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# Nonintellectual Characteristics of Mathematically Gifted Young Adolescents

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# NONINTELLECTUAL CHARACTERISTICS OF MATHEMATICALLY GIFTED YOUNG ADOLESCENTS

by

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VITA

The author, Elizabeth A. Smith, is the daughter of Anne I. Goldman and Carter P. Pfaelzer. She was born March 27, 1957 in Boston, Massachusetts and was raised by Jay Goldman and Anne (Ipsen) Goldman.

She obtained her elementary education at Cambridge Friends School, Cambridge Massachusetts. Her secondary education was obtained at St. Paul Academy, St. Paul, Minnesota and completed at Breck School, Minneapolis, Minnesota in June 1974. In September Ms. Smith entered the University of Minnesota, Minneapolis, Minnesota as an early admissions student. In January 1976 she was awarded a dance scholarship at Butler University, Indianapolis, Indiana. In January 1977, Ms. Smith returned to the University of Minnesota as a psychology major. In March 1979, she received the degree of Bachelor of Arts, Magna Cum Laude. In 1977 while attending the University of Minnesota she was admitted into the Honors division of the College of Liberal Arts and in 1978, she was elected a member of Phi Beta Kappa. In 1979 Ms. Smith began work as a teacher/therapist at Pathways School and Treatment Center, Chicago, Illinois where she stayed until August 1980.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CONTENTS OF APPENDICES

DEDICATION

To my loving husband

Guy

# INTRODUCTION

The University of Minnesota Talented Youth Mathematics Program (UMTYMP) was established in 1976 "to provide accelerated mathematics classes for extremely talented junior high school pupils" (House, 1980, p.1). Until May 1980, this program was sponsored by the State Department of Education. Since that time, the University of Minnesota has taken over the sponsorship and has subsequently established a program similar to the Study of Mathematically Precocious Youth (SMPY) at Johns Hopkins University.

Each year in September, schools in the Minneapolis/St. Paul and surrounding areas are asked to recommend seventh and eighth grade students who have scored "at or above the 97th percentile on a standardized test of mathematical ability or achievement, and who had not yet completed Algebra I" (House, 1980, p.1). In addition, schools are asked to recommend sixth graders who have shown exceptional mathematical ability. These selected students then become eligible to take an entrance exam. Based on the results of this testing session, approximately 60 students are selected to participate in the program beginning in October. Students selected typically have scored higher than 44 out of 50 on the Quantitative section of the School and College Ability Test (SCAT-Q).

Students accepted into this program are excused from their regular math classes and receive math credits by participating in this program. Classes meet once a week for two hours for a total of 30 weeks. Students are expected to do approximately 10 hours per week of work on homework assignments. In the first year of the program, students cover Algebra I and II material, providing a more comprehensive and accelerated course than is taught in regular mathematics classes. During the year, students receive weekly homework assignments and periodic unit tests constructed by the teachers. Students are also required to pass the Algebra I and II tests from the Cooperative Mathematics Test (COOP). The students are divided into two classes of approximately 30 students. One class is composed of all eighth graders, and the other of sixth, seventh, and eighth graders.

To date there are only a handful of programs such as UMTYMP and SMPY, resulting in extensive competition with proportionately few students selected. For example, for the 1982-1983 year of the program, 1150 students qualified to sit for the entrance exam, out of whom only 62 were selected. Consequently, the need to accurately identify students who will succeed and benefit from such programs becomes an important question. In the Minnesota program, administrators felt that other nonintellectual variables might contribute substantially to improving selection pro-

cedures. In addition, there was concern about the number of female students in the program and their performance in the program compared to male students on nonintellectual variables. Finally, program administrators wished to understand nonintellectual characteristics of students participating in a program such as this one, so they could better meet students' needs.

The purpose of this study, therefore, is to examine nonintellectual variables such as personality characteristics, achievement, power, and intimacy motivation, expectations and attitudes towards mathematics and the program, and family climate in order to: 1) provide a descriptive profile of students participating in the program, 2) compare UMTYMP students to other populations in terms of specific nonintellectual variables, 3) identify subsample differences (e.g. sex, and grade), and 4) differentiate highly successful from less successful students.

The California Psychological Inventory (CPI) and Thematic Apperception Test (TAT) were used in this study as descriptive measures, and to predict academic achievement in this program. The TAT was scored for achievement, power, and intimacy motivation. Parent and student questionnaires were also developed to measure other variables such as academic interest, initiative, and history, attitudes, family environment, individual characteristics, program

expectations and committment, and biographical information. In addition, the Classroom Environment Scale (CES) and a program evaluation questionnaire were used to assess the students' perceptions of the classroom environment and the program at the end of the year.

## REVIEW OF THE RELATED LITERATURE

Intellectual giftedness has been a primary area of concern and interest for researchers and educators for many years. Much of this research has concentrated on differentiating gifted children from "normal" children. For instance Lessinger and Martinson (1961) have shown that gifted children tend to be more socially and psychologically mature than their peers. Terman's early longitudinal study on gifted children (1925-1959) and more recent research has generally shown that gifted children grow up to be productive and well-functioning adults who make substantial contributions to society. Despite these findings, people continue to believe the myth that gifted children, particularly the mathematically gifted, have more psychological and social problems than do children of average intelligence.

Little research has been done relating giftedness to scores on various nonintellectual variables. However, previous findings have indicated that gifted children with IQ scores greater than 160 differ from those with IQ scores less than this on variables such as social and psychological adjustment. Few studies, nevertheless, have been conducted to validate this finding (Hollingsworth, 1942). What research there is has mainly been published by Stanley, Keating, and others connected with the Study of Mathemati-

cally Precocious Youth program at Johns Hopkins University (1974, 1976, 1982). This group of researchers has examined biographical variables, personality dimensions, and vocational interests of gifted young adolescents as compared to average-intelligence peers and other gifted samples.

In surveying the literature relating to nonintellectual characteristics of gifted adolescents, three areas will be addressed: 1) gifted profiles on nonintellectual variables, 2) nonintellectual variables relating to academic achievement, and 3) sex differences on nonintellectual variables within gifted populations. While much of the research related to predicting academic achievement has proven disappointing, there are a few instruments, such as the California Psychological Inventory (CPI) and the Thematic Apperception Test (TAT) which have been shown to have some success in predicting academic achievement (Alker & Wohl, 1972; Demos & Weyola, 1966; Flahery & Reutzel, 1965; Gough, 1953, 1964; McClelland, Atkinson, Clark & Lowell, 1953).

Many nonintellectual variables exist that could be examined in relation to giftedness and academic achievement in children. The first area of literature reviewed will concern previous questionnaires or inventories constructed to obtain information about biographical characteristics, attitudes, family environment, parental expectations, and academic achievement. Two sections on the CPI and the TAT will follow.

Biographical Inventories:

Kincaid (1969) conducted a study of highly gifted children with IQ scores at or above 150. In this study, questionnaires were given to both parents and their child to gain a greater understanding of what highly gifted children are like. Results of this study showed the mean age of walking to be 11.8 months, of talking to be 14.7 months, and of reading to be 4.5 years for females and 4.6 years for males. Demographically, 50% of the children were first born, with 79% coming from two to three child families. Approximately 50% of the fathers had professional occupations, and of the 36% of mothers who worked, 58% also had professional occupations. Reading and mathematics were found to be the most popular school subjects. However, several students were not doing well in school. In relation to grades, 16% more girls than boys received A's in music. However, 14% more boys than girls received A's in science. Reading was a favorite pastime for both boys and girls.

Thompson (1976) looked at study habits in relation to academic achievement. His study was based on Wrenn's (1933) premise that in subjects of equal ability, study habits account for differences in academic achievement and on Brown and Holtzman's (1955) finding that study habits and achievement attitudes can significantly affect academic success. Thompson developed a study habits inventory designed to measure achievement motivation. The results

of this study showed that the use of this instrument increased the ability to predict college success.

Birth order and family environment were related to verbal and number ability in a study conducted by Marjoribanks and Walberg (1975). The results of this study provided further support for the belief that first born children have higher "verbal and number ability". Birth order was unrelated, however, to "reasoning and spatial abilities" (p. 81). Achievement motivation was measured according to parents' academic expectations, child's need for socialization, parents' aspirations and educational values, and parents' interest in their child's education. Achievement motivation, as defined here, was more highly correlated with verbal and number ability (p. 66). They concluded that the ways in which parents and their children interact, along with birth order, seems to affect the child's academic ability.

Lehrer and Hieronymus (1977) also conducted a study on nonintellectual predictors of achievement which used selected scales of the Childrens' Report of Parental Behavior Inventory (CRPBI), biographical questions, and items concerning academic achievement taken from several inventories. Results of this study showed that "inclusion of such nonintellectual factors as academic achievement motivation, educational expectations, and biographical

factors can enhance the prediction of academic achievement beyond that of a measure of intellectual functioning" (p. 50).

Cox (1977) conducted a study on "background characteristics" of gifted children with IQ scores at or above 130 in order to provide a descriptive profile of this sample. Data on variables such as birth order, family size, hand preference, age of walking and talking, and leisure activities were collected. Overall, the author found that over 70% came from two or three child families; none were first born, 10.5% were left handed; 46.3% began talking at 10 to 12 months; 53.9% began walking at 9 to 11 months; the most popular pastime activity was reading; and most children reported liking sports (more true of boys than girls).

Touliatos, Lindholm, and Rich (1978) conducted a study on the effects of family environment on academic achievement in different social classes for boys and girls. The results of this particular study showed that high academic achievement was related to intact, small families, and birth order (being first or last born). They also found that girls in general scored higher in academic achievement than did boys, and that higher social status was related to higher achievement.

Tidwell (1980) also conducted a study concerning non-intellectual variables found in gifted high school students with a mean IQ of 137. As part of this study, she developed

a questionnaire which included questions related to school, homework, recreational activities, leadership ability and personal needs. The results of this study showed that students attended school full time, studied about 10 hours per week, were involved in one extracurricular activity per week, and spent 7 hours per week doing chores. Few students worked outside of their home. About 10 hours per week were spent on leisure/recreational activities. Most students slept about 8 hours per day. In addition, most spent about 11 hours per week watching television, most read about 3 books and magazines per week; few held leadership positions, most enjoyed leisure activities such as dancing, movies, sports, and talking on the telephone; most had received two honors and awards; and most felt they had about three talent areas. About 97% said they would attend college. Only 35% saw themselves as popular, 75% said they were happy, and 51% rated achievement and/or intelligence as high personal needs. In relation to life goals, 65% chose achievement and/or intellectually oriented goals while 91% chose higher level or professional goals.

Marjoribanks (1981) conducted another study in the area of academic achievement which examined sex differences and family environment. In this study, "family learning environment" was defined based on parents' "aspirations," "achievement orientations," "press for English" and "press for reading," along with "press for independence" and

"achievement value orientations" for their child (p. 157). The conclusion reached in this study was that high cognitive ability was associated with high academic achievement, but was unrelated to sex. Differences in cognitive ability, academic achievement, and family environment appeared more related to ethnic group affiliation than to sex.

In 1982, Parsons, Adler, and Kaczala published a study examining "parental influences on children's achievement expectancies and self-concepts of ability" particularly as related to the child's sex (p. 310). One theory proposed here was that achievement motivation is related to parental expectancies, and attitudes concerning independence and academic achievement. In this particular report, mathematical ability was selected under the assumption that "boys have both higher expectancies and self-concepts of their math ability than girls" and have a greater likelihood of pursuing "math related careers" (p. 311). The results of this study indicated that in mathematics ability, parents perceived their daughters as doing well due to "hard work" while sons were seen as doing well due to "high ability" (P. 320). The authors concluded that "parents have their major impact as conveyors of expectancies regarding their children's abilities" which suggests that parents perceptions and expectations may relate to differences between boys and girls despite equal math ability (p. 320).

Benbow and Stanley (1980, 1982) attempted to provide descriptive profiles on nonintellectual and intellectual factors so that baseline data for their longitudinal study on gifted adolescents could be obtained. Most relevant to the present study were data obtained from students concerning family background, type of school attended, attitude towards school, mathematics status, math learning method, liking for math, and career importance of math. Conclusions reached in these two studies were that parents were well educated, had high occupational levels and larger than average families, but that only parental education and fathers' occupation tended to correlate with ability level. This finding, however, may be primarily attributable to the small variability within SAT scores of those accepted into their program. In addition, it was found that most attended public school (84%); most strongly liked school, with girls liking school more than boys; students saw themselves as "above average" in mathematics status; most had learned math in regular classrooms (74% of the boys, 81% of the girls); and 92% strongly liked mathematics, with boys liking it more than girls (p. 84). In addition, 90% of students believed math would be important in their future career (no significant sex or ability differences). When SAT scores were related to these variables, few were correlated with ability. In fact, the only difference found was that as girls' SAT-V scores increased, the importance of math for future careers decreased.

Overall, previous research on giftedness has provided a fairly positive picture of these children, both socially and psychologically. In summarizing these studies, it seems that gifted children learn to read early, are more frequently first born, and are more likely to have parents with professional occupations. These children seem also to like to read and interact with others and have primarily academic future goals and orientations.

In relation to predicting achievement, it seems that birth order, family size, parental expectations, study habits, independence, and academic achievement are relevant factors given children of equal ability. Relevant sex differences seem to appear in areas such as verbal ability, parental expectations, and sterotypic sex role factors.

This literature was reviewed in an attempt to include in the present questionnaire, items on nonintellectual and biographical material which are relevant to academic achievement (such as school performance, study habits, social life, family environment and self-initiative behaviors) and to gain a better understanding of the mathematically gifted adolescent. However, no particular hypotheses were generated in relation to the questionnaires constructed for the present study.

## The California Psychological Inventory

In studying the literature on giftedness and academic achievement, several researchers have shown that the California Psychological Inventory (CPI) is useful (Alker & Wohl, 1972; Demos & Weyola, 1966; Flahery & Reutzel, 1965; Gough, 1953, 1964). Although the majority of this research focuses on achievement in college, there are some studies published which have used the CPI with adolescents and a few which have focused on gifted adolescents.

In 1953, Gough began publishing preliminary research on high school seniors using the achievement scale of the CPI. Students matched on sex and IQ displayed a wide range of academic performance (grades). For this study items were selected from previous studies, and several new items were constructed which were felt to measure achievement motivation. The results showed that the 64-item achievement scale had a split half reliability of .72, a greater than .50 correlation with grades, and an increase in predictive ability when combined with IQ scores. When this scale was administered to college students, however, a much lower correlation with grades was found, suggesting that "a somewhat different constellation of factors enters into success at the college level" (p. 330).

Lessinger and Martinson (1961) used the CPI with gifted students. Subjects in this study were eighth grade and high

school students. Although the CPI was developed and normed for only high school and adult populations, the authors justified its use with eighth graders because of their high intellectual ability. The results showed that gifted students (both male and female) showed high levels of psychological and social maturity. When compared to randomly selected eighth graders, their profiles were significantly higher on all 18 CPI scales. Overall, the authors stated that, "the maturity of the gifted eighth grade boys was much more closely related to that of the gifted high school boys and to the general adult population than to the general maturity of their age mates" (p. 573). The same was found for gifted females, except on the Femininity scale where no significant differences were found. The authors generally concluded that "because of the evidently wide discrepancies between gifted students, and their contemporaries, chronological age norms are not completely useful for the assessment of the psychological maturity of the gifted" (p. 574).

Gill and Spilka (1962) examined several nonintellectual variables for their relationships to academic achievement in Mexican-American high school students. Included were four scales from the CPI (Achievement via conformance-Ac, Achievement via independence-Ai, Intellectual efficiency-Ie, and Social maturity-So). Gifted students were classified as either achievers or underachievers based on grade point averages, and were matched on IQ, age, sex, and

grade. The results of the study showed significant differences for the Ie and So scale. The achievers group consistently scored higher on these scales than underachievers on all but the Ai scale. The authors suggested that the lack of significance found on the Ai scale may be explained by the fact that initiative for independence may not be a trait descriptive of students from low socioeconomic backgrounds.

