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Use of the Nurse Entrance Test and Other Factors as Predictors of Academic Success of Nursing Students

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USE OF THE NURSE ENTRANCE TEST AND

OTHER FACTORS AS PREDICTORS OF

ACADEMIC SUCCESS OF NURSING STUDENTS

By

Linda Rhea Hunter

A dissertation submitted in partial fulfillment

of the requirements for the degree of

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ABSTRACT

Use of the Nurse Entrance Test
and Other Factors as Predictors of
Academic Success of Nursing Students

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Professor Robert Drummond, Committee Chairperson

Attrition from schools of nursing continues to
affect almost one third of students enrolled.
Attrition is costly financially and personally to the
student, to the educational institution, the health
care consumer and the profession.

The purpose of this study was to identify
variables measurable at time of admission which might
alone or together be predictive of successful
persistence until graduation from a nursing program.
The variables included cognitive and noncognitive
characteristics measured by the Nurse Entrance Test
(NET) as well as demographic and other academic
achievement measurements.

A convenience sample of associate degree nursing
students admitted into two successive classes of a
large, urban community college was used. Two hundred
sixty seven students participated, with successful
students defined as those who succeeded in each course

of the program and continued in enrollment in an
uninterrupted fashion until graduation.

Cognitive factors included preadmission grade
point average (GPA), California Achievement Test score,
and measurements on the Nurse Entrance Test (NET) for
Math Skills, Reading Comprehension and Rate, Testtaking
Skill and Preferred Learning Style. Noncognitive
factors were NET self-perceived scores on five areas of
Life Stress and a Social Interaction Profile of passive
and aggressive styles. Demographics were age, gender
and race.

Using univariate analysis of variance and
discriminant analysis, the same six characteristics
were found to be significantly different between the
groups of successful and nonsuccessful students and
predictive of success or nonsuccess: Reading
Comprehension, preadmission GPA, age and stress in
three areas - academic, family and social. When a
discriminant analysis using a stepwise inclusion
procedure was performed, these six were included among
the ten variables found together to be useful in a
prediction equation. Added to these six were
Testtaking Skill, Money Stress, Social Interaction

Profile and gender. By measurements in all types of
analyses used, Academic Stress and Reading
Comprehension were consistently the strongest of the
predictors of group membership. Group membership was
successfully predicted in 74.33% of the cases when the
reduced set of ten variables was used.

Findings from this research could be used as a
basis for developing a risk profile for students either
for use in making admission decisions or for
identifying students at risk for nonsuccess. Nursing
educators should become alert to the finding that the
students in this study were at risk for failure because
of noncognitive as well as because of cognitive
characteristics.

Future research could focus on the multifactorial
influences in a student's life which affect success.
Research could focus also on the examination,
implementation and evaluation of intervention
strategies designed to increase retention and improve
academic performance.

CHAPTER 1

Introduction

<u>Introduction</u>

Failure of students enrolled in nursing to successfully complete their programs is a major problem in nursing education. Attrition rates nationally for students already enrolled in nursing have been consistently reported to be between 20% and 41% (Catalano & Eddy, 1990; Huch, Leondura & Gutsch, 1992). These rates for nursing have been reported to be among the highest of any student majors in two- and four-year institutions (Smith, 1990). The high rates continue at a time when schools of nursing have roller-coasted between a leveling off or decline in applications and then an increase in applications beyond enrollment capabilities. Further, troublesome attrition rates occur at a time in which national attention has been drawn to the shortage of practicing nurses in relationship to the nation's health needs. This shortage is projected to continue into the 21st century (Naylor & Sherman, 1987; United States Department of Labor, 1992). A quarter of the 2.9 million new jobs in health care occupations will be for registered nurses.

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Nurses' employment is expected to grow much faster than the average of all occupations through the year 2005 (United States Department of Labor, 1992). Student attrition is inversely related to the number of nurses in the work force. Therefore, because of the national shortage, an examination of the reasons for the failure of one third of students enrolled in nursing to graduate is imperative.

A second reason to examine this high rate of attrition is because of the adverse impact on the educational institution. With faculty-student clinical ratios set by state boards of nursing at one to ten or one to twelve, schools of nursing are an expensive department of educational institutions. Nursing is an area in which costs continue to rise faster than other academic areas (Huch, et al., 1992). The majority of nursing programs are designed to admit a group of students at one point in time and progress them through a two- to four-year sequence of courses. If a student is unsuccessful, the institution is hurt because the position granted to and resources invested in an unsuccessful student could potentially have been granted to a different, successful applicant. Further,

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the vacant slot continues on as vacant and thus
unfunded until that group of students graduates.

The third reason to study attrition is at a more
personal level. The unsuccessful individual student
suffers in many ways: from funds and time expended,
from a loss of future income as a nurse, and from the
psychological impact of failure to become a nurse. The
student's family, peers and instructors are affected
and suffer on a personal level as well.

For all of these reasons, nurse educators are
concerned with being able to select and admit the
candidates most likely to complete nursing programs and
with teaching effectively to assist those students who
are selected in accomplishing that completion. Most
attrition is a result of academic failure (McDonald,
Collins & Walker, 1983; Rosenfeld, 1988; Thurber,
Hollingsworth, Brown & Whitaker, 1989). Part of
responsible and effective teaching should include
identification and remediation of those 20% to 41% of
students who are accepted into programs but who may not
graduate.

Identification of factors which are predictive of
academic success in nursing programs has been the focus

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of research studies in the past. In reviewing the

literature prior to 1975, one author stated that an

admissions officer could justify a stance for or

against any particular selective admission policy

chosen (Grant, 1986). Since that time, many

researchers have demonstrated that past academic

success is the best predictor of two outcome variables:

nursing grade point average (GPA) and passing score on

the National Council Licensing Examination for

Registered Nurses (NCLEX) (Lengacher & Keller, 1990;

Wold & Worth, 1990; Woodham & Taube, 1986; Yang, Glick

& McClelland, 1987). Fewer researchers have studied

factors which are predictive of persistence versus

nonpersistence, or of those who succeeded academically

even to the point of obtaining a cumulative nursing GPA

or qualifying to take the NCLEX. The measures of past

academic success which have shown some predictive

ability for nursing GPA and NCLEX passage are not

clearly related to persistence or nonpersistence

(Allen, Higgs & Holloway, 1988; Benda, 1991; Hutana,

1991; Oliver, 1985). Other findings of demographic or

non-cognitive variables predictive of persistence are

isolated or contradictory (Allen, Nunley & Scott-

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Warner, 1988; Benda, 1991; Felts, 1986; Marshall, 1989;

Smith, 1990). One reviewer (Grant, 1986) suggested

continued multivariate research effort may be helpful

in determining persister/nonpersister characteristics

because the findings may be of highly complex

relationships between intellectual ability, personality

variables, and teacher-student interactions.

The Nurse Entrance Test or NET (Frost, 1990) is an

examination that measures two of the three above areas

-intellectual ability and personality variables. The

NET is widely used in the nursing field (See Appendix

A). The NET provides measures of the cognitive

characteristics of math and reading skills, a

calculation of learning style, and measures of skill in

taking paper and pencil tests. It provides measures of

the personality variables or non-cognitive

characteristics of social interaction (passive/

aggressive leadership style) and a five faceted self-

perceived stress profile. The test's stated purpose is

as a diagnostic instrument to assist nursing education

programs to evaluate the academic and social skills of

applicants. The publishers suggest the NET can be used

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to more objectively screen applicants for admission, or to provide a profile of a class already admitted.

Although the NET is used extensively, a review of the literature revealed no published studies attempting to determine any relationships among NET measured variables and successful completion or noncompletion of any nursing program. Two unpublished studies using the NET yielded contradictory findings. In a dissertation study, Quill (1993) examined the relationship among all of the NET subtests, selected demographics, nursing and non-nursing grades, and the academic success of 45 ADN students in a rural community college in Arizona. No NET subtests or combinations of subtests were identified as predictors of success in the program. Findings regarding the demographic and grade variables, she stated, were difficult to determine due to low number of students and missing data. Low numbers of students may have influenced the study's other findings as well. Abdur-Rahman, Fermea and Gaines (1993) found that successful baccalaureate students had significantly higher NET scores on reading, math, and composite scores, and lower family and social stress scores than unsuccessful students. Their study was

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performed on a sample of 128 students. Success in that study was measured by grades in the first year of professional study, and the NET subscores accounted for up to 33% of the variance in those grades.

Some of the cognitive variables measured by the NET, such as reading comprehension, have been found by previous research to be predictive of success in nursing school (Grant, 1986). Other non-cognitive measures have not been directly studied, such as the different areas of stress in students' lives. The NET, in combination with already measured pre-entry cognitive variables, such as pre-entry GPA and score on California Achievement Test, could help nurse educators to make better admission decisions or to determine which already-admitted students are at risk for non-completion. Those students could then be assisted or remediated to become academically successful.

Purpose

The major purposes of this study were to determine what variables measured by the NET, alone or in combination with other cognitive and demographic variables, contribute significantly to the prediction of success in a nursing program and to investigate

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whether there were any significant differences between those who drop out and those who were academically successful on these variables.

For this study, academic success refers to continuous and uninterrupted enrollment and progression through a nursing program. The nursing program in this study required that for uninterrupted enrollment and progression, a student must attain final course and examination grades of 80% or better and perform satisfactorily in the clinical area (graded on a satisfactory – unsatisfactory basis).

NET variables investigated included the seven subscores: Essential Mathematics Skills, Reading Comprehension, Reading Rate Average, Testtaking Skill, Learning Style, Stress Level Profile, and Social Interaction Profile. Demographic variables included age, gender and race. Cognitive data included preadmission all college GPA and a California Achievement Test score from the average of the verbal and mathematic subtests.

Delimitations and Limitations

Since this study investigated the relationship of variables to the success of students in a large,

public, urban community college in the southeastern United States, the limitation of generalizability to that type of nursing program is created.

This study assumed the following:

1. student records provide reliable data sources;

2. the numbers recorded in student records, as the variables of interest, are assumed to be accurate and valid indicators of the variables;

3. the inclusion of students who withdraw for nonacademic reasons will not affect the sample or findings;

4. the use of convenience sampling could result in biased sample;

5. the inclusion of only selected variables to analyze prediction of academic success could alter the findings; and

6. the use of self-report instruments to measure testtaking skill, stress, and learning style may alter the findings, since self-report measures may be more likely to reflect subjects' perceptions than actual behaviors.

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Statement of Hypotheses

The following hypotheses guided this study with regard to predictability of success in a nursing program:

H_1: The successful and the nonsuccessful student groups will not differ significantly on any of the variables.

H_2: None of the variables will be significant contributors to prediction of successful or nonsuccessful group membership.

H_3: None of the variables will differ from one another in ability to discriminate between successful or nonsuccessful group membership.

Procedures and Methods

The setting for the study was a large, public, urban community college whose nursing program is accredited by the National League for Nursing. Subjects for this ex post-facto study were a convenience sample of 285 nursing students newly admitted into two successive classes in August, 1993, and January, 1994, and students who had been admitted into previous classes but were reinstated at later dates into those two classes. Students entered this

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program having completed prerequisite college credit hours in basic academics and sciences. Students were admitted based on a ranking derived from California Achievement Test score and high school or college grade point average (see Appendix B). Missing data, refusal to participate, or non-return of mailed permits for the study accounted for a few missing cases so that the results were based on data for less than the 141 students admitted into the August, 1993, semester and the 144 into the January, 1994, class and for less than the 33 students readmitted into these groups. All data were obtained from transcripts and related documents provided by the nursing program office and the registrar's office. All data were then coded for confidentiality by the investigator. Permission (Appendices C and D) for the study had been received from the students and the educational institution involved.

Univariate analysis of variance was used to determine if the successful and nonsuccessful student groups were significantly different from each other on each of the variables. Discriminant analysis techniques examined the variables alone and in

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combination with other variables for significance and for value in prediction of either successful or nonsuccessful student group membership. A discriminant analysis classification procedure was utilized to examine how well the optimal set of predictor variables predicted student membership in the two groups.

