Sex Differences among the Mathematically Gifted

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The question "Women in science, why so few?" posed by Alice Rossi in *Science* in 1965 is still a volatile issue in 1987. Although there has been some research and much speculation about the social barriers to equity in career attainment, there still remains in the minds of many the question as to whether or not women possess the aptitude for learning advanced mathematics and physical sciences in the same proportions as men. If more men than women are mathematically and mechanically talented, for example, then it may be unrealistic to expect equal numbers of men and women to pursue careers in engineering and some areas of physics or pure theoretical mathematics. Evidence of differential talent as measured by tests in adolescence, or adulthood, however, in itself is not proof of a biological basis for the difference. Measures of aptitude in adolescence are never totally independent of experience (even though it can be argued that seeking experiences and past learning have themselves been shaped by aptitude). The effort to explain group differences in performance on any measure in terms of innate and/or social-psychological factors is problematic. In some cases it is possible, however, to argue that sex differences in outcome behaviors such as course-taking and career attainment are greater than might be expected on the basis of the size of the observed sex differences on predictor variables such as test performance in high school.

In 1973 Lucy Sells suggested that advanced high school courses in mathematics and the physical sciences more than ability were a "critical filter" for later career opportunities. Fennema and Sherman (1977) further argued that some of the sex differences in performance on mathematics tests in high school resulted from the differences in the greater number and higher levels of mathematics courses in which boys enrolled as compared to girls in the ninth through twelfth grades. Research by Casserly (1975, 1980) and Levine (1976) suggested social rather than aptitude factors leading to differential course-taking.

Sex differences in mathematics course-taking in school, however, do not account for the observed differences in the proportions of males and females identified and described as mathematically talented in grade seven on the basis

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of high scores on the Scholastic Aptitude Test-Mathematics (SAT-M), a test typically taken by high school juniors and seniors for college admission requirements. The ongoing and longitudinal Study of the Mathematically Precious Youth (SMPY) first reported sex differences in test scores in a symposium at the annual meeting of the American Association for the Advancement of Sciences (AAAS) in 1972 (Astin, 1974). Several papers, articles, and books have appeared since that time, including reports at an AAAS symposium in 1976, noting the continued incidence of sex differences on the SAT-M in subsequent talent searches as well as other differences between gifted boys and girls in terms of attitudes and career interest. Indeed, in the summer of 1980, *Women and the Mathematical Mystique* (Fox, Brody, and Tobin 1980) was published in which much of the research on sex differences among the mathematically gifted was reported. These data received little attention from the scientific community until the December 1980 issue of *Science* contained a brief report by Benbow and Stanley on the test score differences. Given the media coverage and reactions to that article it seems sensible to review the background, rationale, and findings of SMPY before launching into the main body of this paper, which deals with the study of possible social influences upon achievement and interests of mathematically gifted youth.

THE IDENTIFICATION OF MATHEMATICALLY PRECOCIOUS YOUTH

The Study of Mathematically Precocious Youth (SMPY) began in the fall of 1971 to search for junior-high school-age students who were precocious in mathematical reasoning ability, as evidenced by very high scores on the Scholastic Aptitude Test Mathematics (SAT-M). In order to discover these talented students, SMPY conducted a talent search in each of the following years: 1972, 1973, 1974, 1976, 1978, and 1979. The rationale for the use of difficult precollege-level tests to discover precocity is discussed elsewhere (Keating, 1974; Stanley, 1977; and Fox, 1981). Subsequently The Johns Hopkins University created the Office for Talent Identification and Development (OTID) to continue the searches on an annual basis.

The number of participants and mean scores, by sex, for all eight searches are shown in TABLE 1. In the 10-year period there have been more than 33,000 students who have participated in one of eight talent searches at Johns Hopkins. Each year the mean score differences between boys and girls on the SAT-M has been 30 or more points. (In the years when the verbal subtest was also taken there was no difference in performance between boys and girls.) The proportions of boys to girls who score 500 or higher on the SAT-M (the criteria for being invited for special programs) has been about two to one each year. The data on support of the validity of the SAT-M for selecting students for special classes have been reported elsewhere (Fox, 1981). Long-range follow-up has begun and initial reports find continued sex differences in the high school years on test performance and course-taking (Fox and Cohn, 1980;

TABLE 1. Summary of Numbers of Students and Mean SAT-M Scores, by Sex and Grade, in Eight Talent Searches.

