, altruism, compliance, and modesty. Some characteristic adaptations of agreeableness include a forgiving attitude, belief in cooperation, inoffensive language, and a potential reputation as a pushover.

Conscientiousness describes socially prescribed impulse control that facilitates task and goal-directed behavior, such as thinking before acting, delaying gratification, following norms and rules, planning, organizing, and prioritizing tasks. Conscientiousness facets are competence, order, dutifulness, achievement striving, self-discipline, and deliberation. Some characteristic adaptations of conscientiousness include leadership skills, long-term plans, organized support network, and technical expertise.

Neuroticism contrasts emotional stability and even-temperedness with negative emotionality, such as feeling anxious, nervous, sad, and tense. Neuroticism has facets such as anxiety, angry hostility, depression, self-consciousness, impulsiveness, and vulnerability. Some characteristic adaptations of neuroticism include low self-esteem, irrational perfectionistic beliefs, and pessimistic attitudes.

O*penness* to experience describes the breadth, depth, originality, and complexity of an individual's mental and experiential life (John & Sriuvastava, 1999) Openness ascribes to facets such as ideas, fantasy, aesthetics, actions, feelings, and values. Some characteristic adaptations of openness include interest in travel, many different hobbies, knowledge of foreign cuisine, diverse vocational interests, and friends who share similar tastes.

While the NEO manual does not report intercorrelations among the five factors for the NEO-FFI (the short version) version it does report intercorrelations for the NEO-PI-R (the long version). In the NEO-PI-R for example conscientiousness correlates with extraversion, neuroticism, openness, and agreeableness at the .27, -.53, -.02, and .24 levels respectively. While the NEO-FFI scales are not equivalent to the NEO-PI-R, the manual suggests that the shorter scales appear to account for about 85% as much variance in the convergent criteria as do the full factor scores (NEO Manual, 1992b).

Personality and Academics

For nearly a century, researchers have turned to personality variables in an attempt to predict academic success as well as academic failure (cf. Binet & Simon, 1905) in arenas as diverse as medical school (cf. Lievens, Coestier, & Maeseneer, 2002) aviation training, and graduate study of psychology (cf. Wiggins & Blackburn, 1969). This research has produced mixed results, which has prompted numerous journal articles and books, as well as two in-depth meta-analyses (Ackerman & Heggestad, 1997; De Raad & Schouwenburg, 1996). There are still no definite answers, but what convergence there has been has been within the FFM. De Fruyt and Mervielde (1996) posited that the FFM seems best suited to explain variance in academic achievement. Although this

dissertation is focused on researching the unique academic environment of UNL's

Intro to Psychology 181- PSI it further extends the quest to predict academic success by

using personality variables, specifically conscientiousness and extraversion.

Because of their potential relationship to the processes and outcomes of

instruction, two of the five personality variables, conscientiousness and extraversion, are

the primary focus of the present study. As previously mentioned, characteristics of

conscientiousness include being orderly, responsible, dependable, planful, and task

oriented. Characteristics of extraversion include being talkative, assertive, energetic, and

liking to be around people. These two factors have been selected because both seem

likely to be associated with the unique factors created by PSI and online dimensions of

UNL's Intro to Psychology 181- PSI course. For example, while conscientiousness and

extroversion can be important in any academic setting, they may be more critical in

UNL's Intro to Psychology 181- PSI environment; because this environment lacks the

structure of the traditional classroom environment and offers limited peer and instructor

interaction. Thus, emphasizing characteristics of conscientiousness and extraversion.

Conscientiousness. Conscientiousness repeatedly has been shown to predict

academic performance (Chamorro-Premuzic & Furnham, 2003; Digman & Takemoto-

Chock, 1981; Dollinger & Orf, 1991; Tross, Harper, Osher, & Kneidinger, 2000). For

example, Goff and Ackerman (1992) found that conscientiousness was a better predictor

of college performance than high school performance and attributed these findings to the

decreased structure provided in college. Research by Tross, Harper, Osher, and

Kneidinger (2000) found that conscientiousness was more predictive of college GPA than

high school GPA. When Dollinger and Orf (1991) looked at personality and performance

they discovered that conscientiousness was a successful predictor of course grade,

objective test performance, and independent credit efforts. Ones and Viswesvaran (1996)

suggested that conscientious individuals are better workers than less conscientious people

because they control their work-related behaviors. For example, they suggest that

individuals with higher conscientiousness show greater productivity because they:

1. spend more time on task
2. acquire greater job knowledge
3. set goals autonomously and persist in following them
4. go beyond role requirement in the workplace
5. avoid counterproductive behaviors

While Ones and Viswesvaran's research focused on the work place, the same

components are likely to make students more proficient in the PSI environment. The

results of this study can help inform PSI or other nontraditional courses but are also

relevant to academia in general. For example, it seems likely that some of the same

characteristics that might allow students to be productive in the PSI-type courses would

also predispose them to be successful students in general and in work settings. Wang and

Newlin (2002) reported that research has shown successful distance learners have an

internal locus of control and are effective time mangers, both characteristics of

conscientiousness.

Extraversion. Entwistle and Entwistle (1970) have suggested that the negative correlation

between extraversion and academic success had to do with introverts' greater ability to

consolidate learning, lower distractibility, and better study habits. More recent research

(e.g., Sanchez-Marin, Rejano-Infante, & Rodriguez-Troyano, 2000) suggests that

extraverts underperform in academic settings because of their distractibility, sociability,

and impulsiveness. Sanchez-Marin et al (2000) further reported that not only do

extraverts underperform but tend to fail their courses more frequently than introverts. Jenkins and Downs (2003) report differences in the social context of traditional classroom versus on-line, pointing out the fact that immediate face-to-face interaction is not a component of on-line courses. The difference in social context that Jenkins and Downs are referring to is one of the main reasons why it is hypothesized that extraverts may do poorly with the non-traditional, PSI-type course.

In a meta-analytic review of extraversion and intelligence, Wolf and Ackerman (2005) suggested that while extraversion and intelligence are not theoretically related, extraversion is me in traditional classrooms further supports the hypothesis that in a much less structured environment, such as a PSI-type environment, extraversion may play a larger role and therefore, negatively correlate with academic success. McCown and Johnson (1991) (as cited in De Fruyt, & Mervielde, 1996) suggested that extraversion correlated with chronic procrastination. McCown and Johnson also found that extraverted students were more involved with social and impulsive activities, and studied for fewer hours per day.

Additional research by Mumford and Gustafason (as cited in Blickle, 1996) remains consistent with Wolf and Ackerman (2005). Mumford and Gustafason suggested that personality can influence grades through facets and habits. More specifically they suggest that personality traits can (1) facilitate or inhibit the use of strategies, (2) provide either motivational inspiration or motivational blocks to learning strategies, and (3) depending on previous trials or failures a person may try again or leave the field. Thus all three have the potential to help or hinder performance. Blickle (1996) suggested that learning strategies can be used as mediators between personality traits and performance.

At the same time, however, research exists that suggest personality variables have little or no effect on academic success. An early study by Kline and Gale (1971), for example, investigated the relationship between introversion-extraversion and neuroticism and performance in first-year psychology examinations. The authors concluded that "…the stability of the relationship between academic success in a psychology examination and extraversion-introversion and neuroticism is low" and suggested it would certainly be unwise "…to state, as a general finding, that academic success is related to personality variables" (p. 93). Farsides and Woodfield's (2003) research with undergraduates and Big Five factors showed that extraversion had no relationship with academic success. Contrary to previous research, they found little evidence of a significant positive association between conscientiousness and academic success. Phillips and his colleagues also reported that extraversion did not appear to be an important predictor of examination motivation or performance (Phillips et al., 2003).

Farsides and Woodfield (2003) attempted to explain some of the discrepancy in the literature regarding personality variables and their ability to predict academic success by pointing out that, in addition to employing samples of varied ages, different studies have drawn samples from different disciplines. Also, authors argue different studies have used different criteria for academic success, ranging from course-specific evaluations, first-year examination scores, final year examination scores, grade point average, and assessment while on "placements." Finally, different studies have permitted considerably different time lapses between collection of predictor and criterion data.

In light of several possible reasons for the null findings, coupled with the large body of research supporting the association between personality and academic success,

this investigation of personality factors in the instructional context of a "hybrid" PSI

and online course provides a unique opportunity. Distinctive features of the course

include: (1) the availability of all study materials and course information online, (2)

interaction between proctors and teaching assistants, (3) flexibility of testing schedules,

and (4) a high degree of reliance on the student responsibility and self motivation. Taken

together, these factors imply a high demand on the students to regulate their own

performance, including the ability to stay on-task, study independently, and complete

requirements with few or no verbal prompts.

Scandell (2000) suggested that the two versions of the NEO (NEO Personality

Inventory-Revised (NEO PI-R) and NEO-Five Factor Inventory (NEO-FFI)) are the most

commonly-used measures of the FFM. The creators of both versions of the NEO, Costa

and McCrae, have sought measures of personality dimensions in which scale scores

represent latent factors that are linked to both item responses and external outcomes

(Ozer, p. 675). The present study utilizes the extensive research and the stability of the

NEO research within the FFM framework to assess the broad measures of personality and

academic success in a PSI course.

The Personalized System of Instruction (PSI)

In 1968 Fred S. Keller wrote a seminal article (Keller, 1968) introducing the

Personalized System of Instruction (PSI). Keller's PSI is a nontraditional approach to

teaching that changed the way that psychology, and soon other courses, were taught

across college campuses nation-wide and internationally. Keller, along with J. G.

Sherman, created this method of instruction within the framework of behavioral theory in

order to provide alternate methods of mastering skills in the classroom. Keller's PSI

was distinguished from traditional courses primarily due to these five points:

1. A go at your own pace feature, permitting students to move through the course at a speed equal to his/her ability and dependent on other demands for their time
2. A unit-perfection requirement for advancement, allowing students to move on only after demonstrating mastery of current work
3. Use of lectures and demonstrations as vehicles of motivation, rather than sources of critical information
4. A stress upon the written word in teacher-student communication
5. Use of proctors, permitting repeated testing, immediate scoring, unavoidable tutoring and marked enhancement of the process of personal-social aspect of the educational process.

These five features place the responsibility for learning course materials directly onto the

students' shoulders, provide personalized educational experiences for students, allow for

a high degree of interaction between students and proctors, allow flexibility for the

different rates that students learn, and provide immediate feedback on student progress

toward mastery of course materials (Bushkist, Cush, & DeGrandpre, 1991).

Shortly after Keller's article was published, the Center for Personalized

Instruction was established at Georgetown University, along with a journal devoted to

PSI research, the *Journal of Personalized Instruction.* Many books and conferences were

developed on the topic of PSI-based instruction (Lamal, 1984). Keller (1968) reported

that the goal of this method is nothing less than fluency with respect to each main feature

of the course. In this same article Keller's premise for the success of this method was

reinforcement theory, "(students)… can learn a great deal if we provide the right

contingencies of reinforcement" (p. 88). Keller's theory of how PSI courses should be

structured and managed was derived from the principles of reinforcement and

contingency management, which allows students varied amounts of responses that can be reinforced toward the desired behavioral goal.

In *The Keller Plan Handbook* Keller and Sherman reported that the superiority of PSI students (versus students in traditional courses) should be attributed to the behavior of independent thinking and studying (Keller & Sherman, 1974). The behaviors that Keller and Sherman attributed to success in PSI courses are consistent with the description of conscientiousness, generally supporting the hypothesis of conscientiousness predicting academic success.

In 1975, the Directory of Teaching Innovations in Psychology stated, "It is clear that the single most influential innovation in recent years has been Keller's Personalized System of Instruction" (Hothersall, 1975, p. 181). Mao-Cohen and Lanson's (1976) research results suggested that students participating in PSI programs performed better, in terms of GPA, both in the concurrent semester and the semester following their PSI course. The authors attribute this to the generalization of the behaviors learned and/or reinforced by a PSI course. As noted above, Keller and Sherman used reinforcement theory as the basis for designing the PSI teaching method. According to Skinner (1953), reinforcement occurs whenever an outcome strengthens a response as measured by an increase in the rate of responding. The central process is the strengthening of a response tendency, so determining if the response behavior is being repeated.

PSI has repeatedly shown its effectiveness in promoting superior final exam results superior to those of traditional lecture methods (e.g., Kulik, Kulik, Bangert-Drowns, 1990; Sherman, Ruskin, & Semb, 1982). In general, the literature suggests that PSI's effectiveness comes from its emphasis on frequent testing of student performance,

immediate feedback to students on their performance, and the requirement that

students re-do work until evaluation shows that they have reached a high standard of

performance (Kulik, Kulik, & Cohen, 1980).

UNL's Intro to Psychology 181- PSI

The current intro to Psychology 181-PSI course in the Department of Psychology

at the University of Nebraska-Lincoln (UNL) is the result of the natural migration of a

long-standing PSI course towards increasing technology, combined with over 20 years of

trial and error experience. This variation still includes three of Keller's five essentials; (1)

go at your own pace, (2) emphasis on written word, and (3) use of student proctors.

Table 1 (below) contains a breakdown of these factors, as well as the rest of Keller's five

PSI essentials, other factors of UNL's Intro to Psychology 181- PSI, and characteristics

of a typical online/distance course.

In UNL's Intro to Psychology 181- PSI course, the classroom environment varies

from a series of web pages available anywhere the internet is accessible, to the Testing

Center on campus where quizzes and exams are proctored, and a "Keller Room," where

students can interact one-on-one with trained undergraduate teaching assistants. UNL's

version of PSI allows students to access all course information via the course webpage.

This webpage contains the syllabus, instructions on how to navigate their account, a

schedule of the pull dates, PowerPoint lectures for each chapter, study questions for each

chapter, a link to the Textbook website containing additional study material, and

important announcements from the Keller Director and/or faculty supervisor. UNL's PSI

version also gives students access to trained undergraduate teaching assistants, housed in

the Keller room, which grade essays, writing assignments, provide immediate

feedback, and are available for individual tutoring.

Table 1 Characteristics of UNL's Intro to Psychology 181 PSI, Traditional PSI, and
Typical Online/Distance Courses

Characteristic	Traditional PSI	Typical Online/Distance	UNL's Intro to Psych-181
Go at your own pace feature	X	X	X
Use of proctors	X		X
Use of lectures	X		
Consistent face-to-face interaction	X		
Discussion boards with peers		X	
Discussion boards with instructor		X	
Unit Mastery	X		
Automatic Scoring/Grading	X		X
Emphasis on written communication	X	X	X
Immediate Feedback	X		X
Learning by doing	X	X	X
On-campus Testing Center			X
Allows for geographic distance		X	
Use of technology to facilitate learning		X	X

The Testing Center, which contains several computers and is staffed by proctors,

allows students to take proctored psychology quizzes and exams at their own pace.

Kulik, Kulik, and Carmichael (1974) reported that in courses such as PSI, students often

fail either to begin or to progress through the course material and therefore results of their

study suggested that in order to maintain test-taking behavior in PSI courses, test-taking

contingencies must be imposed throughout the time-limited courses. In a study

looking at the opportunity for retest on study behavior and academic performance,

Barkmeier, Duncan, and Johnston (1978) found that when limited in the number of

attempts allowed on each unit, students performed at a higher level on initial tests then

when allowed a larger number of tests on each unit. Barkmeier et al. suggest that students

engage in less preparation for initial tests when the number of tests is not limited.

When Dollinger and Orf (1991) examined the relationship between personality

and course performance they discovered that conscientiousness was a successful

predictor of course grade, objective test performance, and independent credit efforts.

