A COMPARATIVE ANALYSIS OF SELECTED CHARACTERISTICS OF INTELLIGENTLY SUPERIOR ACADEMIC STUDENTS WHO PERSISTED AND THOSE WHO DID NOT PERSIST IN AN ADVANCED PLACEMENT PROGRAM

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A COMPARATIVE ANALYSIS OF SELECTED CHARACTERISTICS OF INTELLECTUALLY SUPERIOR FEMALE STUDENTS WHO PERSISTED AND THOSE WHO DID NOT PERSIST IN AN ADVANCED PLACEMENT PROGRAM

DISSERTATION

Presented to the Graduate Council of the North Texas State University in Partial Fulfillment of the Requirements

For the Degree of

DOCTOR OF EDUCATION

by

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CHAPTER I

INTRODUCTION

Background and Need for This Study

Recognizing that by far the greatest source of undeveloped potential intellectual capabilities is to be found among women, increased efforts on the part of many individuals, agencies, and institutions have been directed toward the identification and motivation of superior females so as to encourage the increased utilization of their potentialities (1, 3, 10, 12, 13, 19, 21, 22, 26). The adequate development and utilization of this source of intellectual capabilities could have tremendous effect upon the social, economic, political, and personal welfare of the citizenry of the nation (15, 17, 21, 22, 23). In the report of the President's Commission of National Goals as reported in Goals for Americans (22), it is noted that although the proportion of women in the labor market force has been steadily increasing their rate of entry into the professions has steadily declined. The report further notes that although women win some 30 per cent of the
Bachelor of Arts degrees, they take only about 10 per cent of the degrees awarded at the doctoral level. This waste of talent is perceived as a relic of the past which can no longer be afforded. Women's changing role in the world of work necessitates their achieving at their highest potential level if their expanded participation is to be satisfying, rewarding, and fulfilling.

Conflicting cultural mores and attitudes of American society appear to compound the superior females' decisions and choices involved in their making adequate preparation for multiple roles in constructive and meaningful educational experiences. Margaret Mead (19) advanced the theory that in the American culture the female begins to place less value on achievement about the time of adolescence because she realizes that when she does try to achieve, she comes into conflict with potential marriage partners. Atkinson (1, p. 611) credits Margaret Mead's theory as being the explanation for sexual differences in achievement motivation noted among college populations. This same complex dilemma was observed by Max Lerner (14) and reported in his book, America As a Civilization. He suggested that at no time in historic civilization have women been as free, expressive, and powerful as in America, yet at no time as burdened in trying to be a fulfilled individual because of the many paradoxes which characterize
the social role of capable women. Supporting in essence the theory of Margaret Mead, he stated that the American female is constantly torn between competing and vying with men in jobs and careers and at the same time finding her identity in the traditional role as wife, mother, and woman. Multiple and ambiguous role expectations appear to present a conflictful and frustrating experience for highly capable women.

In order to identify and adequately to motivate superior females in their search for opportunities for self-actualization, knowledge of their basic personality structure becomes vital. This present study is significant and needed in that it utilized a number of self-reporting techniques in an attempt to ascertain how a group of intellectually superior girls who choose to satisfy some of their intellectual needs by participating in an advanced placement program in mathematics and science differed on certain selected variables from a comparable group who choose to drop such a program of study. An effort was made to determine how both groups think and feel "from the inside." The theoretical and empirical framework for the study has emerged from the research regarding intellectually superior individuals. Studies by Terman, Terman and Oden, MacKinnon, Crutchfield, Eiduson, Stein, Holland, McClelland, Roe, Gough, Torrance, et al. (26, 27 and 28, 15, 7, 24, 11, 16,
23, 9, 19) suggest possible directions for fruitful research relative to significant factors in superior females' functioning and producing in intellectual type pursuits. MacKinnon (17), Holland (11), and others (12, 17, 26) have suggested that some of the most promising research in the understanding of talented individuals will be concerned with the noncognitive or nonintellective factors. By testing the hypotheses for this study, which generated from former research, it was hoped that some clues might be revealed as to which, if any, of these selected noncognitive variables appear to be associated with the intellectually superior girls' persisting or dropping a mathematics and science sequence of course offerings.

The significance of this study has been increased by its having been designed as one of three collaborative studies concerned with evaluating an Advanced Placement Program. One of the studies was concerned more from an administrative viewpoint, including measures of students' attitudes toward the program, their academic performances as measured by achievement tests, grade-point averages, creativity, and assessment of work and study skills.

Two of the collaborative studies, including this one, were concerned with nonintellective factors associated with a selected intellectually superior group who persisted and those who did not persist in a sequential program of
One of these studies was concerned with the male population; this present study was concerned with the female population. This team approach to research problems has been suggested by many, but it was forcefully advocated by Findley (8) as an effective way to examine the multifaceted aspects of multidimensional problems. This type approach to research is supported and encouraged by the school district whose scholastic population was involved in this study.

Furthermore, these data assembled for the present three collaborative studies provide a pool of information and a baseline for subsequent follow-up and longitudinal type studies on an intellectually superior population.

Statement of the Problem

This study was undertaken to make a comparative analysis of selected nonintellective characteristics of intellectually superior female students who persisted and those who did not persist in an Advanced Placement Program offering sequentially planned course offerings in mathematics and science. A second dimension of the study was an investigation of selected nonintellective traits to determine if the students' scores are elevated in the same direction as those of superior female adults who have been studied on essentially the same dimensions.
Hypotheses

1. There is a difference in self-sufficiency between the Persistors and Nonpersistors as indicated by an elevated Self-Sufficiency score for the Persistors obtained by combining the scales for Dominance, Capacity for Status, Social Presence, and Self-Acceptance from the California Psychological Inventory.

2. There is a difference between the Persistors and Nonpersistors in their motives for achievement as indicated by an elevated score for the Persistors on the Achievement via Independence and an elevated score for the Nonpersistors on the Achievement via Conformity from these two scales of the California Psychological Inventory.

3. There is a difference between the Persistors and Nonpersistors in those personal traits indicative of femininity as measured by an elevated score for the Persistors, obtained by combining the scales for Psychological-Mindedness, Flexibility, and Femininity from the California Psychological Inventory.

4. There is a difference between the Persistors and Nonpersistors in their preferences for certain types of psychological functioning as indicated by elevated scores for the Persistors on the introversion, intuition, thinking and perception scales from the Myers-Briggs Type Indicator.
5. There is a difference in preferences for scientific and business interests between the Persistors and Nonpersistors as indicated by the Persistors obtaining a higher score for scientific interests and a lower score for business interests.

Definition of Terms

Persistors. This term refers to those female students who in 1958 were enrolled in the Advanced Placement Program and who continued the sequential course offerings in mathematics and/or science.

Nonpersistors. This term refers to those female students who in 1958 were enrolled in the Advanced Placement Program but who discontinued the sequence pattern of courses in mathematics and science at some level, either voluntarily or by request of staff personnel.

Advanced Placement Program. This term refers to an organized pattern of mathematics and science courses which meet the college-level standards set by the College Entrance Examination Board, thus enabling students as seniors in high school to take a fifth year in either or both of these curricular areas for college credit and/or advanced placement. The program is commonly referred to as the Honors Program.
In the program with which this study is concerned, the fifth-year mathematics courses are analytics and calculus, and the science courses are chemistry and physics.

Sequential course offerings. This term refers to the organizational plan of the school for content course offerings of the Advanced Placement Program. The grade levels at which these courses in mathematics and science are offered are as follows:

<table>
<thead>
<tr>
<th>Grade Level</th>
<th>Mathematics</th>
<th>Science</th>
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<tbody>
<tr>
<td>8</td>
<td>Algebra 1</td>
<td>Science 1</td>
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<td></td>
<td>Algebra 2</td>
<td>Science 2</td>
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<td>9</td>
<td>Geometry 1</td>
<td>Biology 1</td>
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<td>10</td>
<td>Algebra 3</td>
<td>Chemistry 1</td>
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<tr>
<td></td>
<td>Solid</td>
<td>Chemistry 2</td>
</tr>
<tr>
<td></td>
<td>Geometry</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Algebra 4</td>
<td>Physics 1</td>
</tr>
<tr>
<td></td>
<td>Trigonometry</td>
<td>Physics 2</td>
</tr>
<tr>
<td>12</td>
<td>Elementary Analysis 10</td>
<td>Chemistry 3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chemistry 4</td>
</tr>
</tbody>
</table>

Nonintellective Factors. This term refers to dimensions of the personality structure which McLelland (16) describes as patterns of values, motives, interests, and interpersonal interactions. All assessments of preferences, motives, and interests in this study were referred to as nonintellective.

Self-Sufficiency. This term refers to a combined score of the scales for Dominance, Capacity for Status, Social Presence, and Self-Acceptance from the California Psychological Inventory.
Femininity of traits. This term refers to a combined score for the scales for Psychological-Mindedness, Flexibility, and Femininity from the California Psychological Inventory.

Limitations of the Study

This study was limited to the study of the members of the 1962-1963 Grade XII female students of ten senior-high schools in a large metropolitan Southwestern area public-school system who in 1958 were enrolled in an Advanced Placement Program. Criteria for enrollment specified the following minimum requirements: IQ of 120 or above, two grade levels above actual grade placement on a standardized achievement test, high scholarship marks, teacher recommendations concerning study and work habits, and desire of the student along with parental approval.

The limitations given above further limited the findings and conclusions of this investigation to the population being studied or to similar populations.

Basic Assumptions

Although it was generally granted that personality can be changed, it was assumed that basic personality structures tend to emerge early in the life of an individual.

It was further assumed that such characteristics tend to remain fairly stable during the life of an individual.
Furthermore, it was assumed that through the utilization of self-reporting instruments, one may note significant emerging aspects of the individual's personality.

Population

The population involved in this study was composed of all the original members of the 1953-1959 Honors Program in the junior-high schools of a large metropolitan Southwest area public school who in 1962-1963 were enrolled as Grade XII students in any one of the senior-high schools of the school district at the time the data to be analyzed were collected.

Eligibility for enrollment in the Honors Program offering the accelerated mathematics/sciences courses was established on the basis of a minimal psychometric performance of at least two grade placements above actual grade placement at the time of testing on standardized achievement tests and scholastic aptitude of at least a 120 IQ. In addition to psychometric indices, other evidences of performance included teacher recommendation and estimations concerning the students' study and work habits and teacher marks usually considered indicative of high scholarship. Expressed desire of the student along with parental approval for such placement were also considered as part of the preliminary planning.
The original group of females given Advanced Placement numbered 334. Of that original number, 273 were enrolled at the time of this study in one of the ten senior-high schools of the public-school system contributing this population. The number included 73 Persistors and 200 Nonpersistors.

Table I indicates the number of Persistors and Nonpersistors enrolled in the various ten high schools in Grade XII during the spring semester of 1962-1963, and the numbers of Nonpersistors who discontinued the sequence at specific grade levels.