		Male		Female	
Year	Grade	Number	Mean	Number	Mean
1972	7	90	460	77	423
	8[a]	133	528	96	458
1973	7	135	495	88	440
	8[a]	286	551	158	511
1974	7	372	473	222	440
	8[a]	556	540	369	503
1976	7[b]	507	458	366	422
1978	7[b]	1549	448	1249	413
1979	7[b]	2046	436	1628	404
1980	7[b]	4525	421	4515	390
1981	7[b]	7343	421	7404	390

[a] A few students of eighth-grade age enrolled in grades 9 or 10 were included.
[b] A few students of seventh-grade age enrolled in grade 8 or 9 were included.
[c] A t test of mean differences for girls and boys is significant for each year ($p < 0.01$).

Benbow, 1981). The details and variations are reported for each search in the following sections.

The 1972 Contest

In March 1972, seventh-, eighth-, and young-in-grade ninth-grade students in the Greater Baltimore area who had scored at or above the 95th percentile on the numerical-concepts subtest of an in-grade standardized achievement test such as the Iowa Tests of Basic Skills were invited to participate in a contest. Three hundred ninety-six students (223 boys and 173 girls) accepted the challenge and took the SAT-M.

The results of the testing were startling. Twenty-two boys (about 10 percent) scored 660–790. This was better than the average Hopkins student scored as an eleventh or twelfth grader. Clearly, there were many mathematically precocious boys. The highest score for a girl, however, was 600. Although 44 percent of the contestants were girls, 19 percent of the boys scored higher than the highest-scoring girl. When the data were anlayzed by grade, only 7.8 percent of the seventh-grade boys outperformed the highest-scoring seventh-grade girl, but 27.1 percent of the eighth-grade males scored higher than the highest-scoring eighth-grade girl.

The 1973 Contest

In the winter of 1973 a second talent search was conducted. This time students were considered eligible for the contest if they scored at or above the

98th percentile on an in-grade numerical-concepts subtest of a standardized test such as the Iowa Tests of Basic Skills. Wider publicity helped to increase the number of students who participated. Students were told that they could enroll for either mathematics or verbal prizes. The total number of students was 953. There were 537 boys (56 percent) and 416 girls (44 percent). The highest SAT-M score for a girl in the 1973 contest was 650, while two boys (one a seventh-grader) attained scores of 800 (Stanley, 1973). Seven percent of the boys in the 1973 contests scored 600 or more. No girl did. Only 3 percent of the seventh-grade boys outscored seventh-grade girls, while 9.8 percent of the eighth-grade boys did better than eighth-grade girls.

The 1974 Contest

In January 1974 the third talent search was held for mathematics only. Students throughout the entire state of Maryland who had scored at or above the 98th percentile on the numerical-concepts subtest of a standardized achievement test were eligible for the contest. Testing was conducted in four centers across the state (The John Hopkins University, the University of Maryland at College Park, Salisbury State College, and Frostburg State College). A total of 1519 students took the SAT-M. Thirty-nine percent of participants were girls (591). Sixty-one students scored 660 or above. Seven of those students were girls. One girl scored 700. The highest score earned by a boy was 760. In 1974, 3 percent of the seventh-grade boys scored higher than the highest-scoring seventh-grade girl, while 2.2 percent of the eighth-grade boys outperformed the eighth-grade girls. The pattern of mean scores in 1974 was similar to that of 1973.

The 1976 Contest

After a hiatus of nearly 2 years, SMPY held its fourth talent search in December 1976. Students were eligible to participate in that search if they were in the seventh grade or of seventh-grade age but in a higher grade and if they lived in Maryland or in the bordering regions of a state that shared a common boundary with Maryland (Delaware, Pennsylvania, Virginia, West Virginia, and the District of Columbia). Forty-two percent of the 873 participants in the 1976 talent search were girls. Only 2 percent of the boys scored higher than the highest-scoring girl, but while the highest-scoring male earned a 730, the highest-scoring female scored 610 (a difference of 120 points).

