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Differences in the Leisure Activities of Mathematically Advanced Secondary School Students

Mary L. Cornell
St. Cloud State University, dendraster@gmail.com

DIFFERENCES IN THE LEISURE ACTIVITIES OF MATHEMATICALLY ADVANCED SECONDARY SCHOOL STUDENTS

by

Mary L. Cornell

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This thesis submitted by Mary L. Cornell in partial fulfillment of the requirements for the Degree of Master of Science at St. Cloud State University is hereby approved by the final evaluation committee.

Jerry J. Willik
Chairperson

Lloyd R. Ayers

Burrell H. Schmidt

Dennis Nunes
Dean
School of Graduate and Continuing Studies

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Mary L. Cornell

A survey designed to gather information about extracurricular and leisure activities was distributed to 332 tenth, eleventh, and twelfth grade students between March 30, 1997 and June 1, 1997. Two hundred and ten surveys from the original sample were analyzed by grouping the various activities into eleven activity indices. Each index was then compared statistically using a series of one-way ANOVAs, and Tukey's box plots. Students were also divided into six groups based on their mathematical accomplishments, and their gender.

Statistically significant differences were found for six of the eleven Activity Indices. The Academic Index, Math Index, and Science and Technology Index show that there are relationships ($p < 0.001$) between the level of math achievement and participation in math, academic, and science and technology oriented activities, respectively. Students with the higher levels of mathematical achievement participate in these activities more often than students with lower levels of mathematical achievement.

The Gaming Index demonstrates that both gender and mathematical achievement are related to participation in gaming activities such as role playing games, logic, board, and card games. Students with high levels of mathematical accomplishment were found to participate more frequently than other students. Males participate in gaming activities more frequently than females.

The Music Index indicates that there are differences ($p < 0.01$) between males and females, and among groups with different levels of mathematical accomplishment. Unlike the results for the other indices, the females are the most frequent participants in music related activities. Females with the highest mathematical accomplishments are also the most active in music related activities.

The Social Index shows that there are differences ($p < 0.001$) between males and females. The Social Index does not seem to be related to achievement in mathematics.

The results show that students demonstrating a high level of mathematical accomplishment are more likely to participate in certain leisure activities. The data suggest that, except for social activities, gender is not nearly as important in the selection of leisure activities as the level of mathematical accomplishment.

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Approved by Research Committee:

Jerry J. Wellik
Jerry Wellik Chairperson

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Chapter I

INTRODUCTION

Gender differences in mathematical achievement have been noted for over 70 years (Fennema, 1981; Terman, 1925; Terman & Oden, 1947). In general, at the highest levels of mathematical achievement, boys consistently out perform girls (Benbow & Stanley, 1980, 1983; Fox & Cohn, 1980). Many reasons for these differences have been suggested, but no single explanation has been shown to satisfactorily account for these observations. This study attempts to discover if particular extra curricular and/or leisure time activities are related to mathematical accomplishment.

Information on the extra curricular and leisure time activities of tenth, eleventh, and twelfth grade students from 54 Minnesota high schools was gathered and analyzed. Student involvement in various types of activities was analyzed and compared by gender and/or mathematical accomplishment, in order to determine if students with high accomplishments in math spend more time on certain types of activities, than students with average mathematical accomplishments, and if participation was also related to gender.

Chapter II

LITERATURE REVIEW

GENDER DIFFERENCES IN MATHEMATICAL ACHIEVEMENT

Much has been written during the last 70 years about the differences in mathematical achievement, and the possible differences in mathematical ability, between boys and girls (Fennema, 1981; Terman, 1925; Terman & Oden, 1947), why this might occur (Childs, 1990; Ernest, 1980; Fennema & Leder, 1990), interventions that have been tried (Belenky et al., 1986; Chipman et al., 1983; Schwartz & Hanson, 1992), and why keeping women in mathematics is important (Sells, 1980).

Research on the general population indicates that there is little difference in overall mathematical achievement or ability among boys or girls who have had the same course work and opportunities (Fennema & Carpenter, 1981), in either the United States or in other countries (Ethington, 1990). When looking at the students with the highest achievement though, a different pattern emerges. Boys significantly out number, and out perform girls at the very highest ranges of mathematical reasoning ability (Benbow & Stanley, 1980, 1983; Fox & Cohn, 1980).

There are many hypotheses about why this might be, or where the equivalent girls are, or even if they exist. Fox and Cohn suggest that

since fewer women than men have achieved eminence in mathematics, it is not surprising that there are few reports of genius and childhood precocity among women. They further suggest that there has been no evidence showing whether precocious development is rarer among females than it is among males, or if it is simply less visible.

Data from the Johns Hopkins Study of Mathematically Precocious Youth, 1972-1982 have been examined by several researchers including Fox and Cohn (1980), Benbow and Stanley (1980), and Brody and Fox (1980). Beginning in the fall of 1971, students in the Johns Hopkins' studies were given the Scholastic Aptitude Test Mathematics (SAT-M) in the following years: 1972, 1973, 1974, 1976, 1978, 1979, 1980, 1981, 1982.

The Johns Hopkins' researchers targeted students first in the Greater Baltimore area, and then in the entire state of Maryland. By 1976 the study was expanded to include the students who lived in Maryland and its bordering regions. In 1978, and 1979 the geographic area increased to include any student who lived in Maryland, Delaware, Pennsylvania, Virginia, West Virginia, and the District of Columbia (Fox & Cohn, 1980). In 1980, 1981, and 1982 students from the Middle Atlantic region of the United States were tested. A nationwide talent search was also conducted for any student who wished to participate (Benbow & Stanley, 1983).

The 1972, 1973, and 1974 tests were open to seventh-, eighth-, and young-in-grade- ninth-grade students. Except for the 1982 nationwide test which was open to any student under the age of 13, all subsequent tests were open only to seventh-graders or students of seventh-grade

age who were enrolled in a higher grade (Benbow & Stanley, 1983; Fox & Cohn, 1980).

In order to participate in the testing in 1972, students had to score 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. In 1973 the minimum score was raised to at or above the 98th percentile. Beginning in 1980, students in the top three percentile in verbal or overall intellectual ability were also eligible, and in 1982 any student who was willing to take the SAT was eligible. By 1983, 31,861 boys and 26,236 girls had taken the SAT-M.

The total number of reported students tested in the Johns Hopkins talent searches and reported by Benbow et al. (1983) is 49,747 (more than 65,000 students have actually been tested but not all reports are included in the 1983 article). Far more boys than girls scored above 700 on SAT-M, even though girls were matched with boys by intellectual ability, age, grade, and voluntary participation. The numbers of such boys identified was 260 and the number of girls 20, a ratio of 13:1.

Several other studies have also looked at this phenomenon and found similar results. Hyde et al. (1990) found that "large gender differences can be found at the extreme tails of distributions even though the gender difference for the entire population is small" (p. 150). Differences favoring males on the SAT-M were also found.

Davenport (1995), and the National Research Council (1989), note that though recent data show that females are enrolling in higher level mathematics course work in increasing numbers, at the very highest levels of college mathematics, males continue to participate in

significantly greater numbers, with women receiving only 35% of the master's degrees and 17% of the Ph.D. degrees in the mathematical sciences.

In general, gender-related differences in mathematics are not evident at the elementary school level, and differences may not appear after elementary school. Starting around seventh grade though, if differences do appear, they tend to be in the males' favor, especially on tasks involving mathematical reasoning (Fennema, 1980). Fennema also found that there was some evidence that gender related differences in mathematics learning in high school were not as great in 1978 as in previous years, and that conclusions reached about male superiority were often gathered from old studies, especially those where the number of mathematics courses taken was not controlled, thus comparing males and females with different mathematics background. Still, in Fennema's (1980) review of the research on gender-related differences in mathematics achievement of highly precocious males and females, significant differences were observed. Seven percent of the junior-high-school boys who were tested on a college-entrance examination scored higher than any girl, and the mean score for boys was significantly higher than the mean score for girls.

INTERVENTIONS DESIGNED TO HELP HIGHLY GIFTED GIRLS STAY IN MATH

Several intervention programs have been developed to both test various hypotheses as to why these gender related differences occur and to attempt to help the girls reach the same level of mathematical competency as the boys. Once such intervention program aimed at

mathematically gifted seventh and eighth grade girls is described by Brody and Fox (1980). The program was conducted at the Johns Hopkins University in the summer of 1973. Their conclusions were that intervention programs were successful for that year since "the girls in the program kept pace with the boys in terms of mathematical acceleration" (p. 176).

Fox and Cohn (1980) also described the results of five additional accelerated mathematics classes sponsored by Johns Hopkins. Their conclusions are less encouraging.

Class 1 (summer of 1972), was comprised of 14 boys and 7 girls. Only 6 of the boys and 1 girl completed their study of all the pre-calculus mathematics. Six of the boys then went on to take calculus the following year.

Class 2 (summer of 1973), was comprised of 22 boys and 9 girls. None of the girls in this class completed all of the pre-calculus mathematics, though 14 of the boys did.

Interviews with the girls in these classes indicated that one major reason that they chose to drop out was their reluctance to become accelerated in their placement in school. "The overall reaction to the classes by the girls was that it was socially unappealing and might have negative social consequences in school" (p. 107).

Class 3 (spring of 1973), was comprised of 26 girls; only 18 of whom completed the year. Though this class was designed to appeal to the social interests of girls in a number of ways, it did not promote the same extent of acceleration for the girls that the other two programs did for the boys.

Classes 4 and 5 (winter of 1974), were set up in a school as fast-paced mathematics classes. Two classes, one of comprised of 12 boys and one comprised of 12 girls were begun. One boy and one girl dropped out of the program. This in-school model was considered to be the most successful for the girls, though whether gender segregation and female teachers as role models were actually crucial for the success of girls was not determined (1980).

