

The Relationship of Cognitive Styles and Stress in Nursing Students¹

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The notion that nursing education may by its very nature be a stressful experience has attracted growing interest and concern among nursing educators. Although the educational process in general has been the subject of much research, few studies have focused specifically on nursing education. This study examines nursing education in light of relationships among cognitive style, tolerance of ambiguity, and stress.

Cognitive style refers to a mental characteristic that influences the way in which we assimilate new information. Cognitive styles vary, so that a particular approach that effects learning in one person may not do the same for another. Moreover, in order to acquire certain kinds of knowledge, an individual may be required to employ multiple, perhaps incompatible, cognitive styles. Such a circumstance can inspire feelings of conflict and may result in a stress response to the learning process.

A construct of cognitive style that is particularly relevant to nursing education is field dependence (FD) versus field independence (FI). The construct describes figure-ground relationships (Witkin, Dyk, Faterson, Goodenough, & Karp, 1962/1974) and relates to whether people perceive, and thus assimilate, information in a global (FD) or in an analytical (FI) fashion. Nursing students are required to engage in educational tasks that demand varying degrees of both analytical and global functioning, often simultaneously. Before they enter a school of nursing, most students have developed a cognitive structure that works effectively for courses such as chemistry, anatomy/physiology, and physics. In these areas the course work is structured and requires an analytical mode of assimilating information (Perry, 1970). Unlike many other disciplines, however, nursing immediately thrusts students into

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the clinical area, where they must perform in situations that require both global and analytical skills.

According to Witkin and Goodenough (1977) and Goldstein and Blackman (1978), two other important constructs related to FD and FI are *tolerance of ambiguity* and *stress*. A person who is tolerant of ambiguity functions best in an ambiguous situation; conversely, ambiguous situations are threatening for individuals who are intolerant of ambiguity. Stress describes the physiological, behavioral, and cognitive responses to uncomfortable situations. In nursing education students encounter both structured and ambiguous situations, and also experience stress in relation to their academic programs.

COGNITIVE STYLES AND STRESS

The cognitive model FD-FI was developed in 1954 by Herman A. Witkin and his associates. Witkin was primarily interested in global and analytical modes of perception (Goodenough & Witkin, 1977). The theory of psychological differentiation posits that individuals who deal with elements independently of their background and who consistently approach tasks analytically are FI. On the other hand, people who approach situations from a global standpoint, consistently focusing on the total field without giving attention to its parts, are considered FD.

A number of studies have suggested that FD and FI subjects differ in their psychological functioning and, consequently, in their preferences for certain fields of study. FI subjects, for example, tended to prefer fields such as mathematics, physics, biology, engineering, and architecture. On the other hand, FD subjects preferred fields such as counseling, teaching, business, and nursing (Barrett & Thornton, 1967; Morris & Bergum, 1978; Osipow, 1969; Witkin, 1973). In addition, FI people were described as preferring solitary activities, being individualistic, and being cold and distancing in their relationships with others. FD people were described as sociable, gregarious, and interested in people (Witkin & Goodenough, 1977).

The "tolerance of ambiguity" construct used in this study was defined by MacDonald in 1970. According to that definition, people with low tolerance of ambiguity desire to have everything reduced to "black and white," whereas people with high tolerance for ambiguity seek it out, enjoy it, and perform well in ambiguous situations.

Stress, although often poorly defined, generally describes a broad range of responses that are readily identifiable. They can range from

nonspecific physiological responses when a demand is placed on the body (Selye, 1956) to the onset of specific illnesses associated with the occurrence of major life changes (Holmes & Rahe, 1967). Although the relationship between social-environmental conditions and physiological responses to stress appears to be well documented (Goldberg & Shlomo, 1982), Thompson and Leckie (1978) were the first to quantify the combined psychological, physiological, and behavioral stress response as experienced by the individual.

The ways in which FD-FI, tolerance of ambiguity, and stress response relate to educational measures, such as grades, scholastic aptitude test scores, and satisfaction with certain courses or fields, have been an enlightening focus of research. A 1977 study by Witkin, Moore, Oltman, Goodenough, Friedman, Owen and Raskin showed significant positive correlations between FI scores and grades in mathematics and science courses. The findings also suggested that FI students do better in natural science; in contrast, FD students preferred the social sciences and humanities.

