

FACTORS RELATED TO CLINICAL PERFORMANCE
OF BACCALAUREATE NURSING STUDENTS

BY

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A DISSERTATION PRESENTED TO THE GRADUATE COUNCIL OF
THE UNIVERSITY OF FLORIDA IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

UNIVERSITY OF FLORIDA

1977

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To

my parents

Lunelle and Henry S. Gassner, Jr.

ACKNOWLEDGMENTS

The author gratefully acknowledges the support and assistance of her advisory committee, Dr. James W. Hensel, chairman; Dr. William Alexander; Dr. Blance I. Urey; Dr. Wilson Guertin; Dr. Margaret K. Morgan; and Dr. Amanda Baker.

To Dr. Hensel and Dr. Morgan I pledge that their very special contribution to my future will be perpetuated through my efforts in behalf of others.

Sincere appreciation is extended to Dr. Rose Mary Ammons, George Mayer, Shirley Lyons, and Pauline Hill for their kind and expert assistance in organizing the data.

Gratitude is expressed to Barbara Bradford and Bobbie Moskot for their help with the hand scoring.

I am deeply indebted to each student from Florida State University, the University of Florida, the University of South Florida, and Barry College who so graciously and professionally participated in this research.

To Sue Kirkpatrick I am sincerely appreciative of her infinite patience in the typing of this study.

For their continued interest and support in all of my endeavors, I am most grateful to my parents, sisters, and brothers.

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Abstract of Dissertation Presented to the Graduate Council
of the University of Florida in Partial Fulfillment of the
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August, 1977

Chairman: James W. Hensel
Major Department: Curriculum and Instruction

The research was designed to identify patterns of behavior in clinical performance of baccalaureate nursing students and to determine their relation to certain personal variables in the cognitive, affective, and psychomotor domains. A total sample of 96 senior level nursing students from three major universities in Florida participated in the project.

A self-report technique was used to collect data over a wide spectrum of clinical performance behaviors. The questions were presented in a Q Sort format for the purpose of compensating for bias due to social desirability of some items. The instrument was given the title "Profile of Perceived Performance." Q factor analysis produced five patterns which accounted for only a small amount of total variance (26%). However, the qualitative descriptions of those patterns seemed to have credibility when compared with personal observations of practicing nurses.

Continuous variables from the shape factors were produced by using each subject's factor loadings on all rotated factors that had qualified as pattern factors (i.e., three or more subjects loading at .50 or above). Pearson product moment correlations were calculated between these variables and the subjects' scores on three subtests of the Comprehensive Ability Battery (CAB) and the 16 scores from the Sixteen Personality Factor Questionnaire (16 PF). Significant relationships were revealed between three of the five shape variables and several of the variables from the 16 PF and the CAB.

An important by-product of the research was the potential usefulness of the Profile of Perceived Performance. It has potential input as a clinical teaching tool and as a source of data for program evaluation in a variety of health-related professions.

CHAPTER 1
INTRODUCTION

Within memory of the present generation of practitioners, the almost extinct role stereotype of the nurse was fairly accurate. Duties and expectations, within limited parameters, clearly defined the nurse's role. The scope of that role has now changed. Alterations in health care, as well as in the agencies providing it, have challenged conventional role expectations (Kelly, 1966; Lysaught, 1970; Henderson, 1973). Today there is no single type, role, set of duties, nor one level of expectation as far as career advancement is concerned. In short, nursing has become such an expansive field in and of itself that there is room for a wide variety of persons, each with his own pattern of individual differences. With the increasing rate of change in role structure, more types of persons will find outlets for their talents in this field.

The study was designed to identify patterns of behavior in clinical performance and to determine their relation to personal variables in the cognitive, affective, and psychomotor domains.

The Procrustean method in which students' individual differences were subdued, transforming them into the stereotype image of the dedicated nurse, is no longer appropriate. Today's nursing educators face a mandate to devise ways of identifying and nurturing individual differences of students in order to provide the varied types of nurses needed by the profession.

The ever-changing status of practice imposes a major responsibility on nursing educators to discover what constellations of personal characteristics exist in students currently enrolled in nursing programs and how they relate to performance characteristics.

Many educators, including those in nursing, become uncomfortable with the thought of accommodating the myriad individual differences that have been identified by behavioral scientists. The problem is confounded because not only are there many roles, but each individual brings his own style of behavior to the role he occupies. That is to say, several similar roles, held by different persons, will be implemented in as many different ways as there are persons (Cronbach, 1970; Cattell, 1973). However, research has shown that such differences tend to fall into patterns or types (Guertin, 1966; McCaulley, 1974).

Nowhere in nursing education is the problem of managing individual differences more apparent than in the

clinical setting. Performance in this area is a unique tripartite aspect of education, residing as it does in three domains. Although once considered to be primarily psychomotor in nature, clinical performance is now recognized as also containing cognitive and affective components (Kelly, 1966). Clinical performance is a synthesis of knowledge gained, cognitive skills acquired, and the attitudes developed, in addition to the purely psychomotor tasks that also remain high in importance.

Since 1965 there has been a significant increase in the development of techniques designed to break large groups into clusterings or subgroups of individuals who share similar characteristics (Hartigan, 1975). These techniques are becoming more widely known and are being adapted to an ever-enlarging range of applications.

Statement of the Problem

In order to nurture those individual differences of nursing students which may contribute to the different styles of clinical performance needed in the health care delivery system, it is necessary to determine first whether such styles can be identified empirically. Only then can the relationship of personal variables to clinical performance styles be studied in a scientific manner.

The objectives identified to achieve the purpose of the study were

1. To identify and isolate style or patterns of nursing performance behaviors; and
2. To determine whether a relation exists between patterns of nursing performance behaviors and personal variables of nursing students.

Assumptions

For the purpose of this research it was assumed that

1. The Sixteen Personality Factor Questionnaire was a valid and reliable instrument for measuring primary source traits of personality;
2. The Comprehensive Ability Battery was a valid and reliable instrument for measuring primary ability factors of personal variables;
3. The sample population had been exposed to curricula similar in overall criteria as defined by the National League for Nursing (1972) and the Florida Nurse Practice Act (1976);
4. Individuals in the sample would respond in a sincere manner;
5. Volunteer participants were representative of the population of nursing students in Florida; and
6. Error would be random.

Delimitations

A recognized delimitation of the research was that

1. Only three baccalaureate nursing programs, having upper division status, were considered.

Limitations

The research is further limited in that

1. Ninety-six senior level nursing students participated in the sample through volunteering; and
2. The Profile of Perceived Performance Instrument required self-perception only.

Operational Definitions

For the purposes of this study the following definitions will be used:

Baccalaureate nursing student--one who is currently enrolled in a program of nursing leading to a four-year degree.

Clinical performance--those experiences which will allow nursing students to apply their knowledge to a client-related situation, real or simulated.

Perceived clinical performance--a self-report by which a nursing student perceives his own level of performance, developed by the researcher for this study.

Personal characteristics--those characteristics or features which distinguish one person from another, such as biographic data.

Personal variables--those entities in the cognitive, affective, and psychomotor domain which distinguish one person from another.

Profile--refers to a set of scores obtained by an individual on a given set of measuring devices.

Pattern--refers to the profile of mean scores of a group of individuals who have been found to have similar profiles.

Holistic--refers to the "wholeness" of an individual.

CHAPTER 2
REVIEW OF RELATED LITERATURE

The chapter is organized around discussions of nursing literature that relate to registered nurses' performance, registered nurses' personality, nursing students' performance, nursing students' personality.

Considering the relatively large amount of research that has been generated by, for, and about nurses in the last twenty years, it is noteworthy that so little has been concerned with clinical performance. Probably the most extensive amount of nursing research involves predicting scores on state licensure examinations, a topic which, according to Smeltzer (1965), has been investigated "up, down, and sideways." This is not to imply that such studies were not needed, since every graduate from a state accredited program of nursing must pass a licensure examination in order to practice as a registered nurse. One of the more recent studies (Williams, 1975) investigated the relationship of personality to the National State Board of Nursing Test Pool Examination scores. Williams determined the existence of relationships between performance on the total National State Board of Nursing

Test Pool Examination (NSBTPE) score and type, as measured by the Myers-Briggs Type Indicator (MBTI), as well as between scores on four of the five subscales of the NSBTPE and type.

However, research also shows that success on the NSBTPE does not necessarily forecast success in nursing practice. Dubs (1975) demonstrated this by comparing on-the-job performance of 30 graduates from a diploma nursing program and their achievement while students in the school to their NSBTPE scores. The study revealed that students' cumulative grade point averages and their nursing theory grades were the best predictors of success on the NSBTPE. However, clinical performance grades were clearly the best predictors of their performances as registered nurses.

Since clinical performance can be considered analogous to the nurses' performance in the "real world," much interest has centered in this area. Two studies of national importance (Knopf, 1972; Schwirian, in press) have addressed this facet of nursing. In 1961, the National League for Nursing initiated a longitudinal study of nursing students, their occupational goals, and demographic characteristics. Significance of the study, as pointed out by Knopf (1972), lay in the broad data base provided by a sample of 45,000 nursing students from three types

of programs: hospital diploma, associate degree, and baccalaureate. Conclusive data about baccalaureate students is not yet available. In another extensive project funded by the Division of Nursing, United States Public Health Service, Schwirian (in press) undertook, among other tasks, the collection of all extant information concerning prediction of nursing students' later performance as registered nurses. The project, now in the third of its four phases, has made extensive use of questionnaires directed to randomly selected basic schools of nursing throughout the United States. Several unpublished tentative conclusions were shared by the project director. A comparison of performance ratings by nursing supervisors and self-reported ratings by graduate nurses indicated notable differences in the areas of interpersonal relations, critical care, and leadership. Supervisors rated graduates' performance in critical care higher than the graduates had rated themselves and lower in the areas of interpersonal relations and leadership than the graduates had rated themselves. Baccalaureate graduates were rated significantly higher on teaching and planning nursing care than were graduates from associate degree and hospital diploma programs.

Recent literature addressing the problem of a broad spectrum of personal variables as they relate to clinical

performance of nursing students is limited (Morgan, 1974; Koehne-Kaplan and Tilden, 1976; French and Rezler, 1976).

Most research that seems to have some bearing on the problem can be considered to fall into one of several categories: performance of registered nurses, personality of registered nurses, performance of nursing students, and personality of nursing students.