Fox and Cohn concluded that precocious males were more likely than precocious females to perform at a very high level on pre-college-level tests of mathematical reasoning ability and that a sizable gap exists between the sexes on mean SAT-M scores at the upper end of the distribution as early as seventh grade. These findings suggested that there may be a biological difference between the sexes with respect to mathematical aptitude. There were, however, strong indications that some of the differences were related to environmental factors. Also, "SMPY [Study of Mathematically Precocious Youth (Johns Hopkins)] has not effectively helped to accelerate any girl as far or as fast as most of the boys in its programs" (p. 109).

A similar program, the University of Minnesota Talented Youth Mathematics Program (UMTYMP), faces similar problems with female drop out rates. Keynes et al. (1990) reported on a project begun in 1989 using a more difficult qualifying test, a higher cutoff from previous tests, an emphasis on classes with equal numbers of boys and girls, and the addition of various social events and math enrichment opportunities such as lectures, Summer Institute, Calculus Luncheon, and a Math Fun Fair.

The project has proven to be successful during its first phase. The dropout rate among girls was below that of boys. At the time of this report the students had completed two years of accelerated math. However, no data were available to show if this intervention program continued to be successful as the students began the Calculus sequence.

There are currently many research projects attempting to find better ways to retain girls in mathematics, but little current research is available dealing specifically with the issue of retaining the most talented girls. Regardless of the reasons for the lack of equal female representation in the highest levels of mathematical achievement, the fact still remains that we as a nation cannot afford to lose or misuse our mathematical talent, regardless of gender.

Sells (1980) emphasized the importance of mathematics when she wrote, "A student's level of high-school mathematics achievement acts as a critical filter for undergraduate college admission ... and limits choices of an undergraduate major for women in general once they are admitted to college" (p. 66). She concludes that this lack of high school mathematics preparations effectively limits women's opportunities in the world of work.

Because mathematics is the foundation of science and technology a strong case can be made for mathematical literacy for all citizens. According to the National Research Council (1989), in order to maintain our nation's leadership in a global technological society U.S. students will need to sustain much higher mathematical achievements.

LEISURE ACTIVITIES

Terman (1925), and Terman and Oden (1947) were some of the first researchers to look at the leisure or "play activities" of gifted children, and how they compared to the control group of non-gifted children. Later studies on leisure activities of gifted children and adolescents have been primarily concerned with how these activities can be used to predict academic achievement and creative behavior (Holland, 1961; Holland & Astin, 1962), academic and extracurricular achievement in college (Holland & Nichols, 1964; Holland & Richards, 1965; Richards et al., 1967), or career guidance (Hong, Milgram, & Whiston, 1993; Hong, Whiston, & Milgram, 1993).

These studies demonstrate that an examination of the leisure activities of gifted children may be a valid predictor of later accomplishment regardless of gender. Hong, Whiston, and Milgram (1993) suggest that one reason that these activities may be good predictors is that "their performance requires not only intellectual abilities but also task commitment, persistence, and other cognitive and personal-social attributes that strongly determine life outcomes" (p. 65). None of these studies has looked specifically at mathematical accomplishment or achievement.

Chapter III

MATERIALS AND METHODS

A survey was designed (Appendix A) to assess the leisure and extra curricular activities of three different groups of high school students. On Saturday, March 30, 1996, surveys were given to tenth, eleventh, and twelfth grade students who participated in the St. Cloud State University Annual Mathematics Contest. These students, from fifty-three Minnesota schools, represented the top 10% of their school's math students.

The survey was distributed at the awards ceremony to an estimated 87% of the students who attended the math contest. Though each grade level had their awards ceremony in a different room, the procedure for distribution was the same for all students. A volunteer handed each student the survey as they came into the room. A request that they complete the survey was also written on the front blackboard, and a further request was also made either by the person distributing the surveys, or the awards presenter. At the end of the awards ceremony, completed surveys were deposited in labeled boxes placed at each exit. Completed surveys were then divided into four groups. One group was selected on the basis of participation in the University of Minnesota's Talented Youth Mathematics Program and represented students with

unusually high ability and accomplishments in mathematics. Students in this group represent the top 0.5% of the population. This group was then divided by gender. The remaining students, who were not involved in the University of Minnesota's Talented Youth Mathematics Program were also divided by gender.

Information was obtained about the contest, and permission to distribute the surveys, from the St. Cloud State University Annual Mathematics Contest coordinators, Drs. Carr, Ernst, and Rysavy.

Students from Cambridge High School were also surveyed. Since they did not participate in the St. Cloud State Annual Math Contest, I arranged with the Cambridge High School Gifted and Talented Coordinator, Meg Lindberg, to have surveys distributed in several social studies classes at her school. These classes are required for graduation and are not grouped by academic or mathematical ability. The survey was given to students in tenth, eleventh, and twelfth grades during May, 1996. These surveys were also divided by gender.

Chapter IV

RESULTS

Two-hundred and twenty-nine tenth through twelfth grade students attended the 1996 St. Cloud State University Annual Math Contest. Surveys were distributed to the estimated 87% of these students who also attended the awards ceremonies with 71% of those students returning a survey. In addition, 93 surveys were distributed and collected from students at Cambridge High School.

Incomplete surveys, and those containing spurious answers (e.g., 50 hours of studying a night), were rejected, and the remaining surveys were sorted into the three groups described in Materials and Methods, and by gender. The resulting six groups are designated as follows: UMTY M (University of Minnesota Talented Youth Mathematics Program Males), UMTY F (University of Minnesota Talented Youth Mathematics Program Females), SCSU M (males attending the Saint Cloud State University Annual Math Contest, excluding those in the UMTY group), SCSU F (females attending the Saint Cloud State University Annual Math Contest, excluding those in the UMTY group), CAMB M (Cambridge High School Males), and CAMB F (Cambridge High School Females). Table 1 shows the number of surveys collected and analyzed in each of the six groups and Table 2 reports their age and grade.

Table 1

Surveys Collected and Analyzed

Group	Number of Surveys Collected	Number of Complete Surveys Analyzed
UMTY M	29	20
UMTY F	11	10
SCSU M	98	64
SCSU F	91	54
CAMB M	56	37
CAMB F	37	25
Totals	322	210

To facilitate the statistical analysis, most of the survey questions were assigned to one of the following 11 general categories: Academic, Arts/Language, Athletic, Gaming, Leisure, Math, Music, Science/Technology, Social, Vocation, and Work/Service.

Table 2

Age and Grade Level of Students

	Grade 10		Grade 11		Grade 12		All Grades	
Group	No.	Age (years)	No.	Age (years)	No.	Age (years)	Total No.	Average Age (years)
UMTY M	7	15.57	6	16.50	7	17.71	20	16.60
UMTY F	4	16.00	2	16.50	4	17.25	10	16.60
SCSU M	20	15.60	29	16.59	15	16.93	64	16.36
SCSU F	35	15.57	13	16.54	6	17.67	54	16.04
CAMB M	14	15.64	12	16.92	11	18.09	37	16.78
CAMB F	12	15.67	8	16.50	5	17.60	25	16.32

Appendix B shows the assignment of each question to a group as well as questions which were not included in these categories.

Activity indices were calculated by summing the responses associated with each category, see Table 3. The responses were processed as follows. For questions which required a yes or no response, a one was assigned for yes and a zero for no. Other questions such as numbers 15 through 47, and 52 through 60, required numerical responses, such as the number of years a student participated in choir. For these questions a value of one was assigned for participation in the activity while a zero was assigned for no participation. This approach served in two ways: first, it served to

Table 3

Calculation of Activity Indices

Activity Index	Method Used to Calculate Activity Index from the Survey Questions
Math	(Q15+Q17+Q18+Q33+Q40+Q46+Q47+Q56+Q68+Q73+Q74+Q75+Q76+Q77+Q78+Q79+Q97[a])/18
Social	(Q08+Q45+Q59+Q81+Q84+Q85+Q90)/7
Academic	(Q31+Q32+Q34+Q36+Q37+Q54)/6
Gaming	(Q22+Q67+Q82+Q87+Q88+Q89)/6
Music	(Q09[a]+Q21+Q23+Q35+Q39+Q57+Q86+Q91+Q93)/10
Sci./Tech.	(Q19+Q24+Q28+Q42+Q53+Q58+Q66+Q94+Q95+Q96)/10
Athletic	(Q26+Q50[a]+Q60+Q83)/5
Arts/Lang.	(Q25+Q27+Q30+Q38+Q43+Q44+Q52+Q55+Q62+Q63+Q64+Q65+Q69)/13
Leisure	Q51[b]+Q61[b]
Work/Service	Q05[b]+Q10[b]+Q11[b]+Q41
Vocation	(Q16+Q20+Q29)/3

[a] Represents a question which can have integer response values between zero and two. The remaining unmarked questions may have response values of either zero or one.

[b] Represents a question which can have continuous values between 0 and ninety-nine.

process the data so that normalization by age or grade was not necessary; second it eliminated problems with the few surveys in which students reported activities incorrectly, such as the case when a students reported their total number of years in choir as 8, when the question asked for years of participation while in high school. The benefits of this approach outweighed the potential loss of information. Questions 9 and 50, which required students to indicate the number of hours spent on particular activities, and question 97, which asked for the number of the student's friends who liked math, were coded so that responses between one and ten were assigned values of one, while responses greater than ten were assigned values of two. This approach was taken in order to provide a graded response while limiting the weight of a single value (which could be large) on an activity index which was mainly composed of binary elements. In the case of the Leisure Index and the Work/Service Index which were composed mainly of responses having the units of hours/week, The indices were calculated by summing the values directly. With the exception of these two indices, each index was normalized by dividing the sum of the responses by the maximum possible value of the index.