Aiken (1963) looked at the relationship between college students' attitudes towards mathematics and their personality variables. Along with several other personality measures, 10 CPI scales were used (Ai, Ac, Ie, Psychological Mindedness-Py, Dominance-Do, Capacity for status-Cs, Sociability-So, Responsibility-Re, Self-control-Sc, and Tolerance-To). Attitudes towards mathematics were measured by a questionnaire previously developed by the author, and revised for this study. Results showed that all 10 scales correlated positively with mathematics attitudes (p. 05), with four scales reaching a .01 level of significance (Ac, Sc, Ie, Py). The author concluded that students scoring high in mathematics attitudes "tend to be more socially and intellectually mature" and "more self-controlled" and that "attitudes towards mathematics is related to a broad constellation of personality variables indicative of adjustment and interest" (p. 479).

Gough (1964) further demonstrated the predictive validity of the CPI for academic achievement in high school students. In this study, using both males and females, academic achievement was primarily defined by grades. From the results of the study, multiple regression equations were derived using selected scales. These results showed that, although IQ best predicted grades (r = .48), Re (r = .48), Ie (r = .43), and Ac (r = .40) were the most effective CPI scales. The coefficient for IQ and CPI scales was .68, which is "significantly higher than that for IQ alone" (p. 178). Gough concluded by stating that high achievers are characterized by intellectual ability and "sensitivity to and acceptance of social values but with retention of individuality" (p. 179).

Demos and Weyola in 1966, conducted a study on achievement and personality characteristics of college honors students. Two groups of honors students were used in this study: 1) students who had completed the first year of the honors program, and 2) students eligible for the honors program who had refused to participate. Eligible students were determined by high school grades. Personality variables used here were sex, CPI scales (Re, So, Ac, Ai, Ie, and Good Impression-Gi). Academic success was measured by honors courses grades and overall grades. Results of this study showed significant differences on four CPI scales, with the refusing students scoring lower on Re, Ai, and

Ie, and higher on the So scale. The authors concluded that the two groups differed primarily in that the refusing students were more socially conforming but were less motivated towards independent achievement or intellectual efficiency" than was the other group. In addition, the authors stated that a multiple regression achievement equation composed of grades units and six scales for the CPI can predict college success much better than can achievement or ability measures.

In further examining the relationship between high achievement and personality variables, Hogan and Weiss (1974) conducted a study using three groups of male college students: 1) those elected to Phi Beta Kappa, 2) an unselected group of students, and 3) those whose Ie scores equaled or exceeded Phi Beta Kappa students. The results of this study showed that the Phi Beta Kappa group scored significantly higher on the Re, So, and Sc scales. Significant differences between high achievers and average students were found on all but one of the 19 scales used (Communality-Cm), with 15 of the scales being statistically significant at the .001 level.

There were two studies conducted by the Johns Hopkins group using the CPI which are highly relevant to the present study. Weiss, Haier, and Keating (1974) in Mathematical Talent: Discovery, Description, and Development (edited by

Stanley, Keating and Fox) described their study on mathematically gifted junior high school boys in relation to personality characteristics. For this study, 19 scales of the CPI were used (18 original and the Empathy scale), and the resulting profiles were compared to three groups whose data were published by Lessinger and Martinson (1961): 1) Eighth Grade Random (EGR), 2) Eighth Grade Gifted (EGG), and 3) High School Gifted (HSG), as well as to a fourth group, High School Random (HSR) whose data were published by Gough (1957). Results obtained in this study showed that the "MG (mathematically gifted) students as a group are not interpersonally ineffective or maladjusted" and when compared to the EGG, HSG, and HSN groups, the MG groups appeared to be "solid, competent individuals" (p. 135). Similar to Lessinger and Martinson's findings (1961), it was found that the MG group differed significantly from the EGR groups in factors such as maturity. The Ai and Fx scales seemed overall to be most representative of the MG group. The Johns Hopkins group generally concluded that the MG group was best described by adjectives such as "independent, quick, sharp-witted, foresighted, versatile, and intelligent" (p. 137).

The other study conducted by the Johns Hopkins group was published by Haier and Denham (1976) in Intellectual Talent: Research and Development (edited by Keating). This study examined sex differences on nonintellectual variables

for mathematically gifted junior high students. In this study the CPI profiles for both mathematically gifted boys and girls showed almost no differences. Significant differences were only apparent on the Femininity scale, where girls scored higher. Further comparisons with Lessinger and Martinson's (1961) data showed that the mathematically gifted girls scored lowest on Femininity and Communality scales than all of the comparison groups. The MG girls were much more "unconventional" than the MG boys (p. 232).

The previously cited studies represent the majority of significant research on the CPI related to mathematical giftedness and academic achievement in junior high and high school students. The studies closest to the present investigation are those conducted by the Johns Hopkins group. The major similarities are the population groups and the use of the CPI. The students selected for the present study were enrolled in an accelerated mathematics program modeled after the Johns Hopkins program. In this study, however, the CPI results were used to predict success in the program as well as used to compare to other research groups, and to compare sex differences. Thus, in relation to the use of the CPI, this study will attempt not only to replicate the finding of the Johns Hopkins group, using a similar population, but will also attempt to determine the predictive ability of the CPI in relation to academic achievement in an accelerated mathematical program.

Overall, most of these studies provide evidence for predicting academic success based on particular CPI scales, and further demonstrate that gifted adolescents are more psychologically and socially mature than their peers. In addition, there seems to be few sex differences on the CPI, except on the Femininity scale which was designed to produce sex differences (females scoring higher). Based on these studies, it is hypothesized here that the Ac, Ai, Ie, Re, and Sc CPI scales will be significant in predicting academic performance (grades) in the present study, that sex differences on the CPI will only exist on the Fe scale, and that the current sample will closely parallel the CPI profiles of the Johns Hopkins students.

## The Thematic Apperception Test

Another body of literature relevant to the study of academic achievement and giftedness consists of those studies using the Thematic Apperception Test (TAT). While much research has been generated about the TAT, the focus here will be on achievement, power, and intimacy motivation, in relation to giftedness, sex differences and academic performance.

McClelland has published numerous books and articles concerning motivation. McClelland discusses the concept of respondent and operant test measures. Basically, respondent measures typically provide a specific stimulus like a state-

ment, which is evaluated and responded to by the individual. However, operant measures typically use vague and unspecified stimuli where the individual does not have to evaluate a statement or his behavior. In comparing these two types of test he proposes that "operant and respondent measures generally do not correlate with each other, and therefore should provide independent estimates of different aspects of personality-even when they purport to be related to the same theme" (1980, p. 12). While the TAT is considered an operant measure, other measures such as the CPI or questionnaire material would be considered respondent measures. McClelland concludes that both kinds of measures are needed in attempting to predict specific behaviors.

Based on previous work in this area, McClelland concludes that achievement motivation is surprisingly unrelated to academic achievement. Atkinson's (1957) work on risk taking indicated that this is because "moderate risk-taking is the chief incentive" for those high in achievement motivation and that provided there is a moderate chance of succeeding, they will try harder than others when there is a very great or a very small chance of succeeding.

The Achievement Motive. Although the majority of research on the TAT has concerned achievement motivation, little has been published concerning need for achievement in children or adolescents regardless of giftedness. Achievement moti-

vation is basically defined as a striving to succeed that is not dependent on the judgement of others. The individual with high achievement motivation is "concerned with improving his own performance" (Atkinson, 1957; McClelland, 1980, p. 301). In this sense, achievement motivation inherently involves interest or concern about other people.

In relating achievement motivation to course grades, one of the earliest studies was conducted by Rosen (1956) who examined the performance of male high school students. The results of this study showed that subjects high in achievement motivation, performed significantly better in school than did those low in this motive. However, level of intelligence was not controlled in this study. This relationship was further supported in a study by Veroff, Atkinson, Feld, Gurin (1960) which showed that both males and females with high achievement motivation subjects were significantly more likely to obtain a college education.

In 1959, Marlowe examined the relationship between achievement motivation and achievement behavior (academic performance) in male college students. The results of this study also found that the TAT measure of achievement motivation could predict achievement behavior. They explained these findings as supporting Rotter's theory that tests measuring internal motivation provide better predictive results.

Littig and Yeracaris (1963) examined the relationship among need for achievement, affiliation, and academic achievement in adults. They concluded that academic achievement (amount of education received) was significantly related to achievement motivation in males but not in females. No relationship was found between need for affiliation and academic achievement for males or females. They concluded by saying that the sex differences in children were most likely related to how much the parents valued early learning, achievement, and independence in the home and in school.

Raynor (1970) examined the relationship between achievement motivation, test anxiety, academic achievement, and future goals, based on the theory that both need-for-achievement and future expectations will affect an individual's academic behavior. The results of this and a second study on college students showed that subjects high in need for achievement and low in test anxiety received better grades than those low in need for achievement and high in test anxiety. However, this was only true when course grades were considered important by the students for future career goals.

Ojha and Jha (1979) in India, examined the relationship among need for achievement, social class, family system, and occupation in college students. The results of this study indicated that high need-for-achievement subjects

typically come from middle class nuclear families with entrepreneurial occupations. They explain these results by saying that middle class values related to competition and independence, a link which has been previously supported (Beller, 1957; Crandall, Rabson, 1960; & McCord, & Verdan, 1962).

The studies reported here have shown that a significant relationship can be found between need-for-achievement as measured by the TAT, academic achievement and other variables such as independence and future goals. Studies showing nonsignificant results suggest that other variables may interact with achievement motivation to predict academic success and sex differences. In relation to this, risk taking behavior, achievement cues, course choice, and anxiety have been raised as possible variables.

To date, the principal investigator knows of no studies which use the TAT with mathematically gifted children or adolescents, to measure academic success, sex differences and achievement motivation. In fact, few studies have even used this instrument with average intelligence children and adolescents. Although it has been suggested that the TAT may not be able to effectively predict academic achievement, it was felt that characteristics particular to mathematically gifted youth might make this possible. This is supported by the fact that most students entered this program voluntarily, and desired academic challenge in an

area of unusual ability. Thus, it is hypothesized here that program students high in achievement motivation will do better in this course than will those low in achievement motivation, regardless of sex.

McClelland (1958b) noted that children high in need for achievement tend to set themselves tasks which are just above their level so as to provide a challenge to them. It is believed that this challenge situation well describes the present program, and thus children high in need for achievement should perform better than low achievement motivation people.

Power Motivation. Power motivation (recently revised by Winter, 1973b) is defined as a need for having a "strong impact on others" (McClelland, 1973, p.305). In the present study, it was decided to score stories for this motive as well, because it was felt that power motivation might predict success in the program, as well as provide sex differences. This is based on the hypotheses that leadership, liking of competition, and high sociability may relate to both power motivation and success in programs such as this.

In discussing power motivation, McClelland felt that leadership ability was related to need-for-power. He stated (McClelland & Steel, 1973) that "an effective leader is an educator. One leads people by helping to set their goals, by communicating them widely through the group, by taking

initiative in formulating means of achieving the goals, and finally by inspiring the members of the group to feel strong enough for those goals" (p.314).

Veroff and Veroff (1972), however, suggested that power motivation relates more to "a person's fear of weakness", or rather a "generalized concern about negative power goals" (p.279). According to Veroff, Atkinson, Feld, & Gurin (1960) since high power motivation indicates a form of inferiority or "fear of weakness", individuals with high academic ability would score correspondingly low (p.279). They found that when educational level was examined, men with college level educations scored lower on power motivation than did those who had only finished grade school, while the opposite finding was true of women. While the authors believed that feeling of inferiority explained male differences, they attributed the female results to the fact that college educated women may feel she is not living up to stereotypic sex role standards.

In one of the few studies on adolescents and power motivation, Skolnick (1966) found that subjects high in power motivation were more frequently high in leadership ability. Veroff and Veroff (1972) in considering these results suggested that in the beginning of adolescence "strong arousing conditions for power" may be "evoked", causing adolescents high in power motivation to be "very

successful adolescents, those who are popular and effective leaders" (p. 283). Thus, these comments suggest that young adolescents who have strong leadership ability and are popular may be high in power motivation.

Veroff and Veroff (1972) in discussing Winter's scoring system for power motivation (the method used in the present study) propose that his power motive is a "blend of achievement and power strivings," and that this particular method then "begins to lose its interpersonal quality and takes on the quality of competence" (p. 289).

According to Stewart and Chester (1982) "women may not differ from men in their level of concern with power" (p. 198). However, McClelland (1975) found several differences between males and females in relation to behaviors that are related to high power motivation. The author is unaware of any studies relating sex differences in power motivation to academic achievement. However, the implication is that in males and females the need-for-power may have different effects on academic achievement. Because of this, the present study will examine separately the predictive ability of power motivation in both males and females.

The author of the present investigation knows of no directly relevant research using Winter's concept of power motivation. In addition, it appears that few studies have

examined sex differences in power motivation in adolescents. Thus, one of the purposes in this study will be to examine this in a mathematically gifted adolescent population. Additional purposes will be to examine its overall predictive ability in relation to success as well as measuring sex differences. Based on previous research, it is difficult to predict how gifted adolescents are affected by power motivation. The present hypothesis is that power motivation will be predictive of academic performance. This is predicted because power motivation appears to be related to leadership ability, liking of competition, initiative, and success in adolescence.

# METHOD

## Subjects

Subjects asked to participate in this study were first year students attending the University of Minnesota Talented Youth Mathematics Program (UMTYMP). Students selected for this program scored at or above 44 out of 50 on the quantitative section of the School and College Ability Test (SCAT-Q). Of the 62 students who were selected for the program (out of 1150 applicants), 61 consented to participate in the study, with data being collected on 60 students (one student dropped out of the program after three weeks, and did not attend the initial testing session). Of the 61 students 59 sets of parents also agreed to participate. Students participating in the study were between ages 10 and 14, and in grades six, seven, and eight (M age = 12.79, SD = .59, M grade = 7.67, SD = .55). There were 42 males (73.7%, M age = 12.76, SD = .66), and 15 females (26.3%, M age = 12.87, SD = .35). The mean age of mothers was 40.67 and of fathers was 41.60. The socioeconomic status of families were as follows: 51% upper class (Class I), 25% upper-middle class (Class II), 22% middle class (Class III), 2% lower-middle class (Class IV), 0% lower class (Class V). These were defined according to occupational and educational position scales outlined by Weiss & Weiss (1979).

## Materials

Materials used in this study were the California Psychological Inventory (CPI), the Thematic Apperception Test (TAT-McClelland cards, group administration), the Classroom Environment Scale (CES), and three questionnaires developed by the author.

The CPI, a paper and pencil test, provides scale scores on 23 scales measuring psychological and social functioning. Appendix A provides a list of the scales used in this study and a brief explanation of what characteristics they measure. Although standardized norms have not been published for junior high school age children, previous research has shown the CPI to be a valid measure in research with subjects who are of superior intellectual ability in this age range (Lessinger & Martinson, 1961; Stanley, Keating, & Fox, 1974).

The McClelland version of the TAT when given in group format consists of pictures depicting scenes involving people. Subjects are given 5 min. to write an imaginative story about each picture which includes a past, present, and future, and the thoughts, feelings, and actions of characters in the story. In this study, 5 slides were presented, and stories scored for Achievement (McClelland, Atkinson, Clark, & Lowell, 1953), Power (Winter, 1973), and Intimacy (McAdams, 1980) Motivation, by trained scorers

with adequate reliability.