Specifically, their results suggest that conscientiousness also predicted early completion

of independent credit. Based upon this research, UNL imposed some restrictions to the

"go at your own pace" principle (i.e., the pull dates for weekly quizzes and exams-

discussed above) so that students did not get behind or wait until the end of the semester

to complete the entire course. Students can work *ahead* in the course as much as they

choose. This again suggests there is a correlation between personality and completion of

tasks. Dollinger and Orf's (1991) findings support the current hypothesis that personality

and its relationship with the completion of chapter requirements, as well as the date of

completion for the entire course may impact academic success.

Among the potential problems with unit-mastery systems such as UNL's,

however, are a bias against poor readers and a possible emphasis on trivia (Rosenkoetter,

1984). In Rosenkoetter's view, when students are allowed to test and retest several times,

the database from which the test questions are pulled must be large enough to

accommodate multiple tests. In order to do this you must have many questions in your

test bank, which can often lead to trivia-type questions. Those students who struggle with reading may also have particular difficulty with these types of questions.

UNL responded to this concern by making adjustments in its program to counter this situation. EDU® software, a proprietary online system at UNL that is employed to manage tests items and examinations, has the capability to randomly select questions from the test bank. No two tests therefore are the same. In fact it even has the capability to rearrange multiple choice answers so that even though the question may be the same, the correct answer one time may be "A" and the next time the correct answer may be "C". This requires students to learn the content, not just memorize that the correct answer is "A". In addition, the faculty supervisor, graduate assistants, and undergraduate teaching assistants have spent considerable time combing through the test bank, assuring less redundancy and editing questions that appeared too focused on minute details. While it is still possible that poor readers may have difficulty in this type of course, alternate study methods are provided. For example, in addition to the course textbook, the course webpage contains a variety of study aids including PowerPoint presentations and highlights of each chapter, as well as games and activities for more visual or hands-on learners.

The disadvantages to UNL's Intro to Psychology 181- PSI course are similar to those of many other courses offered on the web. For example, extra time required of instructors to create and maintain web pages and interact with students individually (Lawson, 2000). Also, some students show frustration with the increase in time it takes to learn how to maneuver through the internet/software system, the absence of face-to-face communication with its accompanying nonverbal cues, and the occasional

malfunctions in internet connections or computer hardware/software that may hinder a students' ability to complete coursework. These issues can lead to student drop out or withdrawal.

Withdraw/Drop Out

According to the U.S. Department of Education (2000), approximately 25% of students at 4-year colleges and universities do not persist beyond their freshman year. Born and Whelan (1973) reported the percentage of withdrawal in PSI was three to five times greater than more traditionally-taught courses and those students who did withdraw were students who had poor academic records. Those students with high GPA's almost never withdrew, however. In contrast, McMichael and Corey (1969) found that the experimental course (Keller Plan) was dropped by fewer students than those dropping the control (traditional) sections. Rosenkoetter (1984) also raised the issue that students with learning disabilities may be more apt to drop out within the first month because mastery courses require reading a textbook.

UNL's Intro to Psychology 181- PSI attempts to combat early withdrawal by including a great number of online didactic components that offer additional learning aids beyond reading the textbook. For example, students have the ability to access practice questions on-line, highlights of each chapter, key vocabulary terms with their definitions, as well as games and activities to aid in learning course material.

Robin (1975) suggested that high withdrawal rates do not take into account the fact that students have many years of exposure to traditional methods of teaching. As a result, when they encounter their first PSI course reinforcement analysis would predict that this new environment could elicit intuitive and negative reactions, potentially

resulting in escape or avoidance responses. She suggested that researchers need to study these responses and create behavior modification measures to handle them. In a meta-analysis of 75 comparative PSI courses, Kulik, Kulik, and Cohen (1979) found similar overall completion rates for PSI and traditional courses. One year later, in a second meta-analysis, Kulik, Kulik and Cohen (1980) reported that after more extensive analysis lower completion rates in PSI courses appeared only in early studies in the literature. Kulik et al (1980) reported that over the years Keller plan users have learned how to deal with student procrastination, incompletion, and withdrawal.

The Nature of Academic Success

For the purpose of this study academic success is defined as final course grade. In the context of research that attempted to predict academic success, Ridgell and Lounsbury (2004) suggest that future research could "…investigate whether differential validity patterns can be found using course grade or GPA as criteria." (p. 650). In an earlier study, Lounsbury, Sundstrum, Loveland and Gibson (2003) found that by using both course grade and GPA in their analysis they created similar validities when general intelligence, Big Five personality traits, and work drive were used as predictors. Academic success predictors usually consist of cognitive measures, mostly pertaining to mental ability or intelligence, and non-cognitive measures, especially personality traits.

For example, Busato, Prins, Elshout, and Hamaker (2000) reported a positive association between conscientiousness and academic success, which generally has been defined as collegiate cumulative grade point average (GPA). Lounsbury, Tatum, Chambers, Owens, and Gibson's 1999 study reported that the historical way of measuring academic success does not take into account the variability in instructors, courses, and

other uncontrolled variance. These authors suggested that choosing a grade in a single course would avoid variability and may serve as a better validity criterion than overall GPA for cognitive and personality predictors.

Wang and Newlin (2000) examined a broad range of factors potentially related academic success, including locus of control, motivation, learning styles, processing styles, and approaches to studying. Results from their study suggested that students who performed well in web-based courses maintained a high level of on-line activity, displayed a high degree of inquisitiveness, and had an internal locus of control. All are traits that are similar to those used to describe the conscientiousness personality factor.

A recent study by Gifford et al. (2006) indicated that both ACT and locus of control predicted GPA, and ACT scores accounted for more variance in cumulative GPA than locus of control. These results suggest a positive relationship between ACT and cumulative GPA ($r = .267$). Chapman, Holloway, and Kelly's study (1977) revealed a positive relationship between GPA and performance in a PSI course and showed that high school performance (GPA) was a better predictor of specific course performance than were student ratings of teacher activities and course characteristics. Davis (1975) reported that students with poorer academic history obtained lower percentages of correct mastery scores than students with higher academic history.

A later study by Badia, Harsh, and Stutts (1976), however, suggested that PSI helped the majority of the students with average and below-average ability more than a lecture method. These authors attributed this to the efficiency and organizational skills required to participate in a PSI course and reported that PSI courses do for students with lower aptitude and poorer study skills what students with higher aptitude and better study

skills can do for themselves. PSI is particularly effective, they suggested, with students

scoring low on various measures of individual differences. Consistent with this research,

the meta-analysis of PSI courses by Kulik et al., (1979) found that the superiority of PSI

to conventional instruction could be seen with both high- and low- aptitude students.

Expectations

The current research study continues to investigate academic success, by

assessing personality variables in the context of the PSI-type environment. Instructors of

PSI courses, and other nontraditional courses such as online instruction and independent

courses, can also benefit from the results of studying personality and academic success.

The primary researcher, however, also is interested in academic failure; is it possible to

identify those students who fail or slip through the proverbial crack based on their

personality variables?

When Smith & Winterbottom (1970) examined personality characteristics of

college students on academic probation, they asked students to estimate grades for each

course in which they were enrolled. Their results suggested that probationary students

were unrealistic in their expectations and aspirations concerning grades. Furthermore,

probationary students did not perceive their difficulties as due to poor study schedules or

distractions, they instead attributed their difficulties to their courses. Specifically, they

found the courses less interesting and more difficult and therefore were more likely to fall

behind in their course work because of the work demand. The researcher in this study

also suggested that of the probation students, those who overestimated their grades were

more likely to end up with poor academic standing. Conversely, those who more

accurately estimated their grades were more likely to get off probation. While this

particular study was done with a traditional course, the components likely can be

applied to non-traditional courses and may be even more relevant, given the unique social

and academic environment of non-traditional courses.

Academic Engagement/Procrastination

Academic engagement has been defined by something as simple as being

attentive and doing their assigned work. Carroll's learning model (Carroll, 1963) posited

simply that the degree of learning was a function of (1) the time spent learning, and (2)

the time needed to learn. The time spent learning has most frequently been defined as the

time allocated for instruction in relationship to the time within it during which the student

was engaged (e.g., Denham & Lieberman, 1980). In addition, time variables (i.e., time

allocated and time engaged) have been reported to be positive correlates of academic

achievement measures (e.g., Brophy, 1979; Gettinger, 1985). In the present study, it was

predicted that academic engagement, or the time spent learning, would be predictive of

course grade. For example, in UNL's Intro to Psychology 181- PSI course, for example,

the students have the opportunity to complete the chapter assignments as many times as

they wished in preparation for each chapter quiz. Every time they attempted a chapter

assignment the EDU® system documented the date and time of this attempt. Presumably,

therefore the more students practice and spend time learning the material the greater

likelihood they would have of getting a higher grade.

Academic procrastination is generally seen to be a debilitating practice strongly

associated with low academic achievement, anxiety, and low self esteem (Owens &

Newbegin, 2000). Their study focused on adolescents in a traditional classrooms and

authors found that the major factor influencing hesitancy to submit assigned work for

students was their past experiences of receiving low grades on tests and assignments in that course. Johnson and Bloom (1995) (as cited in De Fruyt & Mervielde, 1996) found that self-discipline and impulsiveness were the most important predictors of academic procrastination. Schouwenburg and Lay's (1995) research (as cited in De Fruyt & Mervielde, 1996) resulted in all facets of conscientiousness and impulsiveness predicting academic procrastination. The results of the two aforementioned studies are significant because self-discipline is one of the characteristics of conscientiousness and research has suggested extraverts have been shown to behave impulsively (McCown & Johnson, 1991; Sanchez et al., 2000).

<div align="center">Summary and Conclusions</div>

This review of literature has examined several key dimensions of the current study, including its background in personality research and how the researcher chose the personality model used for this study. Next, the history of the PSI environment, and then more specifically UNL's Intro to Psychology 181- PSI was discussed. Subsequently, concerns of withdrawal and drop out in the PSI environment were explored, followed by reviews of personality's relationship to academic success and academic engagement.

Overall, a review of the history of personality research shows that it has been typically organized in terms of a taxonomy, which has allowed for researchers to study domains of personality rather than studying the many different personality attributes of each unique personality. The theory behind taxonomies is that if a personality attribute is salient and socially relevant it will emerge in the language and can be expressed as a single word. Research on taxonomies has resulted in a number of competing personality models. The greatest convergence, however, has been around the five factor model

(FFM). The FFM consists of five global personality domains: neuroticism, extraversion, openness, agreeableness, and conscientiousness. Young and Schinka (2001) stated, "…the five factor model of personality has become the dominant model for the investigation of personality" (p. 412). In the current study, the researcher chose to use this model because of the clarity of these factors, its widespread acceptance, and the relative abundance of research on the FFM and its component factors. The mostly widely used instrument to assess the five factors, the NEO, was also used in the present study to assess the personality variables.

Personality has also been studied in many contexts, including academia, which is the general context for this study. There is a considerable amount of literature (cf. De Fruyt & Mervielde, 1996; Dollinger & Orf, 1991; Kahn et al., 2002) addressing personality factors in the traditional classroom but much less in non-traditional classrooms. With increased technology and advances in software, non-traditional courses are becoming more and more mainstream (Wang & Newlin, 2002). Little research has been conducted, however, regarding the potential role of personality factors in non-traditional courses. UNL's Introduction to Psychology 181-PSI is an example of a non-traditional course that has both PSI features and characteristics an online course; it serves as the specific context of this study.

Finally, there is little known research showing the relationship between personality factors and course withdrawal in PSI-type courses. In general, there have been concerns about withdrawal in PSI courses, which presumably could occur more frequently because of the presumably higher need for individual decision-making and self-regulation in the PSI environment. The actual data on withdrawal rates in PSI

courses are mixed, however. Born and Whelan (1973) suggested that PSI courses have greater rates of withdrawal than traditional courses, while others (e.g., McMichael & Corey, 1969) have found that PSI courses were dropped by *fewer* students than controls. In general, the lack of research in this area supports the need to conduct the current research and a closer examination both of withdrawals in general and their potential relationship to the personality of students in nontraditional PSI-type.

The Present Study

The present study examined academic success as it relates to personality variables in a UNL's Intro to Psychology 181- PSI environment. Specifically, it was hypothesized that conscientiousness would have a positive impact, while extraversion would have a negative impact on academic success (final course grades) in a PSI-type environment. It is anticipated that conscientiousness will be the greatest contributor to academic performance with higher levels of conscientiousness resulting in higher points in terms of grades and also completing homework tasks before due dates. Due to the lack of face-to-face interaction with peers and instructors in a PSI course it also was anticipated that extraversion would be a contributor to poor academic performance resulting in less than average grades, higher drop out rates, and more withdrawals.

Unpublished research by PytlikZillig (personal communication, 2005) suggested that "…the correlation between grade expectancies 'what grade do you expect to get in this course?'…would be bigger than many other, but not all, variables assessed." PytlikZillig's research prompted the present investigator to add a section in the demographic sheet asking students to anticipate the grade they expected to get in the

course. Each student's actual final grade then was correlated with their own expected grade that they chose at the beginning of the semester.

Ridgell and Lounsbury (2004) attempted to predict academic success, using general intelligence, "Big Five" personality traits, and work drive. Ridgell and Lounsbury suggested that future research, "…could investigate whether differential validity patterns can be found using course grade or GPA as criteria." (p. 650). In a previous study by Lounsbury, Sundstrum, Loveland, and Gibson (2003) researchers found that using both course grade and GPA in their analysis created similar validities when general intelligence, Big Five personality traits and work drive were used as predictors. Based on this research other variables that were taken into consideration for the present study include GPA, and ACT/SAT scores (Gifford et al., 2006).

Specific factors that were monitored for each student during this particular course include date of unit completion, the number of quiz attempts, whether or not the student was taking the test on or before the pull date, and the students' expectations of their final grade. While the researcher gathered more data (date of course completion, whether or not the student participated in other forms of extra credit, the number of exam attempts, the number of assignment attempts) only the most salient variables were chosen, based on theory and empirical evidence, as potential variables impacting academic performance.

The relationship between personality and academic success has not been clear-cut; for example, while extraversion is not related to intelligence, extraversion has been shown to be meaningfully related to certain behaviors (e.g., a planful strategy) that affect test performance (Wolf & Ackerman, 2005). These results suggest that extraversion may have an *indirect* effect on academic success. The unique relationship that extraversion,

and other personality variables, may play in academic success lends itself to a unique method of analyzing them. That unique method is path analysis, which allows for both direct *and* indirect causal effect estimation. An indirect effect occurs when a variable affects an independent variable through its effect on some other variable (Mertler & Vannatta, 2002) as in the extraversion example above.

The path analysis model created for this study can be viewed as this researcher's declaration of the beliefs regarding the causal link between personality, as well as factors unique to this nontraditional PSI-type environment, and academic performance. These beliefs are based on research literature, formal and informal theories, personal observations, and experiences with this phenomenon. As Mertler and Vannnatta (2002) stated, causal models are often complicated by the vagueness of many theories in social science research, the potentially limitless number of possible causal determinants which are often posited in the literature, and the complexity of nearly all phenomena in social science research.

CHAPTER 3

Methods

This chapter describes the research methodology used in this study. Included are descriptions of the participants, recruitment, assessment instruments, procedures, research design, and statistical analysis.

Participants

Participants in this study were students enrolled in Introduction to Psychology-181 PSI at a large midwestern university. Approximately 500-600 students enroll in this course each semester; typically fall semester has a larger enrollment. During the semester in which data were collected in the fall of 2004, 450 students were enrolled in the four sections of the Introduction to Psychology-181 PSI course. Historically, the modal enrollee has been freshmen and sophomores, but the course accommodates upper-class and non-traditional students as well. Typically the majority of students will agree to participate in some form of extra credit.