Sixty-two students of the original 334 enrollees had either moved from the school district or enrolled in a private school. Thirteen students, one Persistor and twelve Nonpersistors, were unavailable for testing within the scheduled period of time. Usable data were obtained from 71 Persistors and 182 Nonpersistors. One of the Nonpersistors completed only part of the testing; hence, the number of Nonpersistors varied from 181 to 182 for the data reported.

**Instruments Used**

California Psychological Inventory.—The California Psychological Inventory (9) was used in this study to assess some dimensions of self-sufficiency, motives for achievement, and femininity of interests. It is comprised
<table>
<thead>
<tr>
<th>Group</th>
<th>School Code</th>
<th>Total Number Persists and Nonpersists</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>0 1 2 3 4 5 6 7 8 9</td>
<td></td>
</tr>
<tr>
<td>Persists</td>
<td>6 6 5 2 12 5 7 3 2 25</td>
<td>73</td>
</tr>
<tr>
<td>Nonpersists</td>
<td>2 1</td>
<td>6</td>
</tr>
<tr>
<td>Dropped VIII</td>
<td>2 1 1 1 1 1 1 2 2 10</td>
<td>112</td>
</tr>
<tr>
<td>Dropped IX</td>
<td>2 1 1 3 1 1 2 2 2 72</td>
<td></td>
</tr>
<tr>
<td>Dropped X</td>
<td>10 20 2 2 15 10 15 5 24 2</td>
<td></td>
</tr>
<tr>
<td>Dropped XI</td>
<td>19 6 1 3 6 17 6 6 7 72</td>
<td></td>
</tr>
<tr>
<td>Total number of Nonpersists</td>
<td>33 28 2 3 20 28 34 11 32 9</td>
<td>273</td>
</tr>
</tbody>
</table>
of 180 true-false items, sampling behavior of a social interactional nature and attitudes toward achievement and authority. This instrument was selected as it has been used in studies of superior adults and would, therefore, eliminate some of the difficulties involved in making comparisons.

A second reason for choosing this instrument is related to research findings which suggest a need to explore the dynamics involved in achievement as opposed to the assessment of the absence or presence of value for achievement. McLelland (16) suggested the use of techniques other than the TAT achievement protocol method to assess the need for achievement with populations of very bright students since most of these superior people seem to value achievement and tend as a group to score high on a achievement. The scales indicative of Achievement via Conformance and Independence on this instrument seemed appropriate for investigating a facet of motivation for achievement.

**California Occupational Interest Inventory.**--The California Occupational Interest Inventory (4) was used in this study to obtain a measure indicating personal preferences for scientific or business activities. This particular instrument was selected for use in this study for two reasons: (1) these two scales have a rather high correlation with comparable scales on the Strong Vocational
Interest Blank which has been used extensively with productive adult groups, and (2) comparable forms are available at lower levels for use in selecting participants for an Advanced Placement Program should this study indicate that this dimension seems to differentiate between Persistors and Nonpersistors.

Myers-Briggs Type Indicator.--The Myers-Briggs Type Indicator (20, 25) was used in this study to obtain an indication of personal preferences for certain modes of psychological functioning. The 166 items offer "forced" response choices reflecting the subject's self-reported behavior, preferences, and value judgments. Classification of the responses as to a person's basic preferences includes four dichotomous categories: extraversion-introversion, sensation-intuition, thinking-feeling, and judgment-perception. This particular instrument was used in this study since it also has been used in related studies particularly MacKinnon's (15) study of highly productive adults. Comparative analyses may be more readily and directly made.

Administration of Testing Instruments

The administration of the tests was largely accomplished simultaneously in all ten senior-high schools under study within the time interval of a regular school day which was
planned so as to permit a continuous schedule of testing, uninterrupted except for the usual breaks permitted during a prolonged testing period. Make-up testing for absentees followed the same schedule and was completed within a one-week period of time following the initial day of testing.

The test administrators were the regular school counselors from the schools involved. These counselors were oriented to the research study and trained to administer the particular testing instruments by means of a group meeting with the collaborating researchers. Explicit and uniform written directions were prepared by the collaborating researchers for the counselors to use in the orientation of students to the research study and in the administration of the tests.

**Personal Interview Technique Used**

Approximately three weeks following the objective testing, personal interviews were conducted with both Persistors and Nonpersisters representative of the various grade levels at which the sequence was terminated. Counselors in each building assisted in scheduling the conferences with representative students and with those available at the time of the interviewing. Students interviewed were from seven of the ten high schools contributing the population for this study. These seven
schools were representative of the varying socio-economic areas being served by the school district. A 35 per cent sampling of the Persistors and a 30 per cent sampling of the Nonpersistors were interviewed. No strict time limits were set for the interviews, which ranged in length from approximately twenty-five minutes to an hour.

A nonstructured interview approach was used to encourage and permit free responses to describe the student's feelings about herself as a participant in the Advanced Placement Program and about her interpersonal relationships with peers and significant adults. Students were told that the interview was a continuance of the research project which had initiated the objective testing about three weeks prior to this interview. The student was assured that the purpose of the interview was just to get better acquainted with her as an individual and as an original enrollee and participant in the Honors Program. One of the major concerns in the interviewing was to permit each student freedom to describe the quality of her academic experiences and to elaborate as to why she had persisted or discontinued the mathematics and/or science sequence of courses. The girls were further encouraged to talk about their future educational, vocational, and personal plans for self-realization.

Although spontaneous responses and expressions were encouraged, preconceived areas were utilized chiefly for
possible presentation to the interviewee if needed to encourage more extensive verbalizations. The following quotations represent the usual approach when further encouragement seemed appropriate:

1. "Tell me how you feel about your participation in the Honors Program."

2. "I should be very much interested in how you feel your friends, teachers, and parents have felt about your being in (or discontinuing) the Honors Program."

3. "I wonder if you would share with me what you consider to be some of the advantages and disadvantages of the Honors Program."

4. "Your future plans for yourself would be of interest. I wonder if you would mind sharing with me some of your plans for yourself."

Immediately following each interview notes were made regarding the conference. Many actual quotations were made to facilitate subsequent reporting of the individual's ideas, feelings, attitudes, plans, beliefs, and opinions. This procedure was used to reduce the amount of error involved in the subjective abstracting and reporting of the data obtained by this technique.

No attempt was made to determine the reliability and validity of the students' self-descriptions since the data
obtained in the interviews were primarily aimed at getting a gestalt or "whole" image of these intellectually superior females.

Procedure for Treating Data

Objective Test Data

The mean raw score and standard deviation for each of the test scales pertinent to any one of the hypotheses numbered one, two, three, and five were computed for the two separate groups designated as Persistors and Nonpersistors. The same approach was used for hypothesis four except that raw scores were first converted to continuous scores and then the mean and the standard deviations were computed using these continuous scores. The statistical technique used to test the significance of the difference between the means obtained was Fisher's $t$ test (18) for use with independent groups.

Interview Data

The interview data obtained by means of an unstructured conference approach were analyzed around the following major areas:

1. Feelings about personal capabilities
2. Interpersonal relationships with peers, teachers, parents, and other significant adults mentioned
3. Attitudes and opinions concerning the quality of academic experiences

4. Advantages and disadvantages of the Advanced Placement Program and their personal participation therein

5. Future-oriented plans.

Although these five areas were preconceived as a possible significant part of a framework for discussion, no attempt was made to pry and question when the information was not freely given or else elicited by the preconceived areas for questioning suggested by the representative quotations included earlier.

A composite-portrait method was used in reporting the personal interviews in an effort to present the "average" Persistor and Nonpersistor image; however, actual quotations will be used to attempt to convey a sense of the uniqueness of the individual subject.


15. MacKinnon, D. W., "What Do We Mean by Talent and How Do We Test for It?," The Search for Talent, New York, College Entrance Examination Board, 1960.


CHAPTER II

RELATED LITERATURE

An increased concern for the early identification and education of the intellectually superior student has arisen as society has become more consciously aware of the fullest implications of the maximal utilization of each individual's potential capabilities. Although historically man has evidenced interest in the education of youth as a means of producing a more desirable and effective society, his most elaborate, concerted, and scientific investigations of both the uniqueness of characteristics and the processes of development thereof have been accelerated and extended in a variety of directions within a relatively brief time space. These research investigations have been reviewed at various periods, pointing to trends and important advances in the recognition and provision of the intellectually superior. Newland's (26) review of the literature on the gifted covered a period of time extending to 1953 and were followed by numerous publications on the topic, two of note being those of Tyler (26) and of Passou, Beasley, and Brooks (26). Catherine Cox Miles (23) presented a comprehensive historical overview of the research on gifted
children up to 1954. Fliegler and Bish (6) brought the review to 1959. A slightly more recent review has been that of Goldberg (8). The present emerging trend seems to be the identification of those within the identifiable intellectually superior groups who are likely to become, in terms of total personality, the most competent adults. This current emphasis is quite different from the earlier investigations of curriculum, organization, and other administrative provisions for the gifted. Currently, it appears that the integrated totality of personality, which under appropriate environmental stimulation becomes crucial in the matter of effectiveness in living, bears further investigation. Terman (36) and his associates evidenced awareness of the need for this approach by suggesting exploration of traits other than just the intellect which seem to contribute to exceptional accomplishment in adulthood.

Major Research Findings of Nonintellective Characteristics of the Intellectually Superior

Gowan (25) mentioned the dynamic and fluid properties characteristic of research investigations but indicated research findings relative to the intellectually superior which appear to have been replicated to such an extent that consistency seems apparent. These consistencies include
the following nonintellective factors as being characteristic of the intellectually gifted:

1. Personal and social characteristics of academically talented students appear more favorable than those of the generality.

2. Academically talented children appear well developed physically and are accepted socially by other children; however, some of the evidence indicates that very highly gifted children may have some problems in social acceptance and peer group identification.

3. Special grouping for instructional purposes seemingly has no ill effects upon the academic, social, or personal adjustment.

4. Underachievement appears to be related most directly to the student's lack of value system although a variety of other sociative variables seem significant.

5. Attitudes toward the intellectual life and scholarship attainment seem to be largely a function of community mores.

Miles (23), too, suggested tenable hypotheses about the gifted based upon research findings. The four major views or hypotheses include the following:

1. The intellectually superior child may also have superior innate somatic potentials under which favorable environmental circumstances increase the tendency for superior behavior to emerge and to maintain its development and direction.

2. The superior intellectual individuals readily acquire and accept roles and goals associated with superior social class, making for upward social mobility and providing a basis for social and vocational behavior.

3. Motivation for gifted behavior appears to be associated with variables not easily identifiable
in the usually investigated physical and personal factors. More subtle factors in the subcultural and familial relationships basic to goal-setting behavior, role-learning, identification, and motivational patterns seem to be operant.

Specific but oftentimes chance factors appear to operate as stimulators or repressors of intellectual potential. Usually cumulative good luck as compared with the generality has been experienced; yet innumerable adverse incidents were positively utilized.