The CES, a paper and pencil test, was developed to measure various aspects of the classroom climate. Its authors suggest that the CES is useful in program evaluation as scoring provides a profile consisting of nine scale scores tapping classroom climate. The CES was used in this study to indicate students' opinions concerning the classroom climate of the UMTYMP program.

The Student Questionnaire (SQ), with 86 items, obtained information on students in the following areas: student activities/interests, social involvement, school involvement/history, homework/study skills, family involvement/environment, individual characteristics/career goals, program expectations, and biographical information. Questions included those asking for both objective and factual material and those asking for personal opinions, attitudes, interests, preferences, and expectations. The majority of items were in multiple-choice and checklist form. Few open-ended questions were used in order to facilitate scoring and data analysis. However, many questions also included an 'other' category.

The Parent Questionnaire (PQ), consisting of 62 items, was intended to measure parents' involvement and perception of their mathematically gifted child, along with gathering family demographics. Embedded in this questionnaire were

27 items that were also on the SQ so that differences in perception between parents and their children could be examined.

The Student Evaluation Questionnaire (SEQ) with items developed by the PI was constructed to measure students' attitudes and opinions about various aspects of the course. This questionnaire was administered at the end of the academic year as a supplement to the CES with items specific to this particular program.

## Procedure

Prior to the beginning of the program, parents and students were asked to attend a meeting explaining the UMTYMP program. During this time, program administrators also explained the goals of the present study and described confidentiality procedures. At this time parents and students were told what they would be asked to complete, and the voluntary nature of their participation was explained. Both parents and students were then requested to sign consent forms if they wished to participate.

Phase I. Students participating in the UMTYMP program were asked to complete the CIP, five TAT stories, and the SQ during the first class period. Students who were unable to finish the CPI during the 2 hour classroom time were permitted to complete it at home (approximately half of the

students did so). Students who had agreed to participate in the study but were unable to attend the testing session were asked to complete both the CPI and SQ at home. Altogether, 53 students completed the TAT, 54 students completed the CPI, and 57 students completed the SQ. In addition, at this time, the PQ was sent to parents who had previously agreed to participate in this study, of which 56 were completed and returned.

Phase II. During this academic year, students' academic achievement in the program was monitored. Of particular interest were any students who completed Phase I of the study and then dropped out of the program before the end of the academic year. During the year, two students dropped the course. Student data were collected on only one of these two. However, parent data were collected on both.

Phase III. Four weeks before the end of the course students were given the CES and the SEQ to complete at home and return by the last class. Fifty-three students completed the SEQ, and 52 students completed the CES.

Phase IV. Student grade percentages were calculated at the end of the course based on homework scores, classroom test scores, and standardized Algebra I and II exam scores (COOP). Homework and classroom test scores were gathered for three marking periods, along with the two COOP

scores. Thus, four percentage scores were calculated using these scores: 1) mean homework percentages, 2) mean classroom test score percentages, 3) mean COOP score percentages and 4) mean of the other 3 mean percentage. These final percentage scores were assumed to be fairly similar for the two classes as the same material was covered in each, and the COOP tests were taken by both classes. These percentage scores were felt to be a more objective way of obtaining meaningful rankings of students on a continuum.

# Results

## Description of Sample

The results obtained on the SQ and PQ provided a detailed description of this sample. While at this point no comparative norms exist, these questionnaires allowed for a better understanding of what mathematically gifted adolescents were like in several areas. Individual items used for the SQ and details on means and standard deviations for the continuous SQ questions are provided in Appendix B. Individiual items used for the PQ and details on means and standard deviations for the continuous PQ questions are provided in Appendix C.

### Student Questionnaire:

Students in this study listed cultural (56.1%) and athletic (54.4%) activities most frequently as interests or hobbies. Most enjoyed reading and watching television in their leisure time, and said they played at least one musical instrument. However, most only enjoyed cultural activities a little (e.g. attending concerts, the ballet, or opera). In relation to social life, students cared a good deal about having good friends, had more friends at school than outside of school, but in general, only spent about 25% of their free time with friends.

In general, these students said they enjoyed school, did well academically, put a fair amount of effort into their classes, but were not challenged by them. Most students did not belong to clubs or organizations, but if they did, they tended to belong to academic ones (17.5%). Several students had received awards in academic areas (e.g. honor roll, best student, finalist in national competitions). In relation to school classes, students selected mathematics (47.4%) as their favorite course, with miscellaneous ones selected next most frequently (43.9%-e.g. history, social studies, English). Not included in the miscellaneous category were mathematics, science, and non-academic courses like music, sports, or religion.

Interestingly, most students knew how to use computers and had knowledge of at least one or two programming languages. In fact, 23.4% had a computer in their home, 87.7% had access to a computer at their school, and 59.0% had taken one programming course in school or in a supplementary program (e.g. summer school).

Most students felt they had good study habits and spent about one hour per day on homework. In general, most students did not need to be pushed to complete homework. However, 42.1% of them needed help on assignments from a parent. Overall, homework assignments were seen as not very difficult. As expected, students in this program very much liked mathe-

matics, got A grades in mathematics courses, and considered this knowledge important for future jobs.

When asked about their parents, students tended to describe them as encouraging independence, being moderately strict, and as considering their opinions. Most students felt they spent a fair amount of time with their parents. They also felt that their parents were moderately easy to talk to and were fairly affectionate to them. In general parents were also moderately religious. Overall, most students believed both parents were equally involved with them. When this was not true mothers were rated as being more involved with them.

In describing themselves, almost all students felt that they were best characterized as academically oriented (e.g. good student/smart-90.4%) and secondarily as socially oriented (e.g. popular/nice person-61.5%). In general, these students rated themselves as fairly popular, somewhat athletic, well behaved, and competitive. They currently saw themselves as leaders but felt that they would be better leaders in the future. Almost all believed they would attend college, and most felt that they would go beyond college in school (e.g. graduate or professional school). When asked to list two careers that they were currently considering, 40% listed an area in computers, and 30.9% listed law.

When asked to rate their feelings about attending the UMTYMP program, most felt that they would like it a lot and said they had very much wanted to participate. Most thought they would do well, and believed their parents had also wanted them to participate. When asked what their two main reasons were for wanting to participate in the program, 80.8% said that they wanted to progress (move ahead) more quickly in mathematics.

Parent Questionnaire:

Demographically, 82.1% of these students came from intact families. None of the students had a parent who had died. When their parents were divorced or separated, most students lived with their mothers. The mean number of children in students' families was 2.34, and no family had more than four children. In relation to birth order, 51.8% were first borns, and 10.7% were only children. In relation to work, 97.9% of the fathers were currently employed, and 69.2% of the mothers were employed at least part time. Educationally, the mean educational level for the mothers was "some college", with 15% achieving a level of "more than college," and 9.4% only completing high school. Fathers tended to have much more education than did mothers. Of the fathers, 56.3% had attended graduate or professional school while 31.3% had obtained only college degrees and 2.1% had completed only high school.

In rating use of leisure time, mot felt that their child enjoyed reading and watching television very much. In relation to music practice, 57.6% said no one needed to supervise music practice, and those who were supervised were supervised by their mothers. Socially, these parents felt that their child cared about having friends and spent about 25% of their time with friends.

In relation to school, these parents felt that their child liked school a lot and all rated their academic ability from good to excellent and felt they worked hard at school. They also felt that their child completed his/her homework assignments most of the time, but that they had to be pushed to do so; however, 60% did not as a rule ask their parents for help with assignments. They also felt that their child liked mathematics and that they had provided moderate encouragement in this area.

In rating their families, 87% of parents rated their children as having assigned chores. These were generally supervised by both parents equally, with most students needing some pushing. Most parents felt that they encouraged independence, were moderately strict, and valued good grades. They also felt that they spent a fair amount of time with their child, were fairly affectionate, and strongly considered their child's opinions in decisions concerning him/her.

When asked about characteristics of their child, parents reported the mean age of walking as 11.64 months, 16.46 months for talking and 50.28 months for reading. They felt that their child was moderately popular, fairly athletic, moderately well behaved with generally better behavior at school. They saw their child as leaders, moderately competitive, and very persevering. Forty-two percent of the parents felt that their child's highest level in school would be college, while 48.2% felt that they would attend graduate or professional school. However, in relating to career choices, 66.1% did not know what their children might want to do. When asked about this program, most parents felt that their child would like it a lot and would do well, and most were committed to having their child remain in the program.

Principal Components Analyses:

Since both the SQ and PQ contained numerous items, principal component analyses without iteration, a type of factor analysis, was performed for each questionnaire using only continuous variables. For this process, varimax rotation was used with pairwise deletion of missing values. In this manner, 10 factor scales were identified for each questionnaire. Each of the factor scales were then closely examined to determine what construct best characterized each scale.

Factor scale names for each of the 20 scales are listed below:

SQ Factor Scales

Factor 1: Interactive Sports Involvement

Factor 2: Achievement Conformity Motivation

Factor 3: Family Support System

Factor 4: Social Initiative

Factor 5: Academic/Math Importance

Factor 6: Social Introversion

Factor 7: Self-Initiative

Factor 8: Cultural/Reading Interest

Factor 9: Academic Motivation

Factor 10: Program Commitment

PQ Factor Scales

Factor 1: Social Conformity

Factor 2: Self-Initiative

Factor 3: Birth Order Factors

Factor 4: Parental Respect for Child

Factor 5: Reading Interest

Factor 6: School vs. Family Involvement

Factor 7: Family Support System

Factor 8: Parental Push for Achievement

Factor 9: Family Dependence/Independence

Factor 10: Family Academic Achievement Climate

Pearson correlations between all the questionnaire scales, the three TAT motive scores, and the CPI scales are available in Appendix D.

Parent-Child Similarities:

On the two questionnaires, 27 items were worded similarly. Questionnaires were purposely constructed in this way so that two types of difference scores could be calculated: 1) All students' responses to each question were compared to parents' responses on these same items using dependent t-test analyses, and 2) students' responses to all 27 items were compared to their parents' responses to these items so that a correlation coefficient could be generated for each student. These indicate the degree of agreement between each student and his/her parent on these items. A mean correlation coefficient of .31 (SD = 2.1) was received for agreement of ratings for students and parents across the 27 questions. The results of the dependent t-test analyses will be discussed next. The correlation coefficients, used in computing multiple regression equations to predict program performance, will be discussed later.

Statistically significant dependent t values and means for the 27 similar items are shown in Table 1, with 7 of the 27 questions producing significant results. These differences show that students tended to rate themselves higher on how much they cared about having good friends, the amount of

TABLE 1

Statistically Significant Differences Between Student and Parent Questionnaire Responses on Similar Items

| Item | Student n | Student $\bar{x}$ | Student SD | Parent $\bar{x}$ | Parent SD | t-value (dependent) |
|---|---|---|---|---|---|---|
| Like reading[a] | 53 | 4.23 | 1.03 | 4.51 | .72 | -2.39* |
| Time spend reading[b] | 53 | 3.98 | 1.17 | 4.59 | .69 | -4.07** |
| Care about having friends[a] | 52 | 4.35 | .79 | 4.06 | .73 | 2.33* |
| Free time spent with friends[c] | 53 | 2.70 | .97 | 2.36 | .74 | 2.63* |
| Like school[a] | 53 | 4.08 | 1.00 | 4.45 | .67 | -3.11** |
| Time family spends together[a] | 53 | 3.28 | .95 | 4.11 | .54 | -5.75** |
| Parental encouragement to[a] participate in program | 52 | 4.39 | .87 | 3.56 | .94 | 4.97** |

Note. All items concern the student/child.

[a]5-1 scale where 5 = very much and 1 = not at all/none.

[b]5-1 scale where 5 = 3 or more hrs., 4 = 2 hrs., 3 = 1 hr., 2 = 30 min., and 1 = none.

[c]5-1 scale where 5 = 100% and 1 = 0%.

*$p < .05$. **$p < .01$.

free time spent with friends, and on how much their parents encouraged them to participate in the program. However, parents tended to rate their child higher on how much their child enjoyed reading, how much time each week they spent reading, how much they liked school, and on how much time their family spent together. On the remaining 20 questions, there were no significant differences.

On the TAT, achievement motive scores ranged from -3 to 15 ($\underline{M}$ = 4.32, SD = 4.54). Power motive scores ranged from 0 to 14 ($\underline{M}$ = 4.78, SD = 4.55). Intimacy motive scores ranged from 0 to 8 ($\underline{M}$ = 2.17, SD = 1.80). However, since no norms are currently available these results could not at this time be meaningfully interpreted or compared. More importantly however, is that TAT scores for subsamples within this sample can be compared (e.g. males vs. females).

Comparisons with Other Samples

The CPI results were scored for the 18 original scales and the Empathy scale for all students who completed and returned this measure (N = 54). Since no standardized norms currently exist for junior high school age students, previously published research sample results were used to compare the present group (Minnesota Mathematically Gifted - MMG) to five other groups. The comparison groups are presented by Weiss, Haier, and Keating (1974): Hopkins Mathe-

matically Gifted (HMG) (N = 32), Eighth Grade Random (EGR) (N = 82), Eighth Grade Gifted (EGG) (N = 94), High School Gifted (HSG) (N = 157), and High School Norm (HSN) (N = 3,572). For these five groups, both means and standard deviations were published on the CPI for the 18 original scales, while HMG was the only group with additional Empathy scale scores.

Table 2 represents the means, standard deviations, and t-test significance levels for each of the five groups compared to the present sample (MMG). Figure 1 represents a comparison of mean CPI scale scores for these groups: MMG, HMG, EGR, and EGG. Figure 2 represents a comparison of mean CPI scale scores for these groups: MMG, HMG, HSG, HSN. Many statistically significant differences were found. Overall, it appeard that the two mathematically gifted groups (MMG and HMG) were quite similar with only four significant differences at the .05 level and no significant differences beyond the .01 level. This sample (MMG) was significantly higher that the HMG on three of the four scales (Sociability, Self-Acceptance, and Femininity) and lower on one scale (Sense of Well-Being). However, when compared to all the groups, despite some significant differences between MMG and HMG, mean scores were still less different than when compared to the other four groups, except on Sociability where the MMG was most similar to the EGG group

TABLE 2

Comparison of Mean Differences for Junior High and High School Samples on CPI Scales

| CPI Scale | Minn. Math Gifted (MMG) n=54 | | Hopkins Math Gifted (HMG) n=32 | | Eighth Grade Random (EGR) | |
|---|---|---|---|---|---|---|
| | $\bar{X}$ | SD | $\bar{X}$ | SD | $\bar{X}$ | SD |
| 1. Do (Dominance) | 28.1 | 8.4 | 25.2 | 4.9 | 19.5** | 4.9 |
| 2. Cs (Capacity stat) | 17.3 | 5.5 | 16.9 | 3.3 | 11.3** | 3.5 |
| 3. Sy (Sociability) | 23.5 | 7.0 | 20.0* | 5.6 | 20.7** | 4.2 |
| 4. Sp (Social pres) | 33.6 | 6.3 | 33.4 | 7.3 | 30.6** | 6.2 |
| 5. Sa (Self-Accpet) | 21.9 | 6.3 | 19.1* | 3.9 | 17.6** | 3.8 |
| 6. Wb (Well being) | 29.5 | 6.5 | 32.2* | 4.7 | 27.2* | 6.1 |
| 7. Re (Responsibility) | 28.5 | 5.1 | 28.6 | 4.9 | 21.5** | 5.8 |
| 8. So (Socialization) | 37.0 | 7.4 | 36.4 | 5.1 | 29.9** | 5.3 |
| 9. Sc (Self-Control) | 23.6 | 8.2 | 25.6 | 7.6 | 18.0** | 7.2 |
| 10. To (Tolerance | 18.0 | 5.8 | 19.8 | 5.0 | 12.1** | 4.8 |
| 11. Gi (Good impress) | 13.5 | 7.0 | 13.0 | 4.8 | 10.3** | 4.7 |
| 12. Cm (Communality) | 24.0 | 5.9 | 23.9 | 2.5 | 23.6 | 3.5 |
| 13. Ac (Achiev via Conform) | 24.4 | 5.1 | 23.9 | 3.9 | 16.4** | 4.4 |
| 14. Ai (Achiev via Indep) | 19.4 | 5.9 | 20.2 | 4.0 | 10.9** | 3.5 |
| 15. Ie (Intell efficiency) | 36.2 | 5.3 | 37.2 | 5.0 | 26.0** | 5.3 |
| 16. Py (Psych-Mindedness) | 11.6 | 5.9 | 11.3 | 3.2 | 7.9** | 2.7 |
| 17. Fx (Flexibility) | 11.0 | 5.8 | 13.3 | 3.9 | 7.7** | 2.7 |
| 18. Fe (Femininity) | 20.3 | 5.3 | 17.5* | 3.7 | 15.1** | 3.4 |
| 19. Em (Empathy) | 19.4 | 4.3 | 19.9 | 4.2 | | |

Table 2 continued on following page.