The 1978 Contest

January 1978 saw a major change in SMPY's talent-search strategy. In order to accommodate participants from such a broad geographical region, (Maryland, Pennsylvania, Virginia, West Virginia, and the District of Columbia) SMPY arranged for the Educational Testing Service (ETS) to provide the study with it own code numbers for use during the regular January 1978 administration of the SAT. Students took the test at local testing centers, rather than driving to Hopkins, and their scores were reported to SMPY. Of the total 2798 participants in the 1978 talent search, 44.6 percent were girls. Boys continued to outperform the girls, but only 0.1 percent of the boys scored higher than the highest-scoring girl. One girl scored 760 on the SAT-M; the girl scoring next highest earned a 640. If a score of 640 is taken as the basis of differentiation, 2.5 percent of the boys earned a higher score than the girl scoring second highest.

The 1979 Contest

The national administration of the January 1979 SAT served also as SMPY's sixth talent search. Eligibility criteria were exactly the same as they had been the previous year. Forty-four percent of the participants (3674) were girls. In this only one boy scored higher on the SAT-M than the highest-scoring girl. Similar to the pattern of the previous five contests, however, sex differences on mean scores were 32 points.

The 1980 Contest

In 1980 the searches were taken over by OTID. New Jersey residents were added to the list of eligibles. The search was also expanded to include verbal talent, and the criteria for initial screening was lowered to the 97th percentile on in-grade achievement tests for either mathematics or verbal ability. The numbers who participated increased to 4525 boys and 4515 girls. Although 20.4 percent of the boys scored 500 (the criteria set for eligibility for special summer classes at Hopkins), only 10.3 of the girls did so.

The 1981 Search

This search was nearly identical to the one in 1980. The numbers of participants increased to over 14,000. The mean scores on the SAT-M and proportions of boys and girls scoring over 500 remained about the same.

FOSTERING PRECOCIOUS ACHIEVEMENT

Although it is difficult to draw conclusions about the relative influences of biological and social factors upon test performance on measures of aptitude, there is clear evidence that precocious achievement in mathematics can be directly influenced by environmental factors. Some of the attempts to foster acceleration in mathematics provide some insight into the dynamics of precocious achievement among bright adolescent boys and girls. For example, in the summer of 1972 thirty end-of-the-year sixth graders (eighteen boys and twelve girls) were invited to a special summer mathematics class that met two hours a week. Fourteen boys (78 percent) and seven girls (58 percent) enrolled for the program. The initial success of the class in mastering Algebra I with only 18 hours of instruction was so great that the class continued to meet for two hours a week through the middle of the following summer. Of the twenty-one students who initially began the course, six boys (43 percent) and one girl (14 percent) completed their study of all the pre-calculus mathematics (Algebra I, Algebra II, Algebra III, Plane Geometry, Trigonometry, and Analytic Geometry). The six boys took Calculus, but the girl did not, in the following year in a senior high school (Fox, 1974).

In the summer of 1973 eighty-five students (51 boys and 34 girls) who had participated in the 1973 talent search and who had scored at least 500 on the SAT-M and 400 on the SAT-V were invited to a summer accelerated-mathematics class. Most of these students were eighth-graders who had completed Algebra I. Twenty-two boys (43 percent) and nine girls (29 percent) enrolled. Fourteen boys (64 percent), but one of the girls, completed all the pre-calculus mathematics by the middle of the following summer, meeting only two hours a week during the school year and four hours a week during the second summer (George and Denham, 1976).

Although these clases were highly successful in promoting precocious achievement in mathematics among boys, both were far less successful with girls. First, more boys than girls were eager to enroll in such a program. Second, girls who did enroll tended to drop out of the classes before their completion. Interviews with the girls indicated that one major reason for dropping out was a reluctance to become accelerated in their placement in school. Many of the girls seemed to fear being labeled as different from their friends by virtue of becoming somewhat accelerated. Girls also reported that the class meetings were dull, and some made references to the boys in the classes as "little creeps." The overall reaction to the classes by the girls was that it was socially unappealing and might have negative social consequences in school.