These methods were selected to identify any differences on the variables between the groups and to identify single and combined variables most predictive of academic success. The level of significance was preset at 0.05. The data were analyzed using the Statistical Package for the Social Sciences (SPSS-X) (SPSS-X User's Guide, 1988).

Academic success as previously defined was the dependent variable. The relationship between the following variables and academic success were investigated:

1. age: student age at time of admission was rounded to the nearest year;

2. gender: male and female were the two categories;

3. race: the three divisions were African-American, Caucasian, or Other;

4. all college GPA: this average was of grades
   achieved on previous courses at the college
   level including at least 12 hours of general
   education and Human Anatomy and Physiology I
   and II (6 hours) required for admission into
   the nursing program (See Appendix B);

5. California Achievement Test (CAT): this
   single score was derived by averaging the
   verbal and mathematics subtests;

6. NET variables:

   A.   Essential Math Skills: This score is a
   percentage average of the following
   individual math skills tested:

   Whole Number Operations

   Fraction Operations

   Decimal Operations

   Percentage Operations

   Numbers System Conversion

   Algebra Equation

   The score is based on a 60-minute, 60-
   item examination.   The average score for the
   most recently normed study group of 1745
   beginning ADN students was 69% (Frost, 1993).

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B. Reading Comprehension Skill: The NET
evaluates reading comprehension at the
inferential level for science-related
material. The reading selections are at the
tenth-grade level of difficulty for
vocabulary and sentence syntax - a level
considered "normal" adult reading ability for
applicants to college courses by the NET
publishers. The score is based on a 30-
minute, 32-item examination and is a
percentage score. The average score for the
norming group was 59%.

C. Reading Rate Average: The NET estimates
the words-per-minute that the applicant can
read when placed in a test or study
situation. The normal rate of reading for
the adult learner with at least a 10th-grade
reading ability is between 200 and 450 words-
per- minute. The NET provides a reading rate
based on a one-minute examination. The
reading rate average for the normed group was
308 words-per-minute.

D. Testtaking Skill: The NET measures the ability to utilize testtaking strategies when taking objective, essay and standardized examinations. This score is based on a 20-minute, 30-item examination. The score assigned can be from zero to 100%. Also this score is assigned one of three proficiency levels - frustration, instructional, or independent - based on standard deviation from the mean. To function independently, the normed group scored 48-100; acceptable mastery is at level of 15-47, and below that a student is likely to encounter difficulty in successfully taking examinations, especially multiple choice and true/false questions.

E. Learning Style: The measurement is a calculation of preferred learning style. These scores are based on a 20- minute, 45-item examination. A score of zero to 100% is assigned for each of the six areas. Normed average scores on the Auditory Learner scale were 47%, on the Visual Learner scale were

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65%, on the Social Learner scale were 70%, on the Solitary Learner scale were 62%, on the Oral Dependent Learner scale were 64%, on the Writing Dependent Learner scale were 57%.

F.   Stress Level Profile: These five scores are a self-perceived profile in five areas of personal coping.   High scores on this profile indicate areas of personal stress which may cause difficulty for nurses as they progress through college.   These scores are based on a 12-minute, 50-item examination.   A score of zero to 100% is assigned for each of the five areas.   Normed averages on the Family Stress scale were 24%, on the Social Stress scale were 25%, on the Money/Time Stress scale were 48%, on the Academic Stress scale were 17%, on the Work Place Stress scale were 17%.

G.   Social Interaction Profile: This profile yields a calculation of the passive and aggressive group leadership styles of the individual.   These scores are based on a 10-minute, 30-item examination.   A score of

100% is possible on either of the two styles with a total score for both to achieve 100%. The passive score is usually one-half of the value of the aggressive score. The normed group average was 21% passive, 79% aggressive (Frost, 1993).

Instrument

The major instrument used was the Nurse Entrance Test (NET) (Frost, 1990). All of the following information was derived from the Diagnostic Report (Frost, 1991, 1993). In the development of the NET, a series of standardization procedures were followed to assure that the content of the NET was appropriate for entry level nurses to provide an effective means of interpreting test performance (Frost, 1991). The original standardization of the NET was based on the testing of 1385 beginning nurses from health occupation programs from four geographical areas. Between July, 1991, and October, 1992, another norming study was completed on 1745 ADN students in five geographic regions (Frost 1993). The NET was standardized by equating its individual Composite Percentile (and the individual Math and Reading Comprehension Scores) with

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the scores of the American College Test (ACT) composite and math and reading comprehension scores. The relationship of mean averages for the ACT and NET overall average range from +.79 to +.83 to indicate a substantial relationship between performances on both tests.

The reliability of the NET subtest areas for students who participated in the standardization was examined by the split half method. The forms were evaluated by comparing the odd-numbered items with the even-numbered items on the NET. The coefficients ranged from +.81 for Math to +.98 for the Reading Comprehension subtest with an overall average of +.93, indicating that there is little internal variation in a student's performance from one form of the NET to the next.

Content validity was built into the NET through its design specifications. The selection of test items followed the guidelines developed by an Examination Committee. These guidelines reflected the expressed needs of a survey completed by a representative sample of health occupation program directors across the United States. Test items,

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therefore, were included only if they emphasized appropriate skill focus and learning style behaviors of nurses (Frost, 1993).

The independent variables from the NET were seven subtest scores generated for each examinee, from 31 individual scores. The variables were as follows:

1.   Essential Math Skills
2.   Reading Comprehension Skill
3.   Reading Rate Average
4.   Testtaking Skill
5.   Learning Style
6.   Stress Level Profile
7.   Social Interaction Profile

Significance of the Research

It is clear that the United States will experience a constant and growing need for nursing graduates to serve the nation's health needs (Donovan, 1989; Naylor & Sherman, 1987; United States Department of Labor, 1992). Hospitals expend resources in attempts to recruit and retain practicing nurses while universities and colleges struggle to graduate the qualified practitioners needed by local and national consumers.

In spite of the need for graduates and the efforts to qualify them, nursing programs continue to experience high attrition rates. This phenomenon continues to occur at a time when schools of nursing have experienced a leveling off or decline in the number of applications and enrollment (Smith, 1990). Retention of nursing students has become imperative.

Nurse educators are concerned over attrition. Seventy-five percent of associate degree and 50% of baccalaureate programs surveyed in 1985 and 1986 offered remedial courses in math, reading and/or study skills in attempts to control program mediated effects on attrition. One-third of the programs had remedial courses available in course areas outside nursing, such as in writing and science (Rosenfeld, 1988). Demographic trends projecting an increase in minority and indigent and single-parent raised children entering schools and colleges suggest that remediation may be a more serious problem in the future than it has been in the past.

In an attempt to control program effects on attrition, some schools have offered academic/social support by advisors or faculty, or social support peer

groups (Brown, 1987; Hudepohl & Reed, 1984; Kless, 1989; Marshall, 1989; McDonald, et al., 1983; Rodgers, 1991). Although these support strategies appeared to decrease attrition in isolated programs, the studies do not clearly identify which group or groups of students needed support nor which support strategies were effective or ineffective.

Investigation into the variables related to academic success continues. A dean's survey conducted in 1986 found that 42% of the schools surveyed reported conducting longitudinal studies to determine the best predictors for successful performance on the NCLEX (Yang, et al., 1987). The continued high attrition rates attest to failure to discover measurements which can effectively predict success in school. Reliability and validity of admission criteria and the selection processes continue to be a recurrent and unresolved issue (Brown, Carpio & Roberts, 1991).·

This failure could be because of a lack of research or investigation in particular areas. This study was designed to incorporate investigation into these areas and contribute to the information available

to examine a very practical problem faced by nurse educators — student attrition.

Since 1982, studies predictive of performance on the NCLEX have been primarily related to baccalaureate graduates, although associate degree students represent the largest group of students who sit for the examination (Lengacher & Keller, 1990). Less than one-half of the studies cited in this study were concerned with associate degree students. In a review of student persistence in higher education, Miller (1991) cautions that potential university-wide decisions regarding attrition may be based on information that does not apply to part-time, commuter and older populations. The subjects for this study were associate degree nursing students.

The traditional criteria of past demonstrated achievement appear time and again to be generally but inconsistently predictive of nursing GPA and of NCLEX pass rate (Allen, Higgs and Holloway, 1988; Bauwens & Gerhard, 1987; Benda, 1991; Dell & Valine, 1990; Felts, 1986). Past cognitive achievement measures do not, however, suggest those factors predicting which students will complete their education (Grant, 1986).

The studies examining the outcome variables of nursing GPA and NCLEX pass rate fail to address, except perhaps indirectly, the 20% to 41% of students who never achieve a final GPA nor who graduate to take the NCLEX exam. Use of nursing program GPA or NCLEX pass rate as outcome variables, then, only considers the 60% to 80% of students who remain in the programs. Therefore, the studies do not investigate what characteristics the non-persisters may have or not have in common with the persisters - the academically successful. This study investigated factors involved in successful and nonsuccessful continuance in a program of nursing - a study of all of the students enrolled in a nursing program.

The nonsuccessful are admitted into most programs under the same and typically cognitive achievement measures that admit the successful. Therefore, it is reasonable to assume some but certainly not vast achievement differences between the two groups. As Grant (1986) concluded following a review of research, the prediction of completion of nursing education may involve highly complex interrelationships among intellectual ability, personality variables, and

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teacher-student interactions. There has been little research to determine if any nonacademic characteristics of nursing students affect academic results (Poorman & Martin, 1991). Nurse educators support the inclusion of nonacademic variables in assessing student risk factors for failing to pass NCLEX (Adams, 1990; McKinney, Small, O'Dell & Coonrod, 1988). Schwirian, in her 1984 review of research on nursing students, found fewer studies of noncognitive predictors of persistence in associate degree programs than in other types of programs. This study examined selected cognitive variables obtained before students are admitted, demographic variables, and the cognitive and noncognitive variables measured by the NET.

Since the NET is a widely used instrument in associate and other types of nursing degree programs, the findings could be useful to these programs or to similar programs in different areas of the country. Since the NET is used by some programs to contribute toward or as the admission criteria, indication of its value for prediction of academic success is important for selection of enrollees. Since in other programs the NET is administered at time of or shortly after

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admission, indication of its value for prediction of

academic success could be important for selection of

those students most in need of assistance for success.

Since the literature search revealed no published data

on predictive value of the NET alone or in combination

with other cognitive or demographic factors for

academic success, it was hoped that this study would

add to the information needed to decrease attrition in

nursing programs.

Summary

Chapter 1 has presented the problem which was

studied. The research assessed continuing high

attrition rates in programs of nursing and the need for

better predictors of student success so that better

student selection or remediation can take place.

A sample of two admitted classes at a community

college was utilized. Data on the 141 students in the

August, 1993, and 144 in the January, 1994, classes and

on students reinstated to graduate with these classes

were analyzed.

Chapter 2 contains the literature review on this

topic and is organized into three sections, of the

relationship of cognitive, noncognitive, and

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demographic factors to success in a nursing program.

Chapter 3 presents the methodology of the study. It is divided into: (1) overview, (2) methodology, (3) sample, (4) instrument, (5) data collection, (6) data analysis, and (7) summary.

Chapter 4 presents and describes the analysis of data from the study.

Chapter 5 presents a summary of the findings of the study, addresses the conclusions, and makes recommendations for future study, and implications for use of the findings.

CHAPTER 2

Literature Review

Introduction

In this study the focus was on factors believed to influence the academic success of nursing students. The literature review section is organized into three sections related to this topic: (1) cognitive factors, (2) noncognitive factors, and (3) demographic factors.

Cognitive Factors

Measures of past cognitive achievement generally correlate positively with two measures of cognitive achievement in nursing school: grade point average (GPA) and a passing score on the National Council Licensure Examination for Registered Nurses (NCLEX). The relationship of a third measure of academic success - retention - has not been the subject of a great deal of research. Table 1 lists in chronological order the cognitive measures some researchers have found to be significantly related to each of these three outcome variables.