Table 2 (cont.)

| CPI Scale | Eighth Grade Gifted (EGG) n=94 | | High School Gifted (HSG) n=157 | | High School Norm (HSN) n=3,572 | |
|---|---|---|---|---|---|---|
| | $\bar{X}$ | SD | $\bar{X}$ | SD | $\bar{X}$ | SD |
| 1. Do (Dominance) | 27.0 | 5.5 | 28.8 | 6.3 | 23.2** | 6.0 |
| 2. Cs (Cpapcity stat) | 17.6 | 3.7 | 20.7 | 3.4 | 15.3** | 4.4 |
| 3. Sy (Sociability) | 24.4 | 5.0 | 26.2** | 4.7 | 21.5** | 5.4 |
| 4. Sp (Social pres) | 32.9 | 5.7 | 35.6 | 6.7 | 32.7 | 5.7 |
| 5. Sa (Self-Accept) | 19.6** | 3.5 | 22.6 | 3.8 | 18.7** | 4.1 |
| 6. Wb (Well being) | 35.6** | 4.8 | 35.8** | 4.2 | 33.5** | 5.6 |
| 7. Re (Responsibility) | 31.7** | 4.3 | 31.1 | 5.1 | 26.7* | 5.7 |
| 8. So (Socialization) | 40.8** | 4.9 | 38.1 | 6.4 | 36.3 | 6.0 |
| 9. Sc (Self-control) | 28.2** | 8.8 | 25.8 | 8.3 | 25.3 | 8.0 |
| 10. To (Tolerance) | 22.4** | 4.4 | 23.1 | 4.5 | 17.8 | 5.3 |
| 11. Gi (Good impress) | 16.9* | 6.8 | 15.8* | 6.3 | 15.1 | 6.2 |
| 12. Cm (Communality) | 26.4** | 1.8 | 25.4* | 2.1 | 25.2** | 2.8 |
| 13. Ac (Achiev via Conform) | 26.3* | 4.2 | 27.2** | 4.6 | 22.3** | 5.3 |
| 14. Ai (Achiev via Indep) | 18.0 | 3.9 | 20.8* | 3.5 | 14.6** | 4.1 |
| 15. Ie (Intell efficiency) | 38.7** | 4.4 | 40.5** | 4.3 | 33.6** | 6.3 |
| 16. Py (Psych-mindedness) | 11.2 | 2.7 | 12.0 | 2.6 | 9.2** | 2.6 |
| 17. Fx (Flexibility) | 9.4* | 3.4 | 11.0 | 4.0 | 9.1** | 3.4 |
| 18. Fe (Femininity | 17.4** | 3.2 | 16.1** | 3.4 | 15.4** | 3.6 |
| 19. Em (Empathy) | | | | | | |

Note. The data in the last 5 columns are from Mathematical talent: Discovery, description, and development (p. 130) by J.C. Stanley, D.P. Keating, and L.H. Fox (Eds.), 1974, Baltimore, Md.: The Johns Hopkins University Press.

Note. The MMG group represents the present study. This group was compared here to each of five other relevant groups.

*$p < .05$. **$p < .01$.

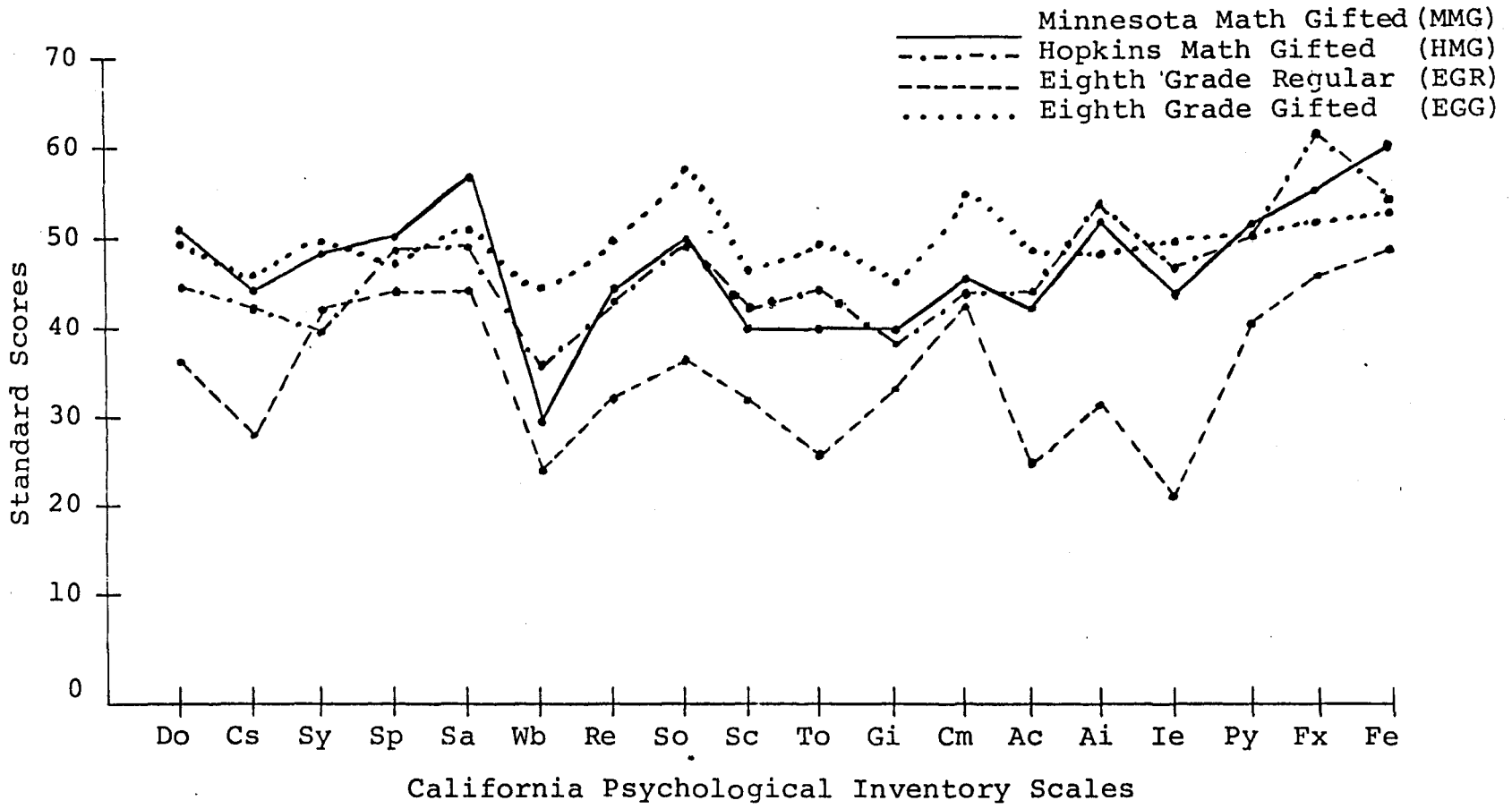


Figure 1. Comparison of Means for MMG, HMG, EGG, and EGR on the CPI

Note. The data for the HMG, EGG, and EGR groups are from Mathematical talent: Discovery, description, and development (p. 132) by J.C. Stanley, D.P. Keating, and L.H. Fox (Eds.), 1974, Baltimore, Md: The Johns Hopkins University Press.

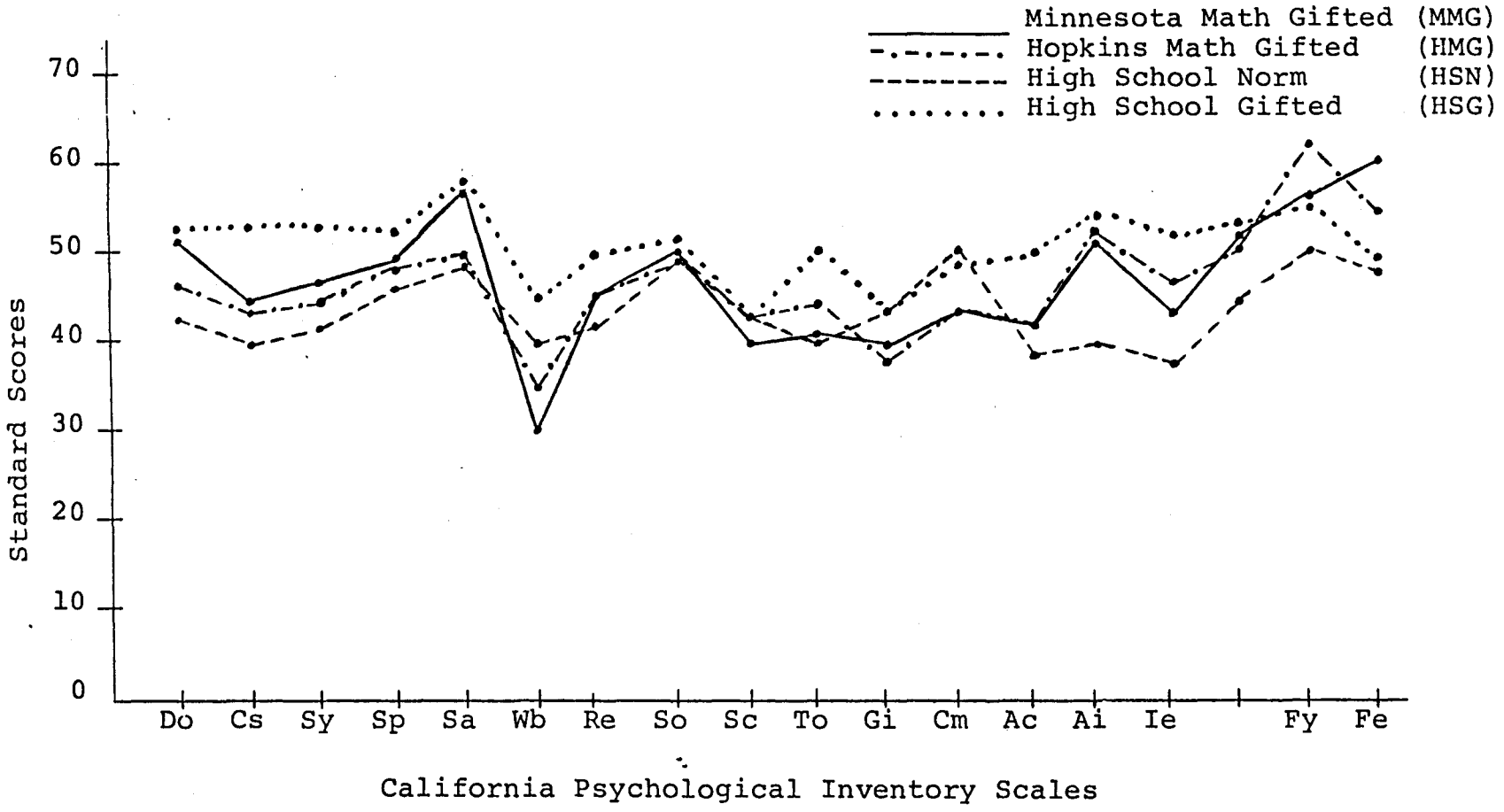


Figure 2. Comparisons of Means for MMG, HMG, HSN, and HSG on the CPI

Note. The data for the HMG, HSN, and HSG groups are from Mathematical talent: Discovery, description, and development (p. 133) by J.C. Stanley, D.P. Keating, and L.H. Fox (Eds.), 1974, Baltimore, Md: The Johns Hopkins University Press.

(no statistically significant difference).

Next to the HMG group, the MMG group was most similar to the HSG group. These two groups showed no significant differences on nine scales (DO, CS, SP, SA, RE, SO, SC, PY, and FX). On eight of the nine significantly different scales, the MMG group was lower, with the present sample being higher only on Femininity.

Compared to other eighth graders (approximately same age peers), clearly the two mathematically gifted groups differ from other groups in several ways. For the EGR group, significant differences were found on all but one scale (Communality), and in all these cases, the MMG group scored much higher, particularly on two scales (Ai and Ie). On Achievement via independence, the MMG group was closest to the EGG group (after the HMG group). When compared to the EGG group, the MGG group showed statistically significant differences on twelve of the eighteen scales, and on nine of these the present group had much lower scores. They scored significantly higher on these scales (Fx, Fe, and Sa).

When comparing these six groups, the two junior high school mathematically gifted groups appeared very similar on all but four scales, and on the four scales with significant differences, these two groups were still more similar than when compared to the remaining four groups. Thus, based

on these two samples, it appears that a specific profile may exist which describes the junior high school mathematically gifted student on "personality characteristics important for social living and social interactions" (Gough, 1975, p. 5), and differentiates this group from same age and slightly older peers who are either generally gifted or not gifted.

## Differences in Subsample

Within this sample, initial differences on measures were examined in two different subpopulations: sex and grade (seventh vs. eighth). For this section of the analyses, the following initial measures were used: SQ and PQ individual items and factor scales, the CPI (18 original scales plus scales scored for Empathy, Independence, Maturity, Leadership, and Social Maturity), and the three TAT motives (achievement, power, and intimacy). Both t-test and Chi Square analyses were used to determine statistically significant differences within these two subpopulations.

### Males vs. Females:

Within this sample, there were 42 boys and 16 girls. Table 3 displays significant t-test values found in this study when students were compared by sex. On the SQ, there were five questions that showed signficant t-test values, and six with significant Chi Square values. Overall, boys

TABLE 3

Statistically Significant Sex Differences
on Dependent Measures

| Measures | Sex: Male n | Male $\bar{X}$ | Male SD | Female n | Female $\bar{X}$ | Female SD | t-value |
|---|---|---|---|---|---|---|---|
| SQ | | | | | | | |
| Factor 1[a] | 41 | .17 | .95 | 16 | -.44 | 1.02 | -2.16** |
| musical instrument involvement[b] | 42 | 5.52 | 3.69 | 15 | 10.13 | 2.17 | 4.55*** |
| enjoy cultural events[c] | 42 | 15.48 | 5.17 | 15 | 20.73 | 3.83 | 3.59*** |
| how much a leader[d] | 42 | 4.29 | 1.02 | 15 | 3.27 | 1.39 | -3.01*** |
| grade in school | 42 | 7.57 | .59 | 15 | 7.93 | .26 | 2.29** |
| PQ | | | | | | | |
| Factor 2[e] | 42 | -.15 | .93 | 14 | .44 | .78 | 2.19** |
| Factor 8[f] | 42 | .18 | .91 | 14 | -.53 | 1.06 | -2.41** |
| number of friends | 41 | 3.61 | .80 | 14 | 4.21 | .58 | 2.59** |
| free time spent with friends[g] | 37 | 3.81 | .94 | 12 | 4.42 | .67 | 2.01** |
| how strict are parents[d] | 42 | 3.76 | .91 | 14 | 3.14 | .86 | -2.24** |
| TAT | | | | | | | |
| Power Motivation | 37 | 5.81 | 4.67 | 16 | 13.06 | | 2.82*** |
| CPI | | | | | | | |
| Independence | 35 | 15.34 | | 16 | 13.06 | | -1.98* |

Table 3 continued on the following page.