The primary reason for existence of any professional program is to prepare persons for performance in that profession. Knowledge of existing activities and behaviors in a profession is essential to those who educationally prepare future performers. Urey (1968) explored a method of identifying and classifying activities and behaviors of nurses through task analysis. Each nursing procedure, selected on the basis of its frequent implementation, was performed by a registered nurse and observed by two observers. The method was determined by the researcher to be reliable and could be easily adopted for use by nursing educators. Prompted by interest in efficient and effective analysis of nurses' performance in the clinical setting, Dunn (1970) examined the relationship between a cognitive test of scientific principles and observed performance of selected registered nurses. Significant differences were observed and reported by the investigator. Five nurses who scored highest on

the cognitive test performed least well in the clinical area, while the five who scored least well on the cognitive test received better scores for actual performance. Both Urey and Dunn supported the necessity for examining a broad spectrum of personal variables as well as further exploration in the area of clinical performance.

Kelly (1974), Gilbert (1975), and Beck (1976) examined the degree of congruence between leadership potential and personality traits. Kelly (1974) compared the scores of registered nurses on the Minnesota Multiphasic Personality Interview, Sixteen Personality Factors Questionnaire, California Psychological Inventory, and Edwards Personal Preference Schedule, with promotion as the criterion. Analysis revealed only one of the derived multiple correlation coefficients as statistically significant. Of those nurses who were promoted, decisive traits were found to be capacity for status, femininity, and poise. Gilbert (1975) compared personality scores with managerial (leadership) scores of 70 graduate students in two specialities: medical-surgical and psychiatric nursing. Although no significant differences in leadership potential were observed between the two groups, distinctions in personality did exist. A related study by Beck (1976) compared registered nurses' scores on the Myers-Briggs Type Indicator with their scores on

the Management Style Diagnosis Test. Beck reported a significant difference between nurses in staff positions and nurses in supervisory positions on the task orientation dimension. Executive style differences existed in that nursing supervisors who scored high on the executive dimension were of the sensing type, while staff nurses on that same dimension were intuitive types. These findings generally support the earlier determinations of Lukens (1965) and Miller (1965).

While studies dealing with demographic and personality characteristics of nursing students have been widespread (Singh, 1971), most have been concerned with a constricted number of variables and, more specifically, have related to the theory portion of nursing education rather than the clinical portion. An exception is the study by Koehne-Kaplan and Tilden (1976), in which they explored a concern about the relationship of personality to the process of clinical judgment in a clinical setting. Test scores from the Jungian Type Survey were used to examine the degree of relationship to Final Examination scores of 99 baccalaureate nursing students. A combination of pen, pencil, and simulated nurse-patient situations were used as the Final Examination Score. Although the analysis revealed no significant relationships, observation of the gross data distinguished personality types. A related

study by Johnson and Leonard (1970) pointed out that noncognitive measures of interest and personality have failed to contribute significantly to the prediction of clinical performance. An earlier observation by Taylor et al. (1966) supports these findings.

Summary

In summary, the review of related literature pointed out the following:

1. Although personality characteristics of registered nurses and nursing students have been the subject of extensive research, most studies are directed toward success in theoretical aspects.
2. Predictors of success in clinical performance are few in number.
3. Few educators have used research models which permit use of a holistic approach to predict successful clinical performance.

CHAPTER 3

PROCEDURES

This chapter includes four phases: Phase One describes the development of the Q Sort instrument and a pilot test of that instrument; Phase Two describes the sample and data collection; Phase Three describes the production of shape (Q analysis) factors; Phase Four describes relationships between shape factors and scores from two other instruments, the Sixteen Personality Factor Questionnaire, and the Comprehensive Ability Battery.

The major question to be answered involved one of analyzing relationships between clinical-performance type variables and personal variables in the cognitive, affective, and psychomotor domains.

Although the available literature provided a wealth of information concerning personal variables and their hypothesized relation to nursing education, it did not provide an instrument for collecting data about students' clinical performance that would be suitable for this study. While instruments have been developed, such as those

by Palmer (1960, 1962) and Tate (1964), none focused on a holistic approach to obtain performance criteria. Also, either they required a huge expenditure of person power and time or were so contaminated with possible error variance as to be relatively useless. Therefore, it was necessary to develop an instrument that encompassed performance in the cognitive, affective, and psychomotor domains, while not requiring the mammoth amount of time usually required for observation in all of these areas.

Rather than focusing on a few specified nursing procedures, it was decided that the project should sample broadly from the total spectrum of clinical experiences encountered in a baccalaureate nursing program. This included sampling from attitudes, knowledges, and psychomotor behaviors in order to provide a holistic frame of reference for the patterns.

After the development of the clinical performance data-gathering instrument, a method was selected for isolating patterns of types from the information to be collected. A major criterion in selection of the pattern-isolation method was that it must lend itself to creating continuous variables from the patterns.

In addition to collecting the data concerning clinical performance, commercial tests of personal variables in the cognitive, affective, and psychomotor domains

were administered to all students in the sample. Pearson product moment correlation coefficients were calculated between scores on those tests and the clinical performance pattern variables.

Phase One: Instrumentation

In order to develop an appropriate technique to collect a broad spectrum of clinical performance data, it was first necessary to ask and respond to two questions:

1. What content should be included to collect a broad spectrum of data on each student's clinical performance?
2. What type of instrument could be utilized to provide a total picture of each student's clinical performance within a reasonable span of time?

Development of the Instrument

Based on statements found in the literature, intensive review of baccalaureate curricula, discussions with nursing educators and practitioners, as well as the investigator's 15 years of personal observation in the clinical setting, 20 seemingly appropriate constructs were reviewed by selected faculty from the University of Florida College of Nursing for the purpose of establishing their suitability to baccalaureate nursing education.

The selected constructs with references are listed as follows:

1. Adaptability (Fischbach, 1977)
2. Breadth of categorization (Urey, 1968)
3. Communications (Raven, 1972; Ryden, 1977; Tetreault, 1976)
4. Confidence (Raven, 1972)
5. Decision-making quality (Schwirian, in press)
6. Flexibility of cognitive closure (Koehne-Kaplan and Tilden, 1976)
7. Initiative (VanDenby, 1976)
8. Mode of perception (Koehne-Kaplan and Tilden, 1976)
9. Persons, data, and things orientation (Moody, 1973)
10. Reality orientation (Henderson, 1973)
11. Responsibility (Ventura, 1976; Richards, 1972)
12. Tolerance for complexity (Schwirian, in press)
13. Assessment (Lewis, 1973)
14. Intervention (Lewis, 1973)
15. Safety (Dunn, 1970)
16. Evaluation (Lewis, 1973)
17. Leadership (Ventura, 1976; Gilbert, 1975)
18. Professional roles and relationships (Ventura, 1976)

19. Research (Lewis, 1973)
20. Teaching (Schweer, 1972).

A total of 193 items were then generated to sample behaviors that seemed to typify the constructs.

The most obvious solution to the problem of obtaining data in many performance areas within a short time span was the use of a self-report technique. Self-report has been validated for a variety of purposes, including clinical performance. Among those, Peterson et al. (1975, p. 13) reported that of a total sample of 164 nursing students, 47 rated themselves exactly as their instructors rated them; 48 rated themselves within 1 point of their instructor's rating; 41 rated themselves within 2 points of their instructor's rating; while 28 rated themselves within 3 or more points of their instructor's rating. Similar results have been reported by Palmer (1962) and Schwirian (in press). Cronbach (1970, p. 493) offered that "self-report can be treated as a record of typical behaviors, which the subject is in a uniquely excellent position to observe." However, self-report posed certain other problems, chiefly that of social desirability biasing the responses. Experts (Cronbach, 1970; Guertin, 1966; Cattell, 1973; Lemon, 1973) recommended that this problem is best handled by an instrument based on a forced-choice format.

Therefore, the instrument that was developed, as described later in this chapter, involved a ranking, or ipsatizing procedure.

Because the selected methodology allowed the ranking of a limited number of items, the investigator could at best only sample behaviors. Further consultation with selected faculty from the University of Florida College of Nursing aided in the final decision of which behaviors to retain. Of the original 193 items, 96 were selected as those most appropriate for describing the selected constructs and most suitable for baccalaureate education.

Pilot Test of the Selected Items

A 5-point Likert scale was developed for use with the 96 items so they could be subjected to a pilot testing procedure.

Twenty senior nursing students from Barry College in Miami, Florida, volunteered to test the selected items. Senior students were requested for the pilot testing since they were essentially at the same academic level and had had clinical experiences similar to those of the sample identified for the total project.

Student comments were solicited by the investigator following the testing procedure in order to determine

readability and clarity of the items. Based on their suggestions and comments, several statements were reworded. Means and standard deviations were computed and examined. The distribution of a large number of items provided evidence of bias due to social desirability of the content. This justified use of a forced-choice format such as the Q Sort.

Q Sort Items: Profile of Perceived Performance

Each of the 96 items was printed on a 2-x-3 card (Figure 1).

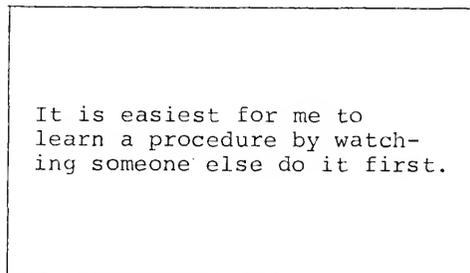


Figure 1. Sample Q Sort card.

The items were separated into two Q Sorts, each having 48 items, to permit ease in the procedure of sorting. The list of items making up both Q Sorts can be found in Figure 2. The first 48 items refer to

motivational concerns subsumed under the identified constructs, while items 49 through 96 refer to actual performance.

I offer assistance to colleagues who need help

Setting priorities in client care is easy for me.

The more challenging client care is, the better I perform.

It is easiest for me to learn a procedure by watching someone else demonstrate it first.

Frequently used procedures rarely become automatic with me.

I am unaware of using one of my senses more than another during client assessment.

Information presented in broad terms is more understandable to me than when it is presented in minute detail.

I take appropriate action on unusual symptoms.

No matter how I feel, I assume responsibility for care of the total client.

I enjoy working with complex information that is necessary for planning effective care.

Above all else, I am a good listener.