The 11 indices may be regarded as continuous variables which may be compared statistically with parametric procedures. Figures 1 through 11 show Tukey's box plots (Tukey, 1977 as cited by Cleveland, 1993) for the 11 activity indices for each of the six groups of students. These data were analyzed in a series of one-way ANOVAs, see Table 4. The results indicate that for six activity indices there are significant differences in the means among the six groups of students.

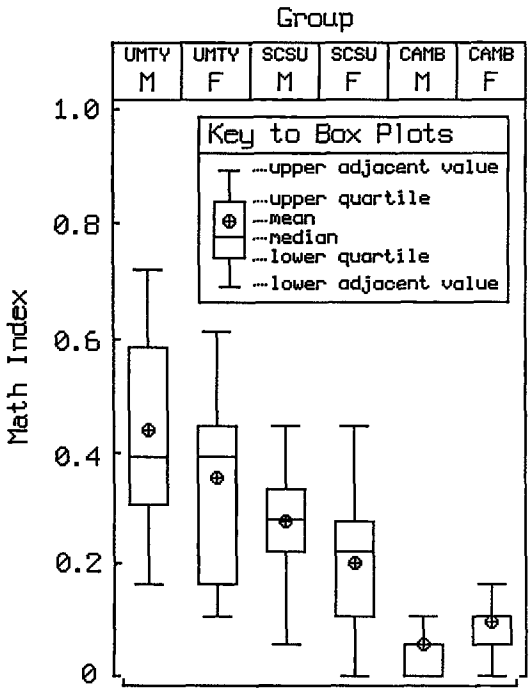

Figure 1

Data Summary of Math Indices for the Six Groups

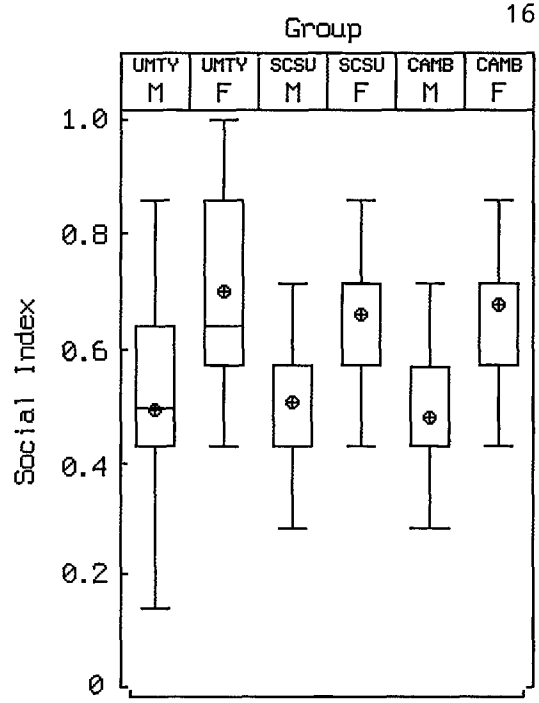

Figure 2

Data Summary of Social Indices for the Six Groups

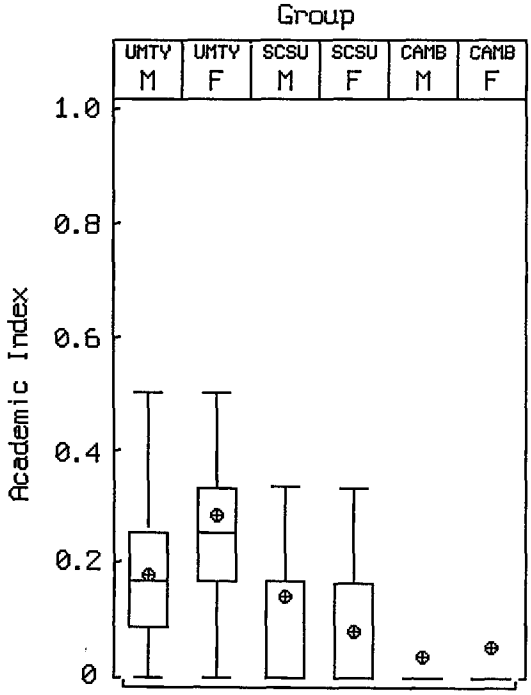

Figure 3

Data Summary of Academic Indices for the Six Groups

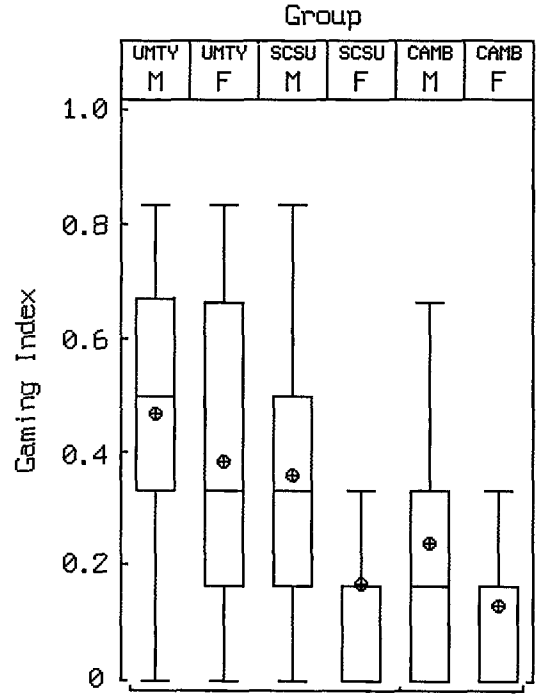

Figure 4

Data Summary of Gaming Indices for the Six Groups

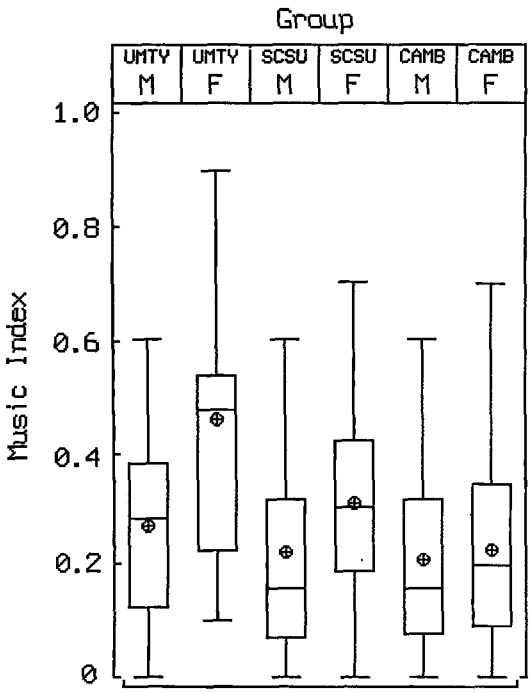

Figure 5

Data Summary of Music Indices for the Six Groups

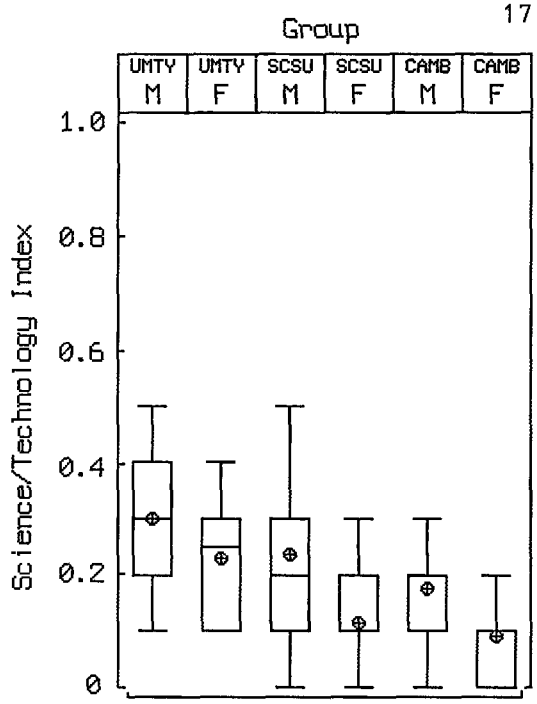

Figure 6

Data Summary of Science/Technology Indices for the Six Groups

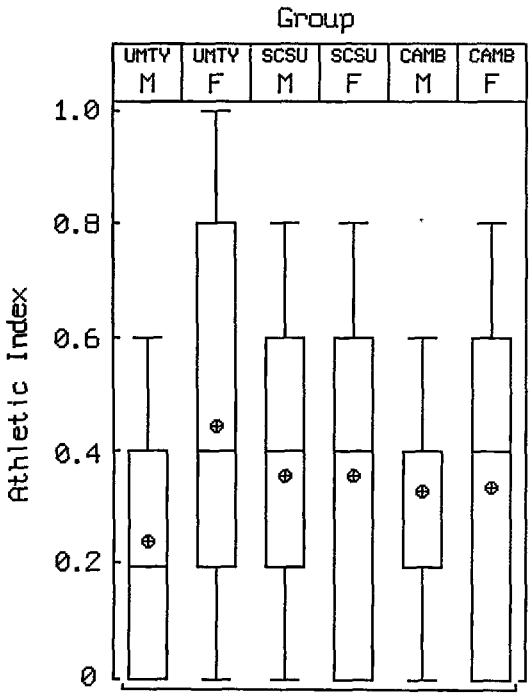

Figure 7

Data Summary of Athletic Indices for the Six Groups

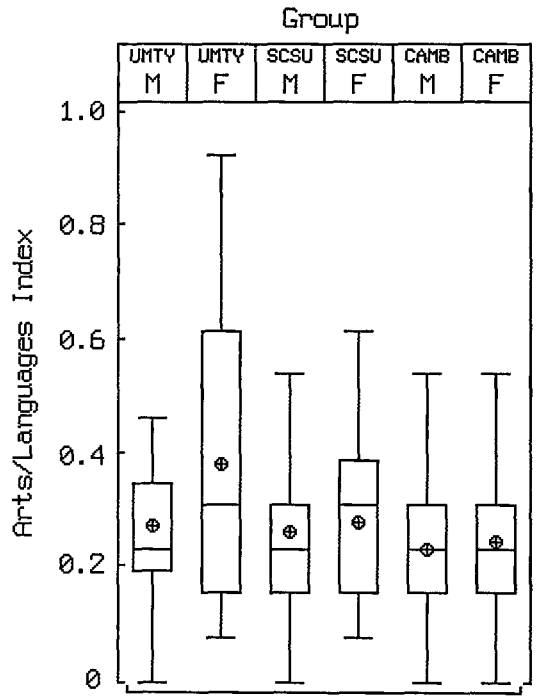

Figure 8

Data Summary of Arts/Languages Indices for the Six Groups

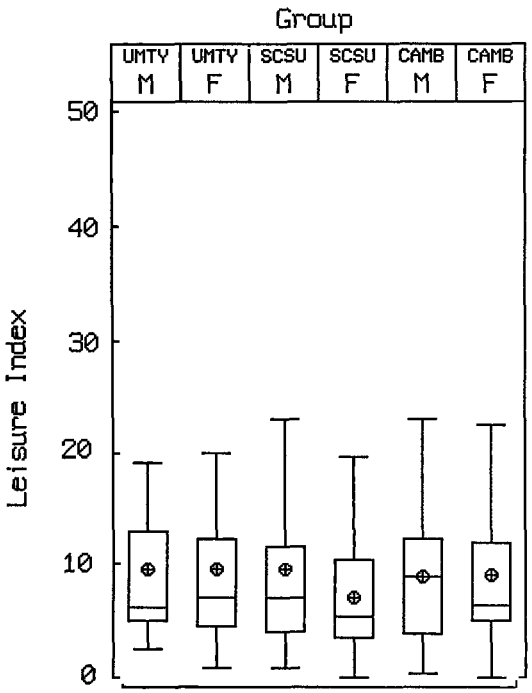

Figure 9

Data Summary of Leisure Indices for the Six Groups

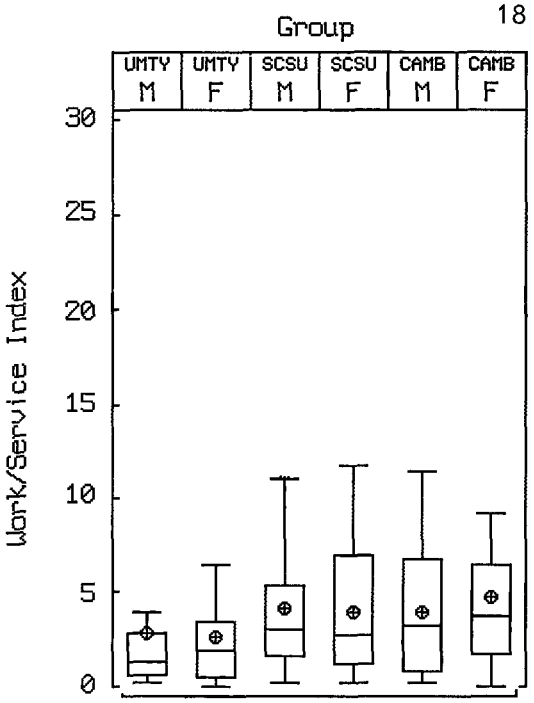

Figure 10

Data Summary of Work/Service Indices for the Six Groups

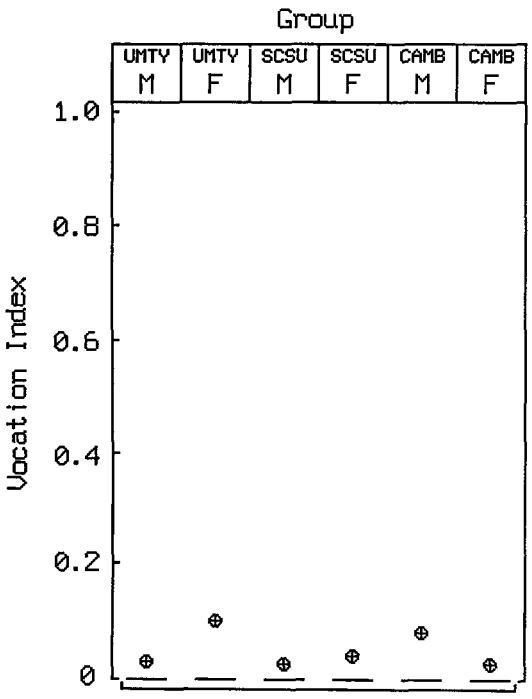

Figure 11

Data Summary of Vocation Indices for the Six Groups

Table 4

One-Way Analysis of Variance of the Activity Indices

Activity Index	Treatments			Error			Totals		
	DF	SS	MS	DF	SS	MS	DF	SS	F
Math	5	2.710	0.540	204	2.930	0.0100	209	5.640	37.63***
Social	5	1.537	0.307	204	6.361	0.0312	209	7.898	9.85***
Academic	5	0.764	0.153	204	4.242	0.0208	209	5.006	7.35***
Gaming	5	2.485	0.497	204	10.01	0.0491	209	12.50	10.12***
Music	5	0.740	0.150	204	7.120	0.0300	209	7.870	4.26**
Sci./Tech.	5	0.954	0.191	204	2.431	0.0119	209	3.385	16.01***
Athletic	5	0.320	0.060	204	15.39	0.0800	209	15.72	0.85
Arts/Lang.	5	0.191	0.0382	204	4.468	0.0219	209	4.658	1.74
Leisure	5	250.5	50.09	204	10923	53.55	209	11174	0.94
Work/Serv.	5	63.83	12.77	204	3006	14.73	209	3069	0.87