The genetic studies of genius which began in 1921 by Terman (36) and subsequently reported by him and his associates (27, 33, 39) have provided the core for scientific investigation. The most recent longitudinal study of this gifted group of individuals at mid-life supports the aforementioned summarization of typical characteristics of the gifted. The individuals in Terman's group seem to have functioned within the typical American framework, having the usual interest in vocations, social orientations, and other values of their various communities. With few exceptions, the data indicate that the superior child becomes the able or superior adult as compared to the generality.

In the area of physical and mental health, the gifted group at mid-life was superior to the generality. Mental disorders serious enough to require hospitalization were slightly greater among the women. Within the group there were small but fairly consistent sex differences in general
adjustment in the direction of more maladjustment among gifted women than among men (38, p. 50). Incidence of general adjustment problems appeared more often among women who failed to graduate from college than among the men who likewise failed to complete college work.

Although the gifted group at mid-life did not differ greatly from the generality in the extent of personality and adjustment problems as shown by incidence of mental breakdowns, suicides, and marital failures, problems related to other personal-social areas, such as alcoholism, homosexuality, and delinquency, were less apparent in the lives of this group than in that of the total population. Terman (38, p. 143) found no negative correlations between intelligence and size, strength, physical well-being, or emotional stability.

Although the greater percentage of Terman's group had records indicating high level achievement, outstanding vocational records, and valuable contributions to knowledge and culture, a number of the group proved to be less successful in that their achievements were considerably short of the standard set by the group as a whole. An attempt was made following the 1940 (38) report to investigate the nonintellective factors that affect life success. A detailed analysis was made of the life histories of 150 most successful and 150 least successful men of the gifted
group. Personality factors appeared to be extremely significant as determiners of achievement. This analysis was supported by the findings of the study of the group at mid-life as positive correlations between success and nonintellective variables such as mental health, emotional stability, and social adjustment were consistently obtained. In summarizing, Terman stated that "notable achievement calls for more than high order of intelligence" (38, p. 146).

In Goldberg's (8) review of the research she reported that gifted children are superior in nonintellective as well as intellective areas of development and behavior. This is supported by Bonsall (1) who found significant temperamental differences between the gifted and average students. Bonsall felt these differences were related to socio-economic backgrounds rather than to intelligence. Goldberg raised questions as to whether the previous findings relative to the physical, social, and emotional superiority of the gifted would stand up if there is the increasing socio-economic representation in the ranks of the gifted as is indicated by Bonsall.

Stodtbeck (22) reported a positive relationship between equalitarian relations in the home and the achieving child's ability to establish loyalties in larger systems outside without disrupting family controls. He suggested that a particular value system affected the development of ideas
of success and achievement in the individual. The more conducive value system endorses the concept of the perfectability of man and a belief in man's ability to control his destiny as opposed to establishing dominance in face-to-face relationships.

Getzels and Jackson (7) found the two groups which they designated high IQ and high creative could be differentiated on certain nonintellective variables, such as goal directedness, interests, emotional stability, and self-concept. The creative group had greater emotional stability but were not as goal-directed as the high IQ group. The creatives seemed less dominated by perceived adult values and aspirations, hence exercised greater freedom in setting personal aspirations and in striving for personally valued goals.

A similar investigation of intelligence and creativity has been made by Torrance (41). The more creative were superior in their techniques of adjustment; however, some of their nonconforming behavior was disturbing to teachers.

Dynamic Characteristics of the Creative Adult in Selected Fields

Increasingly research interest and investigation has turned towards studying the dynamics associated with creative productivity in adults. The National Science Foundation has supported a number of conferences at the University of Utah devoted to the identification and
exploration of creative scientific talent. These conferences edited by Taylor and Barron (35) reported that a consensus of research led one to depict the creative individual as being one of an unconventional and disturbing nature, a nonconformist in many respects.

In further synthesis of the Utah conference research reports, Taylor and Barron (35) reported a highly consistent picture of the productive scientist emerged from the findings of Roe, McClelland, Barron, Saunders, MacCurdy, Knapp, and Cattell. The following delineated description of the productive scientist was given:

1. A high degree of autonomy, self-sufficiency, and self-direction

2. A preference for mental manipulations involving things rather than people; a somewhat distant or detached attitude in interpersonal relations, and a preference for intellectually challenging situations rather than socially challenging ones

3. High ego strength and emotional stability

4. A liking for method, precision, and exactness

5. A preference for such defense mechanisms as repression and isolation in dealing with affect and instinctual energies

6. A high degree of personal dominance but a dislike of personally toned controversy

7. A high degree of control of impulse, amounting almost to overcontrol; relatively little talkativeness, gregariousness, and impulsiveness

8. A liking for abstract thinking, with considerable tolerance of cognitive ambiguity
9. Marked independence of judgment and rejection of group pressures toward conformity in thinking

10. Superior general intelligence

11. An early, very broad interest in intellectual activities

12. A drive toward comprehensiveness and elegance in explanation

13. A special interest in the kind of "wagering" which involves pitting oneself against uncertain circumstances in which one's own effort can be the deciding factor (34, p. 385).

Stein (10) studied and compared two groups of industrial research chemists along a number of psychological dimensions. The two groups were categorized as being "more" or "less" creative individuals. The more creative group were found to be more autonomous, cautious and realistic, assertive, authoritative, and more integrative in their attitudes. They also had a more differentiated value-hierarchy. As a group, the creatives were more consistent in their desires for rewards and seemed to strive for distant goals more so than the less creative group.

In other words, the creative person was seen as capable of tolerating the ambiguity that is involved in long-term research.

Crutchfield (3, 10) reported an intensive study carried on under Gough's direction of the personality assessment of forty-five research scientists. Included in the group were physicists, mathematicians, and engineers.
On a test of conformity a wide range in score was found, but those researchers rated higher on a scale of originality had the lower score on tendency toward conformity.

Barron (35) summarized research carried on at the Institute of Personality Assessment and Research of the University of California, investigating the characteristics of highly regarded doctoral candidates in the sciences. These men were pictured as follows:

1. Superior-measured intelligence
2. Exceptionally independent in judgment and resistant to group-endorsed opinions
3. Marked by a strong need for order and for perceptual closure, combined with a resistance to premature closure and an interest in what may appear as disorder, contradiction, imbalance, or very complex balance whose ordering principle is not immediately apparent
4. Unusually appreciative of the intuitive and nonrational elements in their own nature
5. Distinguished by their profound commitment to the search for aesthetic and philosophic meaning in all experience (35, p. 386).

McLelland (10) abstracted from the research literature certain data which led him to summarize in general terms characteristics associated with the creative physical scientists. Characteristics mentioned were as follows:

1. Men are more likely to become creative scientists than women.
2. Experimental physical scientists come from a background of radical Protestantism more frequently than would be expected by chance but are not themselves religious.

3. Scientists avoid interpersonal contact.

4. Creative scientists are unusually hard working to the extent of appearing almost obsessed with their work.

5. Scientists avoid and are disturbed by complex human emotions, particularly interpersonal aggression.

6. Physical scientists are intensely masculine.

7. Physical scientists like music and dislike art and poetry.

8. Physical scientists develop a strong interest in analysis in the structure of things early in life (10, pp. 144-150).

McLelland concluded that one must take the facts given above and draw inferences about the psychodynamics. In the case of the scientist, McLelland presented the idea that "having been treated indifferently by his parents, he tends to retreat from people" (10, p. 172), thus avoiding the field of human relationships. Furthermore, although the scientists had high standards superimposed by parental figures, it was an atmosphere lacking in psychological warmth, making frustration and aggression part of their chief problems.

Mihudan (4) reported research findings on relevant factors in the lives of forty American research scientists, including physicists, chemists, geologists, biologists, and
zoologists. The primary purposes of the study was to see what these individuals were like psychologically and what variables appeared to contribute towards their becoming scientists. The findings support other research in that the psychological environment provided little in terms of a warm emotional climate with parental figures. Those positive ties which did exist were related to achievement. Although the impersonal emotional climate had some ill effects, these individuals seemed able to compartmentalize personal difficulties from intellectual preoccupations. These scientists were reported (4, p. 247) to be strikingly similar to each other in the area of cognitive and perceptive style. They seemed oriented to perceive the new, the different, or the old with a fresh viewpoint. They fantasied a great deal, toying with ideas and solutions. They had a high tolerance level for frustration, ambiguity, and anxiety. Search for the unfamiliar and the obscure was their life style. Greatest happiness for them was related to their scientific pursuits. Thus, Eiduson revealed the intense nature of internally directed motivations to meet what appeared to be inner determined needs of these scientists.

Kubie (32) made a psychoanalytical analysis of the scientific career pattern. In addition to his own data, he utilized much of Roe's (27, 28, 29, 30, 31) for the
study. He felt an essential element had been left out of the training of the scientist, namely an opportunity to free himself from bondage to the unconscious residues of his own childhood. Scientists were pictured as being "the subtle and complex instruments of their unconscious and conscious processes" (32, p. 257), and as being vulnerable to the emotional stresses of research in terms of "those psychological forces which are unconscious residues from the unresolved neurotic problems of his early childhood" (32, p. 257).

Since 1958 similar approaches have been utilized by MacKinnon (10, 19, 20) and his associates in an intensive study of creativity, the creative person, and the creative process. This research has been carried on at the Institute of Personality Assessment and Research. Results of this research support other major studies concerning the psychological structure of highly creative persons.

MacKinnon's (13, 10, 19, 20) group of creatives included writers, mathematicians, engineers, research scientists, and architects. MacKinnon says the evidence is clear that "the more creative a person is the more he reveals an openness to his own feelings and emotions, a sensitive intellect and understanding self-awareness, and wide-ranging interests including many which in American culture are thought of as feminine" (19, p. 446). The
research findings further indicated creative persons were disposed to perceptual complexity without experiencing anxiety and tension. Tolerance levels for frustration and ambiguity were high. Furthermore, they were found to have intuitive perception with cognitive openness and flexibility. Both mathematicians and research scientists, however, preferred a logical-thinking process aimed at an impersonal fact-weighing analysis rather than one relying upon feelings, a subjective and personal means of evaluation.

In the area of interpersonal behavior these groups were found to be effective individuals. Though not conforming to social demands, they were responsive to the inner needs and feelings of others. This seemed related to their own personal assets of spontaneity, vigorousness, self-acceptance, and self-assertiveness. They were further characterized by a high degree of poise, self-assurance, and autonomy.

Achievement drives for this group were strong, particularly in those pursuits requiring independent and autonomous effort. Independence of thought and action appeared to be necessary components of a situation capable of generating strong motivations to achieve.
Nonintellective Characteristics of Gifted and Creative Females in Selected Areas

In reporting the early history of the gifted group studied by him, Terman noted that the "gifted girls tend to be somewhat more masculine in their play life than the average girl" (37, p. 16). Gifted girls seemed to have had more freedom of activity, leading to so-called "tomboyish" behavior. Too, in their games involving social participation and social organization, they evidenced a higher degree of self-sufficiency and independence than found in the control group.

Terman also noted in his cross-sex comparisons that in "scholastic interests gifted girls resembled gifted boys far more closely than they resembled control girls" (37, p. 9). There was more choosing by the gifted girl of the difficult and rather abstract courses deemed by the culture as being "more masculine."