I perform as well in situations around many persons as when left alone.

I carry out my clinical responsibilities no matter what.

It is easy for me to work within the confines of a hospital routine.

My decisions are usually effective.

Legal aspects related to client care usually influence my nursing practice.

I remain in the clinical area during assigned hours without thinking about frequent breaks.

My instructor and I agree on my level of achievement in the clinical area.

Figure 2. Q Sort items

I enjoy working with clients who have complex equipment helping them.	It gives me confidence to know that my instructor is near by.
It is unusually disturbing to me to be corrected.	It is typical for me to seek out additional learning experiences.
I develop nursing plans that are highly detailed.	Performing adequate "follow-through" on all procedures is typical of me.
My performance is best when I am left alone.	I use all of my senses in picking up cues from clients during assessment.
Using terms that clients understand is typical of me.	If time permits, I do additional work that seems to be needed.
It is important to me to communicate in such a way as to let others know precisely what I mean.	Useful information is usually obtained by me through a client's history.
I find it difficult to see where I am wrong, even when it is pointed out to me.	I prefer to listen to a lecture on a new procedure rather than read about it.
I enjoy working with clients who need reassurance and support.	The nursing plans I develop are actually workable.
Clinical assignments involving many details are difficult for me to handle.	I enjoy developing nursing plans for all clients assigned to me.
Once I have made a decision, I seldom change my mind.	I hate to interrupt working on something because I have to go and work on something else.
Once I have started a procedure, although complicated, I will not stop until it is completed.	Interruptions to my routine do not bother me.

It is unlikely that my decisions contain errors.

My clinical assignments are completed without being urged by my instructor.

New symptoms are interpreted by me without automatically attributing them to an original diagnosis.

Although not pointed out to me, I recognize my limitations.

Last minute changes in a clinical assignment are usually acceptable to me.

It is usual for me to clearly describe a client's reactions.

Routine tasks bore me.

When I complete a task, I think of other ways it might have been done better.

Rate your ability to:

use counseling as a means of helping clients identify and solve their own problems.

initiate assessments of current nursing practices in client care.

reassess situations and plan new approaches for client-related problems.

instruct clients post-operatively, using scientific rationale in terms they understand.

maintain a scholastic effort for development of a knowledge base for safe practice.

formulate and test hypotheses for client care.

proceed safely with a nursing plan before checking with instructor.

make accurate judgments based on scientific knowledge and client data.

accurately interpret physiological data, such as vital signs, lab reports.

protect client from danger, injury or risk.

promote group consensus of solutions to client-related problems.

use library resources in search of a knowledge base.

insure appropriate range of motion exercises for the immobilized client.

establish priorities of client care.

predict client's potential for wellness.	insure appropriate skin care to the immobilized client.
use correct body mechanics.	accurately interpret results of medication.
compare anticipated and actual results of nursing action.	precisely monitor a client's fluid and electrolytes, vital signs, tubes, post-operatively.
solve client care problems that involve others.	substantiate decisions with appropriate documentation.
use concepts of change theory to analyze information.	instruct clients, using information in accord with their changing daily needs.
Meaningfully organize information about a client.	adhere to a moral and ethical code of nursing practice.
give consideration to scientific principles as a way to insure safe practice.	prepare clients for discharge through imparting knowledge, assessing their understanding of current state of health.
pursue reading for personal growth.	provide clients with sufficient explanations about their care so that they can assist in monitoring their own progress.
work well with others.	handle self as professional in client care.
systematically investigate a problem through use of library resources.	utilize group teaching techniques.
develop a workable plan of care.	establish rapport with other members of the health team.
utilize scientific references while completing assignments.	obtain useful information from a client.

Figure 2--(continued)

consider risk of consequences to the client.	make judgments free of personal biases.
give direction to nursing assistants.	perform manual skills.
assess nursing action in light of its possible risk to self and agency.	make decisions based on consideration of the probability of consequences.
give of self while providing direction for the client.	create a climate for free interaction with others.
prepare client pre-operatively, including psychological support.	utilize principles of asepsis when administering intramuscular injections.

Figure 2--(continued)

Sixteen Personality Factor Questionnaire

The Sixteen Personality Factor Questionnaire is a multidimensional set of 16 questionnaire scales (Cattell et al., 1970). The test was used in the research since it measures a number of personality variables that have been considered important by nursing educators. Each factor was measured on a bipolar scale, although the test was comprised of 187 items (Figure 3).

The Sixteen Personality Factors Questionnaire (16 PF) was untimed, although Form B took approximately 50 minutes, when used in the study. The dependability coefficient for Form A is .86 (test-retest). The stability

coefficient for males is .49 and females .62 (test-retest). The validity of the test is construct validity: Direct concept validity is equal to .79 while the indirect validity is equal to .96.

Factor A

Reserved (detached, critical,
cool)

Outgoing (warmhearted,
easy-going,
participating)

Factor B

Less intelligent (concrete-
thinking)

More intelligent (abstract-
thinking)

Factor C

Affected by feelings (less
stable)

Emotionally stable (faces
re-
ality)

Factor E

Humble (mild, accommodating)

Assertive (independent,
aggressive)

Factor F

Sober (prudent)

Happy-go lucky (impul-
sively
lively)

Factor G

Expedient (evades rules)

Conscientious (rule-bound)

Factor H

Shy (timid)

Venturesome (socially bold)

Factor I

Tough-minded (self-reliant)

Tender-minded (dependent)

Figure 3. Sixteen factors for Sixteen Personality Factor Questionnaire.

Factor L

Trusting (adaptable, easy to get on with)	Suspicious (self-opinionated)
---	-------------------------------

Factor M

Practical (careful, regulated by external realities)	Imaginative (wrapped up in inner energies)
--	--

Factor N

Forthright (sentimental)	Shrewd (calculating)
--------------------------	----------------------

Factor O

Placid (self-assured, confident)	Apprehensive (troubled)
----------------------------------	-------------------------

Factor Q₁

Conservative (respecting established ideas)	Experimenting (critical, analytical)
---	--------------------------------------

Factor Q₂

Group-dependent (a joiner)	Self-sufficient (resourceful)
----------------------------	-------------------------------

Factor Q₃

Undisciplined Self-Conflict	Controlled (socially precise)
-----------------------------	-------------------------------

Factor Q₄

Relaxed (unfrustrated)	Tense (frustrated)
------------------------	--------------------

Figure 3--(continued)

Comprehensive Ability Battery

The comprehensive Ability Battery, developed by Hakstian and Cattell (1975), consists of 20 primary mental abilities. Of those, three were selected for use in this study since they offered assessment in areas not usually measured by commercial tests, spontaneous flexibility, ideational fluency, and aiming.

Spontaneous flexibility (F_s) reflects the ability to break traditional sets and use of flexible ideas to generate a large amount of information. It is a timed test of 6 minutes of working time. The reliability (1975) for males is .74, for females, .87. The direct concept validity is .72.

Ideational fluency (F_i) is concerned with generating ideas about a given topic rapidly, thus measuring the ability to quickly retrieve learned material. It is a timed test of 4 1/2 minutes of working time. The reliability (1975) for males is .84, for females, .78. The direct concept validity is .88.

Aiming refers to the ability to carry out precise movements, requiring eye-hand coordination under high speed conditions. It was timed with 5 minutes working time. The reliability (1975) for males is .81, for females, .75. The direct concept validity is .94.

Each of these tests was administered by the investigator according to the designated directions accompanying the test.

Phase Two: Collection of Data

Sample

Ninety-six senior level nursing students from three upper division baccalaureate nursing programs in Florida volunteered to participate in the study. In order to prevent bias that might occur because of any possible dissimilarities in the curricula, an equal number of subjects was chosen from each university. Although 102 students volunteered to participate, they were not equally distributed among the universities. Therefore, 6 excess subjects were randomly eliminated.

Students of senior level status were selected for the project since they were relatively at the same academic level, already had a significant amount of clinical experience, and, therefore, were much closer to "real world" nursing practice. Only students who volunteered to participate were used in the project.

Prior to identifying the sample, criteria were specified by the investigator:

1. Only nursing students having senior level status would be considered.

2. Students must be enrolled in an upper division baccalaureate nursing program in Florida.
3. Students would be volunteers.

The three nursing programs that most matched these criteria were Florida State University, the University of Florida, and the University of South Florida.

Collection of Data

The data for the study were collected during February and March, 1977, by the investigator.

A letter (Appendix A) sent to the Dean of Nursing in each of the three universities selected for the study explained the underlying nature of the study, including a brief description of the instruments that would be used. It was requested that students be allowed the opportunity of participating in the study. A follow-up telephone call to each dean resulted in permission to meet with those students who indicated a willingness to participate. At this time, there was agreement between the dean and the investigator as to a specific time and place for the meeting with the students.

During each testing session with various groups ranging in numbers from 2 to 36, the investigator informed the students of the purpose of the study.

Concern for the protection of human subjects was assured in several ways. First, participation was on a

voluntary basis only. Second, students were assured of the confidentiality of any data that they had contributed. Third, students were assured that the data would not be released by name to anyone other than the investigator. Fourth, confidentiality was maintained by removing identifiable data and substituting a code number.

Subjects who volunteered to participate in the project completed a Biographic Data Form (Appendix B) at the time of test administration. Of the 96 respondents there was a total of 87 females and 9 males; of those, 66 were between the ages of 20-23, 27 between the ages of 24-26, 6 between the ages of 27-29, and 9 were over 30 years of age with the oldest 47. All had been employed at some time, with the exception of 16. Of those that had been employed, 67 had been employed in a health-related area (Table 1).

The investigator was physically present during each testing session. Each student was required to sort two decks of cards (Q Sorts), complete a timed three-part commercial test and one standardized test having 183 items.

Each Q Sort consisted of 48 statements each printed on a separate card as described earlier. In addition to these cards, each student received seven additional cards with numbers printed on them indicating the number of

TABLE 1. Distribution of Biographic Data by University

	Age			Sex		Ethnic Group	
	20-29	30-39	40-49	Male	Female	White	Black
	Florida State University	29	3	-	2	30	32
University of Florida	28	4	-	5	27	31	1
University of South Florida	30	1	1	2	30	32	1

	Prior Work Experience		
	Health Related	Health Related and/or Other	None
	Florida State University	27	13
University of Florida	19	12	5
University of South Florida	21	9	8

TABLE 1-- (continued)

	Reason for Choice of Nursing			
	Economic	Service to Others	Career Opportunities	Other
Florida State University	-	11	15	6
University of Florida	3	14	12	3
University of South Florida	1	18	10	3

statements that must be placed in the pile. Those numbers, 1, 3, 11, 18, 11, 3, 1, were addressed on a continuum from MOST LIKE ME to LEAST LIKE ME. The subjects were allowed to move the cards around if they so chose. Following completion of each Q Sort, cards were labeled by students with their name and student number.