Vocation	5	0.113	0.0225	204	3.695	0.0181	209	3.807	1.24

** $p < 0.01$
*** $p < 0.001$

Tukey's multiple comparison procedure was used, see Table 5, in order to determine the nature of these differences.

Figure 1 suggests that there is a relationship between the Math Index and the six groups of students, such that the groups containing the most highly selected students, with respect to mathematical ability, are also the students with the highest math indices. One-way ANOVA of these data indicate that there are significant differences among the means ($F = 37.63$, $p < 0.001$) and Tukey's Multiple Comparison Procedure (Table 5), shows that there are three distinct sets of means (1,2,3), (4), and (5,6). Tukey's procedure assumes equal sample sizes and consequently the test was performed using the harmonic mean of the group sizes (see Kramer, 1956). There is evidence of unequal variances among the six groups of students; however, when analyzed by a

Table 5

Tukey's Multiple Comparison Procedures for Some Activity Indices

Activity Index	Group		N	Mean	Standard Deviation	Compares equal to group
Math	1	UMTY M	20	0.439	0.1765	2
	2	UMTY F	10	0.350	0.1677	1,3
	3	SCSU M	64	0.275	0.1095	2
	4	SCSU F	54	0.202	0.1132	none
	5	CAMB M	37	0.056	0.0681	6
	6	CAMB F	25	0.098	0.1427	5
Social	1	UMTY M	20	0.493	0.210	3,5
	2	UMTY F	10	0.700	0.196	4,6
	3	SCSU M	64	0.590	0.148	1,5
	4	SCSU F	54	0.659	0.183	2,6
	5	CAMB M	37	0.483	0.200	1,3
	6	CAMB F	25	0.680	0.156	2,4
Academic	1	UMTY M	20	0.175	0.138	2,3,4,6
	2	UMTY F	10	0.283	0.249	1
	3	SCSU M	64	0.141	0.171	1,4,6
	4	SCSU F	54	0.083	0.111	1,3,5,6
	5	CAMB M	37	0.036	0.097	4,6
	6	CAMB F	25	0.053	0.142	1,3,4,5
Gaming	1	UMTY M	20	0.467	0.220	2,3
	2	UMTY F	10	0.383	0.261	1,3,4,5
	3	SCSU M	64	0.362	0.248	1,2,5
	4	SCSU F	54	0.170	0.176	2,5,6
	5	CAMB M	37	0.239	0.262	2,3,4,6
	6	CAMB F	25	0.133	0.144	4,5
Sci./Tech.	1	UMTY M	20	0.300	0.1124	2,3
	2	UMTY F	10	0.230	0.1059	1,3,5
	3	SCSU M	64	0.236	0.1302	1,2,5
	4	SCSU F	54	0.115	0.0878	5,6
	5	CAMB M	37	0.176	0.1140	2,3,4
	6	CAMB F	25	0.088	0.0781	4
Music	1	UMTY M	20	0.270	0.1689	3,4,5,6
	2	UMTY F	10	0.460	0.2547	none
	3	SCSU M	64	0.223	0.2136	1,4,5,6
	4	SCSU F	54	0.309	0.1569	1,3,5,6
	5	CAMB M	37	0.208	0.1738	1,3,4,6
	6	CAMB F	25	0.228	0.1744	1,3,4,5

SAS procedure for unequal variances ($F = 44.1$, $p < 0.001$), the results confirm the original results.