From the four course sections, 260 students agreed to participate and completed the packet of measures. This group of participants included 133 females and 117 males, with ages ranging from 19-46 years old. Of the 260 packets that were completed by this group, two were excluded due to the age of the participants (they were18 years old and the criterion to participate was 19 years old), one packet was only partially completed, and seven packets were eliminated because the profiles were invalid, meaning that the participants' endorsed "no" to any of the three validity questions on the NEO-FFI or they failed to answer the validity questions all together. These exclusion criteria left 250

packets for analysis. Twenty percent of the current study's participants identified themselves as: first year students (N=49), 48% as second year students (N=121), 17% third year students (N=42), and 13% as fourth year students (N=32). Less than one percent identified themselves as fifth year students (N=4) and sixth year (N=2) students.

Recruitment

Participants were recruited during their formal orientation meeting by the principal investigator at the beginning of the 2004 fall semester. In this course, all students attend one formal orientation session that describes the process of maneuvering through the course, provided them with necessary course-related materials, and invited them to contact the instructor via email or during office hours with any questions. This was followed by an explanation of the current study and an invitation from the researcher to participate by completing the packet of measures during this initial meeting. Students had to be 19 years old to participate in this study, which is the legal age of majority in Nebraska.

The measures for the current study took approximately 25-35 minutes to complete. Permission to collect data from all appropriate university authorities as well as individual participation consent was completed prior to students handing in the packet. The nature of the data collection was explained to students and they were advised that their course performance would be tracked in connection with their salient personality traits throughout the semester. They were also informed that the participation in the study would earn four out of eight possible research credits, which is equivalent to the addition of 20 points to their total course grade. A further incentive was the opportunity to obtain their personal results from the personality measures they completed.

Instruments

Informed Consent

Students were asked to sign an informed consent statement indicating that they

understood the purpose of the research, the confidentiality of any personal information

provided in connection with the research, and the expectations of them as participants.

The informed consent form indicated that each student was making a voluntary decision

whether or not to participate in the research study and that there was no obligation or

subsequent repercussions for not participating. It also provided contact information for

the primary researcher, the secondary researcher, and the University of Nebraska-Lincoln

Institutional Review Board. In addition to the research participant's signature

acknowledging informed consent, there was an additional sentence that each research

participant could initial giving permission to the researcher to request the students' GPA

and any admission test scores from the university's registration and records office (See

Institutional Materials Section for a copy of the IRB approved Informed Consent for the

current study).

Demographic Sheet

Students were asked to complete a demographic sheet tapping variables such as

age, gender, number of credit hours accumulated, number of credit hours currently

enrolled, year in school, current GPA, race/ethnicity, and whether students lived on

campus. If they did not live on campus they were asked to report their distance from

campus, if they were employed and if so, for how many hours, level of computer access

in home/dorm room, the grade that students thought they would get, and whether or not

they have taken this PSI course in the past or if they have taken any PSI course. (Note:

some information indicated on the demographic sheet was for course development and does not pertain to the research questions at hand (See Appendix A for a copy of the Demographic Sheet).

NEO-Five Factor Inventory College Form S (NEO-FFI Form S)

The NEO-Five Factory Inventory (NEO-FFI) (1992) is an inventory developed as a short form of the NEO-Personality Inventory-Revised (NEO-PI-R). The NEO-FFI is a 60 item survey that takes approximately 10-15 minutes to complete. There are five potential responses to the 60 questions, SD= strongly disagree, D=disagree, N=neutral, A=agree, and SA=strongly agree. In addition to the 60 items there are three additional yes/no questions that are considered validity checks; (1) Have you responded to all the questions in the correct box?, (2) Have you entered your responses in the correct boxes?, and (3) Have you responded accurately and honestly? Each of the five dimensions is measured with twelve 5-point scale items. Because the NEO-FFI Form S is specifically normed for the college population, it was chosen in this particular study. The NEO-FFI authors' note that the instrument itself is not changed but new norms, specific to the college population, have been provided in the manual.

The NEO-FFI, like the original NEO-Personality Inventory (NEO-PI), has five global domains: neuroticism, extraversion, openness, conscientiousness, and agreeableness. Because the NEO-PI is the longer version it also contains 18 facet scales. To create the NEO-FFI, McCrae and Costa (1989), utilized the validimax factors from the original NEO-PI as their criteria:

> To obtain optimal measures of these 5 dimensions, a method for the orthogonal rotation of principal components to maximize the convergent and discriminant validity of the rotated factors (validimax rotation) was proposed. Data from 983

men and women (aged 19-93 yrs) were used to obtain the factors. The rotation was cross-validated on peer and spouse ratings on the NEO-PI and in a 2nd sample of 100 men. NEO-PI domain scales, varimax factors, and validimax factors all suggest construct validity, but validimax factors were superior, especially as measures of Agreeableness and Conscientiousness (p.107).

When the NEO-FFI was correlated with the NEO-PI-R domain scales,

correlations were .92, .90, .91, .77 and .87 respectively for N, E, O, A, and C domains.

The NEO-FFI Form S shows internal consistency values ranging from .68-.86. Since the

NEO-FFI scales are substantially correlated with the NEO-PI-R scales, this suggests they

inherit a substantial portion of the validity of the longer scales (John & Srivasta, 1999).

John & Srivasta (1999) also state that the NEO questionnaires represent the best-

validated measures Big Five Measures in the questionnaire tradition. Saucier (1994)

reported that the Big Five are so well-represented among personality adjectives that

remarkably short scales can measure them with reasonable reliability.

According to the NEO manual the five domains of the NEO-FFI are:

1. **Neuroticism**. This scale contrasts adjustment or emotional stability with maladjustment or neuroticism. The core of this domain is the tendency to experience negative affects such as anger, guilt, embarrassment, fear, sadness, and disgust.
2. **Extraversion.** This scale assesses sociability, liking people, preferring large groups, and gatherings. Extraverts are assertive, active, and talkative. They are typically upbeat, energetic, and optimistic. A low extraversion score (indicating more introverted behaviors) can be described as reserved, independent, appear shy but may just prefer to be alone. Authors suggest that low extraversion is not the opposite of extraversion rather the absence of it.
3. **Openness.** This scale's elements include active imagination, aesthetic sensitivity, attentiveness to inner feelings, and preference for variety, intellectual curiosity and independence of judgment. Those that score low tend to be conventional in behavior, conservative in outlook, and their emotional responses are somewhat muted
4. **Agreeableness.** This scale's elements suggest fundamentally altruistic beliefs, sympathy toward others, and eagerness to help others. Those

scoring low on agreeableness are typically more egocentric, skeptical of others' intentions, and competitive rather than cooperative.

5. **Conscientiousness.** This scale's elements include purposeful, strong-willed, and determined. High C is associated with academic and occupation achievement, but on the down side this may lead to annoying fastidiousness, compulsive neatness or workaholic behavior. Those that score on the low side of C are more lackadaisical and potentially less exact when applying moral principles.

EDU ® System Measures

Number of Attempts

The software used in the Introduction to Psychology 181-PSI was EDU®, a web-based assessment system created by a faculty member at the University of Nebraska-Lincoln specifically for courses such as this Psychology 181. All students created an account in the software system, which monitored their course activity and progress throughout the semester. Since students had scheduled "pull dates", or days in which quizzes and exams are no longer available to them, the software allowed the instructor to track the date that they complete (or failed to complete) their requirements. It also tracked each time the student attempted each chapter quiz and/or exam, how many times each student attempted a chapter quiz and/or exam, the time spent on each attempt, and the grade for each attempt.

For this study, the researcher was interested in how many times a student attempted each chapter quiz and exam. Research indicates that the traditional Keller structure of requiring student mastery before moving on is associated with the high standard of performance. Although UNL's version of PSI does not require mastery prior to moving onto the next chapter the same principles may still apply; that is, the meaning the number of attempts that students made may play a role in their final grade. It also may

be that their particular personality traits may predict how many times they attempted

each chapter quiz or exam. In relationship to personality variables, they might

differentially choose to master each subject, according to grade, before moving onto the

next chapter or task.

The investigator also was interested in academic engagement, which includes the

time and/or energy put forth for each Chapter. In order to assess academic engagement

the number of attempts was counted for each participant's chapter assignments for each

chapter, number of attempts for each participant's chapter quizzes, and when they

completed them (on or before the pull date). This allowed the researcher to measure how

much effort the student put forth toward studying for each chapter quiz.

Withdraw/Drop out

Although sometimes confused with one another, course withdraw and course drop

out are distinct concepts. If a student chose to withdraw from the course, the student must

have gone to the Registrar and formally withdraw by a pre-set date. The instructor

therefore would have received formal notice of the student's withdrawal from the

university's records and registration office. If a student drops out of a course, however,

meaning the student does not formally remove himself or herself from the course and

they simply stop attending or stop completing course requirements, this results in a

failure in the course and a grade of "F."

Given the research indicating that PSI courses have a considerably higher

withdrawal rate than traditional courses (Born & Whelan, 1973), withdrawal is an

important PSI issue. Semb, Glick and Spencer (1979) have suggested that delayed work

is correlated with both inferior academic performance and eventual course withdrawal in

PSI courses. Both academic performance and course withdrawal are key elements of this research study, therefore examining at which point a student withdraws or stops completing requirements can help confirm or deny this conjecture. It can also help address whether students with certain personality traits are more likely than others to withdraw or drop out of a PSI course. In the present study, withdrawal, if it occurred, was measured by the last date that the student completed their requirements.

Academic Success

Grades/GPA

Following Lounsbury, Sundstrum, Loveland, and Gibson's (1999) suggestion, academic success was measured by student's overall grade in the course. Overall grades were computed by totaling the points from 11 chapter quizzes, three exams, and three writing assignments.

For this particular semester the total point breakdown was as follows:

11 Chapter Quizzes X40 points each	=	440 points
3 Exams X 200 points each	=	600 points
3 Writing Assignments X 80 points each	=	240 points
TOTAL	**=**	**1280 points**

1280 is total number of points possible prior to extra credit. If a student participated in the current study, an additional 20 extra credit points was added to their total. In addition, students also had the opportunity to earn another 20 extra points (equivalent to one quiz) by participating in research experiments offered in the Psychology Department (referred to as Experimetrix). Therefore students had the opportunity to earn a maximum of 40 extra credits. Grades were determined by a points system in which A+ ranged from 92%-100%, A was 92-96.99%, A- was 90-91.999%, B+

87-89.99%, B was 82-86.998%, B- was 80-81.999%, C+ was 77-79.999%, C was 72-76.999%, C- was 70-71.999%, D was 60-69.999% and F is less than 59.999% of the total points available.

GPA also was considered as a variable in the current study but was less consistently available since all of the students didn't provide a GPA score. Wolfe and Johnson (1995), however, have found that high school GPA does have a significant relationship to college GPA, accounting for 19% of the variance in college grades.

Grade Expectation

Previous studies have shown students' internal motivation, or their own expectation (PytlikZillig, personal communication) may be an excellent predictor of academic success. As previously mentioned, unpublished research has shown that the correlation between grade expectancies was bigger than many other, but not all, variables assessed. Previous research with students on academic probation (e.g., Smith & Winterbottom, 1970) has suggested that those students who overestimate their grades are more likely to blame this on external versus internal causes. Grade expectation was measured in the current study by comparing students' self-reported responses of their expected letter grade at the beginning of the semester with their actual grade at the end of the semester. (See Demographic sheet in Appendix A)

ACT/SAT

The standardized scores provided by college aptitude tests given to high school students, most notably ACT (American College Testing) and SAT (Scholastic Aptitude Test) have been used for years as an indicator of academic performance, as evidenced by their continued use as standard cutoffs for admission into colleges and universities nationwide.

Wolfe and Johnson (1995), for example, found that approximately 1/3 of all variance in college GPA is accounted for by: high school GPA, self-control variables and SAT score. Additional research suggested ACT is an effective predictor of student academic success as demonstrated by higher GPA's at the end of their first year (Gifford et al., 2006)

The current study measured ACT/SAT by getting permission from the students' (through the informed consent, see Institutional Materials Section for a copy) to go to the university's registration and records office to obtain test scores that student' provided upon entrance to the university. SAT scores were converted to ACT score equivalents in order to permit statistical analysis. This made analysis much easier since SAT scores are less common than ACT scores at the University of Nebraska-Lincoln. Also, the number of those students who took only SAT alone was very small (N=6). (See Appendix C for a copy of the conversion chart)

Procedures

The sample of the students for the current study was chosen because the primary researcher was actively involved with UNL's Intro to Psychology-181 PSI and had spent time at UNL managing this program. Over time, the strategies and characteristics of students who succeeded and those who struggled in this particular PSI-hybrid course had become clearer, which lent itself to making hypotheses about the role of personality variables in this course and in nontraditional courses in general.

For the fall 2004 semester the primary researcher conducted individual orientations for each of the four different sections of Intro to Psychology-181 PSI. Each section had approximately 150-200 students present. At these orientations, students were

introduced to the researcher (who was also serving as Keller Director), the co-director, and several teaching assistants. During these orientations the students were given the pertinent information about the course itself and strategies for completing the semester successfully. Students were given the syllabus, tutorials regarding the course website, and instruction for using the EDU® system.

After all questions regarding the course were answered, the students were given the opportunity to participate in the current research study. They were told: (1) the goals of the project, (2) the types of questionnaires they would complete, (3) the amount of time it would take to complete the questionnaires, (4) the fact that the packets would be completed during this initial session on site, (5) the importance of signing and initialing the informed consent, (6) contact information for the primary and secondary investigators, IRB, and the faculty supervisor for the course, (7) their right to receive the results of their personality testing if they notified the primary researcher, and (8) that their 20 extra credit points would be posted in the grade book section of course webpage within two weeks. They were encouraged to contact the researcher if they had any questions or concerns about their measures or their extra credit points. In addition, students were informed their participation was completely voluntary, they could withdraw at any point in the study, and their grade would not be affected if they chose not to participate or if they withdrew from the study at a later time.

At this time the students were told if they wanted to participate to stay seated while the rest of the students left the classroom. Those remaining were handed packets to complete. To ensure the test security of the NEO-FFI, the researcher, co-director, and teaching assistants made sure that all test packets were turned in as the students were

leaving and that no packets left the room. Assessment packets were organized

numerically with identification numbers on the outside of packet envelope and the

corresponding number on the lower right hand corner of all of the documents and

measures in the packet (e.g., informed consent, demographic sheet, and NEO-FFI). 260

packets were returned to the researcher.

Design Analysis

Results from this research study were analyzed with the Statistical Package for the

Social Sciences (SPSS) software Version 12.0 using regression path analysis and logistic

regression analysis. SPSS is one of the most popular statistical analysis software

packages available. Path analysis, an extension of the multiple regression model, was

utilized to test the fit of the correlation matrix against two or more causal models and was

used to answer the first research question. The second research question was answered

using logistic regression as the method of statistical analysis. Logistic analysis is utilized

when the dependent variable is dichotomous, while the independent variables can be

continuous or categorical (Pedhazur, 1997). The next two sections will explain both path

analysis and logistic regression in detail.