This study utilized cognitive past achievement variables similar to those listed in many of the studies in the tables. This study's cognitive

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Table 1
Cognitive Measures Significantly Related to Outcome Variables

Cognitive measure(s)	Population	Researcher(s), year
Outcome variable NCLEX		
ACT Composite Prerequisite GPA Microbiology Grade	ADN	Felts, 1986
Pre-admission Cumulative GPA SAT Verbal Nursing GPA	BSN	Payne & Duffy, 1986
SAT Prerequisite GPA Pre-admission Cumulative GPA Nursing School Exams	BSN	Whitley & Chadwick, 1986
Individual Nursing School Course Grades (Theory) Individual SAT Verbal	ADN	Woodham & Taube, 1986
Watson-Glaser Critical Thinking Appraisal Nursing GPA	BSN	Bauwens & Gerhard, 1987

Table 1 (Cont.)

Cognitive measure(s)	Population	Researcher(s), year
Nursing GPA NLN Science Score	ADN & BSN	Gross, Takazawa & Rose, 1987

Individual Nursing
    Course Grades
    (Theory & Clinical)
High School Rank
Prerequisite GPA
ACT Subtest and
    Composite
	BSN	Yang, Glick &
		    McClelland, 1987

Nursing GPA
Mosby Assess Test
Individual and
    Cumulative Nursing
    Course Grades
    (theory & clinical)
SAT Math, Verbal & Total
	BSN	McKinney, Small, O'Dell
		    & Coonrod, 1988

College Cumulative GPA	BSN	Adams, 1990
Nursing GPA ACT Composite	ADN	Lengacher & Keller, 1991
Nursing Course Grades	ADN	Naron & Widlack, 1991

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Table 1 (Cont.)

Cognitive measure(s)	Population	Researcher(s), year
SAT Scores Nursing GPA	BSN	Poorman & Martin, 1991

Outcome variable nursing GPA

High School Rank Biology and English Grades	ADN	Oliver, 1985

Watson-Glaser
    Critical Thinking
    Appraisal
	ADN & BSN	Gross, Takazawa &
		    Rose, 1987

Individual Nursing
    Course Grades (all)
High School Rank
Prerequisite GPA
ACT Subtest and
    Composite
	BSN	Yang, Glick & McClelland,
		    1987

Pre-admission
    Cumulative GPA
Prerequisite GPA
	ADN	Allen, Higgs & Holloway,
		    1988

ACT Composite	ADN	Strum, 1988

Table 1 (Cont.)

Cognitive measure(s)	Population	Researcher(s), year
Prerequisite GPA SAT Verbal	BSN	Wold & Worth, 1990

Learning & Skills
    Inventory (Self
    Efficacy)
Asset Test (Language &
Reading Ability)
	ADN	Chacko & Huba, 1991

High School Grades	(Unknown) Indonesian	Hutana, 1991
SAT Scores	BSN	Rodgers, 1991

Outcome variable retention

ACT Math and Composite High School GPA High School Rank	BSN	Benda, 1991
High School GPA	(Unknown) Indonesian	Hutana, 1991
Prerequisite GPA	BSN	Wold, 1991

variables were as follows: all college GPA; California Achievement Test Score (CAT) derived from an average of the verbal and math subtest scores; and NET scores on Math Skills, Reading Comprehension, Reading Rate, Testtaking Skills, and Learning Style. The choice of these variables addressed the need to add to the knowledge about predictive values of past academic achievement to current success.

All college GPA, CAT, and Math Skills were similar or identical to the variables used in Tables 1. None of those studies, however, investigated retention in the associate degree nursing (ADN) students nor the predictive value of the cognitive variables when used with the NET and its non-intellective measures.

The other independent variables of Reading Comprehension and Rate, Testtaking Skill, and Learning Style have been studied less often and when studied have resulted in mixed results. These variables will be addressed, therefore, separately in this review.

Reading Comprehension/Rate

Many of the variables in Table 1 indirectly measure reading skills. The SAT and ACT subtests for verbal are probably in some part reflections of reading

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speed and comprehension. The SAT and ACT composite as well as other general measures such as high school, nursing, or prerequisite GPA probably reflect to some measure reading skills. There is some indication in the literature that an isolated reading skills index or indexes may prove worthy of analysis as a predictor of academic success (Chacko & Huba, 1991; Grant, 1986).

Reading is a skill necessary to achieve nursing school curricular objectives. Nursing curricula are leveled so that later comprehension is based on comprehension of earlier studies. Thus, if a student is unable to read easily or well or to comprehend what is read, success becomes more difficult as time passes. The average reading level for freshmen entering college has been measured as just over the eleventh grade (Ferguson, 1979). An analysis of readability level of nursing texts used in one program yielded a readability level of eleventh grade for only one book. The rest of the texts ranged from the 13th grade to the 16th – college graduate level (Ferguson, 1979). If nursing students have the same average reading level as other entering freshmen, then the inconsistency between reading ability and program demands would indicate that

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the NET measures for Reading Comprehension and Rate may be worthy of analysis.

In one direct examination of reading ability measured by the ASSET test with associate degree nursing students, Chacko and Huba (1991) found reading skill correlated directly and significantly with first semester nursing grades. In his review of nursing research, Grant (1986) cites over eight studies in which reading skill correlated significantly with some measure of achievement in nursing school. He concludes the review:

> The research devoted to establishing definitive admission criteria continues to be confusing and conflicting. It is likely that the critical variables beyond prior achievement which enable a student to succeed in the nursing major and which can be measured prior to admission, have not been clearly identified. One exception may be reading skill. (p. 100)

Testtaking Skill

A review of the literature in nursing revealed no studies on the cognitive measure of testtaking skills. The NET purports to measure intellective ability to utilize testtaking strategies when taking multiple choice, short answer, and essay examinations. The skills of testtaking could be a factor influencing test anxiety as one aspect of academic comfort as measured by other investigators. Or conversely, test anxiety or academic comfort could be influenced by testtaking skills.

Three of the studies reviewed investigated these testtaking skill-anxiety constructs. In the first, a group of persisting associate degree nursing students scored significantly higher than nonpersisters on the Academic Comfort subscore of the Strong Interest Inventory (Tolland, 1990). Among other related student feelings, this subscale is designed to indicate comfort in an academic setting. The other studies both used Speilberger's Test Anxiety Inventory with baccalaureate nursing students. One study found test anxiety to be significantly inversely correlated with NCLEX performance (Poorman & Martin, 1991). The other

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study's two-way analysis of variance for social

support and test anxiety in relationship to both GPA

and NCLEX scores resulted in non-significant

interactions (Hilbert & Allen, 1985).

Learning Style

The last cognitive factor measured by the NET

which was used as an independent variable, is learning

style. The innumerable instruments used to

measure this construct are strikingly dissimilar, with

the designs and even constructs containing tenuous

connections (DeCoux, 1990). Not surprisingly, results

are often contradictory and a lack of significant

relationships between learning style and other

variables is generally reflected in the literature

(DeCoux, 1990; Miller, Alway & McKinley, 1987).

Seidl and Sauter (1990) found that nontraditional

nursing students (defined as older and with a history

of interrupted education) were discovery learners as

opposed to receptive learners when measured by an

inventory called the Preferred Learning Style Index

(Stone, 1974). Several other studies attempted to

combine the variables of learning style and academic

achievement. The Watson-Glaser Critical Thinking

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Appraisal (Watson & Glaser, 1964) is designed to measure the ability to define problems, select pertinent information, appropriately hypothesize and arrive at valid conclusions. Bauwens and Gerhard (1987) found the Watson-Glaser with entry GPA significantly predictive of 15% of the variance on NCLEX scores. Gross et al. (1987) found student learning characteristics measured by the Watson-Glaser not significantly predictive of persisters versus nonpersisters.

No significant relationships were found between persistence group scores on the Inference Test (Eysenck & Eysenck, 1962) which measures deductive skills, nor on measures of perceptual style related to field dependence/independence (Wold & Worth, 1990). Kolb's Learning Style Inventory 1985 (Kolb, 1976) measures learner characteristics of cognitive styles as concrete, reflective, abstract, or active experimentation. When utilized with one group of ADN students, no significant relationship was found between GPA and Learning Style Inventory measurements (DeCoux, 1988).

The Inventory of Learning Processes (Schmeck &
Grove, 1979) was used in one study which found that
psychology students with high GPAs in a psychology
course scored significantly higher than students with
average GPAs on the Deep Processing Scale (Miller, et
al., 1987). This scale measures a cognitive style
characterized by looking for differences and
similarities among topics; by encoding main ideas and
supportive details; and by comparing, contrasting,
systematizing and critically analyzing information.

It is evident from this review that concepts about
learning style and instruments of measurement of
learning style are difficult to categorize or to
compare to one another. Because of the variability, it
may not be surprising that none of the studies reviewed
assessed learning style in the same conceptual manner
as does the NET (1990): with self-perceived
preferences rated on auditory, visual, social,
solitary, oral dependent and writing dependent learning
styles.

Noncognitive Factors

Academic success of students results from a
complex interaction of processes. Although emotional

factors are frequently overlooked as influences on college performance, they are important variables that can impact a student's ability to meet the challenge of learning (Kalsner, 1992). The clear-cut utility of noncognitive predictors alone or in combination with cognitive predictors of academic success in nursing school remains unanswered. Studies of noncognitive predictors are fewer in number than studies of cognitive predictors, and address such varied personality and values characteristics that it is difficult to make generalizations or comparisons. As mentioned earlier, two unpublished studies examined the NET noncognitive as well as cognitive variables. Quill (1993) found no NET subtest to be predictive of academic success measured by grades or persistence to graduation. Abdur-Rahman et al. (1993) found that the NET subscores for math and reading and family and social stress together accounted for up to 30% of the variance in nursing grades in the first year of professional study.

The NET measures the noncognitive characteristics of Social Interaction Profile by passive and aggressive style and Stress Level Profile by five areas of stress

in personal coping - Family Life, Social Life, the Work Place, Academic Adequacy, and Time/Money. Many of the research studies examining noncognitive characteristics touch directly or peripherally on these measured NET characteristics; therefore, this section of literature review will be organized around these two NET measurements.

Stress Level Profile

A literature review reveals keen interest in stress in nurses and nursing students. In 1974 Marlene Kramer set the nursing world in an uproar with her book Reality Shock: Why Nurses Leave Nursing. She described the stress-related "burn out" causing working nurses at that time to leave the profession in droves. Her work described nurses already in the work force. It could be hypothesized that student nurses experience even more stress than working nurses. Unlike working nurses, students must find time outside of scheduled class and clinical hours to study for examinations and prepare papers. They usually have less financially rewarding jobs than working nurses and, in addition, have school-associated expenses. Students have almost no accomplished skill competencies or self-confidence

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in clinical situations. And, students experience the perceived added stress of having to meet instructor expectations as well as client and colleague expectations in clinical. Students also are learning a new way of "being." They experience personal change and stress because of the demand to become socialized into the role and profession of nursing. They learn early on that even their very dress habits or communication modes are not considered therapeutic and professional. They learn that soon they will be responsible for very ill and physically labile clients' lives. Role conflicts exist and are inevitable in student nurses (Shead, 1991).

The types and degree of stress experienced by nursing students have been investigated. On the General Health Questionnaire (West & Rushton, 1986) student nurses showed significantly more stress than another group of women employed in non-nursing occupations and even more stress than women who were unemployed. The stress increased as training progressed (Lindop, 1991; West & Rushton, 1986). Using this same questionnaire and an inventory of stress, another study of baccalaureate nursing students found

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that the students experienced such high stress levels as to be at risk for physical or psychological illness (Beck & Srivastava, 1991). Use of a self-evaluation questionnaire in another study revealed that a group of university students had the same "trait" anxiety or anxiety-proneness as other college students but that once enrolled in nursing school had the highest "state" anxiety of any other college students (Rosburg, 1988). State anxiety was defined as a transitory condition of perceived tension. Rosburg's findings seemed to indicate that nursing students had the same predilection for stress as any other college student, but they experienced or perceived a higher stress level in nursing school than other college students did in their varied programs.

There is general agreement that nursing students experience high levels of stress. In one study of over 100 student/pupil nurses, 26% reported that they left training as a result of stress (Lindop, 1989). To learn about attrition from stress or stress-related problems, it may be helpful to examine which areas of student life causes stress and how the stress relates to academic success.