In Terman's report of the gifted group at mid-life, he reported that although the majority of these women did attend college, more than 15 per cent did not. Only "32 per cent of the women with no college attendance were satisfied with their education" (37, p. 69). A small number of girls reported their parents as having passive attitudes toward their education and as not having been particularly supportive nor encouraging (37, p. 70). Of this group, however, who reported no parental encouragement, 14 per cent did graduate from college.
Although the gifted women equaled or excelled the men in school achievement from the first grade through college, the majority of them ceased to compete with men in the world's work. Terman attributed this latter characteristic "to lack of motivation and opportunity rather than to lack of ability" (37, p. 106). When careers were pursued, Terman noted these were "greatly influenced by motivational factors and personality adjustment" (37, p. 22). A career was not of primary importance, and the accomplishments of women in this area did not compare with those of the men. Terman felt that the gifted woman had succumbed to other culturally determined patterns for women.

Helson (13, 10) reported college senior women of outstanding creative ability to be less conforming than a group of their peers not seen as being creative. She noted this same trait to be characteristic of creative female mathematicians. Creative women mathematicians tended to view and interpret the world in individualistic ways. As compared with other female mathematicians, these women were more intuitive and perceptive in their mode of approach and less interested in social interaction and social rewards.

Other significant nonintellective characteristics included:

1. Identified with father
2. Experienced sex-role conflict
3. Gave expression to the opposite sides of their nature
4. Were flexible in cognitive processes
5. Exercised strong impulse control.

Nelson suspected that hardship and trauma under which the creative women in her sample grew up may have left "their mark in the form of lessened effectiveness, vitality, and social facility" (13, pp. iv-12). Hardship that was not too intense seemed to have contributed in a positive sense.

In the 1957 California study of programs for gifted pupils, Simpson and Martinson (32) reported that the gifted at the senior-high-school level on measures of emotional maturity resembled college and adult populations more closely than they resembled their own age mates. Gifted high-school girls evidenced emotional maturity far beyond that of a control group of peers. These gifted high-school girls were very similar to a college-norm group in their emotional maturity patterns. There was a direct relationship between an individual's valuing intellectual matters and his sense of personal well-being.

A further analysis of these data was reported by Lessinger and Martinson (18), who found that "gifted students in the secondary school seem to attain psychological maturity early and tend to resemble one another
closely regardless of a wide range" (18, p. 574). They concluded that in planning for gifted high-school girls, it was important to take into consideration their early psychological maturity.

In Holland's (11, 12) study of talented adolescents, he noted that girls with outstanding scientific achievement daydream more about work activities than about helping others. Furthermore, creative performance, as defined by Holland's operational definition, among these gifted girls seemed "to be the outcome of a conscious conception of being original . . . and reinforcement by parents who possess values and attitudes which appear conducive to such performance" (11, p. 142). These girls described themselves as having strong motivational drives to achieve via independent and original approaches.

In the majority of the research literature (10, 13, 19, 20, 36, 37, 38, 39) gifted women have had higher scores on interest scales in those pursuits which permit meanings, implications, and symbolic equivalents of things and ideas. They seemed to be less interested in those pursuits requiring attention to small details.

Summary

A review of the literature relative to investigations of the intellectually superior has been made by a number
of interested individuals (6, 8, 26). Up until 1958 (20, p. 28) the largest percentage of these investigations were concerned solely with the investigation of intellective criteria (grades and academic honors) and the efficiency of only intellective predictors. The current emphases, however, have been to include both intellective and non-intellective predictors as a means to understanding the complexities of effective living.

MacKinnon (20) stated:

Studies of this sort will be required if the "wholistic" concept of talent which I have presented is accepted. From this point of view talent is genotypically more than the possession of superior attitudes and abilities whether general or specific in character, and phenotypically it is more than superior academic achievement; it is the actualization of the self in a lifetime of accomplishments (20, p. 28).

Thus, MacKinnon and others (8, 26, 38) have suggested that maximum understanding and ultimate utilization of talent necessitate employment of nonintellective measures as well as intellective ones.

Longitudinal and intensive studies (4, 12, 19, 31, 39) point to the increasing need to study the total personality, both the unconscious and conscious facets. The implication is that only then would those characteristics beyond mere intellect which affect the lives of the most competent adults become known. These characteristics are believed
to be crucial in the matter of effective and successful living.

The emerging trend is toward exploration of non-intellective traits and appropriate environmental stimulation significant to their development. The majority of researchers in the area of the intellectually superior have reached a consensus that more than superior intellect is needed in the processes involved in self-realization.
CHAPTER BIBLIOGRAPHY


CHAPTER III

PRESENTATION AND ANALYSIS OF THE DATA

This study was an investigation of certain nonintellective characteristics associated with a group of intellectually superior female students persisting or dropping a mathematics and/or science sequence of course offerings. The theoretical framework for the study emerged from similar and related studies; hence, directional predictions were involved in the hypotheses of this study.

A second dimension was an investigation as to whether the female student population of this study would tend to obtain scores elevated in the same direction as those of adult female creative mathematicians who were studied along the same or similar dimensions by MacKinnon (7, 12, 13).

To investigate the major concern of this study, a self-reporting instrument, the California Psychological Inventory, was employed. The high degree of psychological maturity characteristic of both the Persistors and Nonpersistors suggested the significance of nonintellective factors such as effectiveness in social interaction and living as indicated by this instrument. This finding is supportive of other research in this area (11, 13, 20, 21, 22, 5, 6, 75). Comparison of the scores of the Persistors and
Nonpersistors with a female age-mate high-school norm group (4, p. 10) and with a gifted high-school age group (4, p. 10) indicated greater similarity among the three intellectually superior groups who obtained higher mean raw scores than the female age-mate norm population on eight of the nine scales under investigation in this study.

Hypothesis One

Hypothesis One states there is a difference between the Persistors and Nonpersistors in Self-Sufficiency as indicated by elevated scores for the Persistors in Self-Sufficiency found by combining four scales (Dominance, Capacity for Status, Social Presence, Self-Acceptance) from the California Psychological Inventory. The present data do not support this hypothesis. Table II shows the results of the t test which was used to test the significance of difference between the means obtained. The value of t did not reach the .05 level of significance for the Self-Sufficiency score, which makes it necessary to reject the hypothesis of a difference. However, the mean scores and t values presented in Table II for the separate four scales combined to obtain the Self-Sufficiency score further illustrate outstanding characteristics of the groups. Only on one of these subscales, Social Presence, was a significant difference noted. The value of t, which was beyond the
TABLE II

MEAN RAW SCORES, STANDARD DEVIATIONS AND t VALUES FOR CALIFORNIA PSYCHOLOGICAL INVENTORY SCALES FOR Do, Cs, Sp, AND Sa, AND FOR SELF-SUFFICIENCY SCORR (COMBINED SCALES OF Do, Da, Sp, AND Sa) FOR TWO STUDENT GROUPS

<table>
<thead>
<tr>
<th>Scale</th>
<th>Student Groups</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Persists (N = 71)</td>
<td>Nonpersistors (N = 182)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Do</td>
<td>29.2</td>
<td>6.1</td>
<td>29.0</td>
<td>6.3</td>
</tr>
<tr>
<td>Cs</td>
<td>20.9</td>
<td>3.7</td>
<td>20.1</td>
<td>3.8</td>
</tr>
<tr>
<td>Sp</td>
<td>35.3</td>
<td>5.9</td>
<td>33.6</td>
<td>5.7</td>
</tr>
<tr>
<td>Sa</td>
<td>23.1</td>
<td>4.1</td>
<td>22.4</td>
<td>3.8</td>
</tr>
<tr>
<td>Self-sufficiency</td>
<td>108.65</td>
<td>15.0</td>
<td>105.2</td>
<td>15.3</td>
</tr>
</tbody>
</table>

df = 251.

*Two-tailed test.
.05 level of significance, makes it possible to say that the two groups are significantly different in this area. This scale is described as an assessment of poise, spontaneity, and self-confidence in personal and social interaction. Thus, the Persistors, according to the scale, appear to have a more ebullient nature. They could be described as being more active and vigorous, more enthusiastic, informal, spontaneous, and imaginative.

On the other hand, the Nonpersistors as a group appear to be more deliberate, moderate, and self-restrained. In their thinking and judging they appear to be less original than the Persistors.

The data in Table II suggest, however, areas of similarity between the Persistors and Nonpersistors. Neither group appears to be experiencing significant difficulties in the area of interpersonal adjustment. Although both groups obtained scores on the four scales indicative of their having highly developed social skills, the Persistors' significantly higher score on the Social Presence scale suggests a higher degree of effective functioning in their social behavior as indicated by this instrument.

Hypothesis Two

Hypothesis Two states there is a difference between the Persistors and Nonpersistors in their motives for achievement as indicated by an elevated score for the
Persistors on the Achievement via Independence and an elevated score for the Nonpersistors on the Achievement via Conformity from these two scales of the California Psychological Inventory. The present data do not support this hypothesis. Table III shows the results of t tests which were used to test the significance of difference between the means obtained for the two above-named scales.

The value of t for Achievement via Conformity did not reach the .05 level of significance; however, the t value of 2.26 on the Achievement via Independence was significant beyond the .05 level. Although both groups appear to be somewhat similar in those motivational factors facilitating achievement in any setting where conformance is a positive behavior, neither appears to be easily disorganized under stress or pressures to conform. According to the California Psychological Inventory Manual, scores obtained by these two groups on the Achievement via Conformity scale indicate they tend to be best described as being capable, cooperative, efficient, responsible, stable, industrious, and persistent.

However, the significant difference between the Persistors and Nonpersistors suggests important differentiating characteristics. Greater personal autonomy and independence in the utilization of their superior intellectual ability and judgment seem to obtain in the lives of the Persistors. The Nonpersistors appear to be more compliant to the demands
<table>
<thead>
<tr>
<th>Achievement Motive Scales</th>
<th>N</th>
<th>M</th>
<th>SD</th>
<th>t</th>
<th>Significance Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Achievement via Conformance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Persistors</td>
<td>71</td>
<td>27.4</td>
<td>3.3</td>
<td>.63</td>
<td>ns</td>
</tr>
<tr>
<td>Nonpersistors</td>
<td>182</td>
<td>27.8</td>
<td>4.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Achievement via Independence</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Persistors</td>
<td>71</td>
<td>20.9</td>
<td>3.6</td>
<td>2.26</td>
<td>.05*</td>
</tr>
<tr>
<td>Nonpersistors</td>
<td>182</td>
<td>19.8</td>
<td>3.5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

df = 251.

*Two-tailed test.*
of authority than do the Persistors. The latter group do not appear to be as anxious, cautious, or submissive as the former. This finding supports other research \( (3, 6, 7) \) as to the high degree of autonomy manifested among achieving individuals in mathematical and scientific fields.