Path Analysis

With path analysis, researchers can conduct a series of regressions to analyze

influences on dependent variables within the model. Often dependent variables serve as

independent variables for later regressions within the model. In path analysis the variable

that is being explained by the model is called the endogenous variable (i.e., the DV, the

effect, or in this study Z_7), while all other variables not explained by the model are called

exogenous variables (i.e., the IV's, the causes, or in this model $Z_1, Z_2, Z_3, Z_4, Z_5,$ and Z_6)

(Mertler & Vannatta, 2002). Pedhazur (1997) explained that exogenous variables are those whose variation is assumed to be outside of the hypothesized model, while endogenous variables are those whose variation is explained by the exogenous variables in the model. A regression is conducted for each independent variable and its effects are calculated across regressions for cumulative effects (Stage, Carter, & Nora, 2004). The rationale for using this analysis was its ability to estimate both direct and indirect causal effects (Mertler & Vannatta, 2002).

The basic principles of path analysis were created early in the last century by Sewall Wright, a biologist. Its purpose was not to discover causes or causal relationships but instead to test the practical possibility of models developed by the researcher (see LeClair, 1981). In Wright's words:

> The method of path coefficients is not intended to accomplish the impossible task of deducing causal relationship from the values of the correlation coefficients. It is intended to combine the quantitative information given by the correlations with such qualitative information as may be on hand on causal relationship to give a quantitative interpretation. (Wright, 1934 p. 193)

Cook and Campbell (1979) suggested that path analysis can perform two quite different functions: (1) theoretical clarification and (2) estimation of specific causal impacts. They strongly supported its usage as a theoretical clarification and suggested that researchers use their knowledge of theoretical, empirical, and commonsense knowledge of a problem to map the variables believed to be present and the probable links among them.

Miller (as cited in LeClair, 1981) developed a six-step sequence for the application of path analysis. The first step is to develop a causal scheme or model. This model is a representation of the most important variables, while all other variables not in

the equation model are considered "residual." Step 2 is to establish a pattern of

association between variables in the sequence. This includes creating a correlation matrix

to portray the magnitude of the effect that a prior variable has on a subsequent variable.

Step 3 is to create a path diagram (this is discussed in more detail below). Step 4 is the

hand calculation of path coefficients; this reflects the total amount of variability in one

variable explained by the causal impact of the other. Step 5 is the "goodness of fit" test.

This is done by examining how much variability in the dependent variable is explained

by the variables in the causal model. The final step is to interpret the results.

Five main assumptions must be met in order to use path analysis. The first

assumption states that relationships among models are linear, additive, and causal.

Therefore models that are curvilinear, multiplicative, or interactive relations are

excluded. The second assumption is that each residual is not correlated with the variables

that precede it in the model. The third assumption is that the causal flow is one-way, so

reciprocal causation between variables is ruled out. The fourth assumption is that

variables have been measured on an interval scale. The fifth, and final, assumption is that

variables are measured without error.

The goal of path analysis is to offer estimates of the magnitude and significance

of hypothesized causal connections among sets of variables displayed through the use of

path diagrams (Stage, Carter & Nora, 2004). Path diagrams are a graphic representation

that functions somewhat like a flowchart. In path diagrams, a straight line with an arrow

indicates the assumed direction of causation that one variable has on another (Tate, 1992

as cited in Mertler & Vannatta, 2002). A curved line with arrows on both ends represents

a hypothesized correlation between two variables without implying any causal relation

(Crowley & Fan, 1997).

These diagrams/models or hypothesized relationships are analyzed statistically for

goodness-of-fit to determine if the model fits with the sample data. If the model fits, the

researcher should report the strength of hypothesized relations between the variables

(Boomsma, 2000). If the model does not fit, this indicates that rejection or restructuring

of the proposed model is necessary. Therefore, model expansions or respecifications

come to the forefront, and it is imperative that the restructuring is conducted based on

theoretical considerations. Kaplan (as cited in Boomsma, 2000) argued that before

considering model modification it is important to rule out other reasons why the model

did not fit, such as small sample size, non-normality, missing data, and multilevel data.

Boomsma (2000) has further suggested that model modification occur one parameter at a

time due to the potential for large change that may occur after making just one alteration.

This study examined the hypothesized relationships between personality, course

factors, and academic success. The first research question: whether the model-which

describes the causal effects among the variables "Z_1 (extraversion)," "Z_3

(conscientiousness)," "Z_5 (ACT scores/SAT conversions)," "Z_2 (measure of

procrastination based on testing prior to or on pull date)," "Z_4 (grade point average)," "Z_6

(expected grade at beginning of the semester)," and "Z_7 (letter grade at the end of the

course)" – is consistent with our observed correlations among these variables.

The path diagram shown in Figure 1 is a pictorial representation of the theoretical

explanations of cause and effect relationship among a set of variables (Agresti & Finlay,

1997). For example, "P_{21}" represents the path between Z_2 (measure of procrastination

measured by the whether student was testing prior to, or on pull date) and Z_1

(extraversion).

Figure 1. Pictorial Representation of Full Model: Letter Grade
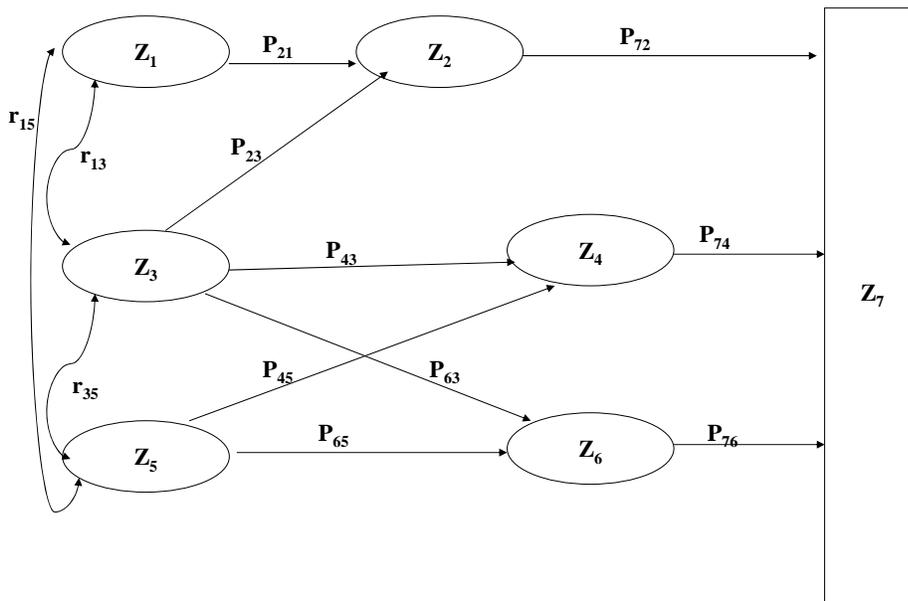
$Z_1 =$ extraversion
$Z_2 =$ procrastination
$Z_3 =$ conscientiousness
$Z_4 =$ GPA
$Z_5 =$ ACT
$Z_6 =$ expected grade
$Z_7 =$ letter grade

Logistic Regression

In order to answer the second research question -Can a student's standing as

"withdrawn" be reliably predicted from knowledge of ("E" (extraversion), "C"

(conscientiousness), "GPA" (grade point average), "PROC" (procrastination), "#qa"

(number of quiz attempts), and "Unit Comp" (the number of days between the last

attempted quiz and the pull date for each unit or chapter averaged over all chapters) in a

nontraditional PSI-type course?- the researcher utilized logistic regression as the method

of statistical analysis. Logistic regression was utilized because the dependent variable, "withdraw" is a dichotomous variable, suggesting only two possible outcomes: either student did or did not withdraw from the course. The researcher was interested in determining if the hypothesized variables ("E" (extraversion), "C" (conscientiousness), "GPA" (grade point average), "PROC" (procrastination), "#qa" (number of quiz attempts), and "Unit Comp" (the number of days between the last attempted quiz and the pull date for each unit or chapter averaged over all chapters) predicted whether a student did or did not withdraw from UNL's Introduction to Psychology-PSI course.

Cizek and Fitzgerald (1999) suggest that logistic regression is the principal analytical tools for relationships that (1) are best modeled with logistic function, (2) do not meet assumptions of linear regression, and (3) involve one or more continuous predictor variables and a dichotomous outcome variable. Davis and Offord (1997) reported that while logistic regression was probably underutilized in clinical research of personality in the past due to previous statistical software being unable to calculate needed computations, the relatively recent developments from statistical programs have increased the ease of use for researchers wishing to do logistic regression. Therefore, Davis and Offord (1997) suggested logistic regression should be given serious consideration when the outcome is dichotomous and predictors are categorical or continuous.

Cizek and Fitzgerald (1999) indicated that the complexity of human behaviors are difficult to measure on interval ratio scales but conversely, the presence, or absence, of a certain characteristic (i.e., dichotomy) can be easier to observe; which supports the use of logistic regression in the area of social science research. As Davis and Offord (1997)

reported logistic regression utilizes odds ratios; odds ratios give certain value to the

predictors and any change in the odds ratio estimates when the values of one or more

predictors are changed. Therefore this allows researchers to study the change as

predictors in the model change. Thus, the value that is actually being predicted in logistic

regression is a probability that ranges from 0 to 1. Because most researchers are familiar

with linear regression Table 2 displays comparisons between linear and logistic

regression so readers can compare the differences.

Table 2 Comparing Linear Regression to Logistic Regression

	Linear Regression	Logistic Regression
Method of Estimation	Least Squares	Maximum Likelihood
Testing the Null	F ratio	Chi Square Statistics
Association between Predictor & outcome	Partial correlation	R
Test of Significance of each predictor	T-test	Wald Statistic
Coefficient of determination	R^2	Exp (B) or odds ratio

There are three main components to consider when using logistic regression

analysis. The first is a goodness-of-fit test which assesses model fit. Assessing model fit

provides information about how well the logistic regression model, consisting of the

predictor variables, fits the data. This is done by looking at the maximum likelihood or

the "-2 Log-Likelihood Statistic." This statistic first provides a value of fit index with

only the constant, which is then compared to another -2 log-likelihood value given after

adding the predictor variables. This comparison indicates whether the combination of

independent variables improved prediction of the dependent variable. This difference,

between the initial (constant only) and the value given after adding predictor variables, is called the chi square. Also considered when assessing model fit are the degrees of freedom, which are equal to the difference in number of parameters in the two models (Cizek & Fitzgerald, 1999).

The second component involves interpreting the coefficients in the model. In logistic regression B weights assess the magnitude of the raw regressions and are dependent on the relationships among the predictor variables. B coefficients present information regarding the log odds of the event. For example, the B coefficient provides information related to the odds of the chosen group or predictor. The third component in logistic regression is testing for statistical significance. When using SPSS the Wald Test statistic is utilized to test whether the coefficient associated with the variables used to predict the probability of a student withdrawing (in this particular study) are significantly different than zero. More specific outcomes from the logistic regression will be discussed in Chapter 4.

CHAPTER 4

Results

This chapter presents the results of the current study. The analyses of the data were carried out in the following sequence. First, the raw data were examined for missing items, and decisions were made in regard to this situation. Second, descriptive statistics were generated for the demographic information about the study participants. Third, correlation matrices were generated for all of the variables. Fourth, path analysis was used to test the proposed relationships among the constructs of interests. After path analysis was conducted, models were respecified and compared. Finally, logistic regression analysis was performed to identify those variables distinguishing between those students who achieved success in the course and those who did not.

Hypothesized Model

The primary purpose of the present study was to examine the relationships between personality factors and performance in the course, Introduction to Psychology 181-PSI, which embodies components of both mastery-oriented PSI and of web-based distance courses. Also included in this examination were other factors known or suspected to relate to academic success as well as to withdrawal. To answer questions regarding academic success the hypothesized model with the dependent variable of letter grade is shown in Figure 1. Letter grade, representing final course grade, served as the dependent variable while conscientiousness, extraversion, procrastination, ACT scores, grade point average(GPA), and expected grade served as independent variables in this model. Thus, in research question number one the researcher is attempting to find the best model predicting the continuous variable letter grade.

In order to answer the second research question, which focused on whether group membership, unsuccessful or successful, in UNL's 181-PSI course can be reliably predicted from measures of extraversion, conscientiousness, GPA, procrastination, number of quizzes completed, and unit comp (the number of days between the last attempted quiz and the pull date for each unit or chapter averaged over all chapters) the researcher utilized logistic regression as the method of statistical analysis. Due to the complexity of human behavior, social science researchers have been utilizing logistic regression as a method of determining which variables predict inclusion or exclusion in a predicted group (Davis & Offord, 1997). Thus, in research question number two the researcher is examining variables that best predict membership in either successful or nonsuccessful groups based on their final grade.

Preliminary Data Analysis

After completion of the preliminary examination of data and management of missing data, descriptive statistics were generated for each indicator to provide baseline information about the subjects. Descriptive statistics were computed using SPSS software. The mean age was 20.6 with a standard deviation of 3.5. The mean ACT score was 21.9 with a standard deviation of 8.1. As mentioned previously, a small number of student SAT scores were converted to ACT composite scores for ease of analysis. (See Appendix C for SAT to ACT conversion chart). Descriptive statistics, including all involved variables in the study are included in Table 3.

Table 3. Descriptive Statistics for All Involved Variables

	Mean	St. Deviation	N
Conscientiousness	52.54	9.706	231
Extraversion	51.97	9.962	232
GPA	2.30	1.346	232
ACT	21.88	8.206	232
Letter Grade	10.49	3.235	232
Quiz Attempts	1.64	.875	227
Unit Completion	*2332.86	*2333.860	231
Procrastination	.90	2.377	225
Expected Grade	**2.58	**1.235	232
Withdraw	1.08	.274	232

*High number to due default number when cell was 0
** Reverse coded (i.e., 1=A+, 2=A-)

Research Question One

Preliminary statistics to determine normality, linearity, and homoscedasticity were examined with results indicating that assumptions of linearity, normality, and homoscedasticity were not met. Due to these results it was determined that transformation was necessary as a remedy for outliers, breaches in non-normality, non-linearity, and lack of homoscedasticity. Transformation equates the variances of the variables while preserving each indicator's distributional qualities (Healey, 1993). It also is an iterative process that requires post-calculation analysis. As a result of the log transformation, linearity was marginally established but assumptions of normality and homoscedasticity still could not be met even though significant improvements were made. No further modifications of the data were attempted; instead these factors are taken into consideration as a limitation of the study in the interpretation of results.

The initial path model is shown in Figure 2. As previously mentioned, straight lines with only one arrow indicate the assumed direction of causation. Multiple regression analysis provides the value for the unbiased estimates of those paths; a

separate regression analysis was computed for each relationship. The curved double-arrowed lines indicate bivariate correlations; a correlation analysis provides the values for those causal paths.

Once the path model was generated, all model variables were screened for outliers and tested for assumptions. Identification of outliers was done by conducting a linear regression model to calculate Mahalanobis distance. Mahalanobis distance is a statistic which indicates the distance in standard deviation units between a set of scores for an individual case and the sample means for all variables. In large samples Mahalanobis distance is distributed with chi square statistic with degrees of freedom equal to the number of variables (Kline, 2005). The chi square (χ^2) critical value was determined by using a standard chi square table. Degrees of freedom were seven, based on the model's seven variables; the critical value of χ^2 at the (p=.001, df =7) was 24.32. There were a number of extreme scores in the dataset. Although it could be argued that the elimination of extreme scores relative to the measure of central tendency (e.g., "outliers") would be an effective means of establishing normality, this procedure was not utilized due to its tendency to drastically reduce sample size and thus hamper statistical power.