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Students relate that one source of high stress while in nursing school is the clinical experiences (Affeldt, 1990; Anderson, 1989; Lindop, 1989, 1991). In increasingly independent roles as the semesters advance, students assume responsibility for assessing complex biopsychosocial situations and implementing correct and therapeutic measures to improve the situations. In addition, clinical experiences thrust students into the intimate care of other people's lives. This provokes a gamut of powerful emotions in the students. Some of these emotions, especially those surrounding life and death or other ethical-legal issues, inevitably cause students to examine their own feelings and previous ways of thinking. All change creates some degree of stress. Dell and Valine (1990) cited studies which indicated that nursing school may even lower students' self-esteem. This lowering could result in part from the stress of clinical and other related educational experiences.

Students also have related that another source of stress in nursing school is general life stress. Huerta (1990) cited studies which indicated that associate degree nursing students were more likely to

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be married, male, non-white and of lower socioeconomic status than students in baccalaureate or diploma programs. Perry (1986) called some of these students in associate degree programs "reentry women." Comprising over two-thirds of the population of associate degree nursing students, these are women who have interrupted their post-secondary education for over four years and are now reentering higher education. The population, therefore, of associate degree programs consists mostly of the nontraditional student. This student may enter a program with more family and financial responsibilities and more academic stress than the traditional 18- or 19-year-old university student. In support of this statement, Huerta's study population reported that they felt significant stress in the areas of family and support system conflicts, financial and work related matters, and academic performance. These areas were major sources of stress and attrition, while age and previous health-related experience were not.

The literature supports the probability that the stress of nursing school is a pervasive finding. Some authors have attempted to examine the relationship

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between general stress and academic performance. The
Lingacher Role Strain Inventory (Lengacher & Keller,
1990) measuring role strain found that the amount of
role strain had no predictive value for NCLEX
performance. Chacko and Huba (1991) investigated the
hypothesis that life stress has a negative association
with academic achievement. They found that life stress
had a direct effect on associate degree students'
concentration and preparation for class, but not a
direct effect on academic achievement as measured by
the first semester nursing course grade.

Use of the Social Readjustment Rating
Questionnaire (Holmes & Rahe, 1967) with junior year
psychology students revealed that life stress was
significantly and inversely related to exam scores,
extra credit points and total course points (DeMeuse,
1985). Similar findings were revealed using the Life
Experiences Survey (Huerta, 1990) with associate degree
nursing students: negative change stress had a
significant relationship to academic achievement
(Huerta, 1990). Analysis of responses to supplemental
questions in this Survey revealed that students
experienced several negative life changes and

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relatively few positive ones. The negative stress was reported to include stress from areas such as finances, support system conflicts, academic fears, illness, and personal relationship changes.

To summarize, it appears that the literature is in accord that nursing students experience a high degree of stress. Some of the reviewed findings support the probability that students who experience high stress tend to experience lower academic achievement and higher attrition rates. The NET gives an overall stress profile measurement and separate measures of self-perceived stress in the areas of family, social, money/time, academic, and work place. Having reviewed and summarized the findings on general stress, now findings on specific areas of stress will be reviewed.

Family Stress

Stress from Family Life is the first subscore reported on the NET Stress Profile. In the review of the literature, stress specifically from and in families in nursing students has not been an area of frequent investigation.

In one survey of associate degree students (McDonald, et al., 1983) family problems were one of

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the issues listed as important and of concern in
adjusting into a nursing program. Clark and Ruffin
(1992) in a study of nursing students in three
different types of educational institutions in
Australia found the sources of stress to be the same
for all types of students and to include stress from
lack of time for family and personal pursuits. Use of
the Non-cognitive Questionnaire (Tracey & Sedlacek,
1984) with all majors of freshman university students
indicated that having family support for college plans
was one of the dimensions most strongly related to
Caucasian (not African-American) students' persistence
in college (Arbona & Novy, 1990). It may be likely
that since the associate degree nursing profile
reflects the older married student with family
responsibilities, stress related to family life and
responsibilities may play a part in high stress and
possibly related academic difficulties.

Social Stress

The second of the NET Stress Profile subscores is
called Social Life. Tinto's (1987, 1988) theory of
student retention includes social integration into
college life as a central concept along with academic

integration/performance. Bean's (1985) conceptual model of university students who drop out was used to theorize that social life had large significant effects on institutional fit for all students. Bean then concluded that peer support is an essential element in retention of students.

Other authors question whether these conceptual models and findings can be applied to the nontraditional or commuter community college student population. Kerka (1989, 1992) in a review of the literature on retaining adult students in higher education, cited several authors who suggested that in nontraditional populations, persistence is independent of integration into campus life. Kerka does however include mentoring by other, successful adult students and peer support groups as suggestions for helping these adults adapt successfully to a university.

In three different studies using surveys, questionnaires or interviews of nursing students, socialization was reported as important. Perry's (1986) reentry women mentioned earlier in this chapter as an older, nontraditional population were reported to want to meet with other reentry women to share similar

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problems, to talk, to make friends. Another study using a critical incident forum and interview found that support networks were essential to assist baccalaureate nursing students to successfully cope with the stressful experiences they encountered in school (Affeldt, 1990). That author concluded that sharing among students both in and out of class was an important concept in maintaining their enthusiasm for learning and their self esteem. Wang (1991) found that in a population described as "adult," students reported a need to interact with classmates during the course of study and to experience the feeling of belonging and peer support.

Other research has investigated the relationships among self-esteem and academic anxiety and social support (Hilbert & Allen, 1985), and decried a dearth of research on the relationship of social support as a buffer of stress in the education situation. Hypothesizing that social support is important to academics, several researchers in group settings used specific supportive behaviors to try to increase perceptions of self-confidence and meet the personal needs of nursing students (Brown, 1987; Cameron-

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Buccheri & Trygstad, 1989; Campbell & Davis, 1990;
McDonald, et. al., 1983). All of these studies' groups
experienced decreases in attrition. Others have used
similar techniques (Hudepohl and Reed, 1984; Kless,
1989; Thurber, et al., 1989) with nursing student
groups but did not discuss results related to academic
success. The use of the Malone Social Networks
Inventory (Malone, 1988) found nursing students who
remained in a program had significantly greater social
network sizes and reported more instances of social
support (Marshall, 1989). In other somewhat
contradictory findings, neither socially-related
experiences; ease of making friends or comfort at the
institution (Benda, 1991); nor student-faculty
interaction frequency or nature (Strum, 1988) affected
educational retention, satisfaction with the program,
or GPA in nursing students.

If, as most of the literature seems to agree,
social support is related to academic success, nursing
educators need to be concerned about the findings of
Rodgers (1991) and Claerbaut (1976) that African-
American nursing students were the most alienated of
all college students in terms of social estrangement.

They had higher levels of social isolation and lower
grades than Caucasians or other minorities. The
African-American nursing students have identified
feelings of alienation and loneliness as barriers to
retention (Allen, Nunley & Scott-Warner, 1988). This
relationship of alienation and grades may seem
important considering that (see Demographic Factors
later in this chapter) African-American nursing
students as a group are less academically successful.

Money/Time and Work Place Stress

The next discussion will concern the NET subscores
for stress of Money/Time and Work Place. These two
areas of stress in student life will be grouped in this
review because the stressors between money and work
place would be difficult conceptually to separate.

Since associate degree students entering nursing
are typically nontraditional students - older, married
with family responsibilities, and working full- or
part-time -, it does seem reasonable that these
students experience stress related to finances and
working while trying to manage time for work, family,
and school. One survey of this same older population
supported the existence of this type of stress. This

survey revealed academic failure as the top concern, and found personal and family problems as well as finances also of great concern (McDonald, et al., 1983). Highlighting concern about time management for school and work, one group of older adult nursing students listed the schedule of courses as their most dominant source of stress (Wang, 1991). In an article written by a nursing student (Leroy, 1988), successful nontraditional students were described as successful managers of the three most difficult challenges facing them: time, money and stress. In concert with these other studies, Anderson (1989) found in a survey of baccalaureate students that the majority of their stressors were associated with time management.

This type of stress — money/time and work place — does generally appear not only to be present in nursing students but to be implicated as a factor in attrition. Over 1,000 non-returning community college students aged 25 to 55 cited financial reasons and conflicting job hours most frequently as the reasons for non-persistence (Stolar, 1991). After first citing dissatisfaction with class scheduling, one group of non-returning baccalaureate students explained they

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left because of insufficient money to support themselves and because of interference from work (Smith, 1990). Departed nursing students have been found to be more concerned with finances and to work more frequently than remaining students (Benda, 1991). Thurber et al. (1989) summarized research findings that first academic problems such as poor grades and then financial difficulties both correlate positively with higher attrition.

In interesting contrast to these findings, nursing faculty and administrators who indicated problems retaining students considered poor study skills and difficulty with required courses (Rosenfeld, 1988; Smith, 1990) as the most important contributors to academic failure. Finances and family obligations were rated a very distant second and third. Allen, Higgs and Holloway (1988) found that the amount of time baccalaureate students spent working in the first two years of college was unrelated to program outcomes of completion, of grades of D or F or of withdrawal from courses.

Academic Stress

The NET score on Academic Stress is the students'
self-perceived stress or comfort in relationship to
academic success. Academics has been cited as the most
frequent source of stress in nursing school (McDonald,
et al., 1983). Long hours required for study and
examinations/grades have been ranked as the first and
second most important stressors (Beck & Srivastava,
1991).

It has been shown that academic self-concept and
achievement are related expectancies and are
significantly related to college persistence (House,
1992). Self-perceived academic adequacy is based on a
variety of personality traits, past experiences, and
self-concept or self-esteem. Kalsner (1992) says self-
efficacy, which is a more concretized expression of
self-esteem, is an important construct for
understanding how students react to academic challenge.
Self-efficacy can affect the students' choice of
activity and ability to exercise coping skills in the
face of obstacles. Other researchers also recognized
self-esteem as a powerful contribution to academic

success or failure (Allen, et al., 1988; Chacko & Huba, 1991; Foster, Zimmerman & Condon, 1991).

Individual students with strong feelings of self-efficacy or high self-esteem regarding academics were found in one study to perform tasks with little anxiety and to persist until they succeeded, while individuals who viewed themselves as inefficacious dwelled on personal deficiencies, imagined potential difficulties, and created stress over failure for themselves (Chacko & Huba, 1991).

Social Interaction Profile

The Social Interaction Profile of the NET is intended to provide insight into the passive/aggressive leadership style of the individual student within a group. It is a measurement of one aspect of personality. Personality of nursing students has been studied before within the context of effects on nursing school outcomes, with contradictory findings. McKinney, et al. (1988) studied the relationship between many cognitive variables and Type A behavior and NCLEX results. In that group of baccalaureate students the cognitive factors of GPA and pre-entrance test scores were significantly predictive of NCLEX

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pass, but little evidence was found that age, sex, or Type A behavior were predictive. W. B. Michael in years past (Michael, Haney, & Jones, 1966; Michael, Haney, Lee, & Michael, 1971) used the 16PF instrument (Cattell, Eber & Tatsouka, 1970) with nursing students to derive information regarding the predictive validities of those personality scales in relationship to various academic criteria. Little or no correlation on any measurement was found. Later, when the 16PF was again studied (Huch et al., 1992), baccalaureate students who remained in the nursing program until graduation scored significantly higher on one factor which characterized them as more lively, enthusiastic, talkative, cheerful and carefree. The nonsuccessful were found more pessimistic, sober, restrained, reticent, introspective and deliberate. However, when personality characteristics similar to these of lively versus restrained were investigated (Wold & Worth, 1990) using the Eysenck Personality Inventory (Eysenck & Eysenck, 1962), the subscores of extroversion/ introversion and of neuroticism/stability were not found predictive of success. Success in that study was measured by persistence to graduation. Those two

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personality subscores also did not enhance prediction when used with cognitive factors.