Table 3 (cont.)

Note. Raw CPI scores were used here.

[a]Factor 1 (SQ) = Interactive Sports Involvement.

[b]Includes number of instruments and number of hours per week spent practicing.

[c]Score of 30 = Very Much, 24 = Fairly Much, 18 = A Little, 12 = Not Much, 6 = Not at All (5 to 1 scale for 6 cultural events).

[d]Score of 5 = Very Much, 4 = Fairly Much, 3 = A Little, 2 = Not Much, 1 = Not at All.

[e]Factor 2 (PQ) = Self-Initiative.

[f]Factor 8 (PQ) = Parental Push for Achievement.

[g]5 to 1 scale where 5 = 100% and 1 = 0%.

*$p < .06$. **$p < .05$. ***$p < .01$

rated themselves higher than did girls in interest in attending sporting events, and were more likely to see themselves as leaders, whereas girls spent more time involved with music (e.g. band, orchestra, practicing) and enjoyed cultural events more (opera, ballet, concert). In addition, girls listed significantly more cultural types of activities/interests. Boys listed more sports activities/interests. When their father was most involved with him or her the child was more frequently male.

On the PQ, three questions had statistically significant t-test values, and three had statistically significant Chi Square values. In general, parents with daughters rated them as needing less supervision on homework, and less push to do homework, while parents with sons rated them as spending more time on homework assignments. In addition, parents of sons reported giving more encourgement to them to participate in the UMTYMP program and rated it more important for sons to receive good grades. There was only one statistically significant Chi Square value on the PQ, which showed that mothers spent more time with a female (76.9&) than with a male child (20%). But when the child was male, then both parents were equally likely to be involved (71.4%) than if female (15.4%). When fathers did spend more time with their child than mothers or both parents, they did so regardless of the sex of the child (7.7% female, 8.6% male).

Only one factor scale on the SQ was statistically significant (interactive sports involvement), with boys scoring higher on this scale. On the PQ, Self-Initiative and Parental Push for Achievement showed statistically significant results, with girls rated higher in self-initiative, and boys higher on parental push for achievement.

On the CPI and TAT statistically significant t-test values resulted on only one CPI scale (Independence) and one TAT motive (Power), with boys scoring higher on both. For Independence, boys received a mean score of 15.34 (N = 35), and girls received a mean score of 13.06 (N = 16). On power motivation, boys received a mean score of 5.81 (N = 37), and girls received a mean score of 2.38 (N = 16). The significant sex differences on power motivation suggests that gifted boys in grades 6-8 are more concerned in their imaginative thought, with having impact, and feeling strong vis-a vist the environment, than are gifted girls of approximately the same age.

Seventh vs. Eighth Graders:

Four measures were analyzed for significant differences between sevent (N = 15) and eighth graders (N = 40) using t-test analyses: SQ Factor Scales, PQ Factor Scales, CPI, and TAT. All together as shown in Table 4, five items/scales showed statistically significant t-values. On the CPI,

TABLE 4

Statistically Significant Grade Differences on Dependent Measures

| Measures | Grade | | | | | | t-value |
|---|---|---|---|---|---|---|---|
| | Seventh | | | Eighth | | | |
| | n | $\bar{X}$ | SD | n | $\bar{X}$ | SD | |
| SQ | | | | | | | |
| Factor 3[a] | 15 | .52 | .48 | 40 | -.19 | 1.09 | 2.42* |
| PQ | | | | | | | |
| Factor 8[b] | 14 | .44 | .59 | 40 | -.20 | 1.05 | 2.15* |
| CPI | | | | | | | |
| well being (Wb) | 14 | 33.36 | 5.67 | 38 | 28.21 | 6.47 | 2.63* |
| intel effic (Ie) | 14 | 38.93 | 4.39 | 38 | 35.50 | 5.27 | 2.17* |
| leadership (Ld) | 14 | 54.86 | 4.04 | 37 | 51.76 | 5.00 | 2.07* |

Note. CPI raw scale scores were used in this study.

[a]SQ Factor 3 = Family Support System.

[b]PQ Factor 8 = Parental Push for Achievement.

*$p < .05$.

seventh graders scored significantly higher on three scales (Well being, Intellectual efficiency, and Leadership). Seventh graders also scored higher on Family Support System (SQ), and on Parental Push for Achievement (PQ). There were no statistically significant differences on the three TAT motive scores.

## Student Evaluations

As part of this study, students completed two evaluation questionnaires. These evaluations provided a general description of students' perceptions of the UMTYMP program, and statistical analyses were then conducted comparing students on variables such as sex, grade (seventh vs. eighth), and dropping (returning next year vs. not returning next year). These analyses were then used to determine if any of these factors had affected students' ratings of the program. Group difference on CES scales and SEQ items were analyzed using t-tests and Chi square analyses.

### Descriptive Evaluation of the Program:

In order to gain a better perspective on the present sample's CES scores, these scale scores were compared to a sample of regular high school and junior high school math class CES scores, published by Moos & Trickett (1974) in the CES manual. Table 5 lists means and standard deviations and statistically significant t-test values for the two

TABLE 5

Comparisons of Mean CES Scores for Regular and Accelerated Math Classes

| Subscale | Class: Regular[a] $\bar{X}$ | Regular[a] SD | Accelerated[b] $\bar{X}$ | Accelerated[b] SD | t-values |
|---|---|---|---|---|---|
| Initiative (I) | 4.37 | 1.3 | 6.10 | 2.4 | 11.19** |
| Affiliative (A) | 6.07 | 1.1 | 3.72 | 2.1 | -18.90** |
| Teacher Support (TS) | 6.08 | 1.5 | 6.91 | 1.8 | 7.98** |
| Task Orientation (TO) | 7.32 | 1.6 | 8.74 | 1.4 | 16.11** |
| Competition (C) | 5.38 | .9 | 6.98 | 1.8 | 20.22** |
| Order & Organization (OO) | 6.09 | 2.0 | 7.68 | 1.9 | 10.83** |
| Rule Clarity (RC) | 6.17 | 1.3 | 4.77 | 2.3 | -10.23** |
| Teacher Control (TC) | 4.34 | 1.7 | 3.02 | 1.9 | - 9.90** |
| Innovation (Inn) | 3.65 | 1.2 | 4.30 | 2.12 | 5.48** |

[a] $n = 48$.

[b] $n = 53$.

**$p < .01$

samples, and Figure 3 show this graphically. Comparisons between the two samples found statistically significant t-values for all CES scales beyond the .002 level. Only three scales were significantly lower in the present sample than the traditional math class sample (Affiliation, Rule Clarity, and Teacher Control). Of all the scales, competition was the most different with students in this program scoring very high on this scale (much above average), and Affiliation was next most extreme, with students scoring a lot lower than average on this scale. Overall, it appeared that these two groups have few similarities, however one similar trend was noted where both groups rated Task Orientation as higher than average. Students in the present study generally seemed to feel that affiliation in the group was very low, while task orientation, competition, and order and organization were quite high.

Since there are no norms currently available for the SEQ, the following will rather be a description of the group as a whole. In general, students liked this program, made a few good friends, liked their teachers, liked Algebra, moderately liked classroom lectures, felt slightly better about math than when they began, worked hard but could have done a little better. They felt they had learned a lot in the course, felt the homework assignments were fairly difficult, and spent about 7.5 hours per week on assignments.

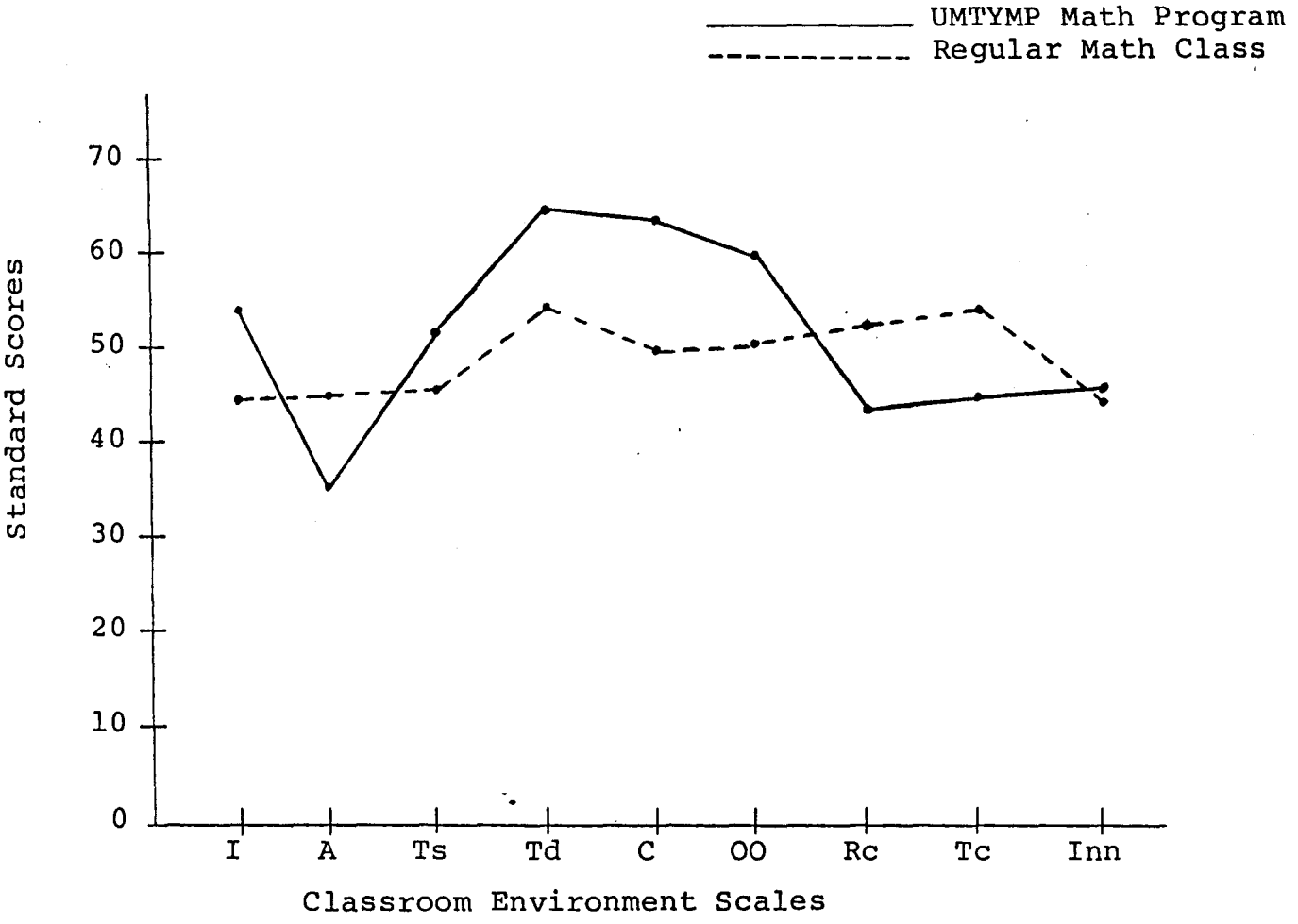


Figure 3. Comparison of Means for the UMTYMP Math Program and a Normal Math Class

Note. The data for the regular math class are from the Manual for the Classroom Environment Scale (p. 6) by R.H. Moos and E.J. Trickett, 1974, Palo Alto, Calif.: Consulting Psychologists Press.

When asked what they liked best, 23.6% said "other students," 23.6% said "the subject (Algebra)," and 21.8% said "the pace." Forty-four said they liked homework assignments the least. Of those students planning to return the following year (N = 40, 71.1%), 31.6% said they were returning because they enjoyed the course, and 28.9% said they liked the pace of the course. Of those not planning to return (N = 14, 25.9%), 38.5% said this was because they would be too busy with other things.

In general, students felt homework assignments provided a good balance of difficulty (55.9%), were challenging (57%), and were interesting (46.4%). In relation to classroom lectures, most believed that they were organized (64.3%), interesting (48.2%), but were hard to understand (41.4%). Thus, overall, students liked and benefited from the course and attributed positive characteristcs to teachers, lectures, and homework assignments although negative alternatives could also have been selected. Those who did not plan to return were primarily doing so for external factors ("too busy"), rather than some factor concerning the program.

Sex Differences:

Class evaluations were then analyzed for significant sex differences. Only three significant differences were found on the SEQ, and none were found on the CES. On the

SEQ, girls said they liked their teacher more than did boys. Those who were not returning next year more often said it was because they were "too busy" (Female N = 4, and male N = 1). Of the returning students, girls more often chose to return because of other students than did boys (although this answer in general was not most frequently given). No significant differences were found between the percentage of girls and boys chosing to return next year.

Grade:

Analyses were also done comparing seventh and eight graders. On the CES, significant differences were found only on the Task Orientation scale, with seventh graders rating this higher. On the SEQ, five significant differences were found. It seems that seventh graders spent more time on their homework assignments, and more frequently rated the class lecture as challenging, organized, and easy to understand than did eighth graders, whereas, eighth graders more frequently rated the class lectures as too slow.

Returning vs. Non-returning Students:

In comparing results of those returning vs. those not returning, statistically significant results were found on seven items. Those students not returning rated the course as lower on Task Orientation (CES) and higher on Innovation (CES), and said they liked the course less, liked Algebra

less, liked the class lectures less, felt they could have done better in the course, felt they had learned less, did not rate the homework assignments as interesting as frequently, and did not describe class lectures as being "just the right length" as frequently as did those students who said they were planning to return the following year.

Performance in the Program

The last area examined in this study was students' performance in the program (grades) in relation to initial measures obtained (SQ and PQ Factor scales, CPI, TAT, and Parent-Child Correlations). In relation to this broad area, several analyses were performed. For each student a mean percentage was calculated based on number of points received divided by number of possible points, for each of three areas for two marking periods: 1) homework assignment scores, 2) classroom test scores, and 3) Coop test scores. Thus, each student received a mean percentage score for each of these three areas which were then averaged together to produce a mean percentage score. Students were assigned Rank 1 (successful), Rank 2 (moderately successful), or Rank 3 (unsuccessful) based on total mean percentage scores (referred to here as TOTALP). Students with TOTALP scores of .90 or above were assigned to Rank 1 (N = 8), those with TOTALP scores of .80 to .89 were assigned to Rank 2 (N = 18), and those with TOTALP scores of .79 or less were

assigned to RANK 3 (N = 10).

In order to find out if there were any significant differences between successful (Rank 1) and unsuccessful (Rank 3) students, t-test analyses were performed. Table 6 shows the results of these analyses, providing significant differences on four variables: Social Introversion (SQ), achievement via independence (CPI), Self-Initiative (PQ), and School vs. Family Involvement (PQ). Thus, successful students scored significantly higher on achievement via independence, self-initiative, and school involvement, and significantly lower on Social Introversion suggesting that these students are much more socially extroverted, show more self-initiative, are more involved with school than with their families, and posess achievement motivation via independence.