Test assumptions were assessed by creating a scatterplot matrix and a residuals plot. The scatterplot matrix indicated that the all seven of the variables involved in this model should be transformed by taking the natural log of each variable. The residual plots were then created with the transformed variables and demonstrated fair dispersion. While assumptions of normality and homoscedasticity were not fully met, both were significantly improved by the transformation process. As mentioned previously, the

inability to demonstrate normality and homoscedasticity was therefore taken into

consideration in the interpretation phase.

Figure 2. Full Model: Letter Grade with coefficients
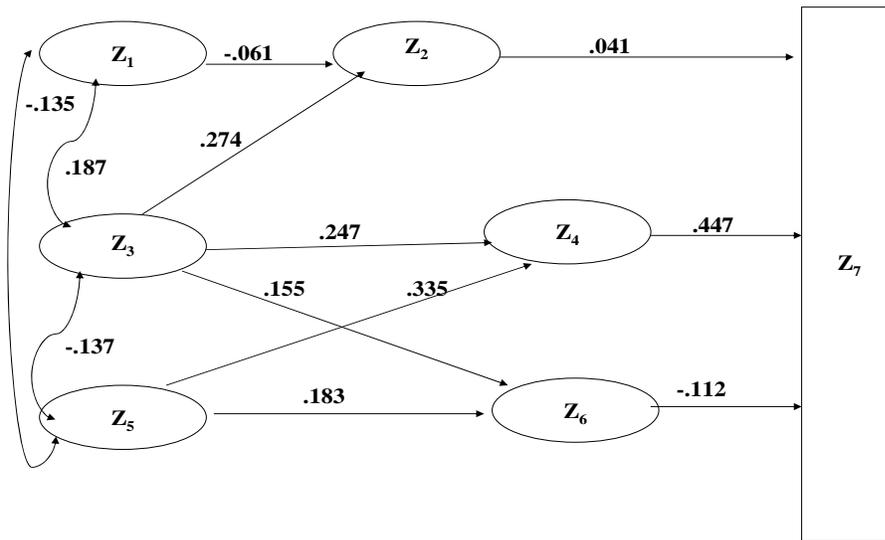
$Z_1 =$ extraversion
$Z_2 =$ procrastination
$Z_3 =$ conscientiousness
$Z_4 =$ GPA
$Z_5 =$ ACT
$Z_6 =$ expected grade
$Z_7 =$ letter grade

The next step was to analyze the following regressions for the four endogenous

variables: Z_2 on Z_1 and Z_3; Z_4 on Z_3 and Z_5; Z_6 on Z_3, and Z_5; and Z_7 on Z_2, Z_4, and Z_6. All

tolerance statistics were greater than .1. Path coefficients can be seen in Figure 2 (above);

these coefficients were then used to calculate the reproduced correlations through path

decompositions, which are displayed in Table 4. The reproduced correlations are the

bivariate correlations that *would* be produced *if* the causal model were correctly specified

(Mertler & Vannatta, 2002). These reproduced correlations can only be calculated by

hand. One way to conduct reproduced correlations is a method called path tracing, which

results in a coefficient for each path. Tate (1992 as cited in Mertler & Vanatta, 2002) suggested there are three rules when creating paths for path tracing. The rules are that no path may (1) pass through the same variable more than once, (2) go backward on an arrow after going forward on another arrow (although it is acceptable to go forward after first going backward), and (3) include more than one double-headed curved arrow.

A comparison of the reproduced correlations to the empirical correlations showed that six of the reproduced correlations differed by more than .05 from the empirical correlations. The model was therefore judged inconsistent with empirical data and therefore needed to be revised or respecified.

Analysis of missing paths, which included all possible paths for each endogenous variable, were conducted and included: Z_4 on Z_1, Z_6; Z_6 on Z_1; and Z_5 on Z_2. Analysis of missing paths for extraversion (Z_1) revealed that no additional paths would contribute to the model. Evaluation of missing paths for GPA (Z_4) indicates that path from expected grade (Z_6) would significantly contribute to the model. Analysis of missing paths for extraversion (Z_1) revealed that no additional paths would contribute to the model. Analysis of missing paths indicated two revisions: (1) removal of extraversion (Z_1) and (2) procrastination (Z_2) paths. In order to obtain the accurate path coefficients for our revised model, regression analysis needed then to be repeated using only the appropriate paths: Z_4 on Z_3, Z_5 and Z_6; Z_4 and Z_4 on Z_7, and Z_6. The revised model is presented in Figure 3 with the revised paths marked and the revised correlations listed.

Figure 3. Revised Pictorial Representation Model: Letter Grade
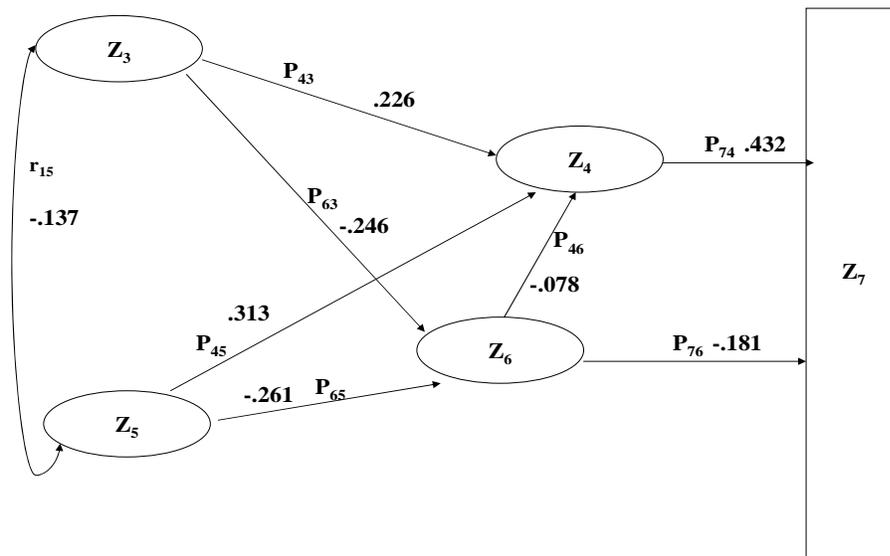
$Z_{3\,=}$ conscientiousness
$Z_{4\,=}$ GPA
$Z_{5\,=}$ ACT
$Z_{6\,=}$ Expected grade
$Z_{7\,=}$ letter grade

Reproduced correlations were calculated as defined by the path compositions and were compared to the empirical correlations (see Table 4). Only two of the reproduced calculations exceeded the criterion of .05 distances; these are starred in Table 4. Thus it can be concluded that the model is reasonably consistent with the empirical data. Because both of the reproduced variables were calculations having to do with the variable expected grade (Z_6) it was determined that if this variable were removed and the model revised again, it might produce a stronger model (See Figure 4 for the revised model). It is important to note that there is no statistical test that will determine whether or not the respecification is within reasonable limits, it is up to the researcher to determine whether the model is a good fit or not. As mentioned above, the researcher could have stopped

with the revised model but since both variables that exceeded .05 indicated that the

variable expected grade (Z_6) was problematic, it was determined that it should be

removed and the process repeated for the re-revised model (See Figure 4).

Table 4. Correlations of Observed, Initial Model, and the Revised Models

	Z1	Z2	Z3	Z4	Z5	Z6	Z7
				Observed Correlations			
Z1	1.000						
Z2	-0.014	1.000					
Z3	0.187	0.265	1.000				
Z4	0.019	0.252	0.193	1.000			
Z5	-0.135	0.090	-0.137	0.294	1.000		
Z6	-0.193	-0.069	-0.193	-0.218	-0.227	1.000	
Z7	0.055	0.161	0.145	0.472	0.163	-0.177	1.000
				Reproduced Correlations (Initial Model)			
Z1	1.000						
Z2	-0.010	1.000					
Z3	0.187	-0.011*	1.000				
Z4	0.001	0.068*	0.201	1.000			
Z5	-0.135	-0.030*	-0.137	0.301	1.000		
Z6	-0.081*	-0.056	-0.210	-0.156*	-0.227	1.000	
Z7	0.007	0.073*	0.125	0.445	0.158	-0.152	1.000
				Reproduced Correlations (First Revised Model)			
Z1	1.000						
Z2	----	1.000					
Z3	----	----	1.000				
Z4	----	----	0.199	1.000			
Z5	----	----	-0.137	0.262	1.000		
Z6	----	----	-0.210	-0.096*	-0.227	1.000	
Z7	----	----	0.124	0.466	0.171	-0.266*	1.000
				Reproduced Correlations (Second Revised Model)			
Z1	1.000						
Z2	----	1.000					
Z3	----	----	1.000				
Z4	----	----	0.201	1.000			
Z5	----	----	-0.137	0.301	1.000		
Z6	----	----	----	----	----	1.000	
Z7	----	----	0.095	0.472	0.142	----	1.000

*Difference between reproduced and observed correlation is greater than 0.05.

Z_1 = extraversion Z_5 = ACT
Z_2 = procrastination Z_6 = expected grade
Z_3 = conscientiousness Z_7 = letter grade
Z_4 = GPA

In order to obtain the accurate path coefficients for the re-revised model,

regression analysis needed be conducted again using only the appropriate paths: Z_4 on Z_3

and Z_5; and Z_7 on Z_4. It was hypothesized that a path could be added from both Z_3 and Z_5 to

Z_7, but when a regression analysis was computed with these variables neither produced

individually significant results. These paths therefore were not added to the model.

Again, reproduced correlations, as defined by the path decompositions, were hand-

calculated and were again compared to the empirical correlations (See Table 4). This time

there were no reproduced calculations that exceeded the criterion of .05 distances. Thus,

it could be concluded that the model is consistent with the empirical data.

Figure 4. Re-revised Model: Letter Grade with coefficients
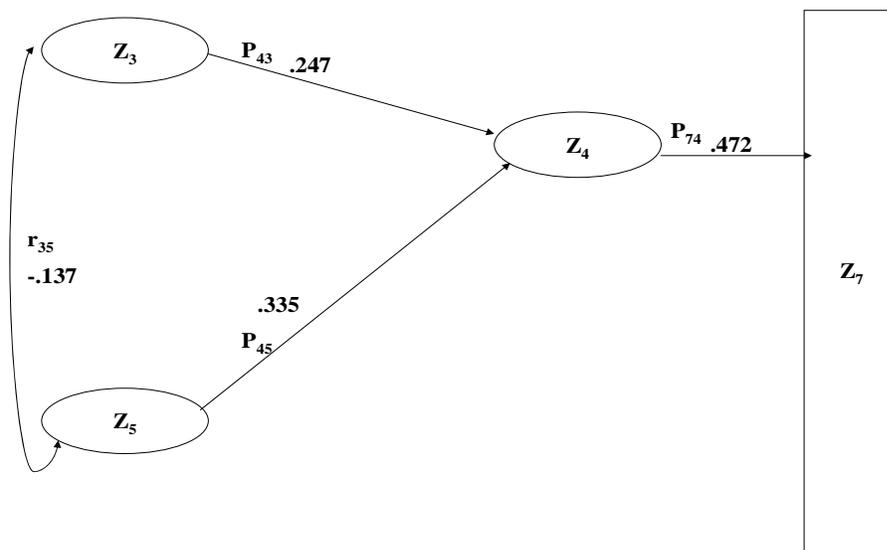
Z_3 = conscientiousness
Z_4 = GPA
Z_5 = ACT
Z_7 = letter grade

The final step is to interpret the causal effects and R^2 values. Standards for determining strength of effect size were based on Cohen's (1988) effect size conventions for R^2 (e.g., small effects >.0196; medium effects >.13; large effects >.26). The final model consisted of the variables ACT and conscientiousness regressing on GPA, and GPA regressing on Letter Grade. This final model with coefficients is presented in Figure 4. The R^2 of .145 for the regression of ACT and conscientiousness on GPA was statistically significant (<.001) suggesting that ACT and conscientiousness account for nearly 15% of the variance in GPA. Based on Cohen's (1988) conventions, the R^2 of .145 is a medium effect size. The R^2 for the regression of GPA regressing on Letter Grade was .222 and was also statistically significant (<.001) suggesting that, in this model, GPA was a medium-sized effect, accounting for 22% of the variance in Letter Grade. The benefit of path analysis can be observed in this model because, although ACT and conscientiousness do not significantly regress on Letter Grade, they can be seen to indirectly impact Letter Grade through their effect on other variables, such as GPA.

Research Question Two

Originally the researcher was interested in testing effects of several variables on withdrawal from the course. This proved to be difficult, however, given the small number of students participating in the study who withdrew from the course (N=18). As a consequence, the research question and associated analyses were modified to address a more general issue of success or lack of success in the course. In the revised question and analyses, students were divided into "successful" and "non-successful" groups, with the latter including not only students in the withdrawal group, but also students who received grades of D+, D, D-, or F. This expansion increased the "unsuccessful" group to N=37.

The second research question was modified such that the original dependent variable was, organized around withdrawing versus remaining in the course, now included students in a non-successful group who did not withdraw, but also who received either failing or lower-than-average grades. This categorization of students thus still generally addresses the issue of academic success and failure and is generally consistent with the original research question. As newly specified, Research Question 2 was whether status as a successful or non-successful student in a non-traditional PSI-type course can be reliably predicted from the variables of extraversion, conscientiousness, grade point average, procrastination, number of quiz attempts, and unit completion (the number of days between the last attempted quiz and the pull date for each unit or chapter averaged over all chapters).

The researcher utilized logistic regression as the method of statistical analysis. Logistic regression often is used when the DV is a dichotomous variable as opposed to a continuous or quantitative variable. For example, in this case the dependent variable of success status is a binary variable, indicating only whether a student is either average or above in her or his course performance or not.

In contrast to discriminant analysis, logistic regression requires no assumptions about the distributions of the predictor variables. That is, the predictors do not have to be normally distributed, linearly related, or have equal variances within each group (Mertler & Vannatta, 2002). Other advantages of this method are its ability to analyze predictor variables of all types including dichotomous, discrete, and continuous. Adding to its overall flexibility, logistic regression is also able to produce non-linear models (Mertler & Vannatta, 2002).

The first step in analysis of logistic regression is to screen the data and examine it for outliers and multicollinearity. This process is done by assessing collinearity diagnostics and testing for outliers using Mahalanobis analysis and chi square. The degrees of freedom were seven based on the number of variables in the logistic regression. The critical value of χ^2 (df =7, p<.001) was 24.32. Upon initial Mahalanobis analysis it was determined that there were two outliers. Because logistic regression is sensitive to outliers (Mertler & Vannatta, 2002) those outliers were removed. When the Mahalanobis analysis was re-run after the deletion of the two outliers, however, it revealed five more outliers. When these outliers were deleted in turn and the Mahalanobis analysis was re-run for a second time, five additional outliers were identified.

At this point, it was clear that deleting the outliers was creating a significant problem by reducing the sample size, which was particularly critical given the initially small sample size for those who were not successful in the course. It was judged that deleting the outliers was less desirable because of its effects on statistical power than leaving the extreme scores in the dataset. Therefore, all cases, including outliers, were included in the sample. This is judged to be a weakness of this analysis and will be discussed further in the analysis section. At the same time, calculation of tolerance statistics indicated greater than .1 for all variables; therefore multicollinearity was not a problem.