To summarize, the reviewed literature revealed few studies which attempted to correlate nursing student personality characteristics with academic success. Of the relevant studies, contradictions were found. The study by Huch and others (1992) did find that academically successful student personality characteristics were different from those of nonsuccessful students. Huch used a measurement which evaluated characteristics similar to the passive/ aggressive leadership style scale measurement of the NET. In Huch's study the unsuccessful students were restrained, reticent, and passive. Successful students were lively and enthusiastic, that is, vigorously energetic traits similar to aggressive traits. Another study of associate degree students found other personality characteristics important in successful students. Chacko and Huba (1991) found that motivation and cognitive abilities did directly relate to self-efficiency, and that self-efficiency had a direct and significant relationship to nursing course grade. Other studies found that self-esteem and academic

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confidence were significantly related to nursing GPA, NCLEX performance, and academic success (Allen, Higgs & Holloway, 1988; Poorman & Martin, 1991) but not related to NCLEX pass rate (Dell & Valine, 1990).

Demographic Factors

A variety of demographic characteristics have been studied to determine possible differences or similarities in those characteristics of nursing students who were successful and those who were not. The criterion variables involved were usually either nursing GPA, NCLEX pass rate, or persistence to graduation.

Age of student at time of entrance into or graduation from nursing school has been investigated. Many researchers found that age was not significantly related to GPA, NCLEX, or persistence (Allen, Higgs & Holloway, 1988; Decoux, 1988; Dell & Valine, 1990; Felts, 1986; Huerta, 1990; Lengacher & Keller, 1990; McKinney, et al., 1988; Strum 1988; Woodham & Taube, 1986). Other studies found age of students to be significant. Gross, Takazawa, and Rose (1987) found that older students scored better on NCLEX, perhaps because of a relationship with more years of education

after high school. Oliver (1985) also found that increased age characterized the academically successful ADN student. But in Marshall's (1989) study, older ADN students dropped out of the program more frequently with academic problems.

A second demographic factor, that of race, has almost invariably been found to be significantly related to criteria of success in nursing school (Gross, et al. 1987; Huerta, 1990; Lengacher & Keller, 1990; Oliver, 1985). Only one study reviewed found race not related to GPA or baccalaureate program completion (Allen, Higgs & Holloway, 1988).

No studies reviewed found a difference in male or female nursing student success. Allen, Higgs, and Holloway (1988), Hilbert & Allen (1985), McDonald, et al. (1989), Oliver (1985), and Marshall (1989) found no difference in academic success or persistence. Strum (1988) found no difference in GPA and McKinney et al. (1988), no difference on NCLEX scores between males and females.

Conclusion

Nationwide, attrition of students enrolled in programs of nursing is 20% to 40%. The failure of these students to graduate is costly to the educational institutions and to the individual student both economically and psychologically. This high attrition rate continues despite efforts of nursing educators to determine which students will be successful if or when admitted into a program.

A review of the literature reveals that measures of past academic success, such as SAT or ACT scores, or high school grade point average are generally positively correlated with two outcome variables: nursing school GPA and success in passing the NCLEX. Studies using these two criteria, however, fail to analyze relationships for those students who fail to continue until graduation and licensure examination time. When studied, relationships between past academic achievement and persistence are unclear. Also a review of the literature reveals that the relationships of noncognitive factors on either nursing GPA, NCLEX, or persistence are unclear and are much less studied than cognitive relationships.

This study used discriminant analysis to investigate whether cognitive and noncognitive variables measured by the Nurse Entrance Test, as well as other selected cognitive and demographic factors, were related to successful continuance in and graduation from an associate degree nursing program. This methodology allowed the variables to be analyzed alone and in combination with other variables for usefulness in predicting success.

The NET publishers have stated that the test can be useful for evaluating applicants or for evaluating the academic and social profile of students and classes already admitted. Although the NET is used by over 75 nursing programs in the United States, no published reports have evaluated its effectiveness. By analyzing the predictive value of the NET and its variables, it is hoped that nurse educators will be better able to select students likely to succeed academically or to more effectively select those students already admitted who may need assistance or remediation in order to become successful.

CHAPTER 3

Methodology

Overview

This chapter describes the research methodology
used in this study. The chapter is divided into
design, sample, instrument, data collection, data
analysis and summary.

Design

This study utilized a descriptive, ex post facto
methodology. The study was a correlational study using
discriminate analysis to examine the predictive value
of variables for academic success or nonsuccess of
nursing students. Academic success in this study was
defined as continuous, uninterrupted enrollment in a
nursing program from admission until graduation.

This study examined if and how the two groups of
successful and nonsuccessful students were different
and which selected characteristics singly or in
combination were the most powerful discriminators
between the groups. The variables which were examined
were measured at the time of student admission. They
included demographic and cognitive factors. Also
included were scores on the Nurse Entrance Test (NET),

which measured some cognitive and some noncognitive student characteristics.

Sample

The population for this study was students in a National League for Nursing accredited associate degree in nursing (ADN) program approved by the Florida Board of Nursing. The program operates in a public community college accredited by the Southern Association of Colleges and Schools. This large, urban community college has four campuses spread over a community of 700,000 with the nursing program centered at the northernmost campus. Over 200 ADN students graduate each year, making it one of the ten largest ADN programs in the United States.

The sample for this study consisted of the 141 students admitted in August, 1993, and the 144 admitted in January, 1994, for a total of 285 students. The sample also included students admitted into but unsuccessful in continuing with previous classes, who were readmitted into the two study groups. The classes were combined for all analyses since comparison of the two classes revealed that there were no significant

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differences on any of the variables considered for program admission decisions.

Data were gathered on all of the 267 students who signed permits. The sample size varied from 260 to 267 on some of the analyses since some respondents did not complete all items or since some data files contained incomplete data.

The students who were considered to be academically successful were those who began the program in August, 1993, and January, 1994, and completed, respectively, in December, 1994, and May, 1995. This accounted for 213 students in the study. The students grouped as academically unsuccessful were those who were no longer enrolled with their class at the time they would normally graduate or those who had begun the program prior to August, 1993, or January, 1994, but had been reinstated and were graduating with those two classes. This unsuccessful group consisted of 54 students.

Students were admitted at the time of the study according to a ranking system based on two main criteria (Appendix B): California Achievement Test score and either high school grade point average (GPA),

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college GPA, or General Education Development Test scores. Qualified students within the geographic service area of the college were selected before those from other areas. Up to one additional point at 0.25 per year for health-related work experience was added to the rank score. The highest ranking candidates were then admitted to each class, with 144 students targeted for admission to each beginning class.

If students withdrew or failed for academic or clinical reasons, they could apply for readmission into the course which they exited, one time. The readmissions were on a space available basis and candidates usually must have completed course-related assignments for remediation as part of the readmission process. Existing records revealed that most students who exited did so for academic reasons. Any course failure was based on a final semester grade below an 80% average on all examinations or a failure of over one-half of all examinations in that course.

<div align="center">Instrument</div>

The Nurse Entrance Test (NET) is a widely used (Appendix A) instrument in programs of nursing. It is used by some schools as part of or as the admission

screening tool. Other schools use its scores to provide information to faculty about the characteristics of the students in the program and to newly admitted students about their aptitude and learning styles.

Validity

The NET was standardized by equating its individual Math and Reading Comprehension scores and their averages (the Composite Percentile) with the same three scores those students achieved on the American College Test (ACT). The latest standardization was based on 1,745 beginning nurses selected to represent the five geographic areas of the United States and tested from July through October, 1992. Correlation coefficients of the NET with the ACT averaged from +.79 to +.83, which indicated that the two instruments were highly correlated (Frost, 1990).

Frost (1991) stated that criterion-related validity was examined by the above determination of the relationship of the NET Composite Percentile to the composite score on the ACT. The values were as follows:

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Average Correlations of Projected NET Composite Scores
with Composite ACT Scores
The mean NET Comprehensive Percentile................50
The mean ACT Composite Score....................18.856
The Standard Deviation of the NET..................24.6
The Standard Deviation of ACT......................5.23
The Correlation Coefficient of Test Data...........0.81
The Score of the Regression Line..................0.872
The Y-Intercept of the Regression Line..........28.103
Confidence Level is above..................99.9 percent

Content validity of the NET was controlled through

design specifications. The selection of test items

followed the guidelines developed by the Examination

Committee. These guidelines reflected the expressed

needs of a survey completed by a representative sample

of health occupation program directors across the

United States. Test items, therefore, were selected

for inclusion if they emphasized appropriate skill

focus and learning style behaviors of nurses. The

current version of the NET was completed in 1990.

Frost (1991) reports that to test diagnostic

validity, the NET was administered during the last

academic month of 365 graduating nurses from health

occupation programs. It was hypothesized that the

presence of academic skill deficits in reading

comprehension and basic mathematics would be less

common among graduating students than in a group of

entering students. A t-test comparing the graduating

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students' performance to the norm was computed for each subtest of the NET. The t-values and their levels of significance show that for each subtest, the performance of the graduating students was significantly higher than the average of the norms established for entering students.

Reliability

The reliability of the NET subtest areas for students who participated in the standardization was examined by the parallel-forms method. The forms were created by treating the odd-numbered questions from the NET as Form A and the even-numbered questions as Form B. The coefficients ranged from +.89 for Math to +.97 for the Reading Comprehension subtest with an overall average of +.93, indicating that the scales had high reliability.

Data Collection

Permission for data collection and the study was received from the institution involved (Appendix D). Students were visited in their classes, given both a verbal and written explanation of the study, and asked to indicate their willingness to participate by signing the permission form. Students absent from class and

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students who had already withdrawn from the program were mailed explanations and permission forms. Ten days after the initial mailing, a reminder letter containing another permit was sent. Copies of all letters and permission slips can be found in Appendix C. Data were then retrieved from the college's files on those students who had given informed consent.

Data Analysis

Data analysis was done using the Statistical Package for the Social Sciences computer package (SPSS, Inc., 1988). Descriptive statistics for each admitting class and for successful and non-successful groups were calculated. Frequency distributions and summary statistics were calculated for all variables. As mentioned previously, slightly different sample sizes were used for different analytic procedures because of partial data missing on individual data cases.

Each research hypothesis is stated below along with the method of statistical analysis utilized to examine that hypothesis. The statistical methods were selected to identify individual and groups of variables which most efficiently predicted academic success. The

.05 level of significance was used to make the decision for support or nonsupport of the hypotheses.

H_1: The successful and the nonsuccessful student group will not differ significantly on any of the variables. Univariate analysis of variance was used to test this hypothesis.

H_2: None of the variables will be significant contributors to prediction of successful or nonsuccessful group membership. To examine this hypothesis a stepwise discriminant analysis was used to identify which variables would comprise the optimal prediction set. Next the discriminant function for this set was calculated and a multivariate measure of group difference over several variables, Wilks lambda, was performed as a test of significance for each variable identified as valuable in prediction. Lastly, a classification procedure was computed to examine how well the function was able to predict student group membership (Klecka, 1980).

H_3: None of the variables will differ from one another in ability to discriminate between successful or nonsuccessful group membership. The correlation between each independent variable identified by

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discriminant analysis as useful in the prediction set, was correlated with the discriminant function identified in the previous hypothesis.

Summary

Chapter 3 has presented the research methodology which was used to study the relationships among some demographic, cognitive and non-cognitive factors, and academic success in a nursing program. The sample was described. The validity and reliability of the NET was examined. The methods of data collection and the analysis of that data were explained. The results of the statistical data analysis for this study will be presented in Chapter 4.

Chapter 4

Data Analysis

Introduction

This study examined whether cognitive and
noncognitive variables measured by the Nurse Entrance
Test (NET) as well as other selected cognitive and
demographic factors were related to successful
continuance in and graduation from an associate degree
nursing program. As stated in Chapter 3, two classes
successively admitted into the program were combined
for analyses, since descriptive statistics on the two
classes revealed only slight differences on variables
used for program admission decisions. For example, the
August, 1993, class had a mean preadmission GPA only
0.13 higher than the December, 1994, class. These
small differences gave support to the decision to
combine the classes for a larger sample size. The
typical student was found to be a Caucasian female aged
30.64 years with a preadmission GPA of 3.29.