Hypothesis Three

Hypothesis Three states that there is a difference between the Persistors and Nonpersistors as indicated by an elevated score for the Persistors on a Femininity Traits score combining three scales (Psychological-Mindedness, Flexibility, and Femininity) from the *California Psychological Inventory*. Present data support this hypothesis. Table IV shows the values of \( t \) obtained for the total Femininity Traits score and for the three subscales involved.

The value of \( t \) for the combined Femininity Traits score makes it necessary to retain this hypothesis. The difference was significant beyond the .05 level. A significant difference on the subscale of Flexibility points to a differentiating characteristic as the value of \( t \) indicates a significance beyond the .05 level between the two groups on this dimension. Important differences are suggested. Higher scores for the Persistors indicate a greater adaptability in their social behavior. Accordingly, they tend to be best described by such descriptive terms as confident, adventurous, insightful, and assertive.
### TABLE IV

**Means, standard deviations, and t values for California Psychological Inventory scales for psychological-mindedness, flexibility, femininity, and combined femininity scores for two student groups**

<table>
<thead>
<tr>
<th>Scale</th>
<th>Student Groups</th>
<th></th>
<th></th>
<th>t</th>
<th>Significance Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Persists (N = 71)</td>
<td>Nonpersistence (N = 132)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td></td>
</tr>
<tr>
<td>Psychological-mindedness</td>
<td>10.8</td>
<td>2.4</td>
<td>10.3</td>
<td>2.5</td>
<td>.23</td>
</tr>
<tr>
<td>Flexibility</td>
<td>10.9</td>
<td>4.2</td>
<td>9.6</td>
<td>3.8</td>
<td>2.28</td>
</tr>
<tr>
<td>Femininity</td>
<td>23.9</td>
<td>3.3</td>
<td>24.0</td>
<td>3.2</td>
<td>.37</td>
</tr>
<tr>
<td>Combined femininity traits</td>
<td>45.5</td>
<td>5.3</td>
<td>43.9</td>
<td>5.2</td>
<td>2.24</td>
</tr>
</tbody>
</table>

df = 251.

*Two-tailed test.
Comparison of the two groups of students indicate the Non-persistors tend to be more rigid and more methodological, more pedantic in thought, and more deferential to authority, custom, and tradition.

Although examination of the Table IV data reveals differences, similarities are noted, too. On two of the scales (Psychological-Mindedness, and Femininity) combined to obtain the Femininity Traits score, tests of significance of the difference did not reach the .05 level. Both the Persistors and Nonpersistors appear to be characterized by their interest in and responsiveness to the inner needs, motives, and experiences of others. Thus, these findings concerning the psychological maturity patterns of the intellectually superior student support the research of others (3, 6, 7, 11).

A dimension of this study was to determine if the students' scores on certain nonintellective traits were elevated in the same direction as have been the scores of superior female adults who have been studied on essentially these same dimensions. MacKinnon's (13) group of adult creatives included sixteen female mathematicians who were chosen from among three hundred female holders of a doctorate of philosophy as being the most creative among their peers. Nelson (7) summarized the outstanding characteristics of this group. It is with this population
of highly creative female mathematicians that the high-
school population in this study was compared.

Both the students and female creatives were assessed
with the California Psychological Inventory. Data pre-
sented in Table V indicate directions of elevated scores.
For this inventory the mean standard score is 50 with a
standard deviation of 10.

The first four scales relate to interpersonal inter-
action. On three of the scales (Dominance, Social Presence,
and Self-Acceptance) both the Persistors and Nonpersistors
obtained higher scores than did the creative mathematicians.
On the Capacity for Status scale the Persistors and cre-
atives obtained the same score which was higher than that
of the Nonpersistors. The Nonpersistors obtained scores
more like the adult creatives on two of the scales (Social
Presence and Self-Acceptance) than did the Persistors.
When a Self-Sufficiency score combining the four scales
of the personal interaction group was computed, the order
of magnitude from the highest to the lowest score obtained
was for the Persistors, the Nonpersistors, and creatives,
respectively. Thus, the Nonpersistors as compared to the
Persistors appear to be more similar to the adult creatives
on this particular dimension. With reference to the
social skills and ascendancy traits, the two student groups
appear to have stronger drives than the adult creatives.
## Table V

Mean Standard Scores on Selected Scales and Two Combined Scale Scores (Self-Sufficiency and Femininity Traits) from the California Psychological Inventory for the Student and the Creative Female Mathematician Populations

<table>
<thead>
<tr>
<th>Scales</th>
<th>Persistors (N = 71)</th>
<th>Nonpersistors (N = 182)</th>
<th>Creative Female Mathematicians (N = 15)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do</td>
<td>54</td>
<td>54</td>
<td>45</td>
</tr>
<tr>
<td>C2</td>
<td>52</td>
<td>50</td>
<td>52</td>
</tr>
<tr>
<td>Sp</td>
<td>58</td>
<td>56</td>
<td>44</td>
</tr>
<tr>
<td>Sa</td>
<td>58</td>
<td>56</td>
<td>44</td>
</tr>
<tr>
<td>Self-sufficiency</td>
<td>54</td>
<td>52</td>
<td>48</td>
</tr>
<tr>
<td>Ac</td>
<td>47</td>
<td>50</td>
<td>46</td>
</tr>
<tr>
<td>Al</td>
<td>55</td>
<td>52</td>
<td>48</td>
</tr>
<tr>
<td>Psy</td>
<td>50</td>
<td>46</td>
<td>68</td>
</tr>
<tr>
<td>Fx</td>
<td>56</td>
<td>53</td>
<td>69</td>
</tr>
<tr>
<td>Fe</td>
<td>53</td>
<td>53</td>
<td>53</td>
</tr>
<tr>
<td>Femininity Traits</td>
<td>53</td>
<td>51</td>
<td>63</td>
</tr>
</tbody>
</table>
The achievement potential scores for these three groups are noted in Table V. On Achievement via Conformance, a hierarchy of means obtained suggests that the creatives are the least oriented towards achieving in this manner. The Persistors obtained the next lowest score followed by the Nonpersistors with the highest score. This order of magnitude was exactly reversed on the Achievement via Independence. The Persistors' scores on both these scales were elevated in the same direction of the adult creatives when using the Nonpersistors as a reference group.

Comparisons of the above-mentioned three groups were made based upon data presented in Table V on those scales measuring intellectual and interest modes. On two of the scales (Psychological-Mindedness and Flexibility) the creative adults obtained the highest scores with the Persistors having the next highest. Thus, compared with the Nonpersistors, the scores of the Persistors were elevated in the direction of the adult creatives. Just as the biggest difference between the adult creatives and a comparison group was on the Flexibility scale, this, too, was the most differentiating scale in the feminine traits areas between the Persistors and Nonpersistors.

On the third scale (Femininity) of this feminine traits group of scales, all three groups obtained the same score. Apparently, no significant difference in this particular
trait obtains. This finding is supportive of Nelson's (7, pp. iv-7) statement that although "the creative women showed signs of masculine identification, they did not appear any more masculine in manner than the comparison groups."

In an over-all comparison of the two student groups with the adult creatives on the California Psychological Inventory, it is noted that the Persistors with reference to the Nonpersistors had elevated scores in the same direction as the adult creatives except for two scales in the social interaction area. In other words, on seven of the nine scales considered, the Persistors obtained scores elevated in the direction of MacKinnon's (12) group when using the nonpersisting student population as a reference group.

**Hypothesis Four**

Hypothesis Four states there is a difference between the Persistors and Nonpersistors in their preferences for certain types of psychological functioning as indicated by higher scores for the Persistors on the introversion, intuition, thinking, and perception scales from the Myers-Briggs Type Indicator. This hypothesis was not supported by data obtained in this study. The data were analyzed in terms of each of the four scales considered separately.
Continuous scores were utilized for statistical computations presented in Table VI.

To test the above hypothesis, means were obtained for each of the scales and a t test of the significance of difference was made. Table VI data reveal significant differences obtaining only for two of the scales. On the sensing-intuitive scale a t test of the significance of difference rendered a value of t significant beyond the .01 level. The Persistors obtained a higher score on intuitiveness. With reference to the Nonpersistors, they were more open to their totality of experiences and more aware of the multiplicity of possibilities. As Myers (13, p. 1) states, they tended to be more "aware of things, people, or occurrences or ideas." On the other hand, the Nonpersistors appear to rely more upon sense perceptions and to function more in terms of observable consciously perceived realities than in terms of the possibilities.

This characteristic appears to be further illustrated by noting the significant difference obtained between the Persistors and Nonpersistors on the judgment-perception scale. A t test value of the significance of difference indicated the difference as being beyond the .05 level. The Persistors appear to delay conclusions and judgments and to explore the possibilities. In the language of Myers (13, p. 2), the Persistors prefer a mode of psychological approach "which is indirect perception by way
TABLE VI

MEAN CONTINUOUS SCORES, STANDARD DEVIATIONS, AND t VALUES
FOR MYERS-BRIGGS TYPE INDICATOR SCALES FOR
PERSISTORS AND NONPERSISTORS

<table>
<thead>
<tr>
<th>Scale</th>
<th>Persistors (N = 71)</th>
<th>Nonpistors (N = 181)</th>
<th>t</th>
<th>Significance Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Extraversion-introversion</td>
<td>101.7</td>
<td>27.1</td>
<td>99.7</td>
<td>24.9</td>
</tr>
<tr>
<td>Sensing-intuitive</td>
<td>116.5</td>
<td>22.2</td>
<td>107.0</td>
<td>22.3</td>
</tr>
<tr>
<td>Thinking-feeling</td>
<td>111.0</td>
<td>21.0</td>
<td>115.9</td>
<td>21.7</td>
</tr>
<tr>
<td>Judgment-perception</td>
<td>109.2</td>
<td>29.6</td>
<td>100.4</td>
<td>28.5</td>
</tr>
</tbody>
</table>

df = 250.

*Two-tailed test.
of the unconscious, accompanied by ideas or associations which the unconscious tacks on to the perceptions coming from outside."

Other tabulations and treatment of the data were employed to illuminate the findings on this measure of psychological functioning. According to Myers (16) the main purpose of this instrument is to ascertain a person's basic preferences, reflecting not traits but dichotomous and categorical types. In Table VII the data indicate the percentage distributions on the Indicator scales and the modal type preference for the Persistors and Nonpersistors. Among the Persistors themselves, they were found to be almost equally distributed on the extraversion-introversion scale, with 49 per cent extraverted and 51 per cent introverted. These percentages were comparable to the Nonpersistors' distribution. Likewise, the two groups distributed themselves similarly on the thinking-feeling scale with percentages for thinking being 30 and 23, respectively for the Persistors and Nonpersistors. On the feeling dimension the Nonpersistors obtained a slightly higher distribution of 77 as compared to 70 for the Persistors.