The results of testing values and interest of boys and girls in 1973 (Fox and Denham, 1974) suggested that even the most mathematically able girls were likely to prefer social activities to theoretical ones. In combination with the results of the first two accelerated-mathematics classes, this suggested that to interest girls in learning mathematics faster it would be important to consider the social aspects of a program. Thus in the spring of 1973 an accelerated Algebra I class was organized for seventh-grade girls who had been in the 1973 contest and who had scored at least 370 on the SAT-M (the average for female juniors in high school). In brief, the class was designed to appeal to the social interests of girls in a number of ways. It emphasized social cooperation rather than competition and was taught by a woman rather than by a man. Male and female scientists and mathematicians spoke to the girls about exciting careers in mathematics and science (such as operations research, health statistics, and social-science research) that deal with social problems as well as theoretical ones. This approach to an accelerated program was considerably more effective in recruiting girls. Of the thirty-four girls invited, twenty-six (76 percent) enrolled; eighteen girls (69 percent) completed the course. Not all the girls, however, chose to accelerate their mathematics in school the following year, and a few actually met with school resistance to their acceleration. Eleven did take Algebra II the following year; ten of these (38 percent of the total female enrollees) were considered to have been successfully accelerated. The emphasis on the social interests of girls was moderately effective in promoting greater achievement in mathematics for girls than the two mixed-sex more theoretically oriented classes had. This approach, however, did not promote the same extent of acceleration for the girls that the other two programs did for the boys (Fox, 1976; Brody and Fox, 1980).

A study of the effects of accelerated programs on attitudes and behaviors of gifted students (Fox, Brody and Tobin, 1979) did, however, find that school-based accelerated programs were more likely to be successful than the experimental classes at Hopkins in recruiting and retaining girls. School-based programs, however, generally had fewer girls than boys meet the criteria for admission to the program. Achievement test scores showed no differences in mastery of the material by boys and girls, even though boys as a group had higher mean scores on the aptitude measures.

In the 1976 follow-up study of 202 eighth graders from the 1972 Talent Search (Fox and Cohn, 1980) it was found that boys were more likely than girls to have accelerated their educational progress. For boys but not girls the degree of acceleration was correlated with their SAT-M scores in grade eight. This suggests that other factors besides aptitude may play a role in the eventual achievements of highly able girls.

SOCIAL PROCESSES THAT MAY ENHANCE OR INHIBIT THE DEVELOPMENT OF COMPETENCE AND INTEREST

If the numbers of women in high-level careers in the sciences are to increase, young girls who have demonstrated ability must be encouraged to pursue these careers. Since such girls appear to be more rare and less motivated than their male counterparts, it is important to study the home and school environments to uncover clues as to ways in which interests may develop. The present study addresses six broad questions, the first five of which will be discussed in depth in this paper. The questions are as follows:

1. In what ways are mathematically able boys and girls alike and different with respect to such variables as self-confidence, willingness to take educational and intellectual risks, perception of usefulness of the study of mathematics, enjoyment of mathematical activities, career interests, and access to positive role models? What are the relationships between these variables?
2. What relationships exist between mathematical abilities and interests and socioeconomic variables such as education or occupation of parents; between mathematical abilities and family constellation variables such as birth order and sex of siblings?
3. How do mathematically able youths perceive the support they receive from parents, teachers, and peers? Are perceptions of support independent

of socioeconomic and family constellation variables and are they different for boys and girls?

4. How do parents think they have fostered the development of mathematical interest and skills? Do parents consider mathematics more appropriate for men than women?

5. Do mathematically able boys and girls learn mathematical and related skills at home before entering school or before topics and skills are taught in school? Who teaches them? Are there differences between boys and girls or between girls high and girls low on measures of interest?

6. What are the characteristics, attitudes, and behaviors of teachers who are perceived by highly able girls as having had a positive influence on the development of their self-confidence and interest in the study of mathematics and/or related careers?