The analysis of data for this study is presented
in this chapter. The findings are organized in
sections according to the three research hypotheses
presented in Chapter 3, Methodology.

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Hypothesis One

The first hypothesis (H_1) states: The successful and nonsuccessful student groups will not differ significantly on any of the variables. Univariate analysis of variance was computed and the results are in Table 2. This first hypothesis was rejected for six of the 22 independent variables.

Six variables were found to be significant past the $p<.05$ level: pre-admission all-college GPA, the Net scored Reading Comprehension, Family, Social and Academic Stress, and age. The variables not found to be significantly related to group membership were the following: CAT score, Math Skills, Reading Rate, Testtaking Skill, Money Stress and Work Stress, Social Interaction Style, gender, and race. Nor were any of the types of Preferred Learning Styles related to success: auditory, visual, social, solitary, or oral or writing dependent.

The first of the significant variables was in the area of cognitive factors. For preadmission GPA, an F of 4.96 ($p=.027$) was calculated. The mean GPA for the successful group was 3.32 as compared to 3.17 for the nonsuccessful group. This finding indicated that the

Table 2

Univariate Analysis of Variable Means for Successful

and NonSuccessful Program Completion Groups

Variables	Group[a]	Mean	Standard deviation	F ratio	Sig
Age	1	30.12	6.63	5.12	.025*
	2	32.73	10.46		
Gender[b]	1	1.21	.41	1.78	.183
	2	1.33	1.13		
Race[c]	1	1.22	.56	1.15	.285
	2	1.31	.64		
Preadmission All College GPA	1	3.32	.41	4.96	.027*
	2	3.17	.42		
CAT	1	742.96	48.54	3.43	.065
	2	729.25	46.87		
Essential Math Skills	1	81.47	10.60	3.04	.082
	2	78.53	11.71		
Reading Comprehension	1	68.32	12.30	9.40	.002*
	2	62.27	13.99		
Reading Rate	1	314.51	76.84	.21	.647
	2	308.65	101.33		
Testtaking Skill	1	40.01	7.83	1.25	.265
	2	41.37	7.67		
Family Stress	1	19.67	16.00	5.89	.016*
	2	26.25	22.38		
Social Stress	1	30.00	16.71	5.86	.016*
	2	36.47	18.85		
Money Stress	1	56.53	19.45	.00	.980
	2	56.45	20.63		

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Table 2 (Cont.)

Variables	Groups	Mean	Standard deviation	F ratio	Sig
Academic Stress	1	27.75	16.12	11.94	.001*
	2	36.86	19.95		
Work Stress	1	18.59	13.94	.08	.775
	2	19.22	14.12		
Passive Social	1	41.93	11.01	.22	.636
Interaction	2	42.78	13.47		
Agressive	1	58.06	11.02	.22	.640
Social	2	57.22	13.47		
Interaction					
Auditory	1	49.03	26.54	.06	.810
Learning Style	2	50.02	25.17		
Visual	1	66.51	23.71	.24	.626
Learning Style	2	64.71	23.80		
Social	1	68.77	22.61	.05	.817
Learning Style	2	69.59	22.53		
Solitary	1	68.08	33.16	1.01	.316
Learning Style	2	62.76	37.08		
Oral Dependent	1	60.02	20.38	.19	.659
Learning Style	2	61.49	24.84		
Writing Depend.	1	57.12	24.35	.51	.478
Learning Style	2	54.41	24.67		

[a] 1 = Successful   2 = Nonsuccessful   *p<.05
[b] 1 = Female   2 = Male
[c] 1 = Caucasion   2 = African-American/Other

successful group of students had a history of better

grade performance in college, as measured by GPA.

Another NET measured variable, that of Reading

Comprehension but not Reading Rate, was also

significantly different between the two groups, with

F=9.40 (p=.002). A mean Reading Comprehension

percentage of 68.32 as compared to 62.27 for the

nonsuccessful group indicated that the successful

students on the average demonstrated greater ability to

understand written material.

Under the NET'S self-perceived Stress Profile,

three types of stress were significantly different

between the two groups. Family Stress was significant,

F=5.89 (p=.016); as was Social Stress, F=5.86 (p=.016),

and as was Academic Stress, F=11.94 (p=.001). The

successful student group averaged 19.67% on Family

Stress while the nonsuccessful's self perceived Family

Stress scores averaged 26.25%. On Social Stress the

study's successful students averaged 30% compared to

36.47% for the nonsuccessful. The unsuccessful

students averaged 27.75% on Academic Stress while the

nonsuccessful averaged significantly more at 36.86%.

So, higher stress from family situations, from social

areas of life, and higher stress regarding academic

performance were all generally characteristic of the

nonsuccessful student group. Additionally, in all of

these three areas, this study's nonsuccessful students

as a group averaged more stress than the most recently

normed study group of ADN students, based on average

scores.

Age was the last of the significant variables,

F=5.12 (p=.025). The mean age of the successful

students was 30.12 years as compared to 32.74 years for

the unsuccessful. Thus, the successful student group

was generally younger than the students in the

nonsuccessful group.

Hypothesis Two

The second hypothesis (H$_2$) states: None of the

variables will be significant contributors to

prediction of successful or nonsuccessful group

membership. Tables 3, 4, and 5 display the results of

the analyses of this hypothesis. This hypothesis was

rejected for ten of the 22 variables. The stepwise

discriminant analysis performed by SPSS selects a

subset of variables producing an optimal discrimination

model. Variables are chosen to enter or leave the

model using the signifance level of an F test from an

analysis of covariance, where the variables already

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chosen act as covariates and the variable under
consideration is the dependent variable. The model so
identified contained the ten variables in Table 3. No
other variable was found to be significant in
discriminating between successful and nonsuccessful
group membership.

Table 3

Discriminant Function with Stepwise Selection for

Successful or Nonsuccessful Program Completion Groups

Variable	Variable In	Wilks' lambda	Sig.	Structure Cofficients
Academic Stress	1	.95	.0003	.49
Reading Comprehension	2	.93	.0001	−.40
Family Stress	3	.91	.0000	.39
Testtaking Skill	4	.90	.0000	.40
Age	5	.89	.0000	.30
Preadmission GPA	6	.87	.0000	−.31
Gender	7	.87	.0000	.26
Money Stress	8	.86	.0000	−.28
Social Stress	9	.85	.0000	.27
Social Interaction Profile	10	.85	.0000	.19

The resulting linear discriminant function was:

$$f = .49v_1 - .40v_2 + .39v_3 + .40v_4 + .30v_5 - .31v_6 + .26v_7 - .28v_8 + .27v_9 + .19v_{10}$$

where f = the discriminant score, and

v_1 = Academic Stress,

v_2 = Reading Comprehension,

v_3 = Family Stress,

v_4 = Testtaking Skill,

v_5 = Age,

v_6 = Preadmission GPA,

v_7 = Gender,

v_8 = Money Stress,

v_9 = Social Stress, and

v_{10} = Social Interaction Profile.

Effectiveness of each variable for predicting successful or nonsuccessful program completion was tested using Wilks' lambda. Results for the ten variables identified as significant in the stepwise procedure are presented in Table 4. The computation yielded significant values of $p < .05$ for six variables: Academic Stress ($p = .0003$), Reading Comprehension ($p = .0025$), Family Stress ($p = .012$), age ($p = .032$),

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preadmission GPA (p=.047), and Social Stress (p=.030).

Among the ten were the six variables identified as

significant in Table 2 using the univariate analysis of

variance. Values for p vary slightly but in both types

of analyses, these six variables were significant.

Table 4

Discriminant Functions for Successful or Nonsuccessful

Program Completion Groups

Variables	Wilks' lambda	Sig.
Academic Stress	0.95	0.000*
Reading Comprehension	0.97	0.003*
Family Stress	0.98	0.012*
Social Stress	0.98	0.030*
Age	0.98	0.032*
Preadmission GPA	0.98	0.047*
Gender	0.99	0.106
Testtaking Skill	1.00	0.286
Social Interaction Profile	1.00	0.74
Money Stress	1.00	0.998

* p<.05

The apparent error rate of the discriminant analysis was calculated by using the discriminant function to classify the original sample. Results are shown in Table 5. That analysis determined that, overall, the variables were efficient in correctly classifying students in 74.33% of the cases. For the successful group, membership was correctly classified in 75.8% of the cases and incorrectly classified in 24.2 % of the cases. In other words, 24.2% of students who did not complete the program successfully would have incorrectly been grouped with the academically successful students. For the academically nonsuccessful, group membership was correctly predicted in 68% of the cases and incorrectly predicted in 32.0% cases. So, 34 students, or 68%, would correctly have been predicted to fail to complete the program in uninterrupted, successful progress.

Hypothesis Three

Hypothesis three (H_3) states: None of the variables will differ from one another in the ability to discriminate successful or nonsuccessful group membership. This hypothesis was rejected.

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Table 5

Discriminating Ability of Variables in Predicting Successful or Nonsuccessful Group Membership

Group	No. of cases	No. correctly grouped/%	No. incorrectly grouped/%	Overall no. correctly classified/%
Successful	21	160/75.8%	51/24.2%	
				176/74.33%
Nonsuccessful	50	34/68.0%	16/32%	

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In testing H₂ only ten variables were considered as significant predictors of success. Thus, 12 were not. These ten variables were correlated with the discriminant function. The results are shown in Table 6. The six variables with the strongest correlation were the six identified as significant in Table 2, which presented the results of the univariate analysis.

Table 6

Correlation of Individual Variables with Discriminant Function.

Variable	Correlation coefficient
Academic Stress	.54
Reading Comprehension	−.45
Family Stress	.37
Social Stress	.32
Age	.32
Preadmission GPA	−.29
Gender	.24
CAT	−.17
Reading Rate	−.16
Testtaking Skill	.16

Academic Stress had the highest correlation, .54.

Reading Comprehension had the next highest, a negative

correlation of .45. Family Social Stress and age and

gender had high positive correlations; preadmission GPA

a moderately high negative correlation. The direction

of the correlations indicates that high academic

achievement as measured by Reading Comprehension and

Preadmission GPA were associated with success, while

high stress as measured by Academic, Family, and Social

Stress were associated with nonsuccess. These findings

also indicated that variables from all of the three

categories were important correlates with prediction -

two cognitive variables: Reading Comprehension and GPA;

three noncognitive variables: Academic, Family and

Social Stress, and two demographic variables: age and

gender.

Summary

Chapter 4 has presented the data and statistical

analyses used to examine the three research hypotheses

of this study.

By univariate analysis of variance, six variables

were identified as significantly different between the

academically successful and nonsuccessful groups:

preadmission GPA, Reading Comprehension, Family, Social and Academic Stress, and age. Discriminant analysis yielded significant values for prediction of group membership for the same variables and four others. These four were Testtaking Skill, Social Interaction Profile, Money Stress, and gender.

Using a discriminant function consisting of these ten variables together, 74.33% of the sample cases were correctly classified into groups of academic successful or nonsuccessful students.

Lastly, those six variables earlier identified as different between groups and valuable in prediction of group membership, correlated the highest between the discriminating variables and the discriminant function. This added to the indication that they may have been of greatest importance.

In Chapter 5 the study and its statistical analyses are further summarized and conclusions and recommendations and implications are presented.

CHAPTER 5

Summary, Conclusions, Recommendations, and Implications

Summary

The major purposes of this study were to determine
what variables measured by the Nurse Entrance Test
(NET) and other cognitive and demographic variables
contribute significantly to the prediction of success
in a nursing program and to investigate whether there
were any significant differences between those who drop
out and those who are academically successful, on those
variables. The variables were examined alone and in
combination. Cognitive variables included preadmission
all-college cumulative grade point average (GPA), and a
composite achievement test score from the California
Achievement Test (CAT). Other cognitive variables were
the Essential Math Skills, Reading Comprehension and
Reading Rate, Testtaking Skill, and Learning Style
scales of the NET (Frost, 1990). The NET scales used
as noncognitive variables were the five scales of the
Stress Level Profile and a Social Interaction Profile.
Demographic variables were age, gender, and race.