As to modal preference, the Persistors obtained an INFP type whereas the Nonpersistors were typed as ENFP. To illuminate further the possible significant differentiating characteristics of the two groups, data are presented


<table>
<thead>
<tr>
<th>Scales</th>
<th>Persisters (N = 71)</th>
<th>Nonpersisters (N = 181)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Percentage Distribution</td>
<td>Percentage Distribution</td>
</tr>
<tr>
<td>Extraversion (E)</td>
<td>49</td>
<td>52</td>
</tr>
<tr>
<td>Introversion (I)</td>
<td>51</td>
<td>48</td>
</tr>
<tr>
<td>Sensing (S)</td>
<td>23</td>
<td>37</td>
</tr>
<tr>
<td>Intuitive (N)</td>
<td>77</td>
<td>63</td>
</tr>
<tr>
<td>Thinking (T)</td>
<td>30</td>
<td>23</td>
</tr>
<tr>
<td>Feeling (F)</td>
<td>70</td>
<td>77</td>
</tr>
<tr>
<td>Judgment (J)</td>
<td>35</td>
<td>47</td>
</tr>
<tr>
<td>Perception (P)</td>
<td>65</td>
<td>53</td>
</tr>
<tr>
<td>Modal Type Preferences</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INFP</td>
<td>14</td>
<td>15</td>
</tr>
<tr>
<td>ENFP</td>
<td>25</td>
<td>15</td>
</tr>
</tbody>
</table>
in Table VIII of the results of a chi-square test of the significance of the difference in the modal type preference. In Table VIII the chi-square (Yates' Correction for Continuity) of 2.19 did not reach the .05 level of significance, hence these two groups do not appear to be significantly different as to modal type classification.

When these two groups of students were compared with the fifteen highly creative female adult mathematicians of MacKinnon's study, neither group of students obtained the same modal type preference as did the creatives. The creative mathematicians indicated modal type preference was that of INTF (introverted, intuitive, thinking, perceptive). Of the two student groups, the Persistors appear to be slightly more like the creative mathematicians as far as modal type preference is concerned; however, the two student groups were not significantly different on this dichotomous categorical classification. For comparative purposes the data in Table IX indicate percentage distributions on the Myers-Briggs Type Indicator for the two student groups and the female creative mathematicians.

The adult creatives did not distribute themselves percentage-wise as equally on the extraversion-introversion scale as did the Persistors and Nonpersistors. The most outstanding percentage distribution value was noted on the sensing-intuitive scale since no one of the creatives was
### Table VIII

**Chi-Square Test of the Significance of the Difference Between Modal Type Preferences for Persistors and NonPersistors**

<table>
<thead>
<tr>
<th>Type Preference</th>
<th>Persistors</th>
<th>Nonpersistors</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>INFP (Introvertive, intuitive, feeling, perceptive)</td>
<td>10</td>
<td>28</td>
<td>38</td>
</tr>
<tr>
<td>ENFP (Extraverted, intuitive, feeling, perceptive)</td>
<td>18</td>
<td>27</td>
<td>45</td>
</tr>
<tr>
<td>Total</td>
<td>28</td>
<td>55</td>
<td>83</td>
</tr>
</tbody>
</table>

\( \text{df} = 1. \)

\( \text{Chi square} = 2.19 \) (Yates Correction for Continuity)

\( P \) - not significant at .05 level.
## TABLE IX

PERCENTAGE DISTRIBUTIONS ON THE SCALES OF MYERS-BRIGGS
TYPE INDICATOR AND MODAL PREFERENCES FOR PERSISTORS,
NONPERSISTORS, AND CREATIVE ADULT FEMALE
MATHEMATICIANS

<table>
<thead>
<tr>
<th>Groups</th>
<th>N</th>
<th>Modal Preferences</th>
<th>Scales*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>E</td>
</tr>
<tr>
<td>Persistors</td>
<td>71</td>
<td>INFP</td>
<td>49</td>
</tr>
<tr>
<td>Nonpersistors</td>
<td>181</td>
<td>ENFP</td>
<td>52</td>
</tr>
<tr>
<td>Creative mathematicians</td>
<td>15</td>
<td>INTP</td>
<td>20</td>
</tr>
</tbody>
</table>

*Legend:  E - Extraversion  
I - Introversion  
S - Sensing  
N - Intuitive  
T - Thinking  
F - Feeling  
J - Judgment  
P - Perception
classified as sensing. As a group, the creative adult females were 100 per cent intuitives as compared to 77 per cent of the Persistor group and 63 per cent of the Nonpersisters.

A dimension of this study was investigation as to whether the same nonintellective characteristics descriptive of adult female creative mathematicians tended also to characterize females at the high-school level who persisted and those who did not persist in an Advanced Placement Program in science and/or mathematics. Chi-square tests of independence were made for the Myers-Briggs scales between the student populations and the adult creatives. Data presented in Table X show chi-square results obtained indicate much greater similarity appears to exist between the Persistors and adult creatives than between the Nonpersistors and the creative adults.

No significant differences were noted between the Persistors and the adult creative mathematicians on any of the dimensions. The Persistors did manifest characteristics congruent with those of the MacKinnon group. This finding supports MacKinnon's (12) speculations that such characteristics as openness and perceptiveness as revealed in adults seemed to have been manifested in high school.

On the other hand, Table X data suggest important differences obtain between the Nonpersistors and the
TABLE X

CHI-SQUARE VALUES AND SIGNIFICANCE LEVELS FOR DIFFERENCES BETWEEN STUDENT GROUPS AND CREATIVE ADULTS ON THE MYERS-BRIGGS TYPE INDICATOR

<table>
<thead>
<tr>
<th>Scales</th>
<th>Frequencies</th>
<th>Chi-Square Values</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Persists</td>
<td>Nonpersists</td>
</tr>
<tr>
<td></td>
<td>(N = ?1)</td>
<td>(N = 181)</td>
</tr>
<tr>
<td>Extraversion</td>
<td>35</td>
<td>99</td>
</tr>
<tr>
<td>Introversion</td>
<td>36</td>
<td>37</td>
</tr>
<tr>
<td>Sensing</td>
<td>16</td>
<td>68</td>
</tr>
<tr>
<td>Intuitive</td>
<td>55</td>
<td>114</td>
</tr>
<tr>
<td>Thinking</td>
<td>21</td>
<td>41</td>
</tr>
<tr>
<td>Feeling</td>
<td>50</td>
<td>141</td>
</tr>
<tr>
<td>Judging</td>
<td>25</td>
<td>86</td>
</tr>
<tr>
<td>Perception</td>
<td>46</td>
<td>96</td>
</tr>
</tbody>
</table>

df = 1.

*Significant beyond .05 level (Yates Correction).

**Significant beyond .01 level (Yates Correction).
creative adult population on three of the four scales. On the extraversion-introversion and thinking-feeling scales the chi-square values obtained were significant beyond the .05 level whereas that on the sensing-intuitive scale was significant beyond the .01 level. However, it must be noted that the chi-square value of the thinking-feeling dimension was obtained from a two-by-two contingency table having fewer than five frequencies in one of the cells for the adult creatives. According to McNemar (15, p. 230) the use of chi-square when any expected frequency is less than five remains questionable. It is noted that the Yates' Correction for Continuity was used in each of the two-by-two contingency tables employed to obtain the values of chi square reported in Table X.

Considering both student groups in comparison with the creative adult mathematicians, the Persistors were more like the adult group, since no significant differences were obtained between the Persistors and creative adults using this particular method of assessment. These intellectually superior high-school girls who persisted in a mathematics and/or science-oriented sequence of courses were markedly like the adult females to whom they were compared on certain dimensions of psychological functioning. This finding was supportive of the theoretical framework from which the hypotheses for this study emerged.
Hypothesis Five

Hypothesis Five states that there is a difference in preferences for scientific and business interests between the Persistors and Nonpersistors as indicated by the Persistors obtaining a higher score for scientific interests and a lower score for business pursuits than do the Nonpersistors. This hypothesis was tested by computing the mean score obtained by each group on the scientific and business scales of the California Occupational Interest Inventory and testing the significance of the difference considering each scale separately. The findings did support this hypothesis. As indicated by the data presented in Table XI, the Persistors and Nonpersistors were differentiated on both scales in the directions predicted in this hypothesis.

On the business scale, the $t$ value obtained was significant beyond the .001 level. Likewise, the value of $t$ on the scientific scale also reached the .001 level of significance. Marked differences were revealed by the data between these two student groups in their basic occupational interests and preferences. The Persistors appear more interested in understanding and manipulating their physical environment. According to the manual for the California Occupational Interest Inventory (9, p. 4), these higher-scoring girls tend to choose items "involving
<table>
<thead>
<tr>
<th>Test Scale</th>
<th>Persister (N = 71)</th>
<th>Nonpersister (N = 182)</th>
<th>t</th>
<th>Significance Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Scientific</td>
<td>20.5</td>
<td>7.1</td>
<td>16.6</td>
<td>5.3</td>
</tr>
<tr>
<td>Business</td>
<td>18.8</td>
<td>7.9</td>
<td>22.4</td>
<td></td>
</tr>
</tbody>
</table>

df = 251.

*Two-tailed test.*
research, invention, determination of cause and effect relationship, and controlled observation. . . ." As a group the Persistors chose those items suggesting use of experimental techniques in both applied and pure science.

As predicted, the Nonpersistors did obtain significantly higher scores than did the Persistors in activities peculiar to the business world. The test items include those related to business contact as well as business detail or office pursuits. Thus, the details involved in major business families, such as clerical, bookkeeping, accounting, selling, buying, and management control, seemed to hold more interest for the nonpersisting group of girls.

When compared with high-school females in general as reported in normative tables of the Occupational Interest Inventory Manual, the Persistors' mean score obtained on the scientific interests scale of the inventory gave them a percentile rank of 60 as compared to a percentile rank of 30 for the Nonpersistors. In the area of business interests, the Nonpersistors' mean score obtained a percentile rank of 30 as compared to a percentile rank of 20 for the Nonpersistors.

This finding lends support to other studies (12, 13) suggesting the closely related aspects of interests and motives. In this study occupational interests did appear
to differentiate and reflect certain degrees of personal drive as indicated in the students' persisting or discontinuing a particular curricular sequence. If, as suggested by the theoretical framework for this study, the occupational choices one makes reflect his inner values, it follows that scientifically oriented curricula appear to hold more intrinsic and self-perpetuating satisfactions for the Persistors than for the Nonpersistors.

In Nelson's (7, pp. iv-4) report of the adult creative female mathematicians' interests and values, she stated that these women were characterized by their "being more intensely interested in mathematics." She further noted (7, pp. iv-5) that Q-Sort items placed high by this group included those relating to their willingness to subordinate other things to their research goals. Their research interests were described as lying "within narrow range" (7, pp. iv-5). The Persistors' inventoried occupational interest patterns appeared to be more congruent with this characteristic description than was that of the Nonpersistors group.