Research Design

Students identified as mathematically able and either highly motivated or less motivated were mailed a set of questionnaires to be completed by them and their mothers and fathers. The instruments included a mixture of open-ended questions, checklists, and scales of Likert items adapted from the Fennema-Sherman Mathematics Attitude Scales. The five samples were chosen as follows:

A_1: The universe of girls who scored $\geqslant$500 on SAT-M as seventh-graders in the 1979 Talent Search and who were considered to be highly motivated on the basis of their learning of mathematics. This included primarily girls who participated in an accelerated summer mathematics program offered by The Johns Hopkins University.

A_2: A sample of girls who scored $\geqslant$ 500 on SAT-M as seventh-graders in the 1979 Talent Search and who were considered to be not as highly motivated as A_1 on the basis of their turning down the opportunity to accelerate their mathematics learning in the summer at The Johns Hopkins University.

B_1: A sample of boys who scored $\geqslant$500 on SAT-M as seventh-graders in the 1979 Talent Search and who were considered highly motivated on the basis of accelerating their learning of mathematics.

B_2: A sample of boys who scored $\geqslant$ 500 on SAT-M as seventh-graders in the 1979 Talent Search and who were considered not highly motivated on the basis of their turning down an opportunity to accelerate their mathematics learning.

C: The universe of girls from the 1980 Talent Search who scored at or above 500 on the SAT-M, but who indicated a low interest in mathematics and high interest in the humanities on the application, were chosen as a sample of girls with high mathematical ability and low interest.

In selecting samples A_1, A_2, B_1, and B_2, the 3675 participants in the 1979

Talent Search were first screened to identify those who scored 500 on the SAT-M. For the 193 boys and 76 girls who met this criterion, background information was obtained from the talent search application and coded. Of this group, 67 boys and 23 girls had participated in an accelerated summer mathematics program at The Johns Hopkins University. The C group was selected from among the 450 girls who scored at least 500 on the SAT-M in 1980, but who showed no signs of interest in mathematical careers, or interest in participating in an accelerated summer program in mathematics, and who had not checked "a strong liking" for mathematics on the Talent Search application. (In 1980, the search was expanded to include verbal as well as mathematical talent, thus offering an opportunity to find high-ability but low-interest girls.) Only 27 girls of the 450 who had scored 500 or more on the SAT-M met the criteria for low interest. Thus, while sample sizes are small, the A_1 and C groups constitute almost the universe of highly able, motivated, and accelerated girls in 1979 and the least interested but able girls in 1980.

Results

There were few differences among the A_1, A_2, B_1, B_2 groups on measures of attitudes, but the C girls had lower scores than all others on measures of self-confidence in mathematics, perception of the usefulness of mathematics, and enjoyment. The girls in A_1, however, also scored significantly lower on the self-confidence scale than B_1 boys. While enjoyment as measured by a Likert item scale was not significantly different for B_1 versus B_2 or A_1 and A_2, the reported behaviors of B_1 boys did differ from all others. Boys in B_1 were the ones who pursued mathematical activities in their leisure time alone or with friends, and more frequently than all others. Boys in both groups were somewhat more likely to stereotype mathematics as a male domain than the girls in any groups, especially the boys who expressed the least enjoyment of mathematics. Although the actual behaviors of A_1 girls and B_1 boys in terms of accelerating their study of mathematics were more "risky" than those of A_2, B_2 and C, there were no differences among the groups when asked to project behavior in hypothetical educational risk-taking situations.

Specific career choices of students varied most for group C who were not oriented towards careers in science or mathematics. More girls in A_1 and A_2 than boys in B_1 and B_2, however, were interested in medical careers. All groups felt that conflict with family responsibilities would be a barrier to careers in science for women, and some felt that access to role models was a barrier. Indeed, girls but not boys expected to need a part-time career or no career while raising small children, and boys in both groups knew more males on a checklist of science-related careers than girls knew women in these fields.

Overall, there were no major differences between A_1 and A_2 girls. The boys in B_1, however, did appear to be somewhat different from A_1 girls on some measures such as self-confidence, enjoyment, and career-related variables. The B_1 boys were very similar to B_2 boys, with the exception of enjoyment behavior. The C girls differed markedly from all other groups on almost all measures.