Nationwide, students who have gained entry into
programs of nursing have difficulty achieving academic

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success. Attrition rates are high and occur at a high cost to the nonsuccessful student, the family, the educational institute, the nation's health care providers and consumers, and the profession. The purpose of this study was to try to identify student characteristics which had predictive ability for success or nonsuccess. Students could then be screened before admission or better identified after admission as needing assistance.

Students in two classes successively admitted to an associate degree nursing program were included in the study. The August, 1993, class admitted 141 students and the January, 1994, class admitted 144 students. By the time permission was obtained in the students' last terms, an overall 67, or 23.5% of students, were no longer enrolled in the program. To the number of enrollees were added 33 students who had been unsuccessful prior to August, 1993, and who had been reinstated into one of the two classes. Both of these groups – those no longer enrolled and those readmitted – were deemed academically nonsuccessful as defined in Chapter 1. Analyses were performed on

the 271 students who had granted permission and on whom data were available.

Descriptive statistics were compared for the two entering classes. There were minor differences on some characteristics of the two classes but not any significant mean difference on any of the variables primarily used for program admission decisions. Therefore, the two classes were combined into one sample. The rest of the analyses were performed to examine similarities or differences of the academically successful and nonsuccessful student groups and the value of the variables in contributing to group prediction for each student case.

Conclusions

Based on the findings of this study, the statistical conclusions are presented and then related to research and literature in the associated areas of cognitive, noncognitive and demographic factors.

Statistical Conclusions

Univariate analysis of variance was utilized to examine whether there were any significant mean differences between successful and nonsuccessful student groups. There were significant mean

differences between the two groups (p<.05) on six variables. These were: preadmission all-college GPA, the NET scored Reading Comprehension, age, and three self-perceived areas of life stress - family, social and academic. Variables not found to be significantly different between the groups were the following: CAT score, Math and Testtaking Skills, Reading Rate, Learning Style, Work/Money Stress, Social Interaction Profile, gender, and race.

The six variables found significant in the univariate analysis were also significant in other analyses. Discriminant analysis using a stepwise inclusion procedure was performed and determined ten of the discriminating variables together to be valuable in prediction. Preadmission GPA, Reading Comprehension, Testtaking Skill, Social Interaction Profile, the NET scores on Family, Academic, Money and Social Stress, and age, and gender were found to comprise the optimal set of independent variables. The remaining variables were not significant predictors, so they were excluded.

After the discriminant function was performed, Wilks' lambda was used as a test of significance. This test determined that all of the ten variables were

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significant in contributing to the prediction of academic success.

The ten variables were then correlated with the discriminant function. The same six variables identified in other analyses had the strongest correlations. Academic Stress and Reading Comprehension, which were significant differences between the groups in the analysis of variance, were selected, respectively, first and second in the weighted stepwise procedure, and had the highest correlations with the discriminant function.

Using the reduced model of ten independent variables, a classification procedure was performed on the original sample. The procedure predicted correctly in 74.33% of the cases. Of the successful group of 210 students, 75.8% were correctly classified; of the nonsuccessful group of 51, 68% were correctly classified.

If, then, the discriminant function with the ten variables was used as the selection decision in this nursing program, 34 students or 68% of the unsuccessful students would not have been admitted. On the other hand, 67 students who actually did graduate

successfully would not have been selected to begin the program. This latter 22.4% error is of a serious nature. However, if the discriminant function was used to identify already admitted students for the purpose of remediation instead of for admission decisions, the serious impact on students and program would lessen. The over-selection of predicted unsuccessful students then would result in something merely wasteful, such as misuse of tutoring or counseling services.

The focus will now turn to a discussion of the relevance and relationship of these varied findings to other research and literature in the areas of cognitive, noncognitive, and demographic characteristics.

Cognitive Factor Conclusions

Cognitive variables examined in this study were the following: all-college preadmission GPA; CAT score derived from an average of the verbal and math subtest scores; and NET scores on Math Skills, Reading Comprehension, Reading Rate, Testtaking Skill, and Learning Style. Of these, only preadmission all-college GPA and Reading Comprehension were significantly different between successful and

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nonsuccessful groups and highly correlated with the discriminant function. Along with these cognitive variables Math Skills and Testtaking Skill were significant for prediction of group membership using discriminant analysis.

Preadmission GPA

Most of the studies reviewed and presented in Table 1 in Chapter 1 found as did this study, grade point average to significantly relate to success. High school rank or GPA (Benda, 1991; Hutana, 1991; Oliver, 1985), pre-requisite cumulative GPA or pre-requisite course grades (Felts, 1986; Payne & Duffy, 1986; Whitley & Chadwick, 1986; Wold & Worth, 1990), and introductory nursing course grades (Lengacher & Keller, 1991; Naron & Widlack, 1991; Woodham & Taube, 1986) have all been examined alone or in combination with other variables and found to relate to NCLEX pass rate or nursing GPA.

Reading Comprehension/Rate

Reading Comprehension was statistically significant for predicting group membership. It was not speed of reading which was important, since Reading Rate was not a significant discriminator, but rather it

was the ability to understand the material read that was important. The predictive ability of Reading Comprehension in this study reinforced Grant's (1986) assertion that beyond prior achievement, reading skill may be one clearly identified, critical variable which can be measured prior to admission and reflect ability to succeed in a nursing major. This he asserted after a review citing eight studies in support of that statement. In one recent and direct examination of reading ability, measured by the ASSET test with ADN students, reading skill did correlate directly and significantly with first semester nursing grades (Chacko & Huba, 1991). Although SAT or ACT verbal scores may in part or indirectly measure reading comprehension, few other studies have isolated the reading variable.

Testtaking Skill

The next variable to be discussed is Testtaking Skill, which was not found in this study to be significantly different between successful or nonsuccessful student groups. Testtaking Skill was one of the ten variables found significant by discriminant analysis. Overall the students in this study scored at

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what the NET publishers labeled "acceptable mastery"
level for performance on multiple choice or essay
examinations. The range for acceptable mastery was
stated to be 15-47, and this study's groups means were
40.01% and 41.37%. This mean performance may indicate
that most students in this sample had little or no
difficulty taking examinations so that this area of
cognitive skill did not affect academic success or
nonsuccess. Or, the results could indicate that
ability to take examinations, whether skillful or
nonskillful, had no relationship to academic success or
nonsuccess.

The nursing education literature reviewed for this
study revealed no direct examination of the
relationship of testtaking abilities and nursing school
performance. Testtaking anxiety had been previously
studied in relationship to performance, and was a
construct which could be hypothesized to be related to
or affected by testtaking skill. Test anxiety was
found in one study to be inversely correlated with
NCLEX performance (Poorman & Martin, 1991), but in
another study was not found significantly related to
GPA or NCLEX (Hilbert & Allen, 1985).

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Preferred Learning Styles

The remaining variable included in this study under cognitive factors was the students' scores on preferred styles of learning. None of the measured aspects of learning style were found significantly predictive of academic success, and none differed markedly from the two groups or from the normed group's averages. The preferences of learning by auditory, visual, social, solitary, oral, and writing dependent learning styles had not been examined in the reviewed literature as being styles preferred by nursing students or for the relationship of these styles to nursing school performance. Students in both study groups and normed groups on the average preferred a social learning style over any other style, and they preferred an auditory style least of all. Though not significantly predictive of academic success, these preferences should be taken into consideration by faculty when planning curricular activities, delineating faculty expertise, and counseling students in study and learning skills.

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Noncognitive Factor Conclusions

There is general agreement that nonacademic factors play an important role in college persistence but little agreement regarding the identity of these factors, how to measure them, and how to use them (Arbona & Novy, 1990; McKinney et al., 1988; Payne & Duffy, 1986; Rodgers, 1991; Schwirian, 1984). The keen interest in this area evidenced by the number and types of characteristics investigated in the literature may reflect a growing consensus that academic achievement of nursing students results from a complex process. That process involves factors innate to the individual learner, economic factors, and characteristics of the society and the learning environment which interact with the individual and each other. This study examined the noncognitive factors of Social Interaction Profile and Stress Level Profile.

Social Interaction Profile

The Social Interaction Profile tested on the NET yielded a calculation of the passive/aggressive group leadership style of the individual. This personality measure was not found to be significantly different between the two groups of the study. It was found

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valuable in the discriminant function, perhaps because of multicollinearity with other variables in the set. Both the successful and nonsuccessful group means were twice as high as the normed group of ADN students on the measure of passivity. This finding is unexplained. The literature review revealed that measures of social interaction style have not been undertaken with nursing students. Other studies, few in number, examined and found contradictions in relationships of other personality characteristics and academic success. The personality aspects and instruments used in these studies, however, were so dissimilar as to resist any comparison. Still if academic success was, as is currently thought (Miller, 1991), a dynamic interaction between characteristics of individuals and their environments, the fact that these characteristics were not well suited to measurement or study does not make them less important as variables of study. Personality tests can not only help students understand themselves better but help faculty and advisors to better know, teach and advise students.

Stress Level Profile

Some of the more interesting results of this study came from an examination of Stress Level Profiles. Academic, family, and social areas of stress were significantly different between groups and predictive of success. Money Stress, however, was a significant predictor of group membership. Caution, of course, must be applied in interpreting these findings since first, stress in this instrument was a self-perceived construct and might not be a true objective reflection of stress in each student's life, nor a measure of how an individual responds to stress. Huerta (1990) discovered some evidence that although Caucasian students reported more stress than other racial or ethnic groups, the high scores reflected merely a greater ability to acknowledge stress. The literature reviewed was in almost unanimous agreement that nursing students experience and report high stress levels (Backer, 1989; Rosburg, 1988; Shead, 1991; Wang, 1991). The relationship of stress and NCLEX or GPA was less clear. This study indicated that certain types of stress were different between groups of successful and nonsuccessful students and were useful in prediction of

academic success in terms of successful progression until graduation. These specific areas of life stress will next be individually addressed.

FAMILY STRESS

In the area of Family Stress, the academically unsuccessful group's mean score was significantly higher than either the successful or the norming groups' means. The academically successful generally perceived themselves the least stressed of these three groups in this area of life. Family problems had been found listed as important in the lives of nursing students (Arbona & Novy, 1990; Clark & Ruffin, 1992; McDonald et al., 1983) but, in the literature review, were not specifically or directly related to persistence in a program.

SOCIAL STRESS

A self-perceived high Social Stress score was also significantly different and predictive of group membership in this study. An unexplained finding is that both the successful and nonsuccessful groups in this nursing program scored much higher on Social Stress than the normed group. High scores on Social Stress could suggest that there exists a need to devise

ways in which students could readily get to know one another and increase networking and peer support. Studies showed that many programs had used student group settings with peer support techniques to decrease attrition (Brown, 1987; Cameron-Bucheri & Trygstad, 1989; Campbell & Davis, 1990; McDonald, 1983).

ACADEMIC STRESS

Academic Stress was the strongest and most valuable difference between groups and predictor of success of any of the variables. This finding was consistent with the literature which revealed nursing students' academic self-confidence (Chacko & Huba, 1991; House, 1992), self-esteem (Allen, et al., 1988; Foster, et al., 1991), self efficacy (Chacko & Huba, 1993), and self-assessed study skills (Miller, 1991) all related to academic achievement.

The students enrolled in the program investigated were largely older or nontraditional students and have usually been out of school for over five years. They might have lacked confidence both because of little-used academic skills and lack of recently proven achievements.

MONEY/TIME AND WORK PLACE STRESS

The general lack of significance for the stressors of Money/Time and Work Place between groups or for prediction of success was surprising. Stressors of this nature have generally (Benda, 1991; Smith, 1990; Stolar, 1991; Thurber et al., 1989) but not always (Allen, Higgs, & Holloway, 1988) been associated with nursing students' poorer academic achievement. It could be that those working or financially stressed students perceived stress in other areas which were a result of but not attributed directly to work or finances.