The Social Indices, presented in Figure 2, shows that there are gender differences among the groups. The three groups of females have similar social indices, as do the three groups of males. One-way ANOVA of the data indicate that there are significant differences among the means ($F = 9.856$, $p < 0.001$) and Tukey's Multiple Comparison Procedure (Table 5), shows that there are two distinct sets of means (1,3,5) representing the three male groups, and (2,4,6), representing the three female groups. Thus, in every case, the females participated in more social activities than did their male counterparts. These activities included dating, student government, and summer camps (see Appendix B).

The relationship between the Academic Index and the six groups of students is shown in Figure 3. One-way ANOVA of these data indicate that there are significant differences among the means ($F = 7.352$, $p < 0.001$) and Tukey's Multiple Comparison Procedure (Table 5), shows that while there are significant differences between some pairs of means, there are no significantly distinct sets of means. However, there appears to be a general relationship between the academic index and math ability. This can be illustrated by calculating new means for the academic indices for the following three combined groups: UMTY M plus UMTY F (mean = 0.211), SCSU M plus SCSU F (mean = 0.144), and CAMB M plus CAMB F (mean = 0.043). One-way ANOVA of these data indicate that there are significant differences among the means ($F = 13.71$, $p < 0.001$) and Tukeys's Multiple Comparison Procedure shows that there are three distinct sets of means.

The indices for Gaming are presented in Figure 4. Table 5 shows that there are differences among the means of the six groups (one-way ANOVA, $F = 10.12$, $p < 0.001$). Tukey's Multiple Comparison Procedure shows that there are significant differences between some pairs of means, but there are no significantly distinct sets of means (see Table 5). Because these data suggest that both math ability and gender have an influence on the gaming indices, UMTY males and females were combined into one group (mean = 0.439), SCSU males and females into a second group (mean = 0.274), and CAMB males and females into a third group (mean = 0.196), and then performed a one-way ANOVA on the data. This analysis shows there are significant differences among the means for the three groups ($F = 10.9$, $p < 0.001$) when the students are grouped according mathematical ability. Tukey's Multiple Comparison Procedure shows that the group containing UMTY males and females is different from the SCSU (males and females) group, and the CAMB (males and females) group, but that the SCSU and CAMB groups are alike in regards to the gaming indices. I also separated the data by gender. The combined means for all males and for all females are 0.342, and 0.184, respectively. A one-way ANOVA ($F = 23.76$, $p < 0.001$) shows that there are significant differences between males and females in regards to the gaming index.

Figure 5 presents the indices for Music, and Table 5 shows that there are significant differences among the groups (one-way ANOVA, $F = 4.26$, $p < 0.01$). Tukey's Multiple Comparison Procedure shows that UMTY F students are significantly different from the other groups. In addition, there are no significant differences among the remaining five

groups, (see Table 5). I also performed a one-way ANOVA on the data after combining UMTY males and females into one group (mean = 0.333), SCSU males and females into a second group (mean = 0.263), and CAMB males and females into a third group (mean = 0.216). This analysis shows there are significant differences among the means for the three groups ($F = 3.84$, $p < 0.5$) when the students are grouped according mathematical ability. Tukey's Multiple Comparison Procedure shows that the group containing UMTY M and UMTY F is different from the CAMB M and CAMB F group, and like the SCSU M and SCSU F group, and that the SCSU and CAMB groups are alike. I also separated the data by gender and calculated the combined means for all males (M = 0.226) and for all females (M = 0.303). A one-way ANOVA of these data ($F = 8.34$, $p < 0.01$) show that there are significant differences between males and females in regards to the music index ($F = 8.30$, $p < 0.01$). These analyses suggest that both math ability and gender relate to the music index.

The relationship between the Index for Science and Technology, and the six groups of students is shown in Figure 6. One-way ANOVA of these data indicate that there are significant differences among the means ($F = 16.01$, $p < 0.001$). This constitutes strong statistical evidence of a difference between true Sci/Tech means. Tukey's Multiple Comparison Procedure (Table 5), shows that while there are significant differences between some pairs of means, there are no significantly distinct sets of means. In order to further clarify these data I again divided the data into 3 groups: UMTY M and UMTY F (mean = 0.227), SCSU M and SCSU F (mean = 0.181), and CAMB M and CAMB F (mean = 0.140). A

one-way ANOVA shows that there are significant differences among the three groups ($F = 12.96$, $p < 0.001$) when they are grouped by math ability. Tukey's Multiple Comparison Procedure shows that the UMTY group differs from both the SCSU and the CAMB groups, and that the SCSU group and CAMB groups are similar. Analyzing the data by gender shows that there is a significant difference on this basis. The males (mean = 0.228) are much more likely than the females (mean = 0.120) to be involved in scientific or technologically related activities ($F = 44.52$, $p < 0.001$).

A one-way ANOVA of the indices for Athletic, Arts/Languages, Leisure Time, Work/Service, and Vocation show no statistical evidence of a difference among the groups, see Tables 4 and 5, and Figures 7 through 11. I further examined Athletics, to see if there were differences among the groups in regards to preferences for individual or group sports (see Table 6). Table 7 lists frequency of different athletic activities by the six groups.

Table 6

Categories of Athletic Activities Among the Groups

	Relative Frequency of Athletic Category Among the Groups					
Category	UMTY M	UMTY F	SCSU M	SCSU F	CAMB M	CAMB F
Individual Sport	0.65	0.80	0.64	0.46	0.38	0.16
No Sport	0.40	0.20	0.34	0.39	0.38	0.52
Team Sport	0.35	0.80	0.56	0.50	0.62	0.52
Totals	1.40	1.80	1.55	1.35	1.38	1.20

Table 7

Athletic Activities Among the Groups

	Relative Frequency of Athletic Activity Among the Groups					
Activity	UMTY M	UMTY F	SCSU M	SCSU F	CAMB M	CAMB F
Badminton	0.00	0.00	0.02	0.00	0.00	0.00
Baseball	0.00	0.00	0.11	0.00	0.14	0.00
Basketball	0.00	0.00	0.16	0.06	0.08	0.00
Bowling	0.00	0.00	0.03	0.00	0.00	0.00
Cheerleading	0.00	0.00	0.00	0.04	0.00	0.04
Cross country	0.00	0.00	0.05	0.04	0.05	0.00
Cross country skiing	0.10	0.00	0.02	0.02	0.00	0.00
Curling	0.00	0.00	0.02	0.00	0.00	0.00
Dance	0.00	0.20	0.00	0.00	0.00	0.00
Danceline	0.00	0.00	0.00	0.02	0.00	0.00
Dogsled	0.00	0.00	0.00	0.00	0.00	0.04
Fencing	0.00	0.00	0.02	0.00	0.00	0.00
Football	0.05	0.00	0.11	0.00	0.16	0.00
Frisbee	0.05	0.00	0.00	0.00	0.00	0.00
Golf	0.15	0.10	0.09	0.07	0.03	0.00
Gymnastics	0.00	0.00	0.00	0.06	0.03	0.00
Hockey	0.10	0.00	0.03	0.02	0.08	0.00
Horseback riding	0.00	0.00	0.00	0.00	0.00	0.04
Marching band	0.00	0.10	0.02	0.02	0.03	0.00
Martial arts	0.10	0.10	0.00	0.00	0.00	0.00
Motor cross	0.00	0.00	0.00	0.00	0.03	0.00
Mountain biking	0.00	0.00	0.00	0.00	0.03	0.00
None	0.40	0.20	0.34	0.39	0.38	0.52
Pepband	0.00	0.10	0.00	0.00	0.00	0.00
Racketball	0.00	0.00	0.03	0.00	0.00	0.00
Skateboarding	0.00	0.00	0.00	0.00	0.03	0.00
Skating	0.00	0.00	0.00	0.02	0.00	0.00
Skiing	0.00	0.00	0.02	0.04	0.08	0.00
Snowboarding	0.00	0.00	0.00	0.00	0.03	0.00
Soccer	0.20	0.30	0.06	0.06	0.14	0.08
Softball	0.00	0.20	0.03	0.13	0.00	0.12
Swimming	0.05	0.00	0.06	0.07	0.03	0.00
Tennis	0.15	0.10	0.14	0.06	0.03	0.00
Track and field	0.05	0.20	0.12	0.04	0.03	0.04
Volleyball	0.00	0.10	0.03	0.17	0.00	0.28
Weight lifting	0.00	0.10	0.02	0.02	0.00	0.00
Wrestling	0.00	0.00	0.03	0.04	0.00	0.04
Totals	1.40	1.80	1.55	1.35	1.38	1.20

The category Work/Service was also examined in detail. Table 8 shows the categories of jobs among the groups (see Appendix C for complete list of responses).

Table 8

Categories of Jobs Among the Groups

	Relative Frequency of Job Category Among the Groups					
Job Category	UMTY M	UMTY F	SCSU M	SCSU F	CAMB M	CAMB F
Agriculture	0.00	0.00	0.03	0.04	0.05	0.00
Cashier	0.00	0.00	0.00	0.06	0.03	0.04
Childcare	0.05	0.00	0.00	0.04	0.00	0.04
Clerk	0.05	0.00	0.06	0.02	0.00	0.00
Custodial	0.00	0.00	0.02	0.02	0.05	0.00
Food service	0.10	0.10	0.11	0.20	0.11	0.16
General labor	0.05	0.00	0.05	0.06	0.19	0.00
Lifeguard	0.00	0.00	0.08	0.00	0.00	0.00
Miscellaneous	0.00	0.00	0.00	0.00	0.03	0.00
None	0.65	0.60	0.53	0.50	0.49	0.56
Office work	0.00	0.10	0.02	0.02	0.00	0.04
Paper carrier	0.00	0.00	0.03	0.00	0.00	0.00
Personal care	0.00	0.10	0.02	0.02	0.00	0.04
Retail	0.05	0.00	0.05	0.04	0.05	0.12
Teaching	0.05	0.10	0.02	0.00	0.00	0.00
Totals	1.00	1.00	1.00	1.00	1.00	1.00

Questions 6, 48, 70-72, 80, 92, and 98-100 of the survey, asked students to furnish written responses such as a listing of the magazines usually read, or the types of athletic activities that they participate in. In such cases it was difficult to provide a statistical analysis of the responses due to the lack of a satisfactory test procedure. However, the data in the following tables summarize the responses to a number of these type of questions. Table 8 shows

the type of jobs held by the students. Tables 6 and 7 summarize the athletic activities in which the students participated. Table 9 shows the types of magazines read by the students (Appendix C lists all the magazines by title). Table 10 lists the hobbies in which the students engaged.