The Comprehensive Ability Battery was administered as a timed test. A stop watch was used so that standardization could be achieved for all persons. Directions were read aloud as indicated in the manual accompanying the test.

The Sixteen Personality Factor Questionnaire was given last. Since it was not a timed test, students were free to leave the testing area as soon as they were finished.

The total testing time for each group was approximately 2 1/2 hours.

Phase Three: Production of Shape Factors

The data from each subject's Q Sort were keypunched onto computer cards, shown graphically in Figure 4. It was necessary to hand score the three subtests of the Comprehensive Ability Battery, but a computer program was available to score the Sixteen Personality Factor Questionnaire (16 PF). The latter test had been

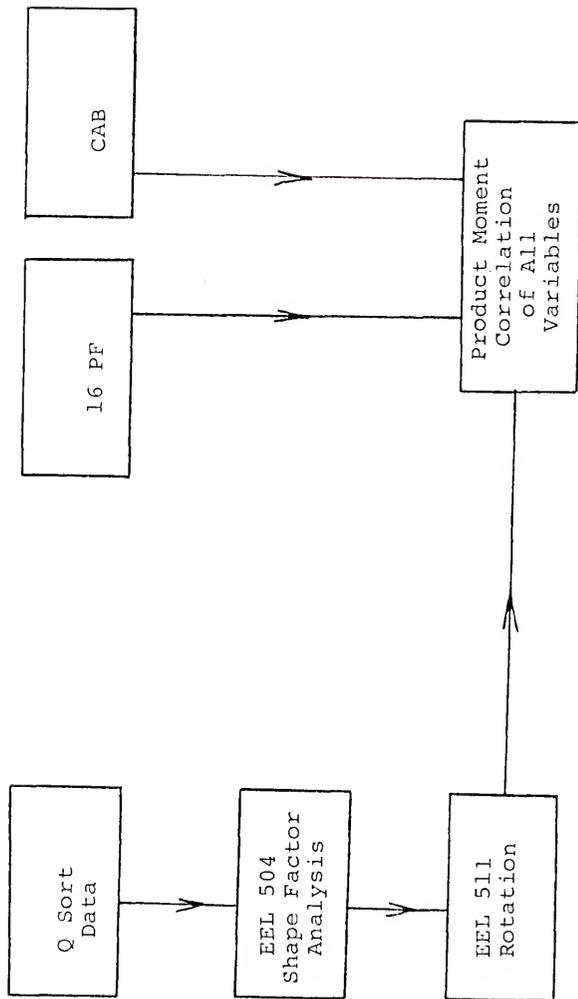


Figure 4. Overview of procedures.

administered on sheets designed for optical scanning, which was the method used to transfer the responses to computer cards prior to scoring.

Scores of the Comprehensive Ability Battery and the 16 PF were transferred to computer cards and later used in a correlation procedure with the variables derived from shape pattern variables.

There are a variety of techniques that may be used to produce types or patterns from sets of data collected on, from, or about individuals. Those data sets are usually called profiles. Types are groups of individuals with similar profiles called patterns.

One of the common misconceptions about types is that they consist only of categories. Eysenck (1973, p. 19) pointed out that

There is no reason to believe that the notion of a typology presupposes a categorical system; both Jung and Kretschmer, who were possibly the best known typologists of the inter-war period, postulated a dimensional rather than the categorical scale.

Since it is more informative to know the degree to which a person fits a type rather than simply knowing what he is or is not, types that could be expressed as a continuum seemed more desirable than those that merely represented a classification. That is to say, it is helpful to know not only with which type one's profile

is most congruent, but to know exactly how congruent it is with that type, and with the other types isolated from the same kinds of data.

The nature of the instrument for collecting clinical performance data placed some restriction on the selection of a pattern analysis technique. Because Q Sort is, in essence, a shaping technique (i.e., students' placement of items actually results in an ordinal positioning of all items), it seemed appropriate to use the analysis Stephenson (1953) recommended for use with Q Sort. First developed by Stephenson in 1936, the technique is a factor analytic procedure involving the correlation of persons rather than of tests. The method was called Q technique by Cattell (1952). It differs from ordinary factor analysis (R analysis) in that the matrix of test scores (or other data) is transposed so that the resultant correlation matrix represents the similarity of each person's profile to the profile of each person in the group. Factor analysis of this correlation matrix then proceeds in the usual way. Factors isolated through this technique are called shape factors. A computer program for this procedure is available in the Education Evaluation Library (Guertin and Bailey, 1970) housed in the Northeast Regional Data Center, Gainesville, Florida, under the title EEL 504.

The use of Q analysis as the method for isolating clinical performance types was particularly desirable because it provided information in the form of factor loadings that give evidence of the relative congruence of each profile with each pattern. An additional incentive was the successful use by Ammons (1972) of shape factor loadings as continuous variables in multivariate analysis.

Accordingly, items of the Q Sorts for each student were submitted to analysis with EEL 504. One item was dropped from each Q Sort to prevent each subject from having any given score predictable from a knowledge of all the others. The principal axes matrix from EEL 504 was produced on computer cards as a by-product of that program, and was submitted to processing with EEL 511, the factor rotation program of the Education Evaluation Library (Guertin and Bailey, 1970), to produce computer cards containing a factor matrix rotated to the Varimax criterion. Output from EEL 511, loadings for each subject on each shape factor, became the pattern variables required by this study.

Phase Four: Computation of Coefficients of Correlation for All Variables

In order to investigate relationships between the type variables and the personal variables from the Sixteen Personality Factor Questionnaire (16 PF) and the Comprehensive Ability Battery (CAB), Pearson product moment correlations were computed.

CHAPTER 4
ANALYSIS AND INTERPRETATION OF DATA

This chapter discusses shape factors, type identification, type descriptions, and correlation of shape factors and personal variables.

The Shape Factors

Shape (Q) analysis, with the 96 subjects as variables, involved 94 of the Q Sort items. The resulting principal axes matrix consisted of 71 factors, which accounted for 88.35 percent of the common variance. That was 92.03 percent of the total variance. Rotation to the Varimax criterion produced a 17-factor solution accounting for 64.48 percent of total variance, which was 70.08 percent of the common variance. This sum of squares loading for each of the rotated factors appears in Table 2.

Identifying the Types

In order to determine which, if any, of the shape factors might have usefulness as type variables, each factor was inspected visually for the strength of its

TABLE 2

The Sum of Squared Loadings of Rotated Shape Factors

Factor	Sum of Squared Loadings
1	8.16
2	5.67
3	2.42
4	2.80
5	4.33
6	2.65
7	2.01
8	2.34
9	3.85
10	3.49
11	2.27
12	5.10
13	3.56
14	4.23
15	2.37
16	2.42
17	2.27

loadings. By use of the criterion of having no less than three subjects loading at a minimal level of .50 (Guertin and Bailey, 1970), factors one, two, three, four, and nine were identified. Loadings of all subjects on those factors are shown in Appendix C. Those five factors accounted for only 23.8 percent of the total variance, which was 26 percent of the common variance. Table 3 presents the number of subjects whose loadings were at the criterion level for each factor that qualified as a type. That table also shows the percentage of common variance

accounted for by each of those factors, defined as the ratio of the sum of squared loadings on the factor to the total common variance extracted by the principal axes matrix.

TABLE 3
Factors Selected as Type Variables

Pattern	Factor	Number of Subjects Loading at .50	% of Common Variance
1	1	8	9.2
2	2	4	6.4
3	3	4	2.7
4	4	3	3.2
5	9	4	4.4

Comparison of data in Table 3 with the sum of squared loadings in Table 2 reveals that those factors which qualified as patterns were not always those accounting for the largest amount of variance. Indeed, patterns three and four were representative of the weaker factors of the rotated solution, respectively explaining only 2.7 percent and 3.2 percent of the variance. The factor loadings were not much different from those expected by chance.

Pattern Descriptions

Development of patterns from the shape factors separately for each of the five factors meeting the criterion was accomplished by identifying the students having loadings of at least .50 on the factor and then determining the means and standard deviations of each Q Sort item for those students. Those data are shown for each of the five type factors, as well as those for the total group, in Table 4.

Qualitative descriptions of each pattern are the result of selecting those items whose mean was particularly high or particularly low. Since the Q Sort items were weighted on a scale 1 through 7, high was defined as a mean of 5.25 or above, while low was defined as a mean of 2.75 or less. These values represented the extreme values for the 7-point scale. Since the weighting scheme for the Q Sort allowed a student to place only 8 percent of the items in each of these extreme categories, it would seem that items with means at the respective levels would reflect meaningful characteristics of the patterns.

Inspection of Tables 5 through 9, showing the content of meaningful items for each pattern, provided an overview for describing salient characteristics of the types.