Multiple Regression Analyses:

In order to discover which variables were predictive of performance in this program, multiple stepwise regression analyses were performed. Variables used in these analyses, were SQ and PQ Factor Scale scores, CPI scores, TAT scores, and Parent-Child Correlation scores, in an attempt to predict performance via TOTALP scores. In this way, three regression equations were obtained to predict performance. These

TABLE 6

Statistically Significant Mean Differences
for Successful and Unsuccessful Students

| Measure | Program Performance: Successful[a] n | $\bar{X}$ | SD | Unsuccessful[b] n | $\bar{X}$ | SD | t-value |
|---|---|---|---|---|---|---|---|
| SQ | | | | | | | |
| Factor 6[c] | 27 | -.04 | .72 | 7 | .95 | .55 | -3.4** |
| PQ | | | | | | | |
| Factor 2[d] | 26 | .42 | .75 | 8 | -.38 | .97 | 2.46* |
| Factor 6[e] | 26 | .24 | .67 | 8 | -.45 | 1.23 | 2.07* |
| CPI | | | | | | | |
| Ach. via Ind (Ai) | 27 | 21.19 | 7.24 | 8 | 15.63 | 4.17 | 2.06* |

Note. CPI raw scores were used in this study.

[a]Successful = TOTALP > .90.

[b]Unsuccessful = TOTALP < .79.

[c]Factor 6 (SQ) = Social Introversion.

[d]Factor 2 (PQ) = Self-Initiative.

[e]Factor 6 (PQ) = School vs. Family Involvement.

*$p$ < .05 **$p$ < .01

equations are provided below:

FEMALE TOTALP = .592 + .014So - .019Sa - .017Ai + .01Ld - .008Power(TAT) - .022Family Dependence(PQ)

MALE TOTALP = 1.255 + .033 Family Dependence(PQ) + .005Sc + .034Program Commitment(SQ) + .033Self-Initiative(PQ) - .01Social Maturity(CPI) + .03Family Support System(SQ)

TOTALP = .868 + .04Family Dependence(PQ) + .032Self-Initiative(PQ) = .026Family Support System(PQ) + .026Program Commitment(SQ) + .005Gi + .015 Self-Initiative(SQ) + .018Family Academic Achievement(PQ) = .003Empathy(CPI)

For these three equations, multiple correlations coefficients with TOTALP were as follows: female equation = .99, male equation = .89, and total equation = .89 with both F and t-values being statistically significant at the .0000 level for all three equations. While these equations appear highly predictive of performance, the same subjects were used to obtain coefficients and to derive equations, thus, further samples need to be tested to determine their predictive

ability and usefulness, particularly in relation to the female results, as this subsample was quite small (N = 16) compared to the male subsample (N = 40). The meaning of the results of the multiple regression equations will be discussed in greater detail in the Discussion section.

# DISCUSSION

## Description of Sample

The two questionnaires used in this study provide a detailed description of these mathematically gifted students from the students' as well as their parents' perspective. Overall, the data obtained here were remarkably similar to results obtained in previous studies on gifted children. As in other studies, these children were found to be talented and well adjusted individuals with many interests.

General findings suggest that reading, sports, and television are popular leisure activities, and that students consider a social life to be important. In school, these children are good students who are interested in many areas, have good study skills, and academic initiative. Overall, however, they remain unchallenged by school.

Students' families were described as supportive of positive growth in their children, with a high percentage of professional families that are small and intact. Students were characterized as academically and socially oriented with high educational and career goals. Most seemed enthusiastic about the program and chose to attend it in order to progress more quickly in math. Additional information of interest was that these children on average began

reading at age 4 years and 2 months, a finding that has been found in other studies. This seems to support the belief that gifted children tend to be academically precocious at an early age.

Parents for the most part responded in the same way as did their children on same item questions, indicating that these parents overall know their children fairly well. Interestingly, these parents seem to believe that child reads and likes school more than the child actually does, and that a social life is not as important to them. From this, it seems that parents may not realize how little challenge most of these children receive academically and the importance of friends in their childrens' lives.

The overall conclusion reached from these results is that these mathematically gifted adolescents appear to be well adjusted. There are no real weaknesses or negative factors which stand out. Based on these findings, there appears little support for the myth of the mathematically gifted child as being socially inept, maladjusted, and isolated, with severe psychological problems. Rather, one must conclude that these children appear psychologically and socially well adjusted.

## Comparisons with Other Samples

When these students are compared to other adolescent

samples (gifted and random students), one can only further conclude that these children are socially and psychologically mature when compared to same age randomly selected peers. More importantly though, was the finding that these students were strikingly similar to mathematically gifted students in the Johns Hopkins program. Thus, not only are these two groups similar intellectually, but also psychologically and socially. This raises the distinct possibility that a specific personality profile may exist which describes the mathematically gifted young adolescent.

In comparison to the other four groups, these children scored significantly higher than the Eighth Grade Gifted group on every scale except communality, a scale designed to "indicate the degree to which an individual's reactions and responses correspond to the modal ("common") pattern established for the inventory" (Gough, 1975, p. 11). This suggests that these children are very different than same age peers in areas other than intellectual functioning, and are significantly more psychologically and socially mature overall. In fact, these children appear more like gifted high school students than gifted eighth graders.

While there are still some significant differences between the two mathematically gifted groups, mathematically gifted junior high school students appear much like gifted high school students on scales tapping leadership ability,

social initiative, ambition, personal versatility, poise, self-confidence, self-worth, independent thinking, responsibility, social maturity, self-control, psychological mindedness, and femininity. Compared to regular high school students, these students have more leadership ability, social initiative, capacity for status, sociability, achievement via conformity, achievement via independence, and femininity. Differences between all these samples and the present one on femininity can be easily explained by the fact that female students were included in the present study but not in the others. Overall, the conclusion reached here is that for these mathematically gifted young adolescents, like the Hopkins students, same age children cannot be considered peers in terms of intellectual, psychological or social functioning. Rather, they appear much more like gifted high school students.

## Differences in Subsample

Two types of subsample variables were of concern in this study: sex and grade. The results from the CPI, TAT, PQ, and SQ factor scales, showed that sex and grade differences did exist. In relation to sex, it was found that boys were more independent, and power motivated and liked sports activities more and cultural activities less than did girls. In general, parents reported daughters to be more responsible than sons and said they gave their sons more

push and encouragement for academic achievement.

These findings suggest that when CPI and TAT scores are compared, psychologically and socially there are almost no differences between these boys and girls, except that boys appear more independent and power motivated. However, when more subtle areas are examined, it appears that some sex stereotypes still exist. Most concerning is the finding that parents do not seem to encourage mathematically gifted daughters to excel academically as much as they do mathematically gifted sons. There are two alternative explanations for this difference. One explanation is that girls tend to be more responsible and interested in excelling academically than are boys. The second explanation is that parents feel it is more important for boys to excel academically, particularly in a typically male dominated field such as mathematics. One can only hypothesize that the best explanation includes both possibilities. The suspicion here is that being more academically responsible allowed these girls to compete successfully with boys who were more encouraged to excel in mathematics. The implication is that if girls were more encouraged to excel by their parents, schools, and society in general, there would be more who qualified for accelerated mathematics programs. The conclusion is that academic responsibility is an important characteristic for the girls in this program, while not necessarily for the boys.

In relation to grade differences, seventh graders scored higher on well being, intellectual efficiency, and leadership than did eighth graders, and had more family support and parental push for achievement. It seems that the younger student are perhaps brighter, slightly more well adjusted, and had more parental support. While it is difficult to explain the higher CPI scores, differences in parental push may be explained by the fact that most of the female students were eighth graders. Female students in general received less parental push for achievement. In addition, family support may be more necessary for the younger students. Interestingly, on no items did seventh graders score significantly lower. This suggests that younger students who qualify for the program are somewhat brighter, and therefore perhaps more mature in some nonintellectual areas.

Student Evaluations

The results of two student evaluations of the program showed that students felt very positively about the program in terms of the subject, teachers, pace, class lectures, and homework. The overwhelming conclusion was that students highly benefited from participating in this program, and that it has much to offer future students. There was no doubt that students found this course stimulating and challenging.

Comparisons between this program and regular math classes on the CES, showed a dramatic difference between them. Unlike typical math classes, this class met only once per week for two hours, and thus needed to cover material rapidly. Because of this, it is not surprising that Task Orientation and Order and Organization scores were much higher. In addition, low Affiliation scores were also not surprising as this scale assesses the amount of time spent with other students, and classroom friendships. Because of the intensity of the classes, and the many geographical regions children came from, the time for socializing in the program was naturally limited.

The most surprising and somewhat disturbing finding was the very high degree of competition between students which may interfere with friendships. While certainly many of these children were in need of more challenge, the level of competition here was perhaps too high. The cost is therefore lowered positive social interactions between students.

High Competition scores, along with lower scores on Rule Clarity and Teacher Control, could be explained by the fact that students interested in participating in the course were very motivated to learn. Consequently, the teachers had less need to be strict or concerned with discipline matters. Higher scores on Involvement support the idea

that these students were more interested in math, more actively involved, and for the most part enjoyed math more causing them to want to participate in the program initially. From all these findings, one can only conclude that this course, while perhaps too competitive and lacking student interaction, had a very stimulating and positive impact on the majority of these students.

There were few sex differences found on evaluations. This finding is encouraging because one concern here was that because of sex stereotypes, girls might not continue to enjoy and feel positively about this type of course. The other concern was that more girls might drop out during the year or not want to return the following year because of social pressures. However, there were no differences in the percentage of girls and boys planning to return the following year. In fact, one of the girls went so far as to state that only "brain damage, death, total paralysis, coma, insanity, or ending of funding to the program" would stop her from returning.

When seventh and eighth graders' evaluations were compared, seventh graders seemed to feel a bit more positively and more challenged than did eighth graders. The suspicion is that eighth graders come into the course with more math knowledge and thus benefit a bit less than seventh graders. This suggests that perhaps more seventh graders should be

admitted into the program, and that had eighth graders been in the course a year earlier, they might have benefited more. Despite these findings, many eighth graders did positively benefit from participating, although perhaps not as much as seventh graders.

In general, it seemed clear that students not planning to return did not like the course as well and did not benefit as much as did those planning to return. That is not to say they disliked or did not benefit from the course, but rather that they did not gain as much as those planning to return. While students most frequently said they were not planning to return because they were too busy, the more likely reason was that they just did not like the course quite as much as did those planning to return for a variety of reasons.

Performance in the Program

When successful (Rank 1) and unsuccessful (Rank 3) students were compared, it was found that four variables discriminated the two groups. Thus, successful students can be described as more socially interactive, self-sufficient, independent, persevering, involved in school (academically and socially), academically mature, self-reliant, academically independent and autonomous than were unsuccessful students. Of these variables, social introversion (SQ) was the most discriminating variable. This finding

suggests that students interested more in unsocial, non-cultural activities (e.g., television, computers), who care little about being popular, and who have not gotten an A in previous math courses, were likely to perform more poorly in this program.

In order to discover variables predictive of success, three multiple regression equations were constructed (for males, females, and the total sample). For females, six variables were useful for predicting performance: sociability (positive weighting-CPI), self acceptance (negative weighting-CPI), achievement via independence (negative weighting-CPI), leadership ability (positive weighting-CPI), power motivation (negative weighting-TAT), and family dependence (negative weighting-PQ). Thus, successful females were more sociable, had more leadership ability, were less dependent on their families, were more easy going, methodical, compliant, and had less need for power than did unsuccessful females. In other words, they were more socially, psychologically, and academically competitive but stereotypically conforming and conventional than unsuccessful females.

For males, six variables seemed to predict performance: family dependence (positive weighting-PQ), self control (positive weighting-CPI), program commitment (positive weighting-SQ), self-initiative (positive weighting-PQ),

social maturity (negative weighting-CPI), and family support system (positive weighting-SQ). Thus, successful males were more consciencious, practical, reflective, dependent on their family, self initiating, less socially mature, had more supportive positive family systems, and were more committed to doing well in the program than were unsuccessful males.

Thus, while socialization skills and conformity were important traits for successful females, self-sufficiency and conscienciousness were important traits for males. The importance of social skills for females and not for males, leads one to suspect that females with more ability to interact with others can find the peer support they need to do well in a male dominated field such as mathematics. In addition, while being competitive and independent, they still need to fit into the system by adopting a more stereotypic female role. The successful male, while not needing to be as conventional and compliant, needs to be self motivated, consciencious, and have a positive family support system which encourages independence, but need not be socially mature.

In the total sample, eight variables combined to predict success: family dependence (positive weighting-PQ), self-initiative (positive weighting-PQ), family support system (negative weighting-PQ), program commitment (positive

weighting-SQ), family academic achievement (positive weighting-PQ) and empathy (negative weighting-CPI). Thus, overall successful students were more dependent on their families, had more self-initiative, had less supportive family environments, were more committed to the program, more enterprising, diligent, helpful, were less empathetic towards others, and had families in which academic achievement was more important.

# CONCLUSION

This study provided much interesting, stimulating, and important information concerning mathematically gifted youth. Many of the results found here supported previous research findings on highly gifted children. This study found the children in this program as a whole to be capable, outgoing, and well adjusted individuals who have many diverse interests other than studying mathematics. Like the Hopkins study, it was found that these children are very different from same age peers. Overall, they most closely resemble mathematically gifted junior high school students, and, secondly, gifted high school students.

While this study found evidence of sex differences attributable primarily to stereotypic sex role identification, in fact there were probably fewer differences for these students than for a randomly selected population. This, along with good social skills, seems to have allowed these girls to succeed this far in a traditionally male field.

The program itself must be considered a success if one examines the results on the student evaluations. The only two apparent concerns appeared to be the high competitiveness and low affiliative classroom climates. It was

not surprising that students planning to return enjoyed many aspects of the program more than non-returning students. However, even those not returning seemed to positively benefit from participating in the program.

Data received on the TAT generally showed that boys scored higher than girls on power motivation, and that lower power motivation was important in predicting success in females. While there are currently no norms on achievement, power, and intimacy motivation in young adolescents, the present study does provide data on these three motives for this sample of mathematically gifted students.

Despite the small sample size, the current study provides much information on nonintellectual characteristics of mathematically gifted youth. The overall conclusion reached here was that indeed nonintellectual variables do exist which can well describe these children, and can be useful in predicting performance in this program. The hope is that future research will provide more information on the generalizability of these results, and their usefulness in selecting students who differ little in their intellectual ability, but show more significant differences on non-intellectual variables related to performance in such a program.

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# APPENDIX A

Do (Dominance): "To assess factors of leadership ability, dominance, persistance, and social status."

Cs (Capacity for status): "To serve as an index of an individiual's capacity for status. The scale attempts to measure the personal qualities and attributes which underlie and lead to status."

Sy (Sociability): "To identify persons of outgoing, sociable participative temperment."

Sp (Social presence): "To assess factors such as poise, spontaneity, and self-confidence in personal and social interaction."

Sa (Self-acceptance): "To assess factors such as sense of personal worth, self-acceptance, and capacity for independent thinking and action."

Wb (Sense of well-being): "To identify persons who minimize their worries and complaints, and who are relatively free from self-doubt and disillusionment."

Re (Responsibility): "To identify persons of conscientious, responsible, and dependable disposition and temperment."

So (Socialization): "to indicate the degree of social maturity, integrety, and rectitude which the individual has attained."

Sc (Self-control): "To assess the degree and adequacy of self-regulation and self-control and freedom from impulsivity and self-centeredness."

To (Tolerance): "To identify persons with permissive, accepting, and non-judgemental social beliefs and attitude."

Gi (Good impression): "To identify persons capable of creating a favorable impression, and who are concerned about how others react to them."

Cm (Communality): "To indicate the degree to which an individual's reactions and responses correspond to the modal pattern established for the inventory."

Ac (Achievement via conformity): "To identify those factors of interest and motivation which facilitate achievement in any setting where conformance is a positive behavior."

Ai (Achievement via independence): "To identify those factors of interest and motivation which facilitate achievement in any setting where autonomy and independence are positive behaviors."