Table 9

Magazine Categories

	Relative Frequency of Magazine Category Read by the Groups					
Magazine Category	UMTY M	UMTY F	SCSU M	SCSU F	CAMB M	CAMB F
Arts and language	0.00	0.30	0.00	0.02	0.00	0.00
Current events	0.25	0.60	0.52	0.37	0.14	0.08
Games	0.20	0.10	0.08	0.02	0.03	0.00
Gender defined	0.15	0.90	0.02	1.41	0.03	1.48
Hobby	0.50	0.20	0.48	0.07	0.54	0.12
Music	0.00	0.10	0.05	0.02	0.22	0.08
None	0.15	0.00	0.14	0.11	0.14	0.16
Science	0.50	0.00	0.06	0.00	0.11	0.00
Special interest	0.00	0.00	0.06	0.04	0.35	0.40
Sports	0.10	0.10	0.44	0.17	0.38	0.20
Travel	0.00	0.20	0.02	0.00	0.03	0.00
Totals	1.85	2.50	1.86	2.22	1.95	2.52

Questions 70 to 72 asked for the names of three book titles read by the students. In this case the large duplication of titles made it clear that the responses reflected more the nature of specific reading assignments from school than the names of freely chosen reading material.

For various reasons, questions number 7, 14, 49, and 92, were not included in any of the activity indices, but are discussed below. The

Table 10

Hobbies Among the Groups

	Relative Frequency of Hobby Among the Groups					
Hobby	UMTY M	UMTY F	SCSU M	SCSU F	CAMB M	CAMB F
Animals	0.00	0.00	0.00	0.00	0.03	0.04
Art	0.00	0.00	0.05	0.07	0.05	0.20
Audio recording	0.00	0.00	0.02	0.00	0.00	0.00
Business	0.00	0.00	0.00	0.00	0.03	0.00
Cartography	0.00	0.00	0.02	0.00	0.00	0.00
Collecting	0.05	0.00	0.11	0.00	0.03	0.00
Computer	0.25	0.00	0.22	0.04	0.14	0.12
Cooking	0.00	0.00	0.00	0.04	0.00	0.00
Crafts	0.00	0.00	0.02	0.07	0.00	0.00
Dancing	0.00	0.20	0.00	0.06	0.00	0.04
Electronics	0.00	0.00	0.02	0.00	0.00	0.00
Gaming	0.40	0.10	0.16	0.00	0.05	0.00
Gardening	0.00	0.00	0.02	0.02	0.00	0.00
Math	0.10	0.00	0.03	0.02	0.00	0.00
Mechanics	0.00	0.00	0.00	0.00	0.14	0.00
Meditation	0.00	0.00	0.02	0.00	0.00	0.00
Models	0.05	0.00	0.11	0.00	0.03	0.00
Motorsports	0.05	0.00	0.00	0.06	0.16	0.04
Movies/tv	0.10	0.10	0.06	0.22	0.11	0.04
Music	0.05	0.10	0.08	0.11	0.11	0.12
Musical instrument	0.10	0.30	0.06	0.17	0.14	0.04
None	0.00	0.00	0.09	0.07	0.16	0.12
Poetry	0.00	0.00	0.00	0.02	0.00	0.04
Puzzles	0.10	0.00	0.02	0.06	0.00	0.00
Radio	0.00	0.00	0.02	0.00	0.00	0.04
Reading	0.15	0.40	0.23	0.28	0.05	0.20
Sewing	0.00	0.10	0.00	0.00	0.00	0.00
Shopping	0.00	0.00	0.00	0.02	0.05	0.08
Social activities	0.00	0.00	0.08	0.19	0.16	0.48
Sport recreation	0.25	0.40	0.33	0.48	0.86	0.56
Sports	0.05	0.00	0.06	0.00	0.05	0.00
Sports organizatins	0.10	0.30	0.08	0.15	0.16	0.40
Theater	0.00	0.10	0.02	0.07	0.00	0.00
Toys	0.00	0.00	0.02	0.00	0.00	0.00
Videogames	0.20	0.00	0.06	0.00	0.03	0.00
Writing	0.00	0.00	0.03	0.07	0.03	0.08
Totals	2.00	2.10	2.00	2.28	2.57	2.64

students reported in question number 7 that about 45% of them owned a car, but no significant differences among the groups were found in car ownership. Question 14, which asked students to list their current math class, produced a wide variety of responses which were difficult to evaluate, since there many different math sequences and courses for students to take. Furthermore, this information did not appear to add any new insights to the analysis. The information from question 49, which dealt with time spent on extracurricular activities, was more clearly obtained by a series of other questions. In the case of question 92, which asked students to list other activities, i.e., activities not already included in the survey, there were insufficient responses to analyze.

Chapter V

DISCUSSION

Evaluation of the data show that a typical student with high accomplishments in math is more likely to be involved in leisure activities that support an interest in math, academic activities, gaming, music, and science and technology than his or her less mathematically inclined peers. In addition, these students participate in athletics, work/service, the arts and languages, and vocation related activities at rates similar to other students. It is also clear that gender is a much more important factor when looking at social activities than is math achievement. As many other researchers have found over the last 50 years, the mathematically precocious students do it all.

This research indicates that when divided by mathematical accomplishment, the girls are doing the same activities as the boys. This research does not address though, what the girls with high mathematical ability and average mathematical accomplishments are doing, and why they are not accelerating in math. High school students typically choose extra curricular activities that are in areas of interest and/or strength. When students who have similar interests are put together a tremendous exchange of knowledge can, and usually does

occur. In addition these students receive both support and challenges from the other students. Analysis of these data show that gender is not nearly as important in the selection of extracurricular activities as is math ability and accomplishment.

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APPENDICES

APPENDIX A

The Survey

SURVEY OF ELECTIVE AND LEISURE ACTIVITIES

1. Age:_____(1)
2. Gender (M/F):_____(2)
3. Year in school (10th, 11th, 12th):_____(3)
4. Do you have a job? (Y/N) _____(4)
5. If you have a job please estimate the number of hours that you work each week:_____(5)
6. If you work, please describe the type of job that you have: _____(6)
7. Do you have your own car? (Y/N) _____(7)
8. Do you date? (Y/N) _____(8)
9. If you play a musical instrument please estimate how many hours you practice each week:_____(9)
10. Please estimate how many hours you spend on family chores each week:_____(10)
11. Please estimate how many hours you spend on religious activities (i.e. church services, youth groups) each week:_____(11)
12. Have you ever been enrolled in the University of Minnesota Talented Youth Mathematics Program (UMTYMP)? (Y/N) _____(12)
13. If you have participated in UMTYMP, please indicate how many years you were involved:_____(13)
14. What math class(es) are your currently enrolled in? _____(14)

While in high school, how many years have you participated in the following extracurricular activities:

15. Math League:_____(15)
16. 4H Club:_____(16)
17. American High School Math Exam (AHSME):_____(17)
18. American Invitational Math Exam (AIME):_____(18)
19. Astronomy Club:_____(19)
20. Automobile Club:_____(20)
21. Band:_____(21)
22. Chess Club:_____(22)
23. Choir:_____(23)
24. Computer club:_____(24)
25. Creative writing contests, school magazine:_____(25)
26. Dance line, cheerleading:_____(26)
27. Drama:_____(27)
28. Engineering club:_____(28)
29. Future Farmers of America:_____(29)
30. Foreign language club(s):_____(30)
31. Future Problem Solving:_____(31)
32. Honor Society:_____(32)
33. International Math Olympiad:_____(33)
34. Knowledge Bowl:_____(34)
35. Minnesota Music Teachers Association contests:_____(35)
36. Mock Trial:_____(36)
37. Odyssey of the Mind:_____(37)

38. One Act Play:_____(38)
39. Orchestra:_____(39)
40. St. Cloud State Annual Math Exam:_____(40)
41. Service Clubs (SADD, etc.):_____(41)
42. Science Fair:_____(42)
43. School Newspaper or Yearbook:_____(43)
44. Speech:_____(44)
45. Student government:_____(45)
46. USA Math Olympiad:_____(46)
47. USA Mathematical Talent Search contest:_____(47)

48. List the athletic activities in which you participate.
_____(48)

49. How many hours do you typically spend on extracurricular activities each week?_____(49)
50. How many hours do you typically spend on, athletic activities each week?_____(50)
51. How many hours do you typically spend on leisure time activities each week?_____(51)

How many years have you participated in the following summer programs?

52. Art or drama programs:_____(52)
53. Computer camp:_____(53)
54. College classes:_____(54)
55. Foreign Language programs/camps:_____(55)
56. Math programs:_____(56)
57. Music camps, activities, or programs:_____(57)
58. Science programs:_____(58)
59. Summer camp (general):_____(59)
60. Sports camps, activities:_____(60)
61. On average, how many hours do you spend each week reading for pleasure?_____(61)

What kind of books do you enjoy reading? (Circle your selection.)