While an increasing number of studies on cognitive style have been relevant to problems in education (Witkin, Moore, Goodenough, & Cox, 1977) no studies explored the constructs of FD-FI, tolerance of ambiguity, and stress within the context of nursing education. The demands that student nurses employ both FD and FI skills in order to assimilate knowledge and to apply it almost immediately in a clinical setting, as well as the ambiguity inherent in clinical practice and in educational settings, may be related to nursing students' academic performance and to the perception that nursing education is a stressful experience (Fox & Diamond, 1965; Garrett, Manuel, & Vincent, 1976; Sobol, 1978; Webb & Herman, 1978). This study was undertaken to investigate those issues.

Research Questions

This study proposes to answer three primary research questions:

- (1) What are the relationships among FD-FI cognitive styles, tolerance of ambiguity, and the stress response in nursing students?
- (2) How do FD-FI, tolerance of ambiguity, and the stress response relate to nursing students' academic performance as measured by overall grade point average, college aptitude tests, natural science course grades, and social science course grades?

- (3) Do FD-FI, tolerance of ambiguity, and the stress response predict nursing students' overall grade point average and, specifically, grades in social science courses and natural science courses?

METHOD

Sample and Setting

The subjects who volunteered for this study were drawn from a sophomore class of 78 students enrolled in the first clinical nursing courses of a baccalaureate degree nursing program at a major state university. A total of 66 students, or 85% of the sophomore class, participated in the study. The sample included 50 White female nursing students, 10 ethnic minorities, and 6 white males. The analyses were limited to the 50 White female nursing students, since conflicting research findings have been associated with FD-FI and the variables of sex and ethnic background (Berry, 1976).

Instruments

Group Embedded Figures Test (GEFT). This test consists of a series of complex figures within which specific simple figures can be located. The subject finds and traces the simple figure directly in the test booklet. The test is scored on 18 complex figures. Each section has a specific time limit, and scores are determined by the total number of simple figures correctly traced in the second and third sections of the test. The first section is used for practice and, consequently, is not included in the total score. An individual is considered more FI as more correct simple figures are identified.

Spearman-Brown Prophecy reliability coefficients have been reported from .92 to .82; a 3-year test-retest reliability of .89 existed for both college men and women (Donlon, 1977; Witkin, Oltman, Raskin, & Karp, 1971). In addition, Denson (1977) found a Kuder-Richardson 20 (KR20) reliability coefficient of .88. In this study, Cronbach's standardized alpha reliability coefficient was .82.

Validity studies have shown the GEFT to be a valid and stable instrument (Adevai, Silverman, & McGough, 1968; Messick & Fritzky, 1963; Mos, Wardell, & Royce, 1974; Witkin, Moore, Goodenough, & Cox, 1977).

Although population norms have not been established for the GEFT, Witkin et al. (1971) reported preliminary norms based on 397 men and 242 women college students from an eastern liberal arts college. The mean for the men was 12.0 (SD 7.4, 10), while the mean for the women was 10.8 (SD = 4.20). Carter and Loo (1980) provided norms for 93 men and 173 women undergraduate students ranging in age from 18 to 24 years old. The mean reported was 13.85 (SD = 4.22) for the women. Carter and Loo concluded that the men and women in their sample were significantly more FI than the norms reported by Witkin et al. (1971).

Ambiguity Tolerance Test (AT-20). MacDonald (1970) conducted a series of studies to investigate the properties of Rydell and Rosen's (1966) original 16-item Ambiguity Tolerance Scale. The adapted scale, called the AT-20, was revised by including four additional items that raised the split-half reliability coefficient (Spearman-Brown Formula) from .64 to .86. Using the KR20, MacDonald found a coefficient of .73. From the data of this study, the Cronbach's standardized alpha reliability coefficient was .74.

The AT-20 consists of true-false statements that are scored for high ambiguity tolerance. Examples of several statements include: "There's a right way and a wrong way to do almost everything" and "I don't like to work on a problem unless there is a possibility of coming out with a clear-cut and unambiguous answer." Evidence of construct validity was reflected in significant correlations between the scale and the Rokeach Dogmatism Scale, the Gough-Sanford Rigidity Scale, and the F Scale for Authoritarianism.

MacDonald (1970) established preliminary norms by administering the AT-20 to 789 undergraduate students and found a mean of 10.87 (SD = 3.32, N = 448) for women and a mean of 10.04 (SD = 3.38, N = 341) for the men.