MacKinnon (13, p. 23) reported the creative and comparison groups studied by him and his associates consistently revealed a pattern of scores on the Strong Vocational Interest Blank having to do with those professions concerned more with meanings, implication, and symbolic equivalents. They
scored low on scales having to do with business and small detail. Although no study is reported in the California Occupational Interest Inventory Manual correlating this inventory with the Strong instrument for women, it does provide a table of correlations obtained in a study by Lindgren and Gilberg (9, p. 11) for a male sample. The reported correlations indicate a high positive relationship between Group II, mathematicians and scientists, of the Strong instrument and the science scale of the California Occupational Interest Inventory. Negative correlations were reported to obtain between this group of the Strong and the business scale of the California inventory. A reasonable expectation would be that similar relationships would also be noted between these same scales of these two instruments for female populations. With this conceptualization as a frame of reference, the Persistors of this study appeared to have interest patterns more similar to the adult female mathematicians of the MacKinnon study than did the Nonpersistors. Published data did not permit more direct comparisons.

Analysis of Personal Interview Data

Following an approximate time lapse of three weeks from the administration date of the objective testing, personal interviews were conducted by the researchers with both
Persistors and Nonpersistors representative of the various points of termination of the mathematics and/or science sequence.

Interview material was secured from a 35 per cent sampling of the Persistors and a 30 per cent sampling of the Nonpersistors. In each of the seven schools where interviews were conducted, the researcher gave to the counselor who assisted in procuring the interviewees a list of both the Persistors and Nonpersistors. This list also noted grade levels at which the mathematics and science sequence was terminated in the school. The counselor was asked to select those students who were representative of the varying levels of persistence and who were available at the time of the interviewing.

A nonstructured interview approach was used. This approach was described by Leonard (10) as a focused interview which provided a concrete situation as a framework for discussion. The concrete situation in this case was mutual interest in the mathematics and/or science sequence of courses and what participation in this program seemed to have meant to the individual. The major concern in the interviewing was to allow for free responses and expressions of the subject’s self-perceived feelings, ideas, values, interests, and attitudes associated with her participating or terminating her original relationship with
the Advanced Placement Program. It was thought that an analysis of such self-perceptions as to the "whys" of an individual's functioning as she did might reveal some clues or at least provide an improved gestalt of the interactive properties of the nonintellective factors being investigated in this study.

Although free response and expression were encouraged in the interviews, several major areas for discussion were preconceived for possible presentation to the interviewee. It was thought that such presentations might be made if the topics were not freely discussed by the student. This focused interview permitted much freedom for the interviewee to describe her self-perceptions and her feelings relative to her academic experiences in the Advanced Placement Program. The preconceived areas presented in some instances to encourage more extensive verbalizing were usually worded as follows:

1. "Tell me how you feel about your participation in the Honors Program."

2. "I should be very much interested in how you feel your friends, teachers, and parents have felt about your being in (or discontinuing) the Honors Program."

3. "I wonder if you would share with me what you consider to be some of the advantages and disadvantages of the Honors Program."
4. "Your future plans for yourself would be of interest. I wonder if you would mind sharing with me some of your plans for yourself."

Notes were made immediately following each interview. These notes were used to reduce the amount of error involved in the reporting. Although composite-type portraits are presented of the Persistors and Nonpersistors, quotations from the interviews are also presented as illustrations of the individuality and uniqueness of the individual subjects.

Feelings About Personal Capabilities

The Persistors more often saw themselves as having always been very capable in the area of academic achievement. They seemed to have developed a scholarly self-image which had been progressively learned during the entire time span involving their academic experiences. Statements were made often by the Persistors that they were always ahead of nearly everyone else in their grade-school classes. They generally reported no surprise at having been identified as highly capable in scholastic ability. Only one student seemed to present a different view. Initially she perceived herself as "unworthy, not smart, and not honors." She recalled feeling unliked by others and even by herself. After a year in the program, she
reported that the scholastic gains made helped her to feel more competent—"like a capable person"—and her interests began to grow and develop.

Nonpersistors, however, seemed to lack this confidence in their personal abilities, more especially so if they had discontinued the sequence in the first or second year. Practically every one of these early leavers of the sequence gave negative self-evaluations of their scholastic aptitude. They seemed to feel their placement was inappropriate from the beginning. "I just never was that good," was a frequent comment.

The largest percentage of Nonpersistors discontinued the sequence at the end of Grade X. This group of girls seemed to feel more personally capable than the early leavers, but not to the extent the Persistors did. At this level, these girls experienced some doubts about their capabilities "to go on" with the program. In most cases, these girls considered the risks and responsibilities involved in continuing the program and felt they might not be able to cope with the advanced work.

The girls who persisted through Grade XI and discontinued the sequence at this point seemed to have feelings about themselves, more compatible with the Persistor group. At this point, it seemed these girls felt rather adequate in that they had demonstrated their intellectual
competencies. Discontinuance of the sequence was more often explained in terms of personal interests and values rather than on the basis of self-doubts relative to capabilities.

Responses of Significant Others

The Persistors seemed to feel that their peers had responded to them in ways which made them feel they had status and prestige as a result of being in the Honors program. For the most part, the Persistors had experienced positive attitudes from peers toward their intellectual achievements. In a minimal number of cases, the Persistors reported slight harassment and teasing for being a "brain." Reportedly, this occurred only at the junior-high-school level. At the senior-high-school level apparently only respect and admiration were experienced.

Nonpersistors almost unanimously expressed a wish that they had remained in the program, at least through Grade XI. They seemed to feel they had enjoyed some status among their peers simply by having been identified as being eligible, hence perceived as capable. Status among peers seemed to be directly related to numbers of years one had persisted in the sequence. Peers often were reported as expressing admiration for program participants who were capable of coping with the advanced work while
simultaneously discharging numerous desirable social obligations. Positive peer responses seemed personally rewarding and satisfying but not supportive enough to keep the girls in a sequence of curricular course offerings incongruent with their self-image.

Teachers' responses to these high-achieving girls apparently communicated a kind of acceptance which tended to enhance and reward their scholarly self-image. For the most part, these girls felt their teachers were "fine" or "wonderful," but they were aware of differences in the capabilities of individual teachers. The occasionally inadequately perceived type was resented by these girls who wanted "the very best teachers."

For them, the adequate teacher was able to stimulate and challenge their students' intellectual activities in a way that encouraged discussion of "really important things" as several students reported. Teachers most frequently mentioned were those who made the students feel capable and adequate.

Nonpersistors seemed to feel their discontinuance was related to their own values and interests rather than to the teacher or teaching per se. In some cases, a teacher had reportedly recommended a student's discontinuing the sequence, but, in general, the girl felt this was
justified in her particular case as she "just was not interested." Several girls mentioned their having discontinued the sequence because they had always been "better than anyone else" in their class, but could not be the "best one" when all the students were excellent. These girls seemed more confident of their ability to compete and "be first" in a nonhonors group.

Parents of the Persistors were reported most frequently as being proud of their child's intellectual potential and accomplishments. Several of these females seemed to have received more support from their fathers than from their mothers. One girl stated that she persisted in the program because her father, a banker, enjoyed helping her with her mathematics assignments. Apparently, this study period was utilized as a vehicle for further communication between father and daughter, which appeared to be a rewarding experience for both of them. Although mothers were also described often as being supportive, they were frequently pictured as being rather ambivalent about their daughter's participating in this accelerated program, particularly if study had interfered greatly with their child's social activities. Persistors, too, reported some attitudinal conflicts existing between them and their parents, especially their mothers, as to what curricular
offerings were most appropriate for girls to strive towards excellence in the existing culture. Much stereotypy concerning appropriate feminine roles seemed to influence parental acceptance and encouragement.

Nonpersistors also reported parents as being proud of their intellectual capabilities. These parents appeared to be more pleased with the recognition their daughters received through being identified as potentially capable than they did because of the girls' high actual productivity in an academic area. This parental value differential was more apparent in the reports of those who discontinued the sequence at the end of Grades VIII, IX, and X. Parental pride seemed more related to the reflected glory parents were experiencing and enjoying than to any basic commitment to academic productivity for their daughters.

Major Advantages and Disadvantages of Advanced Placement

One hundred per cent of the Persistors interviewed expressed personal opinions highly favorable to grouping students for instruction in certain curricular areas such as was done for the mathematics and science sequence under investigation. Grouping these girls with equally capable peers was considered by them to have been a stimulating intellectual challenge. Grouping for instruction was perceived as contributing to the fulfillment of their
cognitive needs by bringing together a group who preferred to delay conclusions and explore, to look for relations and meanings, and to "cover in depth" topics of mutual concern.

Although the opportunities afforded by this program for stimulating intellectual activities was usually the first advantage mentioned, self-esteem needs in addition to cognitive needs apparently were being met. Reasons given for persisting were often related to feelings of competency, adequacy, autonomy, prestige, and mastery. These girls seemed to feel that continuance in the program demonstrated their ability to compete successfully and still have acceptance, approval, and status.

Another advantage frequently mentioned was the opportunity for social interaction with capable peers. Dating partners were more frequently sought among the Honors group since the girls seemed to feel that the boys in Honors "were more interesting." Too, the girls felt they were accepted by their highly capable male classmates without being a threat to the male ego.

Closely related to this social value, however, was a situation considered by a few as a disadvantage in that acquaintance among their peers was sometimes limited because most of their classes were with the same group. In almost every case reporting this limitation a concluding
statement was made to the effect that the individual would not have given up Honors for broader social interaction but would have sought this through other available sources such as church or social organizations.

Nonpersistors mentioned more advantages than disadvantages related to the program. In a majority of the cases, the Nonpersistors would remark that the program was "just wonderful for those who wanted it." Resistances seemed related to the incongruence of high achievement in mathematics or science with the self-images of these girls. They "just could not see any sense in doing all the work" when these curricular areas did not appear to enhance nor contribute to self-realization from their point of view. Too, the work required reportedly would interfere with their actualizing themselves by and through other means perceived as being more valuable.

**Future Orientations**

The future plans of both the Persistors and Nonpersistors appear to be greatly influenced by the cultural and environmental expectations of the feminine role in the present society. Both groups of girls appeared to experience conflict in resolving the issue of aspiring for a career yet meeting societal expectations for marriage and children. This attitudinal conflict seemed paramount for
the Persistors who seemed to feel stronger inner pressures to "do something." The Persistors felt an urge to continue satisfaction of their cognitive needs at "all costs," whereas Nonpersistors would more frequently state a willingness to accept the dominant traditional feminine role if such a choice seemed necessary. One Persistor reported that all of the capable girls felt this keen conflict and worried somewhat about it but seldom discussed it among themselves.

As a group, the Persistors seemed to have more long-range plans relative to further academic training and seemed more determined to realize these goals. Their goals always included vocational plans at a professional level; however, only a minimal number verbalized educational plans for doctorate level study.