Ie (Intellectual efficiency): "To indicate the degree of personal and intellectual efficiency which the individual has attained."

Py (Psychological-mindedness): "To measure the degree to which the individual is interested in, and responsive to, the inner needs, motives, and experiences of others."

Fx (Flexibility): "To indicate the degree of flexibility and adaptability of a person's thinking and social behavior."

Fe (Femininity): "To assess the masculinity or femininity of interests."

Note. From the California Psychological Inventory Manual (p. 10-11) by H.G. Gough, 1975, Palo Alto, Calif.: Consulting Psychologists Press.

# APPENDIX B

# Student Questionnaire

1. What are your main interests/hobbies outside of school?

2. How much do you like to read for pleasure?
   Very Much  Fairly Much  A Little  Not Much  Not at All

3. How much time do you usually spend reading for pleasure each week?
   __None  __30 Minutes  __1 Hour  __2 Hours  __3 or more Hrs.

4. How much do you like team sports?
   Very Much  Fairly Much  A Little  Not Much  Not at All

5. Are you or have you been a member of any sports team?
   ___ Yes  ___ No
   If Yes:
   a. What kinds of sports teams have you been a member of?

6. How much do you like to watch television?
   Very Much  Fairly Much  A Little  Not Much  Not at All

7. How much time do you usually spend a day watching television?
   __None  __30 Mins.  __1 Hr.  __2 Hrs.  __3 or more Hrs.

8. Do you play a musical instrument?  ___ Yes  ___ No
   If Yes:
   a. What instrument(s) do you play?
   b. Do you take music lessons outside of school?
      ___ Yes  ___ No
   c. Are you in the school band or orchestra?  __Yes  __No
   d. How many hours a week do you usually practice music?
   e. Who usually makes you practice music?
      __Mother  __Father  __Both parents  __Myself
      __Other: Specify _____

9. How much do you like music?
   Very Much  Fairly Much  A Little  Not Much  Not at All

10. How much would you enjoy going to the following events:
    a. Orchestra concern
       Very Much-Fairly Much-A Little-Not Much-Not at All

    b. Opera
       Very Much-Fairly Much-A Little-Not Much-Not at All

    c. Rock Concern
       Very Much-Fairly Much-A Little-Not Much-Not at All

    d. Dramatic Play
       Very Much-Fairly Much-A Little-Not Much-Not at All

e. Ballet
Very Much-Fairly Much-A Little-Not Much-Not at All

f. Musical Play
Very Much-Fairly Much-A Little-Not Much-Not at All

g. Sports Event
Very Much-Fairly Much-A Little-Not Much-Not at All

11. Approximately how many good friends your age do you have?
a. _____ At School b. _____ Outside of School

12. How much do you care about having good friends your own age?
Very Much Fairly Much A Little Not Much Not at All

13. How much of your free time do you usually spend with friends?
___100% ___75% ___50% ___25% __0%

14. Check the statement which best describes you:
__ I prefer being with just one good friend
__ I prefer being with a group of friends
__ I prefer being alone

15. How much do you like school?
Very Much Fairly Much A Little Not Much Not at All

16. What clubs or organizations do you belong to in school?

17. Check the statement which best describes your work in classes other than Math:
__ I do very well in school
__ I do well in school but could do better
__ I do OK in school but could do much better
__ I don't do well in school and could do much better
__ I do poorly in school

18. How much effort do you put into your classes other than math?
Very Much Fairly Much A Little Not Much Not at All

19. Check the two subjects that you like the most in school:
__English __Shop __Language(like French or Spanish)
__Art __Mathematics __Home Economics __Physical Education __Typing __Natural Science __Drama __Computer
__History __Religion __Social Science __Other: Specify

20. What kinds of honors or awards have you received in school?

21. How difficult are your classes at school (excluding math)?
Very Much Fairly Much A Little Not Much Not at All

22. Have you ever used a computer? ___Yes ___No
If Yes:
a. What computer language(s) do you know?
b. How many hours a week do you spend on a computer (on average)?
__None __30 Mins. __1 Hr. __2 Hrs. __3 or more Hrs.

23. How would you describe your study habits?
Excellent Good Average Below Average Poor

24. How much time do you usually spend on homework each day (either at school or home)?
__None __30 Mins. __1 Hr. __ 2 Hrs. __3 or more Hrs.

25. How often do you complete homework assignments?
__100% of the time __75% of the time __50% of the time
__25% of the time __0% of the time

26. When you have two weeks to complete an assignment, do you (check one):
__Complete it immediately
__Do a little bit everyday
__Wait until the second week to begin working on it
__Wait until the night before to do it
__Forget to do it altogether

27. Who usually helps you with your homework?
___Mother ___Father ___Both Parents Equally ___No One
___Other: Specify _____

28. How much do your parents have to push you to do your homework?
Very Much Fairly Much A Little Not Much Not at All

29. How difficult do you generally find your homework?
Very Much Fairly Much A Little Not Much Not at All

30. How much do you like mathematics?
Very Much Fairly Much A Little Not Much Not at All

31. How did you learn most of your mathematics?(check one)
__In regular classwork with other students
__In school, but working on your own with some help or direction from your teacher or parent
__On your own outside of school, helped by a tutor or

parent
__On your own outside of school with little help from anyone

32. What overall grade did you receive in math last year?___

33. How important do you think mathematics will be for a job you will some day have?
Very Much Fairly Much A Little Not Much Not at All

34. How much do your parents encourage you to do things for yourself?
Very Much Fairly Much A Little Not Much Not at All

35. Who is most concerned with your education?
___Mother ___Father ___Both parents ___Other: Specify
_____

36. Do you have regular weekly chores at home? __Yes __No
If Yes:
a. How much do your parents have to push you to do your chores?
Very Much Fairly Much A Little Not Much Not at All

37. How strict are your parents?
Very Much Fairly Much A Little Not Much Not at All

38. Who is stricter? __Mother __Father __Both Equally Strict

39. How much do your parents consider your opinions in matters concerning you?
Very Much Fairly Much A Little Not Much Not at All

40. Who is more likely to consider your opinions?
__Mother __Father __Both Parents Equally

41. Who makes the rules in your family?
__Mother __Father __Both Parents

42. Who enforces the rules in your family?
__Mother __Father __Both Parents

43. How much time do you usually spend doing things together in your family?
Very Much Fairly Much A Little Not Much Not at All

44. With which parent do you usually spend the most time?
__Mother __Father ___Both Parents Equally

45. How easy to talk to are your parents?
Very Much Fairly Much A Little Not Much Not at All

46. To whom is it easier to talk?
__Mother __Father __Both Parents Equally

47. How affectionate are your parents?
Very Much Fairly Much A Little Not Much Not at All

48. Which parent is usually more affectionate?
___Mother __Father __Both Parents Equally

49. How frequently do your parents attend religious services?
Very Much Fairly Much A Little Not Much Not at All

50. Which parent attends religious services more frequently?
___Mother ___Father ___Both Parents Equally

51. How popular are you at school?
Very Much Fairly Much A Little Not Much Not at All

52. How much do you care about being popular?
Very Much Fairly Much A Little Not Much Not at All

53. How athletic are you?
Very Much Fairly Much A Little Not Much Not at All

54. How much do you follow the rules at school?
Very Much Fairly Much A Little Not Much Not at All

55. How much do you follow the rules at home?
Very Much Fairly Much A Little Not Much Not at All

56. How competitive are you?
Very Much Fairly Much A Little Not Much Not at All

57. How much do you like competition?
Very Much Fairly Much A Little Not Much Not at All

58. Check the two characteristics that best describe you.
__Smart __Popular __Good looking __Athletic
__Well Behaved __Good Student __Leader __Nice Person

59. Right now, how much do you see yourself as a leader?
Very Much Fairly Much A Little Not Much Not at All

60. When you get older, what kind of a leader do you think you will be?
Excellent Good Average Below Average Poor

61. What is the highest level of education you expect to complete?
__Less than high school __High school __Some college
__College graduate __More than college(Graduate/Profes-

sional school)

62. If you have been considering college, have you thought about specific colleges? ___Yes ___No
If Yes, please name two:

63. Please list two specific occupations that you think you would most like to do for your life's work.

64. How did you find out about the program?
___Parent ___Math teacher ___Friend ___Letter from program ___Poster ___Guidance Counselor ___Other: Specify _____

65. How do you get to the program? (Check one)
___Bus ___Walk __Parent drives you __Other: Specify _____

66. How long does it take you to get to the program? _____

67. If your parent drives you, are you part of a carpool?
_____Yes _____No

68. How much do you think you will like the program?
Very Much Fairly Much A Little Not Much Not at All

69. What are the two main reasons you want to participate in this program:
__To improve your math skills __To get more interesting math course __To get a better math teacher __To meet other kids who are good at math __To be able to progress more quickly in math __Other: Specify_____

70. From whom did you receive the most encouragement to participate in the program?
__Mother __Father __Math teacher __Program teachers __School counselor __Other: Specify_____

71. How much did you want to participate in this program?
Very Much Fairly Much A Little Not Much Not at All

72. How much did your parents want you to participate in this program?
Very Much Fairly Much A Little Not Much Not at All

73. How well do you think you will do in this program?
Excellent Good Average Below Average Poor

74. Your Sex: _____Male _____Female

75. Your Age: Birthdate_____Day_____Mo_____Yr

76. Name of school that you attend"

77. Grade:

78. What kind of school do you attend?
__Public School __Private School __Parochial School

Student Questionnaire-continuous variables data

| Item | n | $\bar{X}$ | SD |
|---|---|---|---|
| 2 | 57 | 4.246 | 1.005 |
| 3 | 57 | 4.053 | 1.156 |
| 4 | 57 | 3.842 | 1.279 |
| 5 | 57 | 4.351 | 1.674 |
| 6 | 56 | 2.429 | .951 |
| 7 | 56 | 2.536 | 1.235 |
| 8 | 57 | 6.373 | 3.917 |
| 9 | 57 | 4.158 | 1.131 |
| 10a-f | 57 | 16.860=2.81/6 | 5.357 |
| 10g | 57 | 4.018 | 1.203 |
| 11a | 55 | 8.509 | 4.488 |
| 11b | 56 | 5.464 | 4.525 |
| 12 | 56 | 4.321 | .765 |
| 13 | 57 | 2.772 | .982 |
| 14 | 57 | 3.544 | 1.794 |
| 15 | 57 | 4.088 | .969 |
| 17 | 57 | 4.632 | .587 |
| 18 | 56 | 4.250 | .858 |
| 20 | 57 | 2.772 | 1.018 |
| 22 | 57 | 9.947 | 3.270 |
| 23 | 57 | 3.754 | .786 |
| 24 | 57 | 3.053 | .971 |
| 25 | 57 | 4.754 | .434 |
| 26 | 57 | 3.404 | .799 |
| 28 | 57 | 3.965 | .999 |
| 29 | 56 | 2.286 | .948 |
| 30 | 57 | 4.579 | .653 |
| 31 | 57 | 2.386 | 1.473 |
| 32 | 56 | 4.911 | .345 |
| 33 | 57 | 4.667 | .577 |
| 34 | 57 | 4.088 | .808 |
| 36 | 45 | 2.667 | .977 |
| 37 | 56 | 3.679 | .834 |
| 39 | 56 | 4.179 | 1.011 |
| 43 | 57 | 3.228 | .982 |
| 45 | 57 | 3.877 | 1.053 |
| 47 | 57 | 4.088 | .912 |
| 49 | 57 | 3.737 | 1.587 |
| 51 | 57 | 3.439 | 1.086 |
| 52 | 56 | 3.018 | 1.258 |
| 54 | 57 | 3.386 | 1.398 |

| Item | n | $\bar{X}$ | SD |
|---|---|---|---|
| 55 | 57 | 4.140 | .789 |
| 56 | 57 | 4.263 | .877 |
| 57 | 57 | 3.789 | 1.130 |
| 59 | 57 | 3.474 | 1.054 |
| 60 | 57 | 4.018 | .744 |
| 61 | 57 | 4.772 | .423 |
| 62 | 57 | 4.526 | 2.848 |
| 63 | 55 | 1.818 | .512 |
| 66 | 56 | 32.50 | 15.580 |
| 68 | 57 | 4.526 | .538 |
| 71 | 56 | 4.625 | .489 |
| 72 | 56 | 4.304 | .913 |
| 73 | 56 | 4.250 | .580 |
| 75 | 57 | 12.789 | .590 |
| 77 | 57 | 7.667 | .546 |

# APPENDIX C

Parent Questionnaire

1. Mother's Age:

2. Father's Age:

3 Mother's Occupation:

4. Father's Occupation:

5. Number of children living in your home:

6. List Childrens' Ages and Sex: (Only those living in your home)

7. How much does your child like to read for pleasure:
Very Much Fairly Much A Little Not Much Not at All

8. How much time does your child usually spend reading for pleasure each week?
__None __30 Min. __1 Hr. __2 Hrs. __3 or more Hrs.

9. How much time does your child spend watching television each day?
__None __30 Min. __1 Hr. __2 Hrs. __3 or more Hrs.

10. If your child plays an instrument:
a. How many hours a week does he/she practice?
__None __30 Min. __1 Hr. __2 Hrs. __3 or more Hrs.

b. Who makes your child practice?
__Myself __My spouse __Both of us __No one __Other:
Specify _____

11. How much does your child care about having friends his/her own age?
Very Much Fairly Much A Little Not Much Not at All

12. How much free time does your child usually spend with friends?
___100% __75% __50% __25% __0%

13. How much does your child like school in general?
Very Much Fairly Much A Little Not Much Not at All

14. How would you rate your child's academic ability in general?
Excellent Good Average Below Average Poor

15. Check the statement which in general best describes your child's work at school (excluding Mathematics):
__Does very well in school
__Does well in school but could do better
__Does OK in school but could do much better
__Does not do well in school and could do much better
__Does poorly in school

16. How much time does your child usually spend on homework each day (either at school or at home)
__None __30 Min. __1 Hr. __2 Hrs. __More than 2 Hrs.