Symptoms of Stress Inventory (SOS). Thompson and Leckie (1978) developed the Symptoms of Stress Inventory to measure the physiological, behavioral, and cognitive components of the stress response. The inventory consists of 94 items based on 5-point Likert scales ranging from *never* to *very frequently*. Examples include: "Have you experienced a dry mouth?" and "In your day-to-day living do you find you have difficulty in concentrating?" The total stress-response score is obtained by adding the frequency designation (0-4) for each item. The total score can range from 0 to 376.

A reliability analysis with a sample of 561 individuals (371 students from the schools of nursing, dentistry, and psychology and 190

nonstudents) revealed a Cronbach's standardized alpha coefficient of .96 for the total scale. In this study a Cronbach's standardized alpha coefficient of .97 was found. The authors established concurrent validity by correlating the scale (.76 $p < .0001$) with the SCL-90 (Derogatis, Rickles, & Rock, 1976).

The SOS had a small but significant correlation with life events from the Schedule of Recent Experience (SRE; Holmes & Rahe, 1967) that occurred in the preceding 6 months. It did not correlate significantly with life events that occurred over a 1-year period. This finding indicated that the SOS is limited to the current time period.

Normative data for the SOS were reported by Nakagawa (1979). Among a group of 561 students and nonstudents ranging in age from 25 to 56 years, the mean total score on the SOS was 70.30 (SD = 44.67). This group of individuals was referred to as "normals." The norms established for 122 clients screened into a stress-management treatment program were also reported. The mean total score for the 91 females was 95.29 (SD = 47.92).

Educational achievements. In this study the grades obtained in the natural science courses and social science courses required for admission into the school of nursing constituted part of the measure of educational achievement. Other measurers were college grade point average, high school grade point average, and college entrance examination scores. Grades were based on a scaled system on which a 4.0 was equivalent to a letter grade of A.

Data Collection and Analysis

Basic baccalaureate sophomore nursing students were given a brief description of the study during an orientation workshop at the beginning of their clinical nursing courses. The students were informed that the researcher would return during the sixth week of the term to ask them to participate in the study. At that time the students were given more information about the study. Questions or concerns were addressed, and students who wished to participate returned the signed consent forms. In addition, their signature allowed the researcher access to their course grades, overall GPA, and college entrance examination scores. The subjects were paid \$5.00 for their participation in the study.

Data were analyzed primarily using Pearson product-moment correlations and multiple regression. A two-tailed analysis was applied to the data, and a probability level of .05 was set as an acceptable level to

declare statistical significance. With regard to multiple regression, Kerlinger and Pedhauzer (1973) recommended that the multiple correlation should be as large as possible. However, to maximize r , the zero-order correlations are treated as if they are error-free, which results in the r being biased upward. Consequently, the adjusted r^2 was used in this study to estimate the percentage of variance explained. This approach was even more appropriate, since the sample size was small (Nie, Hull, Jenkins, Steinbrenner, & Bent, 1975).

RESULTS

Sample

The mean age for the 50 White female nursing students was 22.24 (SD = 2.87) years (range = 19-30). The students had completed a mean of 14.92 (SD = 1.50) years of education.

Group Embedded Figures Test

The mean score on the GEFT was 13.18 (SD = 3.54). Subjects were significantly more FI ($t = 4.75$, $df = 49$, $p < .001$) than the norms of the female college students reported by Witkin et al. (1971; $\bar{X} = 10.80$, $SD = 4.20$). However, they were not significantly different ($t = .28$, $df = 49$, $p = n.s.$) from the college females reported by Carter and Loo (1980; $\bar{X} = 13.04$, $SD = 4.12$).

Ambiguity Tolerance Test

Scores on the AT-20 ($\bar{X} = 8.82$, $SD = 3.65$) ranged from one individual at zero (intolerant of ambiguity) to one person at 18 (more tolerant of ambiguity). The nursing students were significantly more intolerable of ambiguity ($t = 3.93$, $df = 48$, $p < .001$) than the norms reported by MacDonald (1970; $\bar{X} = 10.87$, $SD = 3.23$).