TABLE 4

Means and Standard Deviations of All Items for Each Pattern

Item No.	Total Group (N=96)		Pattern 1 (N=8)		Pattern 2 (N=4)		Pattern 3 (N=4)		Pattern 4 (N=3)		Pattern 5 (N=5)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
1	5.11	0.86	5.63	0.70	3.75	0.43	5.75	0.43	5.00	0.82	4.25	0.43
2	4.13	0.92	4.00	0.87	2.75	0.83	4.75	0.43	5.00	0.00	4.50	0.50
3	4.36	1.00	4.00	0.71	4.25	0.43	4.25	0.43	4.33	0.47	4.50	0.87
4	4.79	1.08	4.63	0.70	5.50	1.12	3.25	0.43	4.00	0.00	5.00	0.71
5	3.03	0.99	3.00	0.71	3.75	0.83	3.25	1.30	3.67	1.25	2.50	0.50
6	3.58	0.83	3.00	0.87	2.75	1.09	3.25	0.43	3.67	1.25	3.00	0.71
7	3.33	0.79	3.50	0.50	3.00	0.71	3.75	0.83	3.00	0.00	2.50	1.12
8	4.27	0.88	3.63	0.48	4.75	0.43	4.00	1.00	5.33	0.47	4.75	0.43
9	4.70	1.09	5.13	0.93	5.25	0.83	4.25	1.09	4.67	0.47	4.75	1.48
10	3.93	0.82	3.63	0.48	3.25	0.83	4.75	1.30	4.00	0.82	5.00	0.71
11	5.04	1.34	6.50	0.71	5.75	0.43	4.25	0.83	4.33	1.25	4.75	1.30
12	3.60	1.08	3.63	0.48	3.50	0.87	4.50	0.50	4.67	0.47	4.00	0.71

TABLE 4, continued

Item No.	Total Group (N=96)		Pattern 1 (N=8)		Pattern 2 (N=4)		Pattern 3 (N=4)		Pattern 4 (N=3)		Pattern 5 (N=5)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
13	4.28	0.99	3.50	0.50	4.00	0.71	5.00	1.00	4.00	0.00	3.75	0.43
14	3.81	1.02	3.13	1.05	3.75	0.43	4.25	0.43	3.67	0.47	4.00	0.71
15	4.53	0.77	4.50	0.50	4.25	0.43	4.50	0.50	6.00	0.82	4.50	0.87
16	3.53	0.94	4.00	0.50	3.75	0.43	3.00	0.71	5.00	0.82	3.75	0.83
17	4.42	0.93	4.38	0.70	3.75	0.43	4.75	0.43	3.67	0.47	4.50	0.50
18	4.36	0.90	4.63	0.99	4.50	0.50	4.75	0.43	5.00	0.00	3.75	0.43
19	3.81	1.07	3.63	0.48	2.25	0.83	4.50	1.12	4.33	1.25	5.00	0.71
20	3.27	0.98	3.13	0.60	4.50	0.50	3.25	0.83	3.00	0.00	2.50	1.66
21	2.64	0.97	2.13	0.60	2.75	0.43	2.75	1.09	1.33	0.47	2.75	0.83
22	4.73	1.20	5.38	0.86	3.75	0.43	5.25	0.83	4.00	0.82	5.50	1.12
23	3.58	0.95	3.88	0.78	4.25	0.43	4.75	0.83	3.00	0.82	3.00	0.71
24	4.16	0.74	4.50	0.97	4.50	0.87	3.75	0.43	4.67	0.47	3.25	0.43
25	4.28	1.29	4.38	1.11	3.25	0.83	3.75	0.83	4.00	0.00	3.75	1.48
26	4.42	0.84	4.88	0.93	4.25	1.09	3.75	0.43	5.00	0.82	5.00	0.00

TABLE 4, continued

Item No.	Total Group (N=96)		Pattern 1 (N=8)		Pattern 2 (N=4)		Pattern 3 (N=4)		Pattern 4 (N=3)		Pattern 5 (N=5)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
27	4.50	0.85	5.13	0.60	4.75	0.43	4.25	0.43	4.67	0.47	4.75	0.43
28	4.69	0.78	4.63	0.86	4.00	0.71	4.25	0.43	4.33	0.47	4.75	0.83
29	4.65	1.04	4.63	0.48	5.00	0.71	4.25	0.83	5.33	1.25	4.50	0.87
30	4.02	0.71	4.50	0.50	4.00	0.00	3.75	0.83	3.67	0.47	4.25	0.83
31	4.00	0.95	4.38	0.70	4.00	1.00	4.00	1.22	3.33	0.47	4.00	0.00
32	5.01	1.22	5.13	0.78	6.50	0.87	6.50	0.87	3.67	0.47	5.25	1.30
33	4.42	0.74	4.63	0.48	4.50	0.50	3.75	0.43	5.00	1.41	4.25	0.83
34	3.04	0.96	3.13	0.33	4.00	0.71	1.75	0.83	2.33	0.47	3.50	0.50
35	3.67	1.01	3.63	0.86	3.75	0.43	2.75	0.83	3.00	0.00	3.50	0.50
36	2.94	1.01	2.50	1.22	2.50	0.50	3.50	0.50	3.00	0.00	3.00	0.00
37	3.65	0.99	3.50	1.12	4.25	0.83	3.25	1.09	3.33	0.47	3.50	0.50
38	4.11	0.93	4.00	0.50	4.50	1.12	3.25	0.83	3.67	0.94	3.75	0.83
39	3.65	0.77	3.88	0.60	3.50	0.87	4.00	0.71	4.33	0.47	4.00	0.00
40	3.31	0.80	3.00	1.12	3.75	0.43	4.00	0.71	3.67	0.94	3.00	1.22

TABLE 4, continued

Item No.	Total Group (N=96)		Pattern 1 (N=8)		Pattern 2 (N=4)		Pattern 3 (N=4)		Pattern 4 (N=3)		Pattern 5 (N=5)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
41	3.90	0.87	4.25	0.66	3.00	0.00	4.75	0.43	4.67	0.94	3.50	0.50
42	4.83	0.84	4.13	0.60	5.25	0.43	4.75	0.83	5.00	0.82	4.25	0.43
43	4.15	0.77	3.75	0.43	4.25	0.83	4.50	0.50	4.33	0.47	4.50	0.87
44	3.57	0.74	3.25	0.66	3.25	0.43	4.00	0.71	4.00	0.00	3.50	1.12
45	3.53	1.26	3.63	1.11	4.25	0.83	3.00	1.58	2.67	0.47	3.25	1.30
46	4.57	0.99	3.88	0.78	4.75	0.43	3.75	0.83	4.33	0.47	5.25	1.09
47	4.34	1.03	4.50	0.71	5.00	1.00	3.00	0.71	3.67	0.47	4.50	0.87
48	4.66	1.13	5.50	0.50	5.50	1.12	4.50	0.87	4.67	0.94	5.75	1.09
49	4.31	0.84	4.00	0.71	3.75	1.09	4.75	0.83	5.00	0.00	4.50	0.50
50	3.75	0.95	4.13	1.05	3.75	0.83	3.75	0.83	4.33	0.47	3.50	0.50
51	4.02	0.94	4.25	0.66	4.00	0.00	4.75	0.43	4.67	0.47	5.00	0.71
52	4.05	0.83	4.63	0.48	4.75	0.43	3.75	0.43	5.00	0.82	4.50	0.50
53	4.87	0.92	4.88	0.60	5.25	0.43	5.25	0.83	5.67	0.94	4.25	0.43
54	4.37	0.78	4.25	0.66	4.75	0.43	4.00	0.71	4.33	0.47	5.00	0.00

TABLE 4, continued

Item No.	Total Group (N=96)		Pattern 1 (N=8)		Pattern 2 (N=4)		Pattern 3 (N=4)		Pattern 4 (N=3)		Pattern 5 (N=5)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
55	3.31	0.93	3.88	0.60	3.50	0.50	3.50	0.50	3.33	1.25	2.75	0.43
56	4.15	1.06	3.75	0.66	4.00	0.71	4.50	1.12	4.00	0.00	5.00	0.71
57	3.47	1.08	2.75	0.83	4.50	0.50	2.75	0.43	3.33	0.47	4.50	1.50
58	2.91	0.95	2.75	0.83	2.50	0.87	2.75	1.09	3.00	0.82	3.25	0.83
59	4.14	0.88	4.00	0.71	4.00	0.71	4.25	0.43	4.00	0.00	3.25	0.43
60	3.64	1.14	3.63	0.99	3.50	1.12	4.00	0.71	3.00	0.00	3.25	0.43
61	4.58	1.04	4.88	1.17	4.50	0.87	5.25	0.43	4.67	0.47	4.25	1.09
62	3.44	0.98	3.63	0.99	3.50	1.12	3.75	0.83	3.00	0.00	4.25	0.43
63	4.31	0.84	4.13	0.33	4.50	0.50	4.00	0.71	3.00	1.41	4.25	0.83
64	3.33	1.07	3.75	0.83	2.25	0.83	1.50	0.50	4.00	0.82	3.50	0.50
65	3.65	0.89	3.13	0.93	3.25	0.83	3.75	0.83	5.00	0.00	4.00	0.71
66	3.53	0.79	3.88	0.78	3.50	0.50	3.50	0.50	3.33	1.25	3.50	0.50
67	4.20	1.07	3.25	1.39	3.75	1.30	4.25	0.43	5.00	0.00	4.50	0.50
68	3.55	1.05	3.50	0.71	4.25	1.09	3.75	0.83	2.33	0.94	4.00	0.71

TABLE 4, continued

Item No.	Total Group (N=96)		Pattern 1 (N=8)		Pattern 2 (N=4)		Pattern 3 (N=4)		Pattern 4 (N=3)		Pattern 5 (N=5)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
69	3.75	1.05	3.13	1.05	3.50	1.12	3.75	0.43	3.33	0.47	3.50	0.87
70	2.71	1.12	3.00	0.50	2.25	0.83	2.00	0.71	3.00	0.82	1.50	0.50
71	4.28	0.89	4.38	0.70	4.00	0.00	4.25	0.83	4.00	0.82	4.50	1.12
72	4.14	1.01	4.13	0.78	5.25	0.83	4.25	0.43	3.33	0.94	4.25	0.43
73	4.90	1.02	4.38	1.11	4.75	0.83	5.50	0.50	4.33	0.47	4.25	0.43
74	3.97	0.96	3.38	0.70	4.00	0.71	4.25	0.83	4.67	0.47	3.75	0.83
75	4.17	0.97	4.75	0.66	4.00	0.71	4.25	0.83	4.67	0.47	4.75	1.09
76	4.06	1.28	3.88	1.36	3.50	1.12	4.75	0.83	4.00	0.82	4.75	1.09
77	4.52	1.04	5.50	0.87	4.00	1.22	3.75	0.43	3.67	0.47	5.75	0.83
78	5.27	1.21	6.00	0.87	5.75	0.83	5.00	1.58	5.67	0.47	4.25	0.83
79	4.96	0.88	5.13	0.60	4.50	0.50	5.00	1.00	5.33	1.25	4.00	0.00
80	2.95	1.05	2.00	0.87	3.25	0.43	3.00	0.00	2.33	0.94	3.75	0.83
81	4.49	0.88	4.25	0.83	4.25	0.43	4.50	0.50	5.33	0.94	3.75	0.83
82	4.56	1.08	4.88	0.78	3.75	0.43	3.75	0.43	4.33	1.25	3.50	0.50