17. How often does your child complete homework assignments?
__100% of the time __75% of the time __50% of the time
__25% of the time __0% of the time

18. Who usually helps your child with his/her homework?
__Yourself __Your spouse __Both Parents Equally __No One __Other: Specify _____

19. How much supervision do you and your spouse give your child with homework?
Very Much Fairly Much A Little Not Much None

20. When your child has 2 weeks to complete an assignment for school, does he/she (check one):
__complete it immediately
__do a little bit every day
__wait until the second week to begin working on it
__wait until the night before to do it
__forget to do it altogether

21. How much does your child need to be pushed to do his/her homework?
Very Much Fairly Much A Little Not Much Not at All

22. How much does your child like mathematics?
Very Much Fairly Much A Little Not Much Not at All

23. How much do you and your spouse encourage your child to learn mathematics?
Very Much Fairly Much A Little Not Much Not at All

24. Does your childhave regular household chores? __Yes __No
If Yes:
a. Who supervises your child's completion of chores?
__Myself __My spouse __Both of us __No one
__Other: Specify _____

b. How much do you and your spouse have to pus your child to complete his/her chores?
Very Much Fairly Much A Little Not Much Not at All

25. How much do you and your spouse encourage your child to be independent?
Very Much Fairly Much A Little Not Much Not at All

26. How strict are you and your spouse with your child?
Very Much Fairly Much A Little Not Much Not at All

27. Who is stricter in your hosue?
__Yourself __Your Spouse __Both of you equally

28. How important is it to you and your spouse that your child receive good grades in school?
Very Much Fairly Much A Little Not Much Not at All

29. How much time does your family usually spend together?
Very Much Fairly Much A Little Not Much None

30. Which of you usually spend the most time with your child?
__Mother __Father __Both Parents Equally

31. How affectionate are you and your spouse towards your child?
Very Much Fairly Much A Little Not Much Not at All

32. Which parent is usually more affectionate towards your child?
__Mother __Father __Both Parents Equally

33. How much do you and your spouse usually consider your child's opinions in making decisions concerning him/her?
Very Much Fairly Much A Little Not Much Not at All

34. At what age did your child do the following?
a. Walk _____ b. Talk _____ c. Read _____

35. Where did your child learn to read?
__Parent __Pre-school __Grade School __Taught him/herself __Other: Specify: _____

36. How popular is your child at school?
Very Much Fairly Much A Little Not Much Not at All

37. How athletic is your child?
Very Much Fairly Much A Little Not Much Not at All

38. How well behaved is your child at home?
Very Much Fairly Much A Little Not Much Not at All

39. How well behaved is your child at school?
Very Much Fairly Much A Little Not Much Not at All

40. How good looking is your child?
Very Much Fairly Much A Little Not Much Not at All

41. How much of a leader is your child?
Very Much Fairly Much A Little Not Much Not at All

42. How competitive is your child?
Very Much Fairly Much A Little Not Much Not at All

43. How persevering is your child?
Very Much Fairly Much A Little Not Much Not at All

44. What is the highest level of education you think your child will complete?
__Less than high school __High school __Some college __College graduate __More than college(Graduate/professional school)

45. If your child goes to college, what colleges would you like to see your child attent?

46. What career or job do you think your child will do for his/her life's work?

47. Where did you find out about the program?
__From my child __Child's math teacher __Friend __Poster __Letter from school Other:Specify _____

48. How much do you think your child will like the program?
Very Much Fairly Much A Little Not Much Not at All

49. What are the two main reasons you want your child to participate in the program?
__Improve math skills __Better math teacher __Make friends __More interesting math course __Faster progression in math __Early admission to college or college courses __To improve chances of attending college of choice

50. How much encouragement did you and your spouse give your child to participate in the program?
Very Much Vairly Much A Little Not Much None

51. Who gave your child the most encouragement to participate in the program?
__Yourself __Your spouse __Math teacher __Program teacher __Child's friend(s) __School counselor
__Other: Specify _____

52. How well do you think your child will do in this program?
Excellent Good Average Below Average Poor?

53. How committed are you and your spouse to having your child stay in this program?
Very Much Fairly Much A Little Not Much Not at All

Demographics:

54. Who lives in your home other than your spouse and children?

55. In what country were you born?

56. In what country was your spouse born?

57. What is the primary language spoken in your home (if not English)?

58. Are you employed? ___Yes ___No

59. Is your spouse employed? ___Yes ___No

60. Are you separated or divorced? ___Yes ___No

61. Is your spouse divorced? ___Yes ___No

62. If you are divorced, have you remarried? ___Yes ___No

63. What is your religious affiliation?

64. What is your spouses's religious affiliation?

65. How often do you and your spouse attend religious services?
Very Much Fairly Much A Little Not Much Not at All

66. Check the highest level of education you have completed:
__less than high school
__high school graduate
__some college
__college graduate
__more than college graduate (graduate/professional school)

67. Check the highest level of education your spouse has completed:
__less than high school
__high school graduate
__some college
__college graduate
__more than college (graduate/professional school)

Parent Questionnaire - continuous variables data

| Item | n | $\bar{X}$ | SD |
|---|---|---|---|
| 1 | 55 | 40.67 | 4.40 |
| 2 | 48 | 41.60 | 4.98 |
| 5 | 56 | 2.34 | .75 |
| 7 | 56 | 4.48 | .71 |
| 8 | 56 | 4.55 | .69 |
| 9 | 56 | 2.70 | 1.06 |
| 10a | 33 | 4.27 | 1.07 |
| 11 | 56 | 4.07 | .71 |
| 12 | 56 | 2.38 | .70 |
| 13 | 56 | 4.46 | .66 |
| 14 | 56 | 4.89 | .31 |
| 15 | 56 | 4.68 | .47 |
| 16 | 55 | 2.96 | .82 |
| 17 | 55 | 4.75 | .48 |
| 19 | 55 | 3.76 | .79 |
| 20 | 54 | 3.44 | .63 |
| 21 | 49 | 3.96 | .91 |
| 22 | 56 | 4.66 | .48 |
| 23 | 55 | 3.86 | .97 |
| 24b | 48 | 2.69 | .97 |
| 25 | 56 | 4.05 | .77 |
| 26 | 56 | 3.79 | .62 |
| 28 | 56 | 4.13 | .79 |
| 29 | 56 | 4.07 | .50 |
| 31 | 56 | 4.21 | .62 |
| 33 | 56 | 4.45 | .57 |
| 34a | 56 | 11.64 | 1.50 |
| 34b | 50 | 16.46 | 5.52 |
| 34c | 54 | 50.28 | 13.82 |
| 36 | 50 | 3.06 | 1.17 |
| 37 | 56 | 3.79 | .89 |
| 38 | 56 | 3.34 | 1.01 |
| 39 | 56 | 4.25 | .64 |
| 40 | 56 | 4.61 | .53 |
| 41 | 54 | 4.22 | .60 |
| 42 | 56 | 3.79 | .73 |
| 43 | 56 | 4.34 | .79 |
| 44 | 56 | 4.39 | .65 |
| 48 | 54 | 4.65 | .52 |
| 50 | 56 | 3.61 | .93 |
| 52 | 56 | 4.39 | .49 |
| 53 | 56 | 4.52 | .71 |
| 65 | 55 | 3.80 | 1.41 |
| 66 | 53 | 3.59 | .87 |
| 67 | 48 | 4.42 | .77 |

# APPENDIX D

Correlation Matrix for
SQ Factor Scales and CPI Scales

| | S1 | S2 | S3 | S4 | S5 | S6 | S7 | S8 | S9 | S10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Do | .26 | .25 | .02 | .40 | .01 | -.12 | .17 | -.19 | .08 | -.09 |
| Cs | .12 | .20 | .05 | .38 | .04 | -.12 | .22 | -.21 | -.06 | -.21 |
| Sy | .32 | .20 | .09 | .32 | .13 | .06 | .15 | -.19 | .05 | -.21 |
| Sp | .37 | -.11 | .10 | .18 | .19 | -.20 | -.05 | -.29 | -.03 | -.07 |
| Sa | .25 | .09 | -.04 | .14 | .06 | -.22 | .08 | -.25 | .06 | -.10 |
| Wb | .05 | .45 | .50 | .19 | .16 | -.02 | .20 | -.04 | -.17 | .12 |
| Re | -.25 | .54 | .11 | .35 | -.05 | .06 | .31 | .07 | .03 | -.18 |
| So | .14 | .52 | .41 | .05 | .25 | -.20 | .30 | -.12 | .05 | -.16 |
| Sc | .03 | .44 | .45 | .14 | -.09 | .16 | .29 | .02 | .07 | -.06 |
| To | -.22 | .38 | .35 | .31 | .13 | .05 | .26 | -.04 | -.04 | -.08 |
| Gi | .08 | .37 | .26 | .34 | -.16 | .22 | .30 | -.05 | .03 | -.09 |
| Cm | .13 | .31 | .14 | .05 | .16 | -.21 | .10 | -.10 | .06 | -.14 |
| Ac | .11 | .53 | .39 | .17 | .11 | -.08 | .20 | -.17 | -.02 | -.28 |
| Ai | .04 | .18 | .26 | .18 | .06 | -.06 | .16 | -.14 | -.03 | -.14 |
| Ie | .03 | .43 | .52 | .30 | .16 | -.13 | .19 | .01 | .01 | .04 |
| Py | .18 | .23 | .07 | .09 | -.01 | -.12 | .20 | -.23 | .05 | -.12 |
| Fx | .25 | .08 | .04 | .27 | .07 | -.02 | .04 | -.19 | -.07 | -.18 |
| Fm | -.14 | .26 | .05 | .21 | .15 | -.17 | .23 | .00 | -.12 | -.21 |
| Em | .08 | .27 | .14 | .45 | .32 | -.15 | -.01 | -.02 | -.05 | -.16 |
| In | .12 | .09 | .28 | .24 | .07 | -.21 | .26 | -.28 | -.02 | .11 |
| Mi | -.01 | .43 | .47 | .38 | .15 | .06 | .14 | .08 | -.03 | .16 |
| Wo | .02 | .45 | .48 | .21 | .29 | .01 | .20 | -.01 | -.06 | -.05 |
| Ld | .09 | .32 | .33 | .36 | .13 | -.25 | .02 | -.15 | -.06 | .14 |
| Sm | -.04 | .54 | .32 | .19 | .30 | -.23 | .23 | -.07 | -.04 | |

Correlation Matrix for
PQ Factor Scales and CPI Scales

| | P1 | P2 | P3 | P4 | P5 | P6 | P7 | P8 | P9 | P10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Do | .33 | .08 | -.03 | -.08 | -.17 | -.06 | .10 | .26 | .02 | .08 |
| Cs | .27 | -.02 | -.04 | -.05 | -.23 | .02 | .10 | .10 | -.04 | -.14 |
| Sy | .39 | .04 | .03 | -.06 | -.15 | -.10 | .05 | .20 | -.03 | -.03 |
| Sp | .41 | -.03 | .12 | -.10 | -.17 | .01 | .09 | .03 | -.10 | .05 |
| Sa | .36 | .08 | -.02 | .06 | -.09 | -.09 | .08 | .13 | -.16 | -.04 |
| Wb | .20 | .02 | .04 | .10 | .03 | -.09 | -.05 | -.01 | .11 | .04 |
| Re | -.04 | .26 | .02 | -.00 | -.10 | .23 | .11 | .22 | .06 | -.07 |
| So | .41 | .33 | .06 | .27 | -.03 | .03 | -.11 | .01 | .13 | -.12 |
| Sc | .09 | .04 | .03 | .27 | .15 | -.01 | .06 | .16 | .20 | -.07 |
| To | .03 | .23 | .01 | .07 | -.02 | .15 | -.05 | .17 | .04 | -.03 |
| Gi | .15 | -.07 | .03 | .08 | -.14 | -.02 | .03 | .26 | .02 | -.16 |
| Cm | .37 | .32 | -.01 | -.01 | -.02 | -.03 | -.02 | .22 | -.01 | -.09 |
| Ac | .27 | .17 | .03 | .08 | -.11 | -.00 | -.05 | .14 | .23 | -.04 |
| Ai | .24 | .28 | .02 | .05 | -.13 | .09 | .08 | .15 | -.07 | -.11 |
| Ie | .24 | .16 | -.11 | .02 | .06 | .05 | .14 | .11 | .25 | .05 |
| Py | .27 | .16 | -.13 | .01 | -.28 | -.06 | .05 | .20 | .03 | -.13 |
| Fx | .26 | .03 | .10 | -.10 | -.31 | .04 | .04 | .04 | -.02 | -.18 |
| Fm | .18 | .19 | -.09 | .10 | -.14 | .08 | -.03 | -.12 | .00 | -.18 |
| Em | .24 | .06 | -.01 | -.05 | -.07 | .09 | .08 | -.15 | .17 | .08 |
| In | .09 | -.15 | -.16 | -.01 | -.16 | -.02 | .24 | -.01 | .06 | .23 |
| Mi | .24 | .10 | .16 | .15 | .11 | -.03 | .02 | -.03 | .10 | .15 |
| Wo | .19 | -.04 | .07 | .09 | -.04 | -.05 | -.02 | -.04 | .11 | -.02 |
| Ld | .31 | .07 | .03 | .07 | .03 | -.08 | .13 | .08 | -.01 | .26 |
| Sm | .23 | .36 | .12 | .19 | -.10 | .18 | -.03 | .09 | .19 | .00 |

Correlation Matrix for
SQ and PQ Factor Scales

| | S1 | S2 | S3 | S4 | S5 | S6 | S7 | S8 | S9 | S10 |
|---|---|---|---|---|---|---|---|---|---|---|
| P1 | .62 | .30 | .08 | .12 | .24 | -.10 | -.07 | -.06 | .15 | .03 |
| P2 | -.05 | .15 | -.03 | -.18 | -.06 | -.15 | -.07 | -.16 | .05 | -.11 |
| P3 | .08 | .13 | -.25 | .10 | -.20 | .00 | -.13 | -.06 | -.09 | -.07 |
| P4 | -.07 | .18 | .19 | .01 | .09 | -.07 | .13 | -.22 | .14 | .08 |
| P5 | -.20 | .04 | .01 | -.17 | .03 | .14 | -.07 | .41 | .22 | .02 |
| P6 | -.21 | .01 | .08 | .30 | -.10 | -.25 | .22 | .05 | -.07 | -.01 |
| P7 | -.12 | -.06 | -.03 | .13 | -.10 | -.15 | -.05 | -.21 | .05 | .18 |
| P8 | .03 | .15 | .09 | -.06 | -.30 | .15 | .03 | .10 | .26 | .03 |
| P9 | -.02 | .29 | .26 | -.04 | -.01 | -.37 | -.07 | .08 | .21 | -.24 |
| P10 | .09 | .01 | .14 | .18 | -.24 | -.09 | -.15 | .06 | .17 | -.06 |

Correlation Matrix for
TAT Motives and CPI Scales

| | Achievement | Power | Intimacy |
|---|---|---|---|
| Do | .07 | .38 | .02 |
| Cs | -.07 | .17 | -.03 |
| Sy | -.11 | .14 | -.04 |
| Sp | -.08 | .16 | -.14 |
| Sa | .05 | .24 | .01 |
| Wb | -.08 | -.04 | .18 |
| Re | .08 | .03 | .01 |
| So | -.07 | -.08 | .12 |
| Sc | -.02 | -.01 | .01 |
| To | -.01 | -.01 | .00 |
| Gi | -.02 | .11 | -.01 |
| Cm | .00 | -.07 | .08 |
| Ac | -.08 | .03 | .14 |
| Ai | .03 | .01 | -.05 |
| Ie | -.05 | .05 | .02 |
| Py | .00 | .22 | -.03 |
| Fy | -.14 | .07 | -.14 |
| Fm | -.05 | .01 | -.04 |
| Em | -.28 | -.08 | .05 |
| In | -.08 | .29 | -.04 |
| Mi | -.02 | .01 | .05 |
| Wo | -.15 | -.05 | .07 |
| Ld | -.00 | .19 | .09 |
| Sm | -.10 | -.04 | .05 |

Correlation Matrix for
TAT Motives and PQ and SQ Factor Scales

| | Achievement | Power | Intimacy |
|---|---|---|---|
| P1 | .18 | .05 | -.05 |
| P2 | .01 | -.13 | -.16 |
| P3 | -.08 | -.21 | .18 |
| P4 | .01 | .01 | .00 |
| P5 | -.08 | .13 | .17 |
| P6 | .15 | -.00 | -.03 |
| P7 | .16 | .16 | -.31 |
| P8 | -.01 | -.05 | -.01 |
| P9 | -.23 | -.10 | .17 |
| P10 | .20 | .16 | -.00 |
| S1 | .04 | .14 | .01 |
| S2 | .06 | -.17 | .17 |
| S3 | -.09 | -.00 | -.04 |
| S4 | .02 | .08 | .10 |
| S5 | -.10 | -.21 | .09 |
| S6 | .04 | -.05 | -.09 |
| S7 | -.08 | .22 | -.01 |
| S8 | -.14 | -.33 | -.03 |
| S9 | .09 | .20 | -.26 |
| S10 | .28 | .15 | -.17 |

APPROVAL SHEET

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The final copies have been examined by the director of the thesis and the signature which appears below verifies the fact that any necessary changes have been incorporated and that the thesis is now given final approval by the Committee with reference to content and form.

The thesis is therefore accepted in partial fulfillment of the requirements for the degree of Masters of Arts.

Oct 7, 1983
Date

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