Although all subjects scored 500 or higher on the SAT-M, the group mean for C was significantly lower than the mean of all other groups. There were no differences on the SAT-V. Some additional test data were available for most of the girls in A_1 and B_1. There were no sex differences on the Raven's Progressive Matrices test of abstract reasoning nor on measures of spatial ability (Revised Minnesota Paper Form Board). Boys did, however, score significantly higher on the Bennett's Test of Mechanical Comprehension.

On measures related to socioeconomic status such as education and occupation of parents the groups were very similar. The vast majority of all parents held at least a Bachelor's degree. The majority of fathers worked in fairly high-status occupations in the professions or were business executives. About half the mothers in all groups worked outside the home, but only a small percent were professionals or business executives. There were no striking patterns of birth order or family size within any group. There was a trend for students to be the oldest in a two-child family. Girls were not disproportionately products of all-girl families. There were no significant differences among groups and these variables did not correlate with any attitudinal measures.

Most parents in all five groups felt they had fostered their child's self-confidence and enjoyment in mathematics. Fathers of A_1 girls did report a higher level of confidence in their daughters' mathematical ability than did fathers of C girls. Although most students reported support from parents, the boys in B_1 reported significantly less support from parents than their parents reported. Parental support for educational risk-taking was highest for B_1 boys and lowest for C girls. Although most parents thought that the study and acceleration of the study of mathematics was important, the study of calculus was seen as less useful by C fathers and A_2 mothers than others. None of the parents tended to stereotype mathematics as a male domain. Parents of C girls, however, were far less likely than other parents to have encouraged their daughters to think about mathematical or scientific careers and reported lower levels of educational aspirations for their daughters than did the other parents. Parents of girls, but not boys, expected their child to interrupt their career for child-rearing responsibilities.

Many parents reported only vague remembrances of their efforts to foster interest, enjoyment, confidence, or competence. The most frequently remembered activity involved variations of game-playing. This ran the gamut from formalized games like chess and Monopoly to informal parent-initiated guessing games while riding in the car. Some parents felt the child had learned some mathematics by modeling behaviors of an older sibling and a few mentioned an active preschool program as the source of learning. Mothers seemed somewhat more likely than fathers to recall their own influence in the preschool and early childhood years. Fathers were more likely to be remembered, if at all, for having helped with homework or independent study of more advanced topics like algebra. There were no striking differences among groups.

The anecdotal accounts from students and parents portrayed the homes of these students as ones in which the children were nurtured by a warm, supportive environment for learning. Evidence of systematic instruction by parents was, however, far from the norm. While many children did appear to have been accelerated in their learning of mathematics, the recollections of parents and students tended to be that the child has learned things on his or her own, more in response to a generally stimulating home environment, in which learning was a natural and enjoyable occurrence, than as a result of systematic study of textbooks. It is perhaps for this reason that students seemed somewhat less aware of the efforts of their parents to nurture their interest and ability than the parents purported that they did. Differences among the groups were not great. There was a trend, however, for the parents of B_1 boys to recall more evidence of precocity and recognize the talent of their child at an earlier age than did parents in the other groups. Mothers of A_1 and C girls, for example, were likely not to have noticed the talent until the child was in the talent search at Johns Hopkins. Fathers of B_1 and B_2 boys were more likely than fathers of A_1 and C girls to recall the child's early play with spatial and manipulative toys. Yet more than 60 percent of the mothers in all groups believed that they had made a conscious effort to supply scientific/mathematical games and toys. The boys in B_1 were somewhat more likely to recall self-study of advanced topics like algebra than early learning of basic arithmetic, perhaps because so many had mastered the basics before starting school. One child even commented that he hadn't learned anything new in school until he was introduced to pre-algebra in the sixth grade. About a third of the boys, but no girls, reported learning computer programming on their own at home or with the help of a father or friend. Interest in computers had been a major factor in the higher incidence of math-related activities outside of school reported by B_1 boys as compared with girls.