Forward logistic regression was conducted to determine which independent variables from among the variables of extraversion, conscientiousness, grade point average, procrastination, number of quiz attempts, and unit completion (the number of days between the last attempted quiz and the pull date for each unit or chapter averaged

over all chapters) were predictors of status as a successful and nonsuccessful students

in UNL's Introduction to Psychology- PSI course. Regression results indicated that two

of the six hypothesized variables (conscientiousness and unit completion) were

statistically reliable in distinguishing between successful and nonsuccessful students (-2

log likelihood=88.189; Goodness of fit=80.795; χ^2 (2) =64.899, p<.001). The model

correctly specified 92.7% of the cases. A perfect model has a -2 log likelihood of "0"

(Mertler & Vannatta, 2002). A model fit with the constant only has a -2 log likelihood

value of 88.189; the value with the addition of two predictors, conscientiousness and unit

completion is the Goodness-of-fit value. In this case the goodness-of-fit value is 80.795.

The value decreased with the addition of the predictors, from 88.189 to 80.795 therefore

the predictors, conscientiousness and unit completion *added* to the fit of the model.

In logistic regression χ^2 is equivalent to a *t*-test in multiple regressions; therefore,

in this analysis, a χ^2 of 64.899 signifies the difference between the constant-only model

and the generated model. A significant chi square indicates that the model generated is

significantly better at predicting group membership than the constant-only model.

Regression coefficients are presented in Table 5.

Table 5 Regression Coefficients for Model Variables: Conscientiousness and Unit Comp

	B	Wald	df	p	Odds Ratio (e^B)
Conscientiousness	-.085	7.302	1	.007	.919
Unit Comp	.000	20.176	1	.000	1.0
Constant	.666	.215	1	.643	

As mentioned previously *B* represents the unstandardized regression coefficient and the effect that the independent variable has on the dependent variable. Degrees of freedom (*df*) and level of significance (*p*) are also presented in Table 5. The Wald statistic is a test of significance for *B* and measures the unique contribution of each variable within the model.

Odds ratios are defined as the ratio of the probability of event X (in this case membership in the nonsuccessful group) occurring and the probability of event X not occurring (Mertler & Vannatta, 2002). The odds ratio represents the increase (if it is > or =1) or decrease (if it is < 1) in the odds of being classified in a group when the predictor variable increases by one. Using the results of Table 5, as the variable conscientiousness increases by one, subjects are .919 times less (because .919 is <1) likely to be classified in the unsuccessful group. Using the same odds ratio process, as the variable unit completion increases by one, subjects are 1.00 times more likely to be classified in the unsuccessful group. Odds ratios for both conscientiousness (e^B= .919) and unit completion (e^B=1.0) revealed little increase in the likelihood of becoming a member of the unsuccessful group when the predictors increase by one.

Table 6 Classification Table for Group Membership as Unsuccessful or Successful

Observed	Predicted		Percent correct
	1.00 (successful)	2.00 (unsuccessful)	Percent correct
1.00 (successful)	207	4	98.1
2.00 (unsuccessful)	13	9	40.9
Overall Percentage			**92.7**

The final piece of information from logistic regression is the classification

information (see Table 6). From this table one can deduce that 216 (207 + 9) cases were

correctly classified. One can also deduce that 17 (13 + 4) were misclassified. Specifically,

based on this model correct predictions were made for the 207 students who fell into the

successful group as well as the 9 students who fell in the nonsuccessful category.

Conversely, incorrect predictions, based on the model, were made for the 4 students who

fell into the successful group as well as the 9 students who fell into the unsuccessful

category. While overall the model predicted 92.7% of the placements in successful and

unsuccessful groups, the researcher feels that this percentage may be a misrepresentation

of the model. As Table 6 indicates the model is 98.1% accurate at predicting membership

in the successful category, but only 40.9% accurate at predicting membership in the

nonsuccessful category. This discrepancy will be discussed later in the discussion section

of this dissertation.

CHAPTER 5

Discussion

The current research study was designed to provide information regarding the use of personality assessment in academia in relationship to course performance and to identify those who are successful, as well as to assist those at risk for nonsuccess, defined as lower than average performance, failure in a non-traditional course (e.g., PSI-type course), or withdrawal from the course. This study utilized path analysis and logistic regression approaches to answer the research questions.

The researcher proposed two primary questions regarding the relationship between personality variables and academic success in PSI-type courses as follows. The first question, whether a model that describes the causal effects in a nontraditional PSI-type course of the personality variables of extraversion and conscientiousness, and also includes ACT score, grade point average (GPA), expected grade, and letter grade was consistent with the observed correlations among these variables. The second research question was whether status as a nonsuccessful student in this same PSI-type course can be reliably predicted from knowledge of extraversion and conscientiousness, plus more standard measures of academic success (GPA), procrastination, number of quiz attempts, and unit completion.

The results will be discussed in detail in this chapter, which includes sections on: (1) the relevance of the results in the context of current theory, recent and historical empirical data, and gaps in the research literature, (2) discussion for research question one, (3) discussion for research question two, (4) limitations of the study, (5) directions for future research, and (4) implications and summary.

Relevance of Results

The results of this study will be put into context by first providing background on the important themes reviewed in this chapter. This will be followed by a discussion regarding the results in the context of current theory, as well as previous and recent empirical data, and finally, the gaps in the research literature.

Although personality variables have been studied extensively throughout the last 20-30 years, given the improvements in technology and in capabilities of new software programs, along with increases in non-traditional courses/settings, it is time to re-examine the relationship between personality variables and academic success. Lounsbury et al. (1999) suggested that using final course grade would avoid variability and may serve as a better validity criterion than overall GPA for cognitive and personality predictors. Therefore, this study measured academic success by final course grade in a specific course context, a PSI-type introductory course that makes extensive use of technology.

Newer technology-based and individual course delivery modes that are currently being offered have the potential for providing useful information in terms of helping students succeed and making economical choices for educational systems. The present study was focused on the relationship between personality and academic performance in UNL's Introduction to Psychology-PSI course and in possible generalization of the results to other non-traditional or hybrid-type courses. There exists a significant gap in the literature regarding the relationship of personality variables to performance in non-traditional courses. This gap created an essential need for this research study; as non-traditional course formats are increasingly utilized by more universities (Roblyer, 1999),

there is relatively little empirical information regarding factors affecting student success and failure in these courses.

As previously mentioned, the research literature has consistently shown a relationship between the personality factor of conscientiousness and general academic success (cf. De Fruyt & Mervielde, 1996; Digman, 1989; Dollinger & Orf, 1991). The research regarding the relationship between extraversion and academic success has been much less consistent, however (cf. Barrick & Mount, 1991; Kline & Gale, 1971). Despite, previous research resulting in mixed results regarding extraversion; it was hypothesized that due to the unique environment of UNL's Introduction to Psychology-PSI course extraversion might impact academic success.

Discussion of Research Question One

As the reader will recall the first question was whether the proposed model-including the personality variables extraversion and conscientiousness, as well as ACT score, grade point average (GPA), and expected grade- describe the causal effects of letter grade in a nontraditional PSI-type course. Path analyses focusing on this question showed that extraversion did not have a role in academic success in this course; it did not have a direct or indirect role on the letter grade students received. These analyses suggested a role for conscientiousness, however. Although conscientiousness did not itself directly or significantly relate to letter grade, it did play an *indirect* role in academic success (i.e., letter grade received in this course). Therefore, conscientiousness does contribute to academic success through the proposed model. ACT was another variable that was determined, according to this model, to have an indirect role in academic success. The only variable in the final model observed to have a direct effect on final

letter grade was GPA. The final re-revised path analysis model met all criteria (<. 05

difference between the re-revised model and empirical data) and therefore it was

concluded that the model *does* fit and it could be said that the model is consistent with the

empirical data.

Specifically, the final re-revised model included the two variables- ACT and

conscientiousness- regressing on GPA, and GPA regressing on course grade. The R^2 for

the regression of ACT and conscientiousness regressing on GPA was .145 and was

statistically significant (p<.001), indicating that ACT and conscientiousness together

account for nearly 15% of the variance in GPA, a medium effect size. The R^2 for the

regression of GPA on Letter Grade was .222, indicating that GPA accounts for

approximately 22% of the variance in Letter Grade. The particular utility of the path

analysis approach therefore is in its revealing that, although ACT and conscientiousness

do not significantly relate directly to course grade, they do have indirect effects through

their impact on GPA.

These findings are consistent with previous research (Wolfe & Johnson, 1995)

which has suggested that conscientiousness accounts for at least a portion of the variance

in GPA. Goff and Ackerman (1992) as well as Tross et al., (2000) found that

conscientiousness was a better predictor of college than high school performance-in their

view this is due to the decreased structure of college and increased need for self-

regulation. These findings are also consistent with Gifford et al.'s, (2006) work that

suggested that ACT can serve as an effective predictor of student academic success as

demonstrated by higher GPAs at the end of their first year for higher ACT students.

As indicated in the literature, reviewed in Chapter 4, the present study found that extraversion did not have a significant impact on academic success. In the initial model of the present study, both extraversion and conscientiousness were hypothesized to have an effect on procrastination, which in turn would have an effect on letter grade. While the correlation between extraversion and procrastination were very small (-.014) and individually nonsignificant (p=.352), the combination of extraversion and conscientiousness made the relationship significant (p<.001) and allowed extraversion to remain in the initial model. In general, however, observed correlations between extraversion and nearly all other variables were very small; the only individually significant correlation that extraversion displayed was with conscientiousness. After the reproduced correlations were completed and compared to the observed correlations, it was determined that extraversion was playing a nonsignificant role, and thus it was removed from the model. Before extraversion was deleted, a regression analysis was conducted to determine if extraversion had an impact on other variables (i.e., GPA, Expected Grade or Letter Grade), hypothesizing other paths besides procrastination. None of these variables produced significant results and therefore were not added as new paths in the model upon revision.

In addition to the final model fit described above, it can also be said the first revised model prior to the final, re-revised model "fit" as well. As the reader may recall, Mertler and Vannatta (2002) suggested there is no single statistical test that determines "fit," nor is there a cut-off number of variables that needs to meet the criteria of the <.05 difference between observed and reproduced correlations. Therefore, this researcher could have stopped with the initially revised model, as only two of the correlations were

> .05. This researcher decided to re-revise the model in an effort to get a tighter fit, which indeed occurred in the final model. The rationale behind taking this process one step further was the fact that the same variable (expected grade) played a role in both of the correlations that exceeded .05. Thus the researcher determined that expected grade should be removed from the revised model. While it was hypothesized that expected grade may have a role in letter grade equal to or larger than personality, this re-revised model did not confirm that hypothesis. Therefore, according to the re-revised, model, expected grade did not have a direct or an indirect relationship with letter grade.

A number of conclusions may be drawn from these findings. One of the main reasons for hypothesizing that extraversion played a role in PSI-type courses was the unique environment that a PSI-type course provides. Due to some of the typical qualities generally attributed to extraverts: assertive, talkative, upbeat, energetic, optimistic, sociable, liking people, preferring large groups, and gatherings, it was speculated that extraverts may be more likely to experience difficulty in this course given the unique environment. The PSI-type environment can be fairly isolative, with little unsolicited peer or instructor interaction, and therefore it may serve as a more difficult environment for an extravert, who enjoys being around people and preferring large groups. Thus the social interaction they have grown accustomed to in the traditional classroom does not exist in a PSI-type course, thus it was hypothesized that extraverts' academic performance may be negatively impacted due to this unique environment.

Another hypothesis about why extraversion did not play a role in final letter grade may be the way that the students utilized their peers. For example, as stated above, the rationale behind extraversion impacting final grade was the idea that the PSI-type

environment is not conducive to the extraverts personality style but if extraverted students were able to create their own social environment with peers, which could allow for a more group-study, and socially active atmosphere, where extraverts are more likely to feel comfortable and thus more successful. If extraverted students strive to create a social-type environment through group study time, peer consultation, and group-work this changes the so-called unique environment, which is often solitary or isolative, that is created by PSI-type or other non-traditional courses. Thus, this changes what was being measured in this study, as it was assumed that students were functioning from the 'supposed' unique environment of PSI-type courses. It is impossible to know if this type of group-study or peer interaction was happening in the current study but future studies can address this issue.

Another important consideration for this study relates to individual differences that are not only expressed in terms of traits but are also reflected by a person's interests and preferences. While this study examined ways that personality can predict academic success it is important to remember that despite some students' scores on the personality inventories, their interest or preference for the subject matter (Psychology) may vary and therefore impact their course grade. For example, if a student that scored extremely high on the conscientiousness scale but disliked the subject matter of psychology, that student still might display the characteristics of conscientiousness but to a lesser extent than if it were a subject the student enjoyed. Conversely, a student scoring high on the extraversion scale who really enjoyed psychology might exhibit more effort, which could affect his or her course participation and ultimately course grade.

Discussion of Research Question Two

As the reader will recall, research question number two was whether status as a nonsuccessful student in UNL's Introductory to Psychology 181 PSI-type course can be reliably predicted from knowledge of extraversion and conscientiousness, plus more standard measures of academic success (GPA), procrastination, number of quiz attempts, and unit completion. The research question was altered due to the small numbers (N=18) of individuals who actually withdrew from the course. The original "withdraw" group expanded to include all students who performed below average in the course, which included not only the group of students who withdrew, but also those receiving course grade of C- or lower and who failed the course (N=37).

The results of the second research question suggest that, according to the hypothesized model, status as an unsuccessful student in a nontraditional PSI-type course in fact can be reliably predicted from knowledge of two of the seven proposed variables. These two variables were conscientiousness and unit completion (i.e., the average number of days between the last attempted quiz and the pull date for each unit or chapter averaged over all chapters), which can be seen as a behavioral index of conscientiousness. As mentioned in Chapter 4, however, these results need to be interpreted with some caution, given the researcher's decision to leave outliers in the sample. Mertler and Vannatta's (2002) have pointed out that logistic regression is sensitive to outliers. In the present data, however, each time outliers were deleted, and Maholanobis and chi square were computed again, more outliers "popped up." After three rounds of deleting outliers a frequency distribution showed that the already small sample size in the nonsuccessful group was diminishing to the point that analyses would

not be meaningful. Deleting the outliers was therefore weighted against the loss of statistical power, with the decision made to retain the larger sample size. Although this decision may have had some impact on the results, it should be noted that, despite the inclusion of the outliers, significant relationships still were demonstrated consistent with the hypothesized model.

As previously stated, while the odds ratios from the logistic regression are small, the fact still remains that as the variable conscientiousness increases, subjects are less likely to be classified in the unsuccessful group. Theoretically this makes sense; as conscientiousness increases, the likelihood of the student falling into the unsuccessful category decreases. Similarly as the variable unit completion increases, subjects are more likely to be classified in the unsuccessful group. Again, theoretically this makes sense, unit completion increasing indicates that students are completing the final task for that unit before the pull date, so they are not waiting until the last possible date to complete units (i.e., chapters) indicating that they are presumably prepared and are happy with the grade they received. Again, unit completion is closely related to the behavioral component of conscientiousness including self regulation, planfulness, goal-directed tasks, and prioritizing tasks.

Some conclusions can be made from the results of this logistic analysis. Initially, with the researcher hypothesizing the reasons for students withdrawing, performing below average, or failing might have to do with the personality of students choosing to participate in extra credit at the beginning of the semester. Students agreeing to participate in extra credit on the first week of school may include preponderance toward a certain type of personality. For example, students who are more inclined to participate in

extra credit the first day of class may be more a conscientious student in and of

themselves, while those having other prominent personality attributes might not have

chosen to participate. It is possible, therefore, that the study might have been weighted

with a large number of conscientious students.

While the logistic regression output indicates that the overall model correctly

specified 92.7% of the cases. For example, the model was able to predict the successful

group with 98.1% accuracy; it was only able to predict the unsuccessful group with

40.9% accuracy. While 40.9% is not an insufficient number, the extremely high score of

classifying the successful group is increasing the overall percentage. It can be

hypothesized that the differences in these classifications of percentages may be strictly

due to the difference in sample size of the two different groups, as one is much smaller

than the other. Despite the differences in the percentages the fact remains that the model

was able to correctly specify 92.7% of the cases, which is an extremely high success rate.