TABLE 4, continued

Item No.	Total Group (N=96)		Pattern 1 (N=8)		Pattern 2 (N=4)		Pattern 3 (N=4)		Pattern 4 (N=3)		Pattern 5 (N=5)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
83	3.60	0.91	3.38	0.86	3.25	1.09	3.00	1.22	3.33	0.47	3.00	1.41
84	4.19	0.83	4.13	0.33	4.50	0.50	4.75	0.43	3.67	0.47	4.00	0.00
85	4.22	0.80	4.00	0.71	4.25	0.43	3.50	0.50	5.33	1.25	4.25	0.83
86	4.09	1.25	4.13	1.27	3.50	0.50	4.50	0.50	4.33	1.25	3.50	0.50
87	2.97	1.12	3.25	0.97	2.25	0.83	3.50	1.12	4.33	1.25	2.75	0.83
88	4.05	1.01	3.88	0.78	4.00	0.00	3.00	1.00	4.00	0.00	4.50	0.87
89	3.21	0.97	3.13	1.05	4.25	0.43	3.00	0.71	3.00	0.82	2.75	0.43
90	3.80	0.87	3.25	0.43	5.00	1.58	4.25	0.43	3.67	0.47	3.75	0.43
91	5.18	1.23	5.50	0.87	4.25	1.09	6.50	0.87	3.67	1.25	6.00	1.22
92	3.92	0.94	4.63	1.22	3.50	0.50	3.75	0.83	4.00	0.00	2.75	0.83
93	4.31	0.79	4.13	0.33	5.25	1.09	4.50	0.50	3.67	0.94	5.00	0.71
94	4.53	0.85	3.88	0.78	5.25	0.43	4.50	0.50	3.67	0.47	4.25	0.43

Type 1

Students in Pattern 1 (Table 5) seem to be cooperative, outgoing individuals who are interested in the client as a person. Low means for "formulating hypotheses . . ." and "use library . . ." suggest a lack of interest in the scientific aspect of client care. An important performance characteristic of these students is their effort to promote client independence where appropriate.

Type 2

Students in Pattern 2 (Table 6) seem to be conscientious and very task- and procedure-oriented. They may be less concerned about the client's psyche and more concerned with his physical needs. The client may be regarded more as a patient than as a person.

Type 3

Students in Pattern 3 (Table 7) seem to be conscientious, cooperative, and have little difficulty in handling many details. There does not seem to be any concern with the ability to establish priority in client care. The unusually high means for ". . . working with clients who need . . . support," and ". . . give of self . . ." are indicative of a warm, nurturing type. Again, in this pattern there is evidence of a lack of interest in the scientific basis of nursing procedures.

TABLE 5
Content of Pattern 1

Item No.	Content	Mean	Standard Deviation
1	I offer assistance to colleagues who need help.	5.63	.70
11	Above all else, I am a good listener.	6.50	.71
22	It is typical for me to seek out additional learning experiences	5.38	.86
48	use counseling as a means of helping clients identify and solve their own problems.	5.50	.50
77	provide clients with sufficient explanations about their care so that they can assist in monitoring their own progress.	5.50	.87
78	work well with others.	6.00	.87
91	give of self while providing direction for the client.	5.50	.87
36	Once I have made a decision, I seldom change my mind.	2.50	1.22
57	use library resources in search of a knowledge base.	2.75	.83
58	formulate and test hypotheses for client care.	2.75	.83
80	systematically investigate a problem through use of library resources.	2.00	.87

TABLE 6
Content of Pattern 2

Item No.	Content	Mean	Standard Deviation
4	It is easiest for me to learn a procedure by watching someone else demonstrate it first.	5.50	1.12
11	Above all else, I am a good listener.	5.75	.43
9	No matter how I feel, I assume responsibility for care of the total client.	5.25	.83
32	I enjoy working with clients who need reassurance and support.	6.50	.87
42	My clinical assignments are completed without being urged by my instructor.	5.25	.43
48	use counselor as a means of helping clients identify and solve their own problems.	5.50	1.12
53	protect client from danger, injury, or risk.	5.25	.43
72	meaningfully organize information about a client.	5.25	.83
93	prepare client pre-operatively, including psychological support.	5.25	1.09
94	utilize principles of asepsis when administering intramuscular injections.	5.25	.43
58	formulate and test hypotheses for client care.	2.50	.87
2	Setting priorities in client care is easy for me.	2.75	.83

TABLE 6--(continued)

Item No.	Content	Mean	Standard Deviation
6	I am unaware of using one of my senses more than another during client assessment.	2.75	1.09
19	I enjoy working with clients who have complex equipment helping them.	2.25	.83
36	Once I have made a decision, I seldom change my mind.	2.50	.50
64	use correct body mechanics.	2.25	.83

TABLE 7
Content of Pattern 3

Item No.	Content	Mean	Standard Deviation
1	I offer assistance to colleagues who need help.	5.75	.43
22	It is typical for me to seek out additional learning experiences.	5.25	.83
32	I enjoy working with clients who need reassurance and support.	6.50	.87
53	protect client from danger, injury or risk.	5.25	.83
61	establish priorities of client care.	5.25	.43
73	adhere to a moral and ethical code of nursing practice.	5.50	.50
91	give of self while providing direction for the client.	6.50	.87
34	Clinical assignments involving many details are difficult for me to handle.	1.75	.83
35	I enjoy developing nursing plans for all clients assigned to me.	2.75	.83
57	use library resources in search of a knowledge base.	2.75	.43
58	formulate and test hypotheses for client care.	2.75	1.09
64	use correct body mechanics.	1.50	.50

Type 4

Students in Pattern 4 (Table 8) are destined to be stars in any critical care nursing unit. They are able to handle routine tasks without boredom but also seem alert to the unusual. They work well with teams, but do not seem to be outgoing, person-oriented individuals. They differ from the preceding three patterns in a seeming disinterest in interpersonal involvement with clients.

Type 5

Students in Pattern 5 (Table 9) appear to be loners who lack self-assurance and seem to be more comfortable with clients than with peers. They prefer information presented in an uncomplicated fashion. Another characteristic of these students is to promote client independence where appropriate. They are probably more adequate than they feel themselves to be.

Correlation of Shape Factors and Personal Variables

Pearson product moment correlation coefficients were computed between the five type variables, the 16 personal variables from the Sixteen Personality Factor Questionnaire (16 PF), the two cognitive variables from the Comprehensive Ability Battery (CAB), and the single

TABLE 8
Content of Pattern 4

Item No.	Content	Mean	Standard Deviation
8	I take appropriate action on unusual symptoms.	5.33	.47
53	protect client from danger, injury, or risk.	5.67	.94
78	work well with others.	5.67	.47
79	handle self as professional in client care.	5.33	1.25
81	develop a workable plan of care.	5.33	.94
85	consider risk of consequences to the client.	5.33	1.25
38	Clinical assignments involving many details are difficult for me to handle.	2.33	.47
45	Routine tasks bore me.	2.67	.47
68	solve client care problems that involve others.	2.33	.94
18	systematically investigate a problem through use of library resources.	2.33	.94

TABLE 9
Content of Pattern 5

Item No.	Content	Mean	Standard Deviation
22	It is typical for me to seek out additional learning experiences.	5.50	1.12
32	I enjoy working with clients who need reassurance and support.	5.25	1.30
46	Although not pointed out to me, I recognize my limitations.	5.25	1.09
48	use counseling as a means of helping clients identify and solve their own problems.	5.75	1.09
77	provide clients with sufficient explanations about their care so that they can assist in monitoring their own progress.	5.75	.83
91	give of self while providing direction for the client.	6.00	1.22
5	Frequently used procedures rarely become automatic with me.	2.50	.50
7	Information presented in broad terms is more understandable to me than when it is presented in minute detail.	2.50	1.12
55	promote group consensus of solutions to client-related problems.	2.75	.43
87	give direction to nursing assistants.	2.75	.83
89	assess nursing action in light of its possible risk to self and agency.	2.75	.43

TABLE 9--(continued)

Item No.	Content	Mean	Standard Deviation
92	create a climate for free interaction with others.	2.75	.83

psychomotor variable from the latter instrument. These coefficients are shown in Table 10.

Using the procedure described by Guilford (1965, p. 162), each correlation coefficient was tested to determine whether or not it represented a significant departure from 0. Stated in a null form, the hypothesis was

$$H_0: \bar{r}_{xy} = 0.$$

$$\alpha .01$$

The procedure involved calculation of \bar{z} , or deviation units, for each correlation coefficient with the formula

$$\bar{z} = \frac{r_{xy}}{\sigma_{r=0}}$$

where

$$1/\sqrt{N}.$$

The significance of \bar{z} is determined by relating that statistic to the area under the normal distribution. A correlation coefficient of .26 was required to reject the hypothesis of zero correlation for the data presented in Table 10.

TABLE 10
 Correlations Between Type Variables and
 Personal Variables

Item No.	Type				
	1	2	3	4	5
1	0.22	0.07	-0.12	-0.08	-0.15
2	0.14	-0.02	-0.03	0.15	0.10
3	0.10	-0.12	-0.17	-0.06	-0.07
4	-0.13	-0.08	0.07	0.07	-0.15
5	-.25	-0.04	0.12	0.04	-0.05
6	0.21	-0.00	-0.19	0.08	-0.01
7	0.27*	-0.20	-0.13	-0.17	-0.10
8	0.06	0.18	0.26*	0.16	0.21
9	-0.20	0.12	0.15	-0.10	0.11
10	-0.24	-0.01	0.14	0.09	0.01
11	0.09	0.02	-0.01	0.01	0.08
12	-0.11	0.09	0.29	0.07	-0.03
13	-0.26*	-0.02	-0.10	0.02	-0.10
14	-0.35*	0.05	0.04	0.07	0.09
15	0.12	-0.08	-0.28*	-0.09	0.01
16	-0.20	0.13	0.15	-0.05	0.12
17	-0.04	-0.05	0.08	0.01	-0.28*
18	0.13	0.13	-0.16	-0.04	0.01
19	-0.05	0.03	-0.01	0.05	0.08
20	1.00	0.05	-0.01	-0.20	-0.08

TABLE 10--(continued)

Item No.	Type				
	1	2	3	4	5
21	0.06	1.00	-0.04	-0.12	0.10
22	-0.01	-0.04	1.00	0.04	-0.12
23	-0.18	-0.13	0.04	1.00	0.01
24	-0.07	0.10	-0.02	0.01	1.00

*p < .01.