62. Fiction . . . . . Y N (62)
63. Inspirational . . . . . Y N (63)
64. Science Fiction, Fantasy. . . . . Y N (64)
65. Poetry. . . . . Y N (65)
66. Technical books, manuals. . . . . Y N (66)
67. Gaming, roll playing. . . . . Y N (67)
68. Puzzle and/or logic . . . . . Y N (68)
69. Non fiction . . . . . Y N (69)

Please list three interesting books that you have read this year:

70. _____(70)
71. _____(71)
72. _____(72)

Have you read any of the following books or authors?
(Circle your selection.)

73. Anything by Raymond Smullyan . . . . . Y N (73)
74. Anything by Martin Gardner . . . . . Y N (74)
75. Gödel's Proof . . . . . Y N (75)
76. Flatland. . . . . Y N (76)
77. Sphereland. . . . . Y N (77)
78. Puzzle or logic books . . . . . Y N (78)
79. Math books other than school textbooks. . . Y N (79)

What magazines do you usually read?

80. _____(80)

When you are with your friends do you usually:
(Circle your selection.)

81. Go shopping . . . . . Y N (81)
82. Play video games, Nintendo, etc . . . . . Y N (82)
83. Participate in sports or athletic activities. . Y N (83)
84. Go out to eat . . . . . Y N (84)
85. Watch movies, videos, or TV . . . . . Y N (85)
86. Listen to music, dance. . . . . Y N (86)
87. Play cards, cribbage, board games . . . . . Y N (87)
88. Play Magic, or similar card games . . . . . Y N (88)
89. Role playing games (D&D, etc.). . . . . Y N (89)
90. Sit and talk. . . . . Y N (90)
91. Play musical instruments, sing. . . . . Y N (91)
92. Other:_____(92)

93. Have you ever written an original piece of music?. . . . Y N (93)
94. Have you ever written an original computer program?. . . Y N (94)
95. Do you or your family own a computer? . . . . . Y N (95)
96. Do you regularly use the internet?. . . . . .Y N (96)
97. How many friends do you have who like math? _____(97)

Please list your favorite hobbies and indicate how much time you usually spend on them each week.

	Hobby	
98.	_____	____ hours (98)
99.	_____	____ hours (99)
100.	_____	____ hours (100)

APPENDIX B

Assignment of Survey Questions to Activities

Assignment of Survey Questions to an Activity

Item Number	Survey Question Number	Question Description	Activity or Category
1	31	Future Prob Solving	Academics
2	32	Honor Society	Academics
3	34	Knowledge Bowl	Academics
4	36	Mock Trial	Academics
5	37	Odyssey of the Mind	Academics
6	54	College Class	Academics
7	26	Dance Line/Cheerlead	Athletics
8	50	Athletics Hours	Athletics
9	60	Sport camps	Athletics
10	83	Sports	Athletics
11	25	Creative Writing	Arts/Languages
12	27	Drama	Arts/Languages
13	30	Foreign Lang. Club	Arts/Languages
14	38	One Act Play	Arts/Languages
15	43	Newpaper/Yearbook	Arts/Languages
16	44	Speech	Arts/Languages
17	52	Art/Drama	Arts/Languages
18	55	Foreign Language Camp	Arts/Languages
19	62	Fiction	Arts/Languages
20	63	Inspirational	Arts/Languages
21	64	SciFi/Fantasy	Arts/Languages
22	65	Poetry	Arts/Languages
23	69	Non-Fiction	Arts/Languages
24	22	Chess Club	Gaming
25	67	Gaming	Gaming
26	82	Video Games	Gaming
27	87	Cards/Board Games	Gaming
28	88	Play Magic	Gaming
29	89	Role Play	Gaming
30	51	Leisure Hours	Leisure
31	61	Pleasure Read Hours	Leisure
32	15	Math League	Math
33	17	AHSME	Math
34	18	AIME	Math
35	33	Int Math Olympiad	Math
36	40	SCSU Annual Math Contes	Math
37	46	USA Math Olympiad	Math
38	47	USA Math Tal Search	Math
39	56	Math Programs	Math
40	68	Puzzle/Logic	Math
41	73	Smullyan	Math
42	74	Gardner	Math
43	75	Goedel's Proof	Math

Item Number	Survey Question Number	Question Description	Activity or Category
44	76	Flatland	Math
45	77	Sphereland	Math
46	78	Puzzle/Logic	Math
47	79	Math Books	Math
48	97	How many math friends	Math
49	09	Instrument	Music
50	21	Band	Music
51	23	Choir	Music
52	35	MMTA	Music
53	39	Orchestra	Music
54	57	Music camps	Music
55	86	Listen Music/dance	Music
56	91	Play Musical Instrument	Music
57	93	Write Music	Music
58	05	Work Hours	Work/Service
59	10	Chore Hours	Work/Service
60	11	Religious Hours	Work/Service
61	41	Service Clubs	Work/Service
62	19	Astronomy	Science/Technology
63	24	Computer Club	Science/Technology
64	28	Engineering	Science/Technology
65	42	Science Fair	Science/Technology
66	53	Computer Camp	Science/Technology
67	58	Science Programs	Science/Technology
68	66	Technical	Science/Technology
69	94	Write Computer Program	Science/Technology
70	95	Own a Computer	Science/Technology
71	96	Use Internet	Science/Technology
72	08	Date (y/n)	Social
73	45	Student Government	Social
74	59	Summer Camp (general)	Social
75	81	Shopping	Social
76	84	Eat Out	Social
77	85	Movies/TV	Social
78	90	Sit and talk	Social
79	16	4H	Vocation
80	20	Auto Club	Vocation
81	29	FFA	Vocation
82	01	Age	demographic
83	02	Gender	demographic
84	03	Grade in School	demographic
88	12	UMTYMP	demographic
90	13	UMTYMP years	demographic
85	04	Job (y/n)	no assignment
87	07	Car (y/n)	no assignment
89	14	Math Classes	no assignment

Item Number	Survey Question Number	Question Description	Activity or Category
92	49	Extracurricular Hours	no assignment
93	70	Book Title	no assignment
94	71	Book Title	no assignment
95	72	Book Title	no assignment
97	92	Other Activities	no assignment
86	06	Job Title	written answer
91	48	Athletic Activities	written answer
96	80	Magazines	written answer
98	98	Hobbies	written answer
99	99	Hobbies	written answer
100	100	Hobbies	written answer

APPENDIX C

Tables of Jobs and Magazines

Jobs Among the Groups

Job	Relative Frequency of Job Among the Groups					
	UMTY M	UMTY F	SCSU M	SCSU F	CAMB M	CAMB F
Animal care	0.00	0.00	0.02	0.02	0.00	0.00
Babysitter	0.00	0.00	0.00	0.00	0.00	0.04
Bagger	0.00	0.00	0.00	0.00	0.05	0.00
Beautician	0.00	0.10	0.00	0.00	0.00	0.00
Care giver	0.00	0.00	0.00	0.40	0.00	0.04
Carpenter	0.00	0.00	0.00	0.00	0.03	0.00
Cashier	0.00	0.00	0.00	0.06	0.03	0.04
Cleaning	0.00	0.00	0.00	0.02	0.03	0.00
Clerk	0.05	0.00	0.02	0.02	0.00	0.00
Computer	0.00	0.00	0.05	0.00	0.00	0.00
Cook	0.00	0.00	0.00	0.06	0.03	0.00
Counselor	0.05	0.00	0.00	0.00	0.00	0.00
Custodian	0.00	0.00	0.00	0.00	0.03	0.00
Dishwasher	0.00	0.00	0.03	0.00	0.00	0.00
Farming	0.00	0.00	0.02	0.04	0.05	0.00
Food	0.10	0.10	0.06	0.13	0.08	0.12
Gopher	0.00	0.00	0.02	0.00	0.00	0.00
Grounds	0.00	0.00	0.02	0.00	0.00	0.00
Home	0.00	0.00	0.00	0.02	0.00	0.00
Host	0.00	0.00	0.02	0.00	0.00	0.00
Instructor	0.00	0.00	0.02	0.00	0.00	0.00
Labor	0.05	0.00	0.02	0.02	0.03	0.00
Library	0.00	0.00	0.02	0.02	0.00	0.00
Lifeguard	0.00	0.00	0.08	0.00	0.00	0.00
Manager	0.00	0.00	0.02	0.00	0.03	0.00
Merchant	0.05	0.00	0.00	0.00	0.00	0.00
Network	0.00	0.00	0.00	0.00	0.03	0.00
None	0.65	0.60	0.53	0.50	0.49	0.56
Nurses' aide	0.00	0.00	0.02	0.00	0.00	0.00
Painter	0.00	0.00	0.00	0.00	0.03	0.00
Paper carrier	0.00	0.00	0.03	0.00	0.00	0.00
Retail	0.00	0.00	0.00	0.00	0.00	0.04
Sales	0.00	0.00	0.03	0.04	0.03	0.08
Secretary	0.00	0.10	0.02	0.02	0.00	0.04
Stocker	0.00	0.00	0.00	0.00	0.03	0.00
Swimming instructor	0.05	0.00	0.00	0.00	0.00	0.00
Trapboy	0.00	0.00	0.00	0.00	0.03	0.00
Tutor	0.00	0.10	0.00	0.00	0.00	0.00
Waitress	0.00	0.00	0.00	0.02	0.00	0.04
Totals	1.00	1.00	1.00	1.00	1.00	1.00