Limitations

As with most studies, there are limitations. For the first research question it is

important to note that the model only explains academic success in terms of the variables

included. Although fit indices suggest that the variables in the final re-revised model are

a good representation of the current data, other variables could be profitably included in

future models. The initial variables were chosen based on theory and previous research

regarding personality, PSI-type and non-traditional courses, and variables known or

suspected to predict academic success. While other information was gathered from this

sample set (i.e., gender, year in school, other personality variables gained from the NEO-

FFI, and previous experience with PSI courses etc…) the current variables were deemed the most important given the research questions.

Due to the time consuming and lengthy process of hand calculating all possible paths for the reproduced correlations in order to calculate the path decomposition (each time the model is revised) it would be advantageous to limit the number of variables in the model. One future suggestion that could avoid limiting variables is the use of structural equation modeling (SEM) as the method of statistical analysis. While this requires some expertise in the SEM area as well as knowledge of, and access to, additional statistical software, SEM may prove to be a more efficient means of utilizing more of the potential variables gained in this dataset as the software is capable of doing more of the analysis for the researcher.

Another limitation for question two in this study was the relatively small sample size (N=37) for the classification group "unsuccessful." While overall this is a good sign, indicating that few students that participated in the study were less than average, failed, or withdrew, in terms of predicting group membership it was more difficult. While often considered a limitation, it is important to note that the path analysis model showed good consistency with empirical data *in spite of* the fact that criteria for linearity, normality, and homoscedasticity were not fully met, even after transformation. One can conclude that if the sample size had met tests of assumption, the model may produce even stronger results.

The final limitation discussed in this dissertation could be the personality measure, the NEO-FFI. Because the NEO-FFI is the short version of the NEO-PI-R it does not contain the six more specific facets of each of the five factors. If the NEO-PI-R

would have been utilized in this study it may have impacted the different components

of both extraversion and conscientiousness. For example, if the NEO-PI-R had been used

the six facets of extraversion: warmth, gregariousness, assertiveness, activity, excitement-

seeking, and positive emotions could have their own specific measure; while the six

facets for conscientiousness are competence, order, dutifulness, achievement striving,

self-discipline, and deliberation. Knowing those more specific facets may have given the

researcher more direction in terms of the specific characteristics of those students that are

successful in this unique academic environment.

Suggestions for Future Research

As previously mentioned regarding question one, the possibility of students

creating their own comfortable social environment amidst the PSI-type environment may

account for some of extraversion not impacting letter grade. A future direction for

research, and way to assess this would be to survey participating students about their

study habits and the way they approach the course with their peers. This would give the

researcher some idea of the way that students may or may not be utilizing peers, study

groups, and other social ways of changing the unique PSI-type environment. While the

researcher is not discouraging this type of behavior, in fact this behavior is encouraged

within the realm of students completing their own, individual work; it would just be an

essential component to know the *context* of how each person is utilizing their study time

and the way they approach this course with their peers.

Another potential confounding variable for both question number one and number

two was student's individual interests and preferences despite their personality profile.

One way of assessing student interest/preferences would be to have students rate their

like/dislike for psychology matter on a Likert scale of 1-10. Although this may still be

problematic as typically the majority of the students that enroll in this course are

underclass students and this may be their first exposure to the materials and therefore

they could not answer this question at the beginning of the semester. Another way around

this issue could be to assess their like/dislike of the subject matter at the end of the

semester.

Summary and Implications

The current study addresses import gaps in the literature relating personality

factors to academic performance. The study contributes not only to an understanding of

the potential role of personality in academic settings, but more specifically to theories

about how personality factors such as conscientiousness might related to academic

performance in non-traditional, PSI-type courses. As readers may recall the lack of

research in this area was one of the primary reasons for continuing this type of research.

This goal was accomplished with final re-revised model suggesting that ACT,

conscientiousness, and GPA are all significantly related to academic success.

Interestingly, however, the former two factors-ACT scores and conscientiousness- did not

exert their effects on course grade directly, but indirectly through GPA. The current study

was successful in creating a path analysis model that was consistent with the empirical

data, which is the ultimate goal of path analysis.

It was also determined, from the present model, that conscientiousness and unit

completion predict membership into groups of students who are successful or not in

UNL's Introduction to Psychology 181-PSI course. In logistic regression, a model

containing these two variables correctly classified 92.7% of the students into their

respective groups. Although it may be possible to overinterpret these findings, and to potentially misrepresent the percentages, it still is an extremely high number. This has significant implications in terms of how the course is marketed to students and academic advisors. For example, in the initial orientation meeting the Keller Director can discuss the characteristics (of conscientiousness) that successful students have historically displayed and how this may impact their course grade.

The second variable (unit completion) that impacted group membership in the unsuccessful group will also be important to stress to new students, as this is a measure of their work ethic and/or study habits, and potentially a behavioral component of conscientiousness. Encouraging students to test prior to the pull date and stay on task for each unit/chapter may significantly help their grade.

Thus the goals of this research study have been attained and can therefore impact future PSI-type courses as well as personality research. This research has contributed to the already-present body of literature supporting conscientiousness and its role in academic success, as well as literature supporting ACT as an important aspect of academic success. But potentially more importantly, it contributes to the *smaller* body of research regarding nontraditional courses such as PSI-type and can serve as a catalyst for future research on these unique environments.

References

Ackerman, P.L., & Heggestad, E. D. (1997). Intelligence, personality, and interests:
Evidence for overlapping traits. *Psychological Bulletin,* 121, 219-245.

Allik, J., Laidra, K., Realo, A., & Pullmann, H. (2004). Personality development from
12-18 years of age: Changes in mean levels and structure of traits. *European Journal of Personality,* 18, 445-462.

Allport, G.W. (1937). *Personality: A psychological interpretation.* New York: Holt.

Allport, G. W., & Odbert, H.S. (1936). Trait names: A psycholexical study.
Psychological Monographs, 47, 211.

Agresti, A., & Finlay, B. (1997). Introduction to multivariate relationships. In Agresti, A.,
& Finlay, B. (Eds.), Statistical methods for the social sciences (3rd ed.). Prentice Hall, Upper Saddle River, pp 356-372.

Badia, P., Harsh, J., & Stutts, C. (1978). An assessment of methods of instruction and
measures of ability. *Journal of Personalized Instruction, 3(2),* 69-75.

Barkmeier, D. R., Duncan, P. K., & Johnston, J. M. (1978). Effects of opportunity for
retest on study behavior and academic performance. *Journal of Personalized Instruction,* 3(2), 89-92.

Barrick, M. R., & Mount, M. K. (1991). The big five personality dimensions and job
performance: A meta-analysis. *Personal Psychology,* 44, 1-26.

Binet, A., & Simon, T. (1905). Methodes nouvelles pour lediagnostique du niveau

intellectual des anormaux {New Methods for the diagnosis of the intellectual

levels of subnormals} (E.S. Kite, Trans). In JJ Jenkins, & D.G. Paterson (reprint

Eds.). *Studies in individual differences, the search for intelligence (pp 90-96).*

New York: Appleton-Century-Croft (reprinted in 1961).

Blickle, G. (1996). Personality traits, learning strategies, and performance. *European*

Journal of Personality, 10, 337-352.

Bollen, K. A. & Long, J. S. (1993). *Testing Structural Equation Models.* Newbury Park,

CA: Sage.

Boomsma, A. (2000). Reporting analyses of covariance structures. *Structural Equation*

Modeling, 7(3), 461-483.

Borgotta, E. F. (1964). The Structure of personality characteristics. *Behavioral Science,*

9, 8-17.

Born, D. G., & Whelan, P. (1973). Some descriptive characteristics of student

performance in PSI and lecture courses. *The Psychological Record. 23,* 145-152.

Brophy, J. (1979). Teacher behavior and its effects. *Journal of Educational Psychology,*

71(6), 733-750.

Busato, V. V., Prins, F. J., Elshout, J. J., & Hamaker, C. (2000). Intellectual ability,

learning style, achievement motivation and academic success of psychology

students in higher education. *Personality and Individual Differences*, 29, 1057-

1068.

Bushkit, W., Cush, D., DeGrandpre, J. (1991). The life and times of PSI. *Journal of*

Behavioral Education, 1(2), 215-234.

Byrne, B. (1994). *Structural equation modeling with EQA and EQS/Windows: Basic concepts, applications, and programming.* Newbury Park, CA: Sage.

Carroll, J. B. (1963). A model of school learning. Teachers College Record, 64, 723-733.

Cattell, R. B. (1943). The description of personality: Basic traits that resolved into clusters. *Journal of Abnormal and Social Psychology, 38,* 476-506.

Chamorro-Premuzic, T., & Furnham, A. (2003). Personality traits and academic examination performance. *European Journal of Personality, 17*, 237-250.

Chapman, D. W., Holloway, R., & Kelly, E. (1977). Using ratings by students to predict high and low achievers in a PSI course: A discriminant analysis. *AV Communication Review, 25(4),* 411-422.

Cizek, G. J., & Fitzgerald, S. M. (1999). An introduction to logistic regression. *Measurement & Evaluation in Counseling & Development,* 31(4), 223- 245.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). New York: Academic Press.

Cook, T. D. & Campbell, D. T. (1979). *Quasi-Experimentation: Design and analysis issues for field settings.* Boston, MA: Houghton Mifflin Company.

Costa, P. T. Jr., & McCrae, R. R. (1980). Still stable after all these years: Personality as a key to some issues in adulthood and old age. In P. B. Baltes & O. G. Brim Jr. (Eds.), *Life span development and behavior.* (pp.65-102). New York: Academic.

Costa, P. T. Jr., & McCrae, R. R. (1989). *NEO-PI-NEO-FFI Manual Supplement.* Odessa, FL: Psychological Assessment Resources.

Costa, P. T. Jr., & McCrae, R. R. (1992a). Stability and change in personality

    assessment: The revised Davis, M. L. (1975). Mastery test proficiency

    requirements affect mastery test performance. In J. M. Johnston (Ed.), *Behavioral*

    Research and Technology in Higher Education. Springfield, IL: Charles C.

    Thomas.

Costa, P. T. Jr., & McCrae, R. R. (1992b). *Revised NEO Personality Inventory (NEO PI-*

    R) and NEO Five Factor Inventory (NEO-FFI): Professional manual. Odessa,

    FL: Psychological Assessment Resources.

Costa, P. T. Jr., & McCrae, R. R. (1992c). Normal personality assessment in clinical

    practice: The NEO personality inventory. *Psychological Assessment,* 4, 5-13.

Costa, P. T. Jr., & McCrae, R. R. (1997). Stability and change in personality assessment:

    The revised NEO personality inventory in the year 2000. *Journal of Personality*

    Assessment, 68(1), 86-94.

Crowley, S. L., & Fan, X. (1997). Structural equation modeling: Basic concepts and

    applications in personality assessment research. *Journal of Personality*

    Assessment, 68(3), 508-511.

Davis, L. J., & Offord, K. P. (1997). Logistic regression. *Journal of Personality*

    Assessment, 68(3), 497-507.

De Fruyt, F. D., & Mervielde, I. (1996). Personality and interests as predictors of

    educational streaming and achievement. *European Journal of Personality,* 10,

    405-425.

De Raad, B., & Schouwenburg, H. C. (1996). Personality in learning and education: A

    review. *European Journal of Personality*, 10, 303-336.

Denham, C., & Lieberman, A. (1980). *Time to learn*. Washington, DC: U.S.

Department of Education.

Digman, J. M., & Takemoto-Chock, N. K. (1981). Factors in the natural language of

personality: Re-analysis, comparison, and interpretation of six major studies.

Multivariate Behavioral Research, 16, 419-170.

Digman, J. M. (1989). Five robust trait dimensions: Development, stability, and utility.

Journal of Personality, 57(2), 195-214.

Digman, J. M. (1990). Personality structure: Emergence of the five-factor model. *Annual

Review of Psychology,* 41, 417-440.

Dollinger, S. J., & Orf, L. A. (1991). Personality and performance in "personality":

Conscientiousness and openness. *Journal of Research in Personality, 25,* 276-

284.

Entwistle, N. J., & Entwistle, D. (1970). The relationships between personality, study

methods and academic performance. *British Journal of Educational Psychology*,

40(2), 132-143.

Farsides, T., & Woodfield, R. (2003). Individual differences and undergraduate

academic success: The roles of personality, intelligence and application.

Personality and Individual Differences, 34, 1225-1243.

Gettinger, M. (1985). Time allocated and time spent relative to time needed for learning

as determinants of achievement. *Journal of Educational Psychology*, 77, 3-11.

Gifford, D. B., Briceno-Perriott, J., & Mianzo, F. (2006). Locus of Control: Academic

Achievement and Retention in a Sample of University First-Year Students.

Journal of College Admission, 191, 18-25.

Goff, M., & Ackerman, P. L. (1992). Personality-Intelligence relations: Assessment of typical intellectual engagement. *Journal of Educational Psychology, 84(4),* 537-552.

Goldberg, L. R. (1972). Some recent trends in personality assessment. *Journal of Personality Assessment, 36,* 547-560.

Goldberg, L. R. (1981). Language and Individual differences: The search for universals in personality lexicons. In *Review of Personality and Social Psychology*, ed. L. Wheeler, 2, 141-65. Beverly Hills, CA: Sage.

Goldberg, L. R. (1982). From ace to zombie: Some explorations in the language of personality. In C. D. Spielberger & J. N. Butcher (Eds.), Advances in personality assessment, (Vol. 1, pp. 203-234). Hillsdale, NJ: Erlbaum.

Gosling, S. D., Rentfrow, P. J., & Swann, W. J. (2003). A very brief measure of the Big Five personality domains. *Journal of Research in Personality, 37,* 504-528.

Healey, J. F. (1993). Statistics: A tool for social research (3rd ed.). Belmont, CA: Wadsworth Inc.

Hogan, R. (1982). A socioanalytic theory of personality. In M. M. Page (Ed.), *1982 Nebraska Symposium on Motivation* (pp. 55-89). Lincoln, NE: University of Nebraska Press.

Hothersall, D. (1975). A rolling stone gathers no…Review of Directory of teaching innovations in psychology by J. B. Maas & D. A. Kleiber, Eds.) *Teaching of Psychology*, 2, 181.

Jang, K. L., McCrae, R. R., Angleitner, A., Riemann, R., & Livesley, W. J. (1998). Heritability of facet-level traits in a cross-cultural twin sample: Support for a

hierarchical model of personality. *Journal of Personality and Social*

Psychology, 74, 1556-1565.

Jenkins, S. J., & Downs, E. (2003). Demographic, attitude, and personality differences

reported by students enrolled in online versus traditional courses. *Psychological*

Reports, 93, 213-221.

John, O. P. (1990). The "Big Five" factor taxonomy: Dimensions of personality in the

natural language and in questionnaires. In L. A. Pervin (Ed.), *Handbook of*

personality: Theory and research (pp. 66-100). New York: Guilford Press.

John, O. P., & Sriuvastava, S. (1999). The Big Five trait taxonomy: History,

measurement and theoretical perspectives. In L. A. Pervin & O. P. John (Eds.),

Handbook of Personality: Theory and research (pp102-138).   New York, NY:

Guilford Press.