Although the larger percentage of Nonpersistors did plan for educational experiences beyond the high-school level, stated vocational preferences frequently appeared to be for careers usually deemed less demanding of intellectual potential than that possessed by these girls. One such Nonpersistor stated she had been strongly influenced by her mother, who had begged her to take typing "just for me." Strong external pressures for the so-called practical courses seemed to have been exerted in several cases.
Summary

Data relevant to an examination of the hypothesized differences between persisting and nonpersisting Grade XII females in an Advanced Placement Program of mathematics and science were analyzed. The hypothesis that the persisting girls were more self-sufficient than the nonpersisting girls was rejected. Only on the social-presence aspect of the self-sufficiency dimension were the two groups differentiated. Further differentiating characteristics were noted although the hypothesis that the persisting females would tend to achieve via independence and not via conformance was not confirmed by the data. However, the persisting females were characterized by their motive to achieve via independence when considered separately. Another hypothesis supported by the study was that persisting females would tend to give greater expression to those traits described as being feminine. Acceptance of this hypothesis was related to the significant difference between the Persistors and Nonpersistors in the area of flexibility. The hypothesis of a greater preference on the part of the persisting girls for introversion, intuition, thinking, and perception was rejected; however, significant differences did obtain on the scales for intuitiveness and perception when the four scales were considered separately with the Persistors having the higher
scores. Persisting females expressed preferences for scientific interests significantly more so than did the Nonpersistors, whereas the latter group chose business interest in preference to scientific. The hypothesis relative to the direction of interest preferences was accepted.

When the Persistors and Nonpersistors were compared with the adult creative female mathematicians of MacKinnon's study, the Persistors manifested a greater similarity with the adults than did the Nonpersistors. This finding supports MacKinnon's speculations that certain nonintellective characteristics revealed in adults seemed to have been manifested at the high-school level.

The personal interview material indicated important differences in self-perceptions between the Persistors and Nonpersistors. Apparently, these females respond to academic opportunities largely in terms of relevancy to self-realization. This finding supports a number of theorists' (1, 14, 17) motivational concepts associated with self-actualizing tendencies. Both student groups exhibited behavior which appeared resultant of a "perverse channeling of some of the actualizing tendency into behaviors which do not actualize" (8, p. 19).
CHAPTER BIBLIOGRAPHY


CHAPTER IV

SUMMARY, FINDINGS, CONCLUSIONS,
AND RECOMMENDATIONS

Summary

The major concern of this study was to investigate the relationship of certain nonintellective factors associated with a group of intellectually superior females' persisting or discontinuing a five-year sequence of course offerings in mathematics and/or science. The population included Grade XII girls from ten senior-high schools of a large, metropolitan Southwestern public-school system. These girls were selected in 1958 for enrollment in an Advanced Placement Program offering opportunities for acceleration in mathematics and/or science course offerings. Enrollment eligibility was based upon psychometric test data, teacher marks indicative of quality performance, teacher nomination, and parental approval. Psychometric evidence required were a minimal IQ of 120 and performance on a standardized achievement test of at least two grade levels above actual grade placement at the time of the testing. Teacher nominations considered individual personal application and productiveness in classroom activities.
The initial 1958 Grade VIII grouping included 334 enrollees. Of this original number, 273 were enrolled in Grade XII classes during 1962-1963 in the school district furnishing the population for this study. Sixty-two students had either moved from the district or enrolled in private schools. Of these 273 students, 200 were Non-persistors and 73 were Persistors. Through the utilization of self-reporting instruments usable test data were obtained for this study from 71 Persistors and 182 Nonpersistors; however, since one Nonpersistor was unable to finish part of the testing, the numbers for the Nonpersistors varied from 181 to 182.

A review of the research regarding the nonintellective characteristics of intellectually superior individuals, especially those who appeared to be highly productive in mathematics and the sciences, provided the theoretical framework from which the hypotheses of this study were formulated. It was hypothesized that the persisting females as compared to the nonpersisting females would tend to be more self-sufficient, would be more motivated to achieve via Independence, and would tend to give greater expression to the feminine side of their nature. As to preferences for certain types of psychological functioning, it was hypothesized that the Persistors more so than the Nonpersistors would prefer introversive, intuitive, thinking, and perceptive approaches. It was further hypothesized that
the interests of these two groups were different in that
the Persistors would prefer scientific activities involving
understanding and manipulating their environment whereas
the Nonpersistors would prefer activities peculiar to busi-
extness interactions.

A further concern of this study was to investigate
whether the performances of the Persistors would be elevated
in the direction of the performance of the adult female
mathematicians of the MacKinnon-directed investigation at
the Institute of Personality Assessment and Research. Two
of the same psychometric instruments (California Psychologi-
cal Inventory and Myers-Briggs Type Indicator) which were
used in the IPAR study were employed. An interest inventory
(California Occupational Interest Inventory) was used for
which research data indicated a high positive relationship
to the Strong Vocational Interest Blank for the scales
relevant to this study. The SVIB was used in the IPAR study.
When possible, direct comparisons were made between the
student and the adult mathematician populations.

Additional data presented were obtained approximately
three weeks following the objective testing by means of
semistructured interviews held with Persistors and Non-
persistors representative of students who had continued the
program for varying periods of time. The data were examined
and a composite-type portrait description given of the
Persistors and Nonpersistors as a group accompanied by abstracted quotations to illustrate the individuality and uniqueness of the individuals. Especial attention was given to the student's experiences and reactions relative to her participation in the Advanced Placement Program.

Findings

Hypothesis One, which stated that Persistors would be more self-sufficient than Nonpersistors, was rejected. This self-sufficiency score was obtained by combining the four subscales for Dominance, Capacity for Status, Social Presence, and Self-Acceptance from the California Psychological Inventory. A definite type analysis of the data indicated Persistors and Nonpersistors were significantly different on the Social Presence scale with the Persistors obtaining the higher score indicative of greater poise, spontaneity, and self-confidence in social interactions.

Comparison with the creative adult female mathematician's performance on these same subscales revealed that the Nonpersistors appeared to be more similar than did the Persistors to the adults on three of the four scales being considered. Both student groups, however, obtained higher scores than the adults on these three scales with the Persistors and adults obtaining equal scores on the fourth,
Capacity for Status scale. On this latter scale the scores obtained by the Persistors and adults were higher than those of the Nonpersistors.

Hypothesis Two stated a difference between the Persistors and Nonpersistors in their motives for achievement with the Persistors having elevated scores on the Achievement via Independence and the Nonpersistors having elevated scores on the Achievement via Conformity scale. This hypothesis was rejected; however, the Persistors did obtain an elevated score on the Achievement via Independence scale. Both groups appeared to possess that facet of interest and motivation which facilitates achievement where conformance is a positive behavior. Although the hypothesis was not supported as stated, the Persistors evidenced motives for achievement more like those of the adult mathematicians than did the Nonpersistors.

Hypothesis Three stated that a difference between the Persistors and Nonpersistors would be indicated by elevated scores for the Persistors on a Femininity Traits score, operationally defined as a combined score for the subscales of Psychological-Mindedness, Flexibility, and Femininity. This hypothesis was retained. Greater flexibility and social adaptiveness were characteristic of the Persistors, thus suggesting a marked likeness with the creative adult population with whom they were compared.
Hypothesis Four stated that the Persistors more so than the Nonpersistors would prefer introversive, intuitive, thinking, and perceptive modes of psychological functioning. This hypothesis was rejected. An examination of the data, however, suggested the Persistors were significantly more intuitive and perceptive. These latter characteristics they held in common with the creative adults. An extended analysis of the data revealed no significant differences to obtain between the Persistors and creative adults in their modal preferences of psychological functioning.

Hypothesis Five stated that Persistors would tend to prefer scientific pursuits requiring understanding whereas the Nonpersistors would tend to prefer business details and pursuits peculiar to business interactions. This hypothesis was retained. Again, the Persistors expressed preferences more similar to those of the creative adults than did the Nonpersistors.

Personal interview data indicated that intellectually superior females were more likely to pursue those curricular offerings most congruent with maintaining, enhancing, and actualizing themselves in terms of their self-image and inner needs. Support by significant others appeared to be most encouraging when the girl was made to feel adequate, capable, competent, and accepted even though achieving in areas perceived by the greater culture as not being
traditionally feminine. Intellectual stimulation was apparently a most rewarding experience, strongly motivating a girl to persist even when encouraged to seek other types of social rewards. Societal expectations of the traditional feminine roles aroused much conflict among these students in their attempts to plan for their dichotomous life roles.

Conclusions

The following conclusions may be drawn from the present study:

1. Intellectually superior female youth who persist or discontinue an accelerated mathematics and/or science sequence of high-school courses appear to have achieved a greater level of psychological maturity in terms of self-assurance, capacity for status seeking, and effective interacting with their environment than have their age peers in high-school populations.

2. Intellectually superior female youth who persist in an accelerated mathematics and/or science sequence of high-school courses evidence motivational preferences for achieving through independent and autonomous behavior similar to those preferences of creative female adults in similar areas and to a greater extent than do their equally capable female peers who discontinue the sequence.
3. Intellectually superior female youth who persist or who discontinue an accelerated mathematics/science sequence of courses in high school tend to be conforming when conformity is externally perceived as a positive behavior facilitating achievement.

4. Intellectually superior female youth who persist in an accelerated mathematics/science sequence of high-school courses evidence more flexibility and adaptability in their thinking and social behavior than do equally capable female youth who discontinue the sequence.

5. Intellectually superior female youth who persist in a mathematics/science sequence of high-school courses tend to prefer an intuitive and indirect perceptive approach to new awarenesses and possibilities more so than do their equally capable peers who discontinue the sequence.

6. The persisting female youth more so than the non-persisting youth evidence less interest in the details of business and more interest in scientific experimentation just as did the creative female adults.

Recommendations

Recommendations for further study and planning for academic experiences of intellectually superior female youth as indicated by this study include the following:

1. A replication of this study should be made with Grade VIII females who were completing the first year of
the five-year mathematics/sciences sequence to determine if the same differentiating characteristics noted in this study tend to emerge at an earlier age.

2. Utilization of an occupational interest inventory should be included in the psychometric battery used in selecting females for acceleration in a program emphasizing mathematics and/or science.

3. An appraisal of nonintellective characteristics of intellectually superior girls should also be considered in their academic selection and placement. The need-meeting characteristics of certain curricular offerings for girls with certain preferred modes of psychological functioning should be further investigated.

4. Further investigation should be conducted of the psychological climate of classrooms which appear to support and encourage intellectually capable girls in achieving their maximum potentials. This would include an investigation of the degree and ways by which girls are made to feel feminine and accepted while pursuing and competing in culturally defined "masculine" course offerings.

5. Experimentation should be carried out with multidimensional counseling for academically capable girls with particular attention being given to possible areas of conflict and frustration resulting from their anticipation of dual roles and responsibilities. Other relevant topics
for exploration and attention might include (1) cultural biases affecting "feminine" choices, (2) possible sex-role conflicts based upon relationships and identifications with significant others, especially parents, and (3) frustration tolerance necessary to harmonize dilemma created by societal pressures exerted upon females to conform while individualism and originality are being rewarded in the greater society.

7. Persisting females of this study should be followed through their subsequent educational experiences with attention being given to their academic choices, major study stability and/or change, interrupted study plans, and graduate study plans.

8. An attempt should be made to formulate a theory of career development in intellectually superior females including both a psycho-social and psycho-dynamic approach as a framework for future research.

9. Investigation should be made as to whether or not earlier grouping of the intellectually superior female youth is conducive or crucial to their continuing an academically accelerated program in particular curricular offerings. Such knowledge would be highly significant to early identification and nurturant processes.
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