Variables Labels

16 PF (bipolar)	12. Self-assured--Apprehensive
1. Reserved--Outgoing	13. Conservative--Experimenting
2. Less intelligent--More intelligent	14. Group dependent--Self-sufficient
3. Affected by feelings--Emotionally unstable	15. Undisciplined--Controlled
4. Humble--Assertive	16. Relaxed--Tense
5. Sober--Happy-go-lucky	17. Spontaneous Flexibility
6. Expedient--Conscientious	18. Ideational fluency
7. Shy--Venturesome	19. Aiming
8. Tough-minded--Tender-minded	20. Type 1
9. Trusting--Suspicious	21. Type 2
10. Practical--Imaginative	22. Type 3
11. Forthright--Astute	23. Type 4
	24. Type 5

Inspection of Table 10 reveals that three out of the five shape variables correlated ($p < .01$) with one or more of the personal variables.

The Type One variable (shape factor loadings) correlated positively with the 16 PF bipolar variable "shy versus venturesome" and negatively with the 16 PF bipolar variables "conservative versus experimenting" and "group-dependency versus self-sufficient." Since the higher scores on the bipolar variables represent, as in the usual format, behaviors more typical of that connoted by the second named (or right-hand) descriptor, Type One's positive correlation with "venturesome" and negative correlation with "experimenting" and with "self-sufficient" seems contradictory. However, considering the description of the Type One students as "cooperative . . . outgoing . . . interested in the client as a person . . ." it is possible to visualize them as socially venturesome in the extraverted sense, and group-oriented in that they are comfortable with and are stimulated by others. Such persons might well be conservative in areas not related to personal interaction.

The Type Three variable showed positive correlation with the 16 PF variable "tough-minded versus tender-minded" and negative correlation with the instrument's variable called "undisciplined self-conflict versus

controlled." The type description was suggestive of a warm nurturing personality, quite consistent with the positive correlation with the 16 PF "tender-minded" variable. The type's high mean on the Profile of Perceived Performance item concerning ". . . give of self . . ." is not inconsistent with the negative correlation with the 16 PF "controlled" variable, which is further described (Cattell, 1973) as "socially precise, compulsive." In order to give freely of self, it may be necessary on occasion to be something less than precise in regard to social considerations. A high degree of self-control, in fact, probably inhibits the giving of self by many persons whose inner wishes may be in the direction of showing concern and caring for others but who are prevented from doing so by fear of revealing their inner selves.

The Type Five variable correlated negatively with the cognitive spontaneous flexibility from the Comprehensive Ability Battery (CAB). This variable, as indicated in Chapter 3 involves the breaking of sets and the generation of a large amount of new semantic information in a short time. As measured in the CAB, it is similar to what is commonly termed verbal fluency. This relationship may explain to some degree the poor self-concept that seems embedded in the Type Five description.

These persons feel themselves to be in a poor light in modern society, where the ability to verbalize is often mistaken for intelligence. However, it is a highly desired characteristic in a social context, as it is in an educational context.

Neither type variables Two nor Four correlated highly with any of the personal variables.

In light of the correlations described for Types One, Three, and Five, it can be concluded that there might be some personal variables that are significantly related to patterns of perceived clinical performance.

CHAPTER 5

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This chapter summarizes the earlier chapters. Conclusions of the statistical analyses and recommendations for further investigations are discussed.

The research was designed to identify patterns of behavior in clinical performance of baccalaureate nursing students and to determine their relation to certain personal variables in the cognitive, affective, and psychomotor domains. A total sample of 96 senior level nursing students from three major universities in Florida participated in the project.

In order to nurture those individual differences of nursing students which may contribute to the different styles of clinical performance needed in the health care delivery system, it was necessary to determine first whether such styles could be identified empirically. The objectives identified to achieve this purpose were

1. To isolate and identify styles or patterns of nursing performance behaviors, and
2. To determine whether a relation exists between patterns of nursing performance behaviors and personal variables of nursing students.

Because available instruments required a huge expenditure of person power and time or were considerably contaminated with possible error variance, it was necessary to develop an instrument that encompassed performance in the cognitive, affective, and psychomotor domains.

Rather than focusing on a few specified nursing procedures, it was decided that the project should sample broadly from the total spectrum of clinical experiences encountered in a baccalaureate nursing program. This spectrum included sampling from attitudes, knowledges, and psychomotor behaviors in order to provide a holistic frame of reference for the patterns.

A self-report technique was used to collect data over a wide spectrum of clinical performance behaviors. The items were presented in a Q Sort format for the purpose of compensating for bias due to social desirability of some items. The instrument was given the title "Profile of Perceived Performance."

After development of the clinical performance data-gathering instrument, a method was selected for isolating patterns or types from the information that was to be collected. A major criterion in selection of the pattern-isolation method was that it lend itself to creating continuous variables from the patterns.

The use of Q factor analysis as the method for isolating clinical performance types was particularly desirable

because it provided information in the form of factor loadings that gave evidence of the relative congruence of each profile with each pattern. Q factor analysis, a factor analytic procedure involving the correlation of persons rather than tests, produced five patterns which accounted for only a small amount of total variance (26%). However, the qualitative descriptions of those patterns seemed to have credibility when compared with personal observations of practicing nurses.

Continuous variables from the shape factors were produced by using each subject's factor loadings on all rotated factors that had qualified as pattern factors (i.e., three or more subjects loading at .50 or above).

In addition to collecting the data concerning clinical performance, commercial tests of personal variables in the cognitive, affective, and psychomotor domains were administered to all subjects in the sample.

Pearson product moment correlation coefficients were computed between the five type variables, the 16 personal variables from the Sixteen Personality Factor Questionnaire, and the two cognitive variables from the Comprehensive Ability Battery, and the single psychomotor variable from the latter instrument.

Conclusions

Although five types were identified by applying the previously specified criteria, the Q factors from which

they were derived did not account for the major portion of variance associated with the "person" intercorrelation matrix. Thus, over half of the variance was associated with those factors on which fewer than three persons loaded at .50 or higher. For that reason, caution should be used in making inferences concerning the type variables.

There are several possibilities that might explain the limited success of the instrument (Profile of Perceived Performance) in identifying patterns of nursing performance behaviors. One possibility involves the processes by which students were selected by the various upper division nursing programs. A dual screening process, encompassing academic success and persistence through two years of lower division course work as well as a formal screening procedure prior to being admitted to the nursing program, had been utilized. Such processes tend to bring about a truncated range of cognitive talent and may well result in a similar truncation in affective areas.

Also contributing to the limited success of the instrument to identify patterns may have been the wording of the items. The relative lack of student sophistication, in so far as the terminology of nursing education is concerned, may have contributed to a variety of item interpretations.

A relationship between clinical performance and some measurable personal characteristics was tentatively confirmed, since three out of the five shape variables

correlated ($p < .01$) with one or more of the personal variables. The Type One variable (shape factor loadings) correlated positively with the Sixteen Personality Factor Questionnaire (16 PF) bipolar variable "shy versus venture-some" and negatively with the 16 PF bipolar variables "conservative versus experimenting" and "group-dependency versus self-sufficient." The Type Three variable correlated positively with the 16 PF bipolar variable "tough-minded versus tender-minded" and negatively with the variable "undisciplined self-conflict versus controlled." The Type Five variable correlated negatively with the cognitive "spontaneous flexibility" from the Comprehensive Ability Battery (CAB).

Neither variables Type Two nor Type Four correlated highly with any of the personal variables.

In light of the correlations described for Types One, Three, and Five, it was concluded that there might be some personal variables that are significantly related to patterns of perceived clinical performance.

Recommendations

The instrument developed for this study has potential usefulness in a variety of situations. With some adaptation its self-report format makes it an excellent tool for helping nursing students to acquire insight into their clinical skill. Instructors' ratings of the students'

skills could be compared to the students' own self-report ratings, and both instructors and students might well be enlightened in the process.

Another potential use is in program evaluation. Data on students' perceived strengths and weaknesses, coupled with the faculty's own observations in that regard, might point out areas for curricular or methodological adjustments. Conversely, it could point out the students' need for greater skills in reality testing. Further recommendations are that the Profile of Perceived Performance (POPP) be developed into a forced-choice format that is less time consuming in scoring so that a larger sampling could be made. Also, criterion measures in clinical performance, such as clinical grades and faculty estimates of students' performance, should be obtained and examined for relationships with student profiles on the POPP, with type variables derived from the POPP, and, possibly, with the individual items from that instrument, as well as with Q and R factors in relation to those external clinical performance criteria.

An additional utilization of the study might be to develop a questionnaire using the 20 selected constructs which faculty members could place in order of priority according to their relative importance for students in baccalaureate nursing programs. Additionally, faculty might be given the opportunity of suggesting other basic

constructs whose values had not been previously recognized. Items could then be developed, assigning weights relative to the information obtained from the questionnaire.

With some adaptation, the POPP might also be administered to junior level nursing students. A combination of items identified from junior and senior level nursing students could be used to assist administrators of nursing programs in identifying the actual performance level of their students. Such information might not correspond to the level purported to be that of a particular nursing program. However, the results might assist a faculty in differentiating between the idealized and actual performance level at which they are preparing students for practice.

By use of faculty and student input, discrepancies between the idealized and actual levels of performance might be detected.

Further exploration with other personal variables, such as needs, locus of control, cognitive closure, and related cognitive variables should be undertaken with the POPP to determine whether relationships exist between performance type and a larger number of personal variables.

The method used to identify patterns of nursing performance behaviors could be easily adapted for use with practicing nurses. By sampling nurses who are successful in "real world" settings, the value and suitability of

the patterns for particular roles in a variety of clinical specialties might be determined (i.e., leaders and followers in intensive care nursing, surgical nursing, and psychiatric nursing). A comparison could then be made between patterns or styles of students and practicing nurses to determine the degree to which nursing programs are preparing nurses who can function successfully in various "real world" settings.

The potential usefulness of the method and the instrument is not limited to nursing education and nursing practice. Other health care professions should find adaptation of both the method and instrument beneficial in studying these disciplines.