Kaplan, D. (1995) Statistical Power in Structural Equation Modeling. In R. H. Hoyle

(Ed.), *Structural Equation Modeling, Concepts, Issues, and Applications* (pp. 100-

117) Thousand Oaks, CA: Sage Publications.

Kaplan, D. (2000). *Structural equation modeling: Foundations and extensions.* London:

Sage Publications.

Kahn, J. H., Gailbreath, R. D., Tipps, J. & Chartrand, J. M. (2002). The utility of career

and personality assessment in predicting academic progress. *Journal of Career*

Assessment, 10(1), 3-23.

Keller, F. S. (1968). Goodbye teacher. Journal of Applied Behavior Analysis, 1, 79-89.

Keller, F. S., & Sherman, J. G. (1974). PSI, the Keller Plan Handbook: Essays on a personalized System of Instruction. Menlo Park, CA: Benjamin.

Klages, L. (1926/1932). The science of character (Translated 1932). London: Allen and Unwin.

Kline, R. B. (2005). *Principles and practice of structural equation modeling. (2nd ed.).* New York: Guilford Press.

Kline, P., & Gale, A. (1971). Extraversion, neuroticism and performance in a psychology examination. British Journal of Educational Psychology, 41(1), 90-94.

Kulik, C. L. C., Kulik, J. A., & Bangert-Drowns, R. L. (1990). Effectiveness of mastery learning programs: A meta-analysis. *Review of Educational Research, 60,* 265-299.

Kulik, J. A., Kulik, C. L. C., & Carmichael, K. (1974). The Keller-plan in science teaching. *Science,* 83, 379-383.

Kulik, J. A., Kulik, C. L. C., & Cohen, P. A. (1979). A meta-analysis of outcome studies of Keller's personalized system of instruction. *American Psychologist,* 34, 307-318.

Kulik, J. A., Kulik, C., & Cohen, P. A. (1980). Instructional technology and college teaching. *Teaching of Psychology*, 7(4), 199-205.

Lamal, P. A. (1984). Interest in PSI across sixteen years. *Teaching of Psychology,* 11, 237-238.

Lawson, T. J. (2000). Teaching a social psychology course on the web. *Teaching of Psychology,* 27, 285-288.

LeClair, S. W. (1981). Path analysis: An informal introduction. *The Personnel and Guidance Journal,* 59, 643-646

Lievens, F., Coestier, P., & Maeseneer, J. (2002). Medical students' personality characteristics and academic performance: A five factor model perspective. *Medical Education, 36,* 1050-1056.

Lloyd, M. E., & Lloyd, K. E. (1986). Has lightning struck twice? Use of PSI in college classrooms. *Teaching of Psychology,* 13(3), 149-151.

Lounsbury, J. W., Sundstrum, E., Loveland, J. M., & Gibson, L. W. (2003). Intelligence, "Big Five" personality traits, and work drive as predictors of course grade. *Personality and Individual Differences,* 35, 1231-1239.

Lounsbury, J. W., Tatum, H.E., Chambers, W., Owens, K., & Gibson, L.W. (1999). An investigation of career decidedness in relation to "Big Five" personality constructs and life satisfaction. *College Student Journal,* 18, 646-652.

MacCullum, R. C., & Austin, J. T. (2000). Applications of structural equation modeling in psychological research. *Annual Review of Psychology,* 51, 201-226.

Maki, R. H., Maki, W. S., Patterson, M., and Whittaker, R. D. (2000). Evaluation of a web-based introductory to psychology course: I. Learning and satisfaction in on-line versus lecture courses. *Behavior, research methods, instruments, & computers. 32(2),* 230-239.

Mao-Cohen, D., and Lanson, R. N. (1975). Effects of the PSI experience beyond the PSI classroom. *Journal of personalized instruction,* 1(2), 76-79.

McCrae, R. R., & Costa, P. T. Jr., (1986). Clinical assessment can benefit from recent advances in personality psychology. *American Psychologist,* 41, 1001-1003.

McCrae, R. R., & Costa, P. T. Jr., (1987). Validation of the Five-Factor Model of personality across instruments and observers. *Journal of Personality and Social Psychology, 52(1),* 81-90.

McCrae, R. R., & Costa, P. T. Jr., (1989). Rotation to maximize the construct validity of factors in the NEO Personality Inventory. *Multivariate Behavioral Research*, 24(1), 107-124.

McCrae, R. R., & Costa, P. T., Jr., (1981). Personality trait as a human universal. *American Psychologist,* 52, 509-516.

McCrae, R. R., & Costa, P. T. Jr., (1999). A five-factor theory of personality. In L. A. Pervin (Ed.), *Handbook of personality: Theory and research* (pp. 138-153). New York: Guilford.

McMichael, J. S., & Corey, J. R. (1969). Contingency management in an introductory psychology course produces better learning. *Journal of Applied Behavior Analysis, 2,* 79-83.

Mertler C. A., & Vannatta, R. A. (2002). *Advanced and Multivariate Statistical Methods*. Glendale, CA: Pyrczak Publishing

Mills, L., & Suter, D. (1997). Distance learning: A window of opportunity for higher education.

Norman, W. T. (1963). Toward an adequate taxonomy of personality attributes: Replicated factor structure in peer nomination personality ratings. *Journal of Abnormal and Social Psychology,* 66, 574-583.

Ones, D. S., & Viswesvaran, C. (1996). Bandwidth-fidelity dilemma in personality measurement for personnel selection. *Journal of Organizational Behavior and Human Decision Making Process,* 17(6), 609-626.

Owens, A. M., & Newbegin, I. (2000). Academic procrastination of adolescents in English and mathematics: Gender and personality variations. *Journal of Social Behavior and Personality, 15, (5),* 111-124.

Ozer, D. J. (1999). Four principles for personality assessment. In L. A. Pervin & O. P. John (Eds.), *Handbook of Personality: Theory and research* (pp. 671-686). New York: Guilford Press.

Pedhazur, E. J. (1997). *Multiple regression in behavioral research* (3rd ed.). Belmont, CA: Wadsworth.

Phillips, P., Abraham, C., & Bond, R. (2003). Personality, cognition, and university students' examination performance. *European Journal of Personality, 17,* 435-448.

PytlikZillig, L. M. (personal communication, October 17, 2005)

Rigdon, E. (2005). **Retrieved December 2005, from http://www2.gsu.edu/~mkteer/sem.html**

Ridgell S. D., & Lounsbury, J. W. (2004). Predicting academic success: General intelligence, 'Big Five' personality traits, and work drive. *College Student Journal,* 38(4), 607-619.

Robin, A. L. (1975). Nonspecifics in personalized instruction. *Teaching of Psychology, 2, (1)*, 3-7.

Robyler, M. D. (1999). Is choice important in distance learning? A study of student

    motives for taking internet-based courses at the high school and community

    college levels. *Journal of Research on Computing in Education, 32,* 157-171.

Rosenkoetter, J.S. (1984). Teaching psychology to large classes: Videotapes, PSI and

    lecturing. *Teaching of Psychology, 11(2),* 85-87.

Ross, L. L., & McBean, D. (1995). A comparison of pacing contingencies in classes

    using a personalized system of instruction. *Journal of Applied Behavior Analysis,*

    28, 87-88.

Salgado, J. F. (2002). The big five personality dimensions and counterproductive

    behavior. *International Journal of Selection and Assessment,* 10(1/2), 117-125.

Sanchez, M. M., Rejano, E. I., & Rodriquez, Y. T. (2001). Personality and academic

    productivity in the university student. *Social Behavior and Personality, 29(3),*

    299-306.

SAT Program information: SAT/ACT comparisons. **Retrieved April 28, 2006 from**

    http://www.collegeboard.com/sat/cbsenionr/html/stat00f.html

Saucier, G. (1994). Mini-Markers: A brief version of Goldberg's unipolar big five

    markers. *Journal of Personality Assessment,* 63(3), 506-516.

Saucier, G. (1998). Replicable item-cluster subcomponents in the NEO five-factor

    inventory. *Journal of Personality Assessment*, 70(2), 263-276.

Savage, R. D. (1964). Personality factors and academic performance. *British Journal of*

    Educational Psychology, 32(3), 251-253.

Scandell, D. J. (2000). Development and initial validation of validity scales for the NEO-Five Factor Inventory. *Personality and Individual Differences, 29,* 1153-1162.

Schmitt, D. R. (1998). The introductory class in higher education: Some old problems and new considerations. *The Behavior Analyst, 21(2),* 281-287.

Schumacker, R. E., & Lomax, R. G. (2004). *A beginner's guide to structural equation modeling* (2nd ed.). Mahwah, NJ: Lawrence Erlbaum Associates.

Semb, G., Glick, M.D., & Spencer, R. E. (1979). Student withdraws and delayed work patterns in self-paced psychology courses. *Teaching of Psychology, 6(1),* 23-25.

Shepard, W. O., & Popp, A. (1976). PSI-problems in practice. *Psychological Reports, 38,* 297-298.

Sherman, J. G., Ruskin, R. S., & Semb, G. B. (Eds.). (1982). *The personalized system of instruction: 48 seminal papers.* Lawrence, KS: TRI Publications.

Skinner, B. (1953). *Science and human behavior.* New York: MacMillan

Smith C. P., & Winterbottom, M. T. (1970). Personality characteristics of college students on academic probation. *Journal of Personality, 38(3),* 379-391.

Snow, R. E., Corno, L., & Jackson, D. (1996) Individual differences in affective and conative functions. In D. C. Berlinger, & R.C. Calfee (Eds.), *Handbook of educational psychology.* (pp. 243-310).

Soldz, S., & Vaillant, G. E. (1999). The Big Five personality traits and the life course: A 45-year longitudinal study. *Journal of Research in Personality, 33,* 208-232.

Stage, F. K., Carter, H. C., & Nora, A.(2004). Path analysis: An introduction and analysis of a decade of research. *The Journal of Educational Research, 98(1),* 5-12.

Stevens, J. (1992). *Applied multivariate statistics for the social sciences (2nd ed.).*
New York: Lawrence Erlbaum Associates.

Tellegen, A. (1985). Structures of mood and personality and their relevance to assessing
anxiety, with an emphasis on self-report. In A. H. Tuma & J.D. Maser (Eds.),
Anxiety and the anxiety disorders (pp.681-776). Hillsdale, NJ: Erlbaum.

Tokar, D. M., Fischer, A. R., Snell, A. R., & Harik-Williams, N. (1999). Efficient
assessment of the five-factor model of personality; Structural validity analyses of
the NEO five-factor inventory (Form S). *Measurement & Evaluation in
Counseling and Development, 32(1),* 14-30.

Tross, S. A., Harper, J. P., Osher, L. W., & Kneidinger, L. M. (2000). Not just the usual
cast of characteristics: Using personality to predict college performance and
retention. *Journal of College Student Development, 41(3),* 323-334.

Tupes, E. C., & Christal, R.E. (1961). Recurrent personality factors based on trait ratings
(Tech. Rep. Nos. 61-67). Lackland, TX: US Air Force Aeronautical Systems
Division.

U.S. Department of Education, National Center for Education Statistics. (2000).
*Descriptive summary of 1995-96 beginning postsecondary students: Three years
later.* (NCES 200-154) Washington, DC: Author.

Wang, A. Y., & Newlin, M. H. (2000). Characteristics of students who enroll and
succeed in psychology web-based classes. *Journal of Educational Psychology,
92(1),* 137-143.

Widiger, T. A., & Trull, T. J. (1997). Assessment of the Five-Factor model of
personality. *Journal of Personality Assessment, 68(2)* 228-250.

Wiggins, N., Blackburn, M., & Hackman, J. R. (1969). Prediction of first-year graduate success in psychology: Peer ratings. *The Journal of Educational Research, 63(2),* 81-85.

Wiggins, J.S. (1968). Personality structure. *Annual Review of Psychology,* 19, 320-322.

Wolfe, R. N., & Johnson, S. D. (1995). Personality as a predictor of college performance. *Educational and Psychological Measurement, 55(2),* 177-185.

Wolf, M. B., & Ackerman, P. L. (2005). Extraversion and Intelligence: A meta-analytic investigation. *Personality and Individual Differences, 39,* 531-542.

Wright, S. (1934). The method of path coefficients. *Annals of Mathematical Statistics, 5,* 161-215.

Young, M. S., & Schinka, J. A. (2001). Research validity scales for the NEO-PI-R: Additional evidence for reliability and validity. *Journal of Personality Assessment, 76*(3), 412-420.

APPENDIX A

DEMOGRAPHIC SHEET

<u>Demographic Sheet</u>

Name: _____

Age: _____ Gender: Circle One: Male Female

Number of credit hours you have accumulated thus far: _____

Number of credits in which you are currently enrolled: _____

Year in school: _____Current GPA: _____

Last four digits of parent's home number: _____

Major: _____ Minor:_____

Race: Please check the appropriate box.

_____ African American   _____ Asian/Pacific Island
_____ Hispanic   _____ American Indian
_____ Caucasian   _____ Other (please list) _____

Do you live on campus? (If yes, skip the next question)
Circle one: YES   NO

If you do not live on campus, how many miles do you live from campus? _____

Are you currently employed? Circle one: YES   NO

Skip this question if you answered no to the previous question.
If yes, how many hours per week do you work? _____

Do you have a computer that can access the internet in your home/dorm room?
Circle one: YES   NO

Have you ever taken a personalized system of instruction (PSI) course before?
Circle one: YES   NO

Is this your first time taking PSYC 181 (PSI) or Keller Psychology (as it is commonly called)?
Circle one: YES   NO

What grade do you *think* you will get in this course? Circle one.

A+ A A- B+ B B- C+ C C- D+ D D- F

APPENDIX B

SCALE NAMES

Abbreviations

NEO-FFI	=	NEO-Five Factor Inventory
E	=	Extraversion
C	=	Conscientiousness
ACT	=	ACT scores and SAT scores converted to ACT scores
GPA	=	Grade point average (on 4 point scale)
Unit_com	=	the number of days between the last attempted quiz and the pull date for each unit or chapter averaged over all chapters
Cour_com	=	Date of Course completion subtracted from last day of semester
#qa	=	Average number of Quiz Attempts for each chapter
#ea	=	Average number of Exam Attempts for each Exam
#aa	=	Average number of Assignment Attempts for each Chapter
eca	=	Any type of extra Credit participation
proc	=	Procrastination
expgra	=	Student's expected grade at the beginning of the semester
letGrade	=	Letter grade at the completion of the Course

APPENDIX C

SAT to ACT Conversion Table

SAT to ACT Conversion Chart

Recentered SAT I Score Verbal+Math	ACT Composite Score
1600	36
1560-1590	35
1510-1550	34
1460-1500	33
1410-1450	32
1360-1400	31
1320-1350	30
1280-1310	29
1240-1270	28
1210-1230	27
1170-1200	26
1130-1160	25
1090-1120	24
1060-1080	23
1020-1050	22
980-1010	21
940-970	20
900-930	19
860-890	18
810-850	17
760-800	16
710-750	15
660-700	14
590-650	13
520-580	12
500-510	11

"Concordance Between ACT Assessment and Recentered SAT I Sum Scores" by N.J. Dorans, C.F. Lyu, M. Pommerich, and W.M. Houston

(1997), *College and University*, 73, 24-31; "Concordance between SAT I and ACT Scores for Individual Students" by D. Schneider and N.J.

Dorans, *Research Notes (RN-07)*, College Entrance Examination Board, New York: 1999; "Correspondences between ACT and SAT I Scores" by

N.J. Dorans, *College Board Research Report 99-1*, College Entrance Examination Board, New York: 1999; *ETS Research Report 99-2*,

Educational Testing Service, Princeton: 1999.