Symptoms of Stress Inventory Scores

The mean score of the SOS was 115.86 (SD = 52.12). Also the number of stress symptoms was obtained by adding the total number of items

marked in the inventory and ignoring the magnitude of response ($x = 56.74$, $SD = 15.97$). The nursing students had significantly higher stress responses ($t = 2.76$, $df = 49$, $p < .01$) than the norm group ($\bar{X} = 95.29$, $SD = 47.92$) of clients in the stress-management treatment group reported by Nakagawa (1979).

Relationship Between FD-FI, Tolerance of Ambiguity, and the Stress Response

The first question tested whether individuals who were more FI were also more tolerant of ambiguity. The result of the Pearson's r was $-.10$ ($p = n.s.$). The analysis was taken a step further by controlling for the stress response. The SOS scores were dichotomized at the median for a high-stress group and a low-stress group. The correlation of the low-stress group (26 students) was $.27$ ($p = n.s.$). The correlation for the high-stress group, consisting of 24 students, was $-.50$ ($p < .01$). The results indicated that, for the high-stress group, the FI subjects were more intolerant of ambiguity. The Pearson's r between tolerance of ambiguity and the stress response was $-.24$ ($p < .05$), indicating that the more stress was reported by the students the more intolerant they were of ambiguity. Finally, the data indicated there was essentially no relationship between FD-FI and stress ($r = -.01$, $P = n.s.$).

Grades in Natural Science and Social Science Courses, High School GPA, College GPA, and College Aptitude Scores

The mean grade for the required natural science courses was 3.24 ($SD = 0.43$) and for social science courses was 3.39 ($SD = .041$). Mean high school GPA was 3.57 ($SD = 0.33$) and college mean GPA was 3.31 ($SD = 0.33$). Most students maintained a B average or better in all areas. Students had earned an average of 67.44 college credits ($SD = 46.10$). After the students had completed the three required nursing courses during the first term in clinical nursing, their GPA rose to 3.39 ($SD = 0.38$).

Based on a total of 44 students, the mean total score for the precollege test was slightly above the 50th percentile ($\bar{X} = 11.98$, $SD = 12.29$).

The student sample was asked to indicate their preference for natural science courses, social science courses, or humanity courses. The

majority of 58% of the students reported natural science courses as their preference, with 20% indicating social science and 16% the humanities. The remaining 6% wrote in other preferences.

Subjects were also asked to indicate the type of educational presentations they primarily preferred. Clinical presentations were the most frequent responses, with 40% of the students responding affirmatively. The seminar-discussion format was chosen by 30% of the sample, while another 22% preferred lectures. Laboratory work was cited by only 4% of the students.

Prediction of Selected Variables Under Study

Required natural science courses GPA. Using forward stepwise regression, and adjusted r^2 81% of the explained variance for GPA in the required natural science courses was accounted for by higher college GPA and lower total number of credits earned. The data suggest that these two variables are important predictors of the GPA in the natural science courses.

Required social science courses GPA. The multiple regression for the required social science courses had less explained variance. Based on the adjusted r^2 , the four steps explained only 34% of the total variance. A higher college GPA and a lower stress response contributed most to the prediction of the GPA in the social sciences, with little of the variance accounted for by FD-FI and age.

College GPA. A total of five variables contributed to predicting college GPA. Based on the adjusted r^2 , these variables explained 81% of the variance. The required natural science GPA and the total scores on the precollege test best predicted college GPA.

DISCUSSION

The nursing students were significantly more FI than the average female college students reported by Witkin et al. (1971), while similar to those reported by Carter and Loo (1980). However, Osipow (1969) suggested that the field of nursing tends to fit the characteristics often attributed to more FD individuals. As an example, FD characteristics include a concern and interest in other people, as well as a preference for interpersonal and group situations (Witkin & Goodenough, 1977). FI

individuals, on the other hand, prefer physical distance from other people, engage in solitary activities, and are less interested in humanitarian activities. The FI trend for the nursing students in this study raises several questions. Is nursing changing to a more FI profession? Are the criteria for acceptance into a baccalaureate nursing program placing greater emphasis on characteristics associated with FI individuals? If so, admission criteria perhaps should include more social science and humanities courses as prerequisites for admission. In addition, the results of this research suggest a need for interventions studies to determine ways to help students adjust their cognitive style to the many different rules required to function effectively as a nurse.