Demographic Factor Conclusions

Age

Of the three demographic factors examined in this study, age was found to be a significant difference between groups and valuable in prediction of academic success or nonsuccess. With the academically successful group averaging 30.12 years of age versus the nonsuccessful average of 32.74, it was evident that the younger student belonged more often in the successful group. Most studies reviewed have not found age significantly related to success when GPA, NCLEX,

or persistence were used as criteria (Allen, Higgs & Holloway, 1988; Decoux, 1989; Dell & Valine, 1990; Felts, 1986; Huerta, 1990; Lengacher & Keller, 1990; McKinney, et al., 1988; Strum, 1988; Woodhan & Taube, 1986). In the one study of ADN students which found increasing age a factor in nonpersistence (Marshall, 1989), it was suggested that family obligations may be a factor in retention. Family obligations not only for children but for aging parents might place students in their middle 30's as compared to younger students, more at risk for academic failure.

The older age of the nonsuccessful student group might also be associated with the nonsuccessful students' higher level of self-perceived stress in social areas of life. Miller's (1991) review of literature on persistence in higher education found that while social integration into the institution had limited influence on decisions to persist, having a number of friends in college was important for older students' persistence. It could be that students who are older and also who perceive a high degree of social stress are at great risk for nonpersistence.

Race

Race was not in this study found predictive of academic success, or different between the two groups. This was a finding contradictory to almost all other studies (Gross et al., 1987; Huerta, 1990; Lengacher & Keller, 1990; Oliver, 1985), but none of the studies reviewed used persistence or success until graduation as the criterion variable. Race, then, might not be significantly predictive of success if success is measured by persistence.

Gender

This sample contained 212 females and 54 males. The literature usually revealed a nonsignificant relationship between gender and either persistence, GPA, or NCLEX. Gender was found to be one of the ten significant predictors in discriminant analysis, and was moderately positively correlated with the discriminant funtion. There was no significant gender difference between successful and nonsuccessful groups.

This section of Chapter 5 contained specific findings of this study. The next section will discuss the recommendations and the final section will address implications of the study.

Recommendations

Based on the findings of this study, others may wish to perform future research on variables which contribute to the prediction of academic success in a nursing program and on differences between students who are academically successful and those who do not graduate. Suggestions for future research follow.

1. Researchers may wish to control for or include other variables. The choice of variables is almost endless: income level, hours spent working, marital status, number of dependents, fear-of-success, intelligence quotient, study skills/ habits, or critical thinking skills might all be valuable discriminators. It is possible that especially the non-intellective variables of greatest significance have yet to be determined (Tolland, 1990). Also not considered were differences in student characteristics across a variety of subgroups of students.

2. Researchers may wish to include other measuring instruments. The NET relies on self-report to measure all variables except reading and math. Self-report measurements are more likely to

measure subjects' perceptions than actual
behaviors (Chacko & Huba, 1991).

3. Researchers may use random sampling and samples
    drawn from additional classes and or/samples from
    other associate degree programs utilizing the NET.
    This would strengthen the generalizability of
    findings to settings other than an urban commuter
    college setting. It also would decrease the
    chance that unique characteristics of environment,
    program or population influenced the results.

4. Researchers may separate students who withdrew
    with passing grades from those who withdrew while
    failing or as a result of failing grades.
    Although records revealed that most students
    exited failing, inclusion of others may have based
    the findings.

Implications

This study has contributed to understanding the
factors involved in nursing students' academic success
or nonsuccess. The summary suggestions for use of this
study's findings by nurse educators and researchers
follow.

1. Nurse educators should seek to be cognizant of research findings in the area of student characteristics predictive of success. Much of the literature now supports and encourages examination and utilization of noncognitive as well as cognitive student characteristics for admission and remediation decisions. Most nursing programs continue to utilize purely intellective measures for those decisions.

2. Nurse educators should adjust admission and remediation criteria to reflect the importance of not one or two isolated factors believed directly related to academic achievement, but criteria should be reflective of the multifactorial influences in a student's life which affect success. The combination may be more precisely able to distinguish the effective from the less effective learner (Chacko & Huba, 1991).

3. Educators should dialogue and perform local studies to identify barriers to success in their programs' populations and curricula. A local profile could be developed for early

identification and remediation of at-risk students.

4. Educators could, based on findings from this and other studies, devise strategies to reduce student stress in needed areas. For example, availability of low cost child care could help reduce stress in family life. To reduce stress in academic areas, strategies could include academic advisors, tutors, instruction in how to get help early, or adult-learner support groups. For stress in social groups, provisions for peer orientation programs, peer tutoring, or study group structuring could be stress reducing.

5. A needs assessment should be performed on students to identify stresses outside of and in school from financial, personal, and academic areas of life. Faculty may benefit from an increased awareness of the demands on and needs of the older student. Faculty also may need a heightened awareness that students have a life – sometimes a stressful one – outside of class. The faculty's role in stress management may be one also of validation and

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legitimization of students' stress and coping experiences (Backer, 1989).

6. Remediation programs have proven time and again to decrease attrition. Reed and Hudepohl (1983) recommend that the core of such a program is the reading laboratory. Unless a student can comprehend reading material, this study and others have shown that there is a significant risk of student nurse failure in college.

7. Nurse educators and researchers should consider shifting focus from selecting or altering the applicant to fit the program to one of changing the instructional process to contribute to success. With the older, "re-entry" woman (Perry, 1986), for example, alternatives to traditional study such as independent learning modules, contracts, reduced course load, or reduced student/faculty ratio might allow the flexibility which adult lifestyles demand.

8. Research should focus on the examination, implementation and evaluation of intervention strategies designed to increase retention and improve academic performance.

9. More research is needed in the retention of disadvantaged and minority students.

10. Nursing researchers should perform cross-validations of this and existing studies to examine what appear to be variables significant for prediction of success or nonsuccess in school.

APPENDIX A

CLIENTS OF NURSE ENTRANCE TEST

NURSE ENTRANCE TEST (NET) CLIENTS IN THE UNITED STATES

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)rage, AK 99508
786-1282

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592-1000

Moffett-Samford U.
iine
ikeshore Dr
igham, AL 35229
370-2872

inville State Univ
Latham
illace Sch of Nursing
nville, AL 36265
782-5428

outh Alabama
nanda Baker, Dean
ipring Hill Ave
:, AL 36688
134-3415

t Sch of Nursing
ie McCormick
Colonel Glenn Rd
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223-7402

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ox 2404
ille, AR 72501
'93-4919

e College
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is, AZ 85607
64-7943

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57-4331

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San Luis Obispo, CA 93403
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an Comm College
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APPENDIX B

CALCULATION OF RANK SCORE

Ranking Procedure

Each applicant for continuance in the nursing program is ranked on two criteria. These criteria are:

- CAT score — all applicants must submit CAT scores, and
- any one of the following:
  - ▲ all college cumulative GPA of 2.0 or better, must have completed at least 12 semester credits in general education courses required by the nursing program,
  - ▲ high school GPA must be 2.0 or higher, or
  - ▲ General Education Development (GED) test scores.

All applicants are evaluated for continuance based on a ranking point scale of 10-5 (see ranking chart below).

- The average of the rank scores for the two criteria is computed.
- The applicant with a final rank of 5.0 or higher is considered a qualified applicant.
- The final ranks for all qualified applicants are placed in rank order within two groups: program service district students and other students.

Ranking Chart

California Achievement Test (CAT)		Grade Point Average High School and/or College		General Education Development Test (GED)	
Rank	Scale	Rank	Scale	Rank	GED Score
10.0	826-850	10.0	4.0	10.0	72.6-up
9.5	801-825	9.5	3.8	9.5	70.1-72.5
9.0	776-800	9.0	3.6	9.0	67.6-70.0
8.5	751-775	8.5	3.4	8.5	65.1-67.5
8.0	726-750	8.0	3.2	8.0	62.6-65.0
7.5	701-725	7.5	3.0	7.5	60.1-62.5
7.0	676-700	7.0	2.8	7.0	57.6-60.0
6.5	651-675	6.5	2.6	6.5	55.1-57.5
6.0	626-650	6.0	2.4	6.0	52.6-55.0
5.5	601-625	5.5	2.2	5.5	50.1-52.5
5.0	576-600	5.0	2.0	5.0	Pass-50.0
	average score				

Applicants to the generic track (not the bridge option), who have work experience as a licensed practical nurse, medical corpsman, respiratory therapy technician or FCCJ trained medical assistant, may increase their rank by a maximum of one point at the rate of .25 for every year of work experience up to four years. These applicants are also eligible to earn advanced placement by taking a challenge examination once they have been admitted to the program. Work experience must be documented on employer stationery and include beginning and ending dates of employment.

APPENDIX C

LETTERS TO SUBJECTS

Dear Student:

I am interested in studying factors which may help students successfully complete our nursing program. Factors such as prerequisite grade point average, California Achievement Test, rank score, Nurse Entrance Test, as well as age, sex and race are of interest as contributors to success.

I would like to collect this data on all students in your class, and need your permission to obtain the data from your college records. As soon as the data is obtained it will be coded for confidentiality. Participation is voluntary.

Thank you for your consideration and assistance.

Sincerely,
Signature Removed

Linda R. Hunter

TO WHOM IT MAY CONCERN:

I hereby grant permission to the registrar/nursing office at Florida Community College at Jacksonville to release to Linda R. Hunter from my files the following information: grade point averages for high school and college classes, California Achievement Test scores, nursing admission rank score, Nurse Entrance Test scores, nursing class grades and age, sex and race.

I understand that my participation in this study is voluntary, and that once the data is obtained it will be immediately coded for confidentiality so that my identity will be anonymous.

_____
STUDENT NAME

_____
SOCIAL SECURITY NUMBER

_____
DATE

Linda R. Hunter
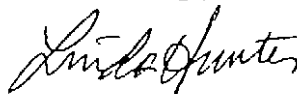5341 Diaz Place
Jacksonville, Florida 32210

Dear Nursing Student or Former Nursing Student:

I am an instructor in the Associate Degree Nursing program at Florida Community College. I am interested in studying factors which may help students successfully complete this nursing program. It is hoped that the study will generate findings which will help more students graduate on time or avoid difficult interruptions in career paths. Factors such as prerequisite and nursing grade point average, California Achievement Test, Nurse Entrance Test and rank scores as well as age, sex and race may be of interest as contributors to success.

I would like to collect this data on the approximately 144 students who were admitted into your Fundamentals class, and need your voluntary permission to obtain your data from the college's records. The data will be coded for confidentiality as soon as it is obtained. This study is part of the requirements in a doctoral program in education.

Please indicate your permission by signing and placing the enclosed postcard in the mail. Thank you for your consideration and assistance.

Sincerely,

Linda R. Hunter

TO WHOM IT MAY CONCERN:

    I hereby grant permission to the registrar/ nursing office at FCCJ to release to Linda Hunter from my files the following information: grade point averages for high school and college classes, California Achievement Test scores, nursing admission rank score, Nurse Entrance Test scores, nursing class grades and age, sex and race.

    I understand that my participation in this study is voluntary, and that once the data is obtained it will be immediately coded for confidentiality so that my identity will be anonymous.

NAME _____ SS# _____

APPENDIX D

PERMISSION FOR STUDY

Florida Community College at Jacksonville
Martin Center for College Services
501 W. State St.
Jacksonville, FL 32202
(904) 632-3222

August 24, 1994

Ms. Linda Rhea Hunter
5341 Diaz Place
Jacksonville, FL   32210

Dear Ms. Hunter:

I am in receipt of your letter of June 25, 1994 concerning
data collection for your dissertation. I apologize for the
delay in responding but as Linda Giddens shared with you, we
interpreted the letter as just advising us of your intended
course of action and copied the appropriate staff.

I have confirmed with Sandra Willis in the Student Records
Office and with Barbara Witherspoon that there is no
objection to the manner in which you intend to obtain the
student information as detailed in your recent letter.

Please let me know if we can provide you with additional
information.

Sincerely,
Signature Removed

Charles Spence

cc: Dr. Ed Napier
     Ms. Barbara Witherspoon
     Ms. Sandra Willis

Mission
We are dedicated to meaningful learning and excellent teaching, enabling individuals to achieve their hopes, dreams and full potential,
and to being a leading partner in creating a dynamic, prosperous community of enlightened leaders and thoughtful, effective, global citizens.

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