The network of significant correlations among attitudinal, interest and perceived support variables is shown in FIGURE 1. There are more significant correlations between variables for girls than boys. Confidence and enjoyment appear to be key variables for girls. For girls, confidence correlated directly with career choices of a scientific/mathematical nature. For boys, enjoyment and the perception of the usefulness of mathematics had the largest number of significant correlations with other variables and both correlated significantly with career choices.

SUMMARY AND CONCLUSIONS

It is clear that at grade seven there are differences between the performances of boys and girls on a difficult test of mathematics reasoning, the SAT-M. The extent to which this difference reflects a basic difference in aptitude for careers in mathematics, engineering, and the physical sciences is unclear.

Also, this observed sex difference in test performance in grade seven may result from the influence of social-environmental factors and/or differences in test-taking strategies rather than from sex differences in hormones or cerebral organization. It is, however, difficult to demonstrate a causal linkage between attitudes and aptitudes and home and school influences.

If we assumed that a score of 500 or higher in grade eight is a criterion for potential for high-school scientific study, then twice as many boys as girls

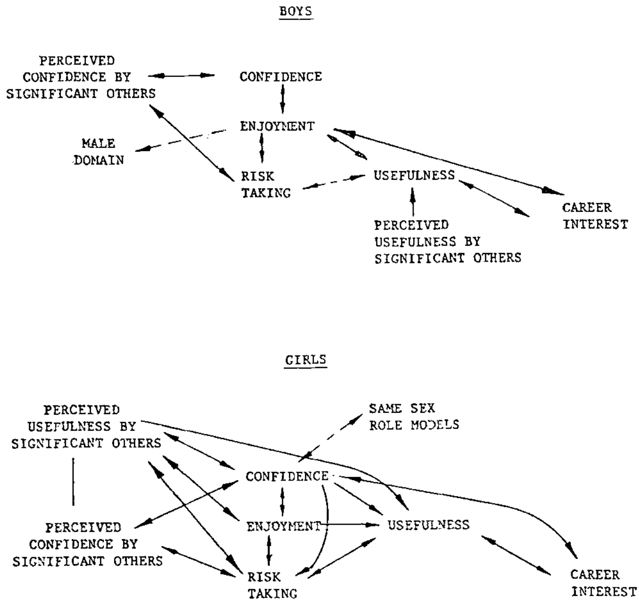

FIGURE 1. Network of significant correlates of attitudinal and interest variables.

appear to be candidates for such careers. This, however, would still lead one to expect more women in physics and engineering that is currently the case. The ongoing longitudinal study of these highly gifted youths may eventually shed more light on the predictive power of the SAT-M.

The goal of the study reported here was to identify some social influences that might affect career outcomes independent of aptitude. Thus, subjects were chosen on the basis of very high scores on the SAT-M at grade seven. Differences between boys and girls and between motivated and unmotivated students within each sex could then be examined within the context of presumed equal potential.

The weakness of the present study is the reliance of retrospective recall and self-report. The actual lives, home environments, and experiences of students may or may not be accurately described. Clearly the reported perceptions of mothers, fathers and students with the same family were not always in agreement. The general trend was for parents to report more informal and indirect efforts to foster the child's achievements, enjoyment, and interests than the students reported. By and large few parents or students in any group, however, reported actual formalized efforts on the part of parents to teach mathematics in the home.

The two major findings of the study would seem to be the following:

1. The development of self-confidence in mathematics may be a far more

critical factor for girls than for boys in the pursuit of scientific careers. More research is needed on how this confidence develops.

2. The major biological difference between these boys and girls, the maternal child-bearing function, is the factor both boys and girls perceive to be the major barrier to careers in the sciences for women. This is further supported by the fact that girls and parents of girls, but not boys or their parents, see a need for career interruption to perform the child-bearing/child-care functions.

The most obvious and simple answer to "Women in science, why so few?," even in 1987, is that women still don't really believe they are as intellectually able as they are or as men are, and many women may still believe that a demanding career is not possible if the woman still wishes to fulfill a near-traditional maternal role. Until men insist upon sharing the maternal role and society reverses its values and practices with respect to child-care/child-rearing, gifted women may still gravitate away from many professional careers in the sciences.

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