The mean score on the AT-20 for the nursing students in this study was significantly lower than MacDonald (1970) reported for college women, suggesting that nursing students are less tolerant of ambiguity than others. This finding is supported, in part, by Perry's (1970) claim that students embarking on college careers tend to view the world in polar terms, such as "we-right-good" versus "other-wrong-bad." In other words, right versus wrong answers exist for virtually everything, and they are viewed as absolute. The findings on ambiguity tolerance in this study also support faculty observations that sophomore-level nursing students want the right answers and exhibit an attitude of "tell me what to do." Since these students are in the earlier maturational phase of their professional growth, further research is indicated to determine if tolerance of ambiguity changes as they progress through their programs.

The results of this study also suggest that nursing students are in a high-risk group for stress response. Their mean score on the SOS was significantly higher than that of the "normal" sample in Nakagawa's (1979) study and higher than that of clients who participated in a stress-management program (Thompson & Leckie, 1978). Fox and Diamond (1965), Garrett et al. (1976), Sobol (1978), and Webb and Herman (1978) have all emphasized that nursing education can be stressful for students. Further, when students focus on managing high levels of stress, it is likely that their learning experience will suffer to a certain extent.

Nursing, unlike most other applied fields, requires students to function in the clinical area almost immediately. Acknowledging to students that their work is likely to be stressful may help to reduce some of the stress they experience. When the results were shared with the participants, one of the students stated that just finding out that her

response was stress-related and that she was not going "crazy" was reassuring. Obviously, future research is needed to determine whether informing the students about their stress levels actually reduces their stress response.

Although the relationship between FD-FI and tolerance of ambiguity was not supported in this study, further investigation that controlled for the stress response produced a significant relationship between these constructs in the high-stress group, but in the opposite direction expected. Among students who rated themselves as experiencing high stress, the more FI students were less tolerant of ambiguity. These results contradict those reported by Breskin and Gorman (1969), Feather (1967), Hritzuk and Taylor (1973), and Lefever and Ehri (1976). However, Moore, Gleser, and Warm (1970) and Nebelkopf and Dreyer (1973) theorized that FI individuals imposed structure spontaneously on ambiguous stimulus material, whereas FD individuals tended to leave the material "as is." When FI students are experiencing high stress, however, their usual mechanism for adding structure to ambiguous material may be hampered. Consequently, FI individuals may be less tolerant of ambiguity during these periods of time. In the low-stress group there was no relationship between FI and tolerance of ambiguity.

Hill and Feigenbaum (1966) and Reinking, Goldstein, and Houston (1974) suggested that individuals actually become more FD or more FI when experiencing high levels of stress. Although Feather (1967), Messick and Fritzky (1963), and Wyman (1979) found significant relationships between FD-FI and anxiety, this study found no relationship between FD-FI and stress responses. Environmental stress may have caused the nursing students to be more FD or more FI, but baseline data were not available in this study for purposes of comparison.

A statistically significant negative correlation was found between the stress response and tolerance of ambiguity, supporting the hypotheses proposed by Cowen (1952), Davids (1955), and Baer (1964).

No relationship was found between FD-FI and GPA in the required social science courses taken by the nursing students. They were academically successful in both the social sciences and the natural sciences. This finding was consistent with Witkin, Moore, Oltman, Goodenough, Friedman, Owen, and Raskin (1977), who determined that students who performed well in the natural sciences also performed well in the social sciences. However, among the nursing school admission prerequisites for the students participating in the study, there was a larger percentage of natural science courses than social science

courses. Nursing school admission standards may require adjustment in order to provide a more even balance between natural and social science prerequisites.

Predicting the GPA in the required natural science courses and social science courses produced an interesting contrast. The most important variable in predicting the GPA in natural science courses was the college GPA, whereas it did not contribute to the prediction of the GPA in required social science courses. This phenomenon shows that students entering the nursing school have a strong background in the natural sciences. Nursing, however, often draws heavily on the social sciences, and many skills necessary for nursing practice fall into the areas of the social sciences.

In conclusion, the study raises certain provocative questions. Are nurse educators placing students under too much stress and, thereby, hindering their learning process? Second, is too much emphasis placed on natural science requirements as admission criteria and, consequently, are more FD students excluded from entering a field that must balance analytical and global skills? These questions raise areas of concern and suggest focus for future research endeavors.

NOTE

¹This research was supported in part by the National Institute of Health National Research Services Award, 5F31 NU5140-03 from the Division of Nursing.

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