APPENDIX A

LETTER TO THE DEANS

S. Joan Gregory
10575 125th Street, North
Largo, Florida 33540

February 1, 1977

Gwendoline R. MacDonald, Ed.D.
Dean, College of Nursing
University of South Florida
4202 Fowler Avenue

Dear Dean MacDonald,

Over the past several years I have been interested in personal variables as they affect clinical performance in nursing. As you know, authorities at the national level consider this question to be one of great significance. Therefore, I am utilizing my doctoral research as an opportunity to increase the small body of knowledge that exists in this area.

The purpose of this study is to investigate cognitive, affective, and psychomotor factors related to clinical performance of baccalaureate nursing students. This will be accomplished through the use of four short standardized tests and a Q Sort that has been especially designed for the baccalaureate level student. The total time required to complete these instruments is approximately two hours per student.

I have selected senior level nursing students in three State upper division nursing programs for study. A sample of 33 such students from each of the three programs will be necessary for a successful study.

I am hereby requesting your permission to include the University of South Florida in the sample. You may be assured that I will supply you with complete results of the study. Also, I would be pleased to provide test interpretation to each participating student.

I will contact you next week by phone for your response. At that time, I would also like to discuss specific dates for administration of the tests, selection of students who will participate in the study, and other related details.

Sincerely yours,

S. Joan Gregory

APPENDIX B
BIOGRAPHIC DATA

Last Name	First Name	Middle Name	Social Sec. No.
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Permanent Address--Street No.	City, County, State	Zip Code
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Mailing Address--Street No.	City, County, State	Zip Code
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Sex	Birth Date	Number of:	Have you ever
<input type="checkbox"/> Male	No. Day Yr.	<input type="checkbox"/> Brothers	attended a junior
<input type="checkbox"/> Female		<input type="checkbox"/> Sisters	college?
		<input type="checkbox"/> Children	<input type="checkbox"/> Yes How long? <input type="checkbox"/>
			<input type="checkbox"/> No

How do you describe yourself? (Please check ONE.)

1. Am. Indian 2. Black, non-Hispanic origin
3. Asian or Pacific Islander 4. Hispanic
5. White, non-Hispanic origin 6. Foreign student,
non-immigrant
-

Previous work experience (Please check where applicable to you.)

1. Hospital 2. Nursing home 3. Doctor's
office
4. Other 5. None
-

Why did you choose nursing? (Please check only ONE.)

1. Economic 2. Service to others 3. Career
Oppor-
tunities
4. Medical school
not available 5. Other

APPENDIX C
LOADINGS ON SHAPE PATTERN FACTORS

Item	Pattern 1	Pattern 2	Pattern 3	Pattern 4	Pattern 5
1	0.4809	0.2711	0.0215	-0.0010	0.0270
2	0.1082	0.1745	-0.0477	0.1528	0.0273
3	0.0566	0.2336	0.0715	0.2246	0.1923
4	0.5537	0.1843	0.0716	0.1333	0.3127
5	0.2016	0.2944	-0.1763	0.2914	-0.0127
6	0.0288	0.4423	0.0311	0.0488	0.4539
7	0.0943	0.0066	-0.0657	0.1330	0.1083
8	0.0587	0.0669	-0.1414	0.3000	0.1190
9	0.2766	0.6399	-0.0072	0.0847	0.1190
10	0.0703	0.0285	-0.0209	0.7894	0.0347
11	0.1360	0.1158	-0.0197	0.2055	0.0456
12	0.5222	0.1653	0.1925	-0.0009	0.0924
13	-0.0157	0.0564	0.0642	-0.0070	0.0515
14	0.1268	0.1672	-0.1599	0.0167	0.2345
15	0.3162	0.5522	0.1606	-0.0360	-0.0263
16	0.3868	0.1869	-0.1734	0.0327	0.2725
17	0.1842	0.2494	0.2292	0.1384	0.1887
18	0.5039	0.1167	-0.0227	0.3481	0.0900
19	0.1959	0.2920	0.1423	0.0729	0.1183
20	0.1069	0.0373	0.0321	-0.0496	0.0703

APPENDIX C, continued

Item	Pattern 1	Pattern 2	Pattern 3	Pattern 4	Pattern 5
21	0.0149	0.0945	0.2403	0.4265	0.2904
22	0.1081	0.3557	0.1113	0.2181	0.1029
23	0.3550	0.1658	-0.0950	0.2050	0.0686
24	0.2401	0.3483	0.1350	0.0122	0.1787
25	0.4244	0.4083	0.1326	-0.0561	0.0877
26	0.1929	0.3701	0.1134	0.0267	0.1309
27	0.4153	0.2647	0.2506	0.1171	0.0877
28	0.4791	0.4466	-0.0349	0.2314	0.1569
29	0.0423	0.0362	0.7323	0.0251	0.0898
30	0.0876	0.3359	-0.0510	-0.1025	0.2464
31	-0.0413	0.1293	-0.0505	0.0606	0.0203
32	0.2747	0.2533	-0.0661	-0.0470	0.2960
33	0.2877	0.2431	0.0561	0.0666	-0.0786
34	0.1055	-0.0807	0.0812	0.0811	0.0257
35	0.1795	0.4390	-0.2566	0.1152	-0.0370
36	0.1904	0.0594	-0.2768	0.0080	0.0842
37	0.3800	0.0862	0.0132	0.0273	0.1733
38	0.0631	0.0699	-0.1109	0.2109	-0.1111
39	0.3479	0.1020	0.2010	0.0504	-0.1017
40	0.4859	0.3221	-0.2783	0.1336	0.0838
41	0.4925	0.1156	-0.0473	0.0239	-0.0464
42	0.1989	0.1118	-0.0972	-0.0355	0.1642

APPENDIX C, continued

Item	Pattern 1	Pattern 2	Pattern 3	Pattern 4	Pattern 5
43	0.2729	-0.3349	0.1469	-0.0610	0.1022
44	0.1787	0.1681	-0.0316	-0.0145	0.1247
45	0.4792	0.2536	-0.0607	0.0062	0.2278
46	0.4252	0.2564	0.0896	0.0211	0.0834
47	0.1221	0.1917	0.0041	0.0644	-0.0099
48	0.3028	0.0189	0.0716	0.1109	0.1831
49	0.3257	0.1166	-0.2000	0.1128	0.0838
50	0.2358	0.0841	0.0955	0.0976	0.1227
51	0.2890	-0.0921	-0.3340	0.0642	0.2145
52	0.4960	0.0121	0.0612	0.2148	0.0278
53	0.7576	0.1263	-0.1080	-0.0206	-0.0007
54	0.4322	0.0905	-0.0355	0.0027	-0.0252
55	0.2225	0.1166	0.0440	0.0455	0.0156
56	0.1541	0.1554	-0.0990	0.0286	0.4074
57	-0.0380	0.2849	-0.1991	-0.0652	0.0753
58	-0.0552	0.1530	-0.0822	0.0802	0.3421
59	0.1404	-0.0705	0.1412	0.3390	0.0826
60	-0.0103	0.1966	0.3526	0.0272	-0.0101
61	0.3887	0.2078	0.0230	0.3539	0.1915
62	0.1400	0.0288	-0.0227	0.1317	-0.0548
63	0.2081	0.0318	0.0544	-0.1140	-0.0545
64	0.5642	0.1746	0.1029	0.0533	0.1716

APPENDIX C, continued

Item	Pattern 1	Pattern 2	Pattern 3	Pattern 4	Pattern 5
65	0.2981	0.2253	0.0264	-0.0864	0.1885
66	0.3275	0.1013	0.0949	0.0335	0.0857
67	0.5261	0.0609	-0.2531	-0.0347	0.2344
68	0.2527	0.1898	0.2244	-0.1323	0.1876
69	0.2652	0.4045	0.0016	0.1920	0.1499
70	-0.0054	0.2492	-0.0425	0.2765	0.3245
71	0.3650	0.1281	-0.0078	-0.0175	0.1913
72	0.0981	0.1414	0.0230	0.4191	0.1931
73	0.5325	0.2518	-0.0197	-0.0039	0.1769
74	0.2288	-0.0298	-0.0453	0.1047	0.2457
75	0.0778	-0.0219	0.2328	0.3797	0.3529
76	0.3363	0.1857	0.1431	0.1060	0.1264
77	0.4489	0.0619	0.2957	0.1701	0.0910
78	0.1734	0.3546	-0.0297	0.0649	0.3146
79	0.3448	0.0865	-0.0693	0.0934	0.1241
80	0.2819	0.3345	-0.0677	-0.1154	0.2268
81	0.1266	0.2434	-0.1977	0.1633	0.5920
82	0.1965	0.4997	0.0134	-0.1182	0.3996
83	0.4440	0.1479	0.0486	0.2001	0.3660
84	0.1611	0.0736	0.0723	0.1035	0.6244
85	0.2236	0.1882	-0.0654	0.1436	-0.0686
86	0.0595	0.0651	-0.2818	-0.0918	0.1958

APPENDIX C, continued

Item	Pattern 1	Pattern 2	Pattern 3	Pattern 4	Pattern 5
87	0.1633	0.1459	-0.1254	0.3139	0.1168
88	0.0990	0.6244	0.0356	0.0106	0.0926
89	0.1931	0.2273	-0.2843	0.0239	0.2900
90	0.1540	0.0948	0.0400	0.1989	0.2134
91	0.1864	0.4475	-0.0346	0.1476	0.1595
92	-0.0690	-0.0473	-0.1599	-0.1204	-0.1100
93	0.1842	0.0127	-0.1101	0.1382	0.1146
94	0.1739	0.1335	0.2540	-0.0339	0.4693
95	0.1250	0.4313	-0.2150	0.0658	0.1022
96	0.2058	0.3781	0.0486	0.0423	0.0160

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BIOGRAPHICAL SKETCH

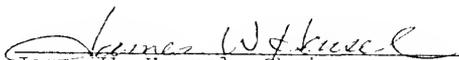
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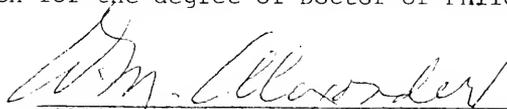
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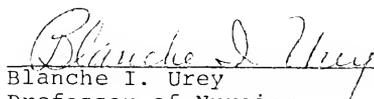
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August, 1977

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