Magazines Read by the Groups

Magazine	Relative Frequency of Magazines Read by the Groups					
	UMTY M	UMTY F	SCSU M	SCSU F	CAMB M	CAMB F
Air and Space	0.05	0.00	0.00	0.00	0.00	0.00
Alaska	0.00	0.00	0.00	0.00	0.03	0.00
Allure	0.00	0.00	0.00	0.02	0.00	0.00
American Hunter	0.00	0.00	0.00	0.00	0.03	0.00
Astronomy	0.00	0.00	0.02	0.00	0.00	0.00
Automobile	0.00	0.00	0.00	0.00	0.03	0.00
Awake!	0.00	0.00	0.02	0.00	0.00	0.00
Backpacker	0.00	0.00	0.02	0.00	0.00	0.00
Baseball Player	0.00	0.00	0.02	0.00	0.00	0.00
Baseball Week	0.00	0.00	0.02	0.00	0.00	0.00
Bazaar	0.00	0.00	0.00	0.00	0.00	0.04
BBC Monthly	0.00	0.00	0.00	0.00	0.03	0.00
Beckett	0.00	0.00	0.00	0.00	0.03	0.00
Bicycling	0.00	0.00	0.02	0.00	0.00	0.00
Bike	0.00	0.00	0.02	0.00	0.00	0.00
Brigade Quarterly	0.00	0.00	0.00	0.00	0.03	0.00
Bow Hunter	0.00	0.00	0.00	0.00	0.03	0.00
Boys Life	0.00	0.00	0.02	0.00	0.00	0.00
Brio	0.00	0.00	0.00	0.06	0.00	0.00
Business Week	0.00	0.10	0.00	0.00	0.00	0.00
Byte	0.00	0.00	0.02	0.00	0.00	0.00
Canoe and Kayak	0.00	0.00	0.02	0.00	0.00	0.00
Car magazines	0.00	0.00	0.00	0.02	0.00	0.00
Carcraft	0.00	0.00	0.00	0.00	0.03	0.00
CCM	0.00	0.00	0.00	0.02	0.00	0.00
Child	0.00	0.00	0.00	0.00	0.00	0.04
Circle Track	0.00	0.00	0.00	0.00	0.03	0.00
Circus	0.00	0.00	0.00	0.00	0.00	0.04
Civilization	0.00	0.10	0.00	0.00	0.00	0.00
Coinage	0.00	0.00	0.02	0.00	0.00	0.00
Comics	0.00	0.00	0.02	0.00	0.03	0.00
Computer Game Review	0.00	0.00	0.02	0.00	0.00	0.00
Computer Gaming World	0.05	0.00	0.00	0.00	0.00	0.00
Computer Magician	0.05	0.00	0.00	0.00	0.00	0.00
Computer Shopper	0.00	0.00	0.02	0.00	0.00	0.00
Cosmopolitan	0.00	0.00	0.00	0.02	0.00	0.04
Countryside	0.00	0.00	0.00	0.02	0.00	0.00
Crutchfield	0.00	0.00	0.00	0.00	0.03	0.00
Dance	0.00	0.10	0.00	0.00	0.00	0.00
Dirtbike	0.00	0.00	0.02	0.00	0.03	0.00
Dirtrider	0.00	0.00	0.00	0.00	0.03	0.00
Discover	0.20	0.00	0.02	0.00	0.03	0.00

Magazine	Relative Frequency of Magazines Read by the Groups					
	UMTY M	UMTY F	SCSU M	SCSU F	CAMB M	CAMB F
DOS World	0.00	0.00	0.02	0.00	0.00	0.00
Dragon	0.10	0.00	0.00	0.00	0.00	0.00
Dramatics	0.00	0.00	0.00	0.02	0.00	0.00
Duelist	0.10	0.00	0.02	0.00	0.00	0.00
Economist	0.00	0.00	0.02	0.00	0.00	0.00
Electronic Gaming	0.00	0.00	0.00	0.00	0.03	0.00
Elle	0.00	0.00	0.00	0.02	0.00	0.04
Entertainment Weekly	0.00	0.00	0.02	0.02	0.00	0.00
Entrepreneur	0.00	0.00	0.00	0.02	0.00	0.00
Field and Stream	0.00	0.00	0.03	0.02	0.03	0.00
Fitness	0.00	0.00	0.00	0.00	0.00	0.04
Flex	0.00	0.00	0.00	0.00	0.03	0.00
Flight Training	0.05	0.00	0.00	0.00	0.00	0.00
Four Wheeler	0.00	0.00	0.00	0.00	0.03	0.04
Game informer	0.05	0.00	0.00	0.00	0.00	0.00
Gamefan	0.00	0.00	0.00	0.00	0.03	0.00
Gamepro	0.00	0.00	0.02	0.00	0.00	0.00
Games	0.15	0.10	0.00	0.02	0.00	0.00
Glamour	0.00	0.00	0.00	0.11	0.00	0.04
Golf	0.00	0.00	0.00	0.02	0.00	0.00
Golf Digest	0.05	0.00	0.00	0.00	0.00	0.00
Good Housekeeping	0.00	0.00	0.00	0.00	0.00	0.04
Guitar	0.00	0.00	0.02	0.00	0.00	0.00
Guitar World	0.00	0.10	0.00	0.00	0.05	0.00
High Times	0.00	0.00	0.00	0.00	0.03	0.00
Hit Parade	0.00	0.00	0.00	0.00	0.00	0.04
Horoscope	0.00	0.00	0.00	0.02	0.00	0.00
Horse and Rider	0.00	0.00	0.00	0.00	0.00	0.04
Horse Illustrated	0.00	0.00	0.00	0.02	0.03	0.00
Hotrod	0.00	0.00	0.02	0.00	0.00	0.00
Hunting Magazines	0.00	0.00	0.00	0.00	0.05	0.00
Hustler	0.05	0.00	0.00	0.00	0.00	0.00
Inquest	0.00	0.00	0.02	0.00	0.00	0.00
Inside Sports	0.00	0.00	0.02	0.00	0.00	0.00
Insider	0.00	0.00	0.02	0.00	0.00	0.00
International Gym.	0.00	0.00	0.00	0.02	0.00	0.00
Mac World	0.00	0.00	0.03	0.00	0.00	0.00
Mad	0.00	0.00	0.02	0.00	0.00	0.04
Madamoiselle	0.00	0.00	0.00	0.02	0.00	0.12
Minneapolis St. Paul	0.00	0.10	0.00	0.00	0.00	0.00
Minnesota Monthly	0.00	0.10	0.02	0.00	0.00	0.00
Model Airplane	0.00	0.00	0.02	0.00	0.00	0.00
Modern Design	0.00	0.10	0.00	0.00	0.00	0.00
Monthly Review	0.00	0.10	0.00	0.00	0.00	0.00
Motor Trend	0.05	0.00	0.00	0.00	0.03	0.00

Magazine	Relative Frequency of Magazines Read by the Groups					
	UMTY M	UMTY F	SCSU M	SCSU F	CAMB M	CAMB F
Motorbike Action	0.00	0.00	0.02	0.00	0.00	0.00
Motorcross Action	0.00	0.00	0.00	0.00	0.05	0.00
Multimedia World	0.00	0.00	0.02	0.00	0.00	0.00
Muscle Fitness	0.00	0.00	0.00	0.00	0.03	0.00
National Geographic	0.00	0.00	0.05	0.04	0.03	0.00
National Review	0.00	0.00	0.02	0.00	0.00	0.00
Natural History	0.00	0.00	0.02	0.00	0.00	0.00
Netguide	0.00	0.00	0.02	0.00	0.00	0.00
New Baby	0.00	0.00	0.00	0.00	0.00	0.04
Newsweek	0.05	0.20	0.12	0.02	0.05	0.04
Nintendo Power	0.00	0.00	0.02	0.00	0.00	0.00
None	0.15	0.00	0.14	0.11	0.14	0.16
Omni	0.05	0.00	0.00	0.00	0.03	0.00
Open Wheel	0.00	0.00	0.00	0.00	0.03	0.00
Outdoor Life	0.00	0.00	0.03	0.00	0.03	0.00
Parent	0.00	0.00	0.00	0.00	0.00	0.04
PC Computer	0.00	0.00	0.03	0.00	0.00	0.00
PC Gamer	0.00	0.00	0.02	0.00	0.00	0.00
PC Magazine	0.00	0.00	0.02	0.00	0.03	0.00
PC World	0.00	0.00	0.05	0.00	0.03	0.00
People	0.00	0.00	0.03	0.09	0.00	0.00
Pilot Training	0.05	0.00	0.00	0.00	0.00	0.00
Playboy	0.05	0.00	0.00	0.00	0.03	0.00
Playgirl	0.05	0.00	0.00	0.02	0.00	0.00
Popular Mechanics	0.00	0.00	0.02	0.00	0.00	0.00
Popular Science	0.05	0.00	0.00	0.00	0.05	0.00
Powder	0.00	0.00	0.00	0.00	0.03	0.00
Puzzle Magazine	0.00	0.00	0.02	0.00	0.00	0.00
QH Journal	0.00	0.00	0.00	0.00	0.00	0.04
Readers' Digest	0.00	0.00	0.05	0.13	0.00	0.00
RIP	0.00	0.00	0.00	0.00	0.00	0.04
Road and Track	0.00	0.00	0.02	0.00	0.00	0.00
Rolling Stone	0.00	0.00	0.02	0.00	0.11	0.04
Runners' World	0.00	0.00	0.02	0.02	0.00	0.00
Science Fiction Mag.	0.00	0.00	0.00	0.02	0.00	0.00
Scientific American	0.20	0.00	0.03	0.00	0.00	0.00
Scrye	0.00	0.10	0.03	0.00	0.00	0.00
Self	0.00	0.00	0.00	0.00	0.00	0.08
Seventeen	0.00	0.40	0.00	0.35	0.00	0.52
Shape	0.00	0.00	0.00	0.00	0.00	0.04
Shommerteck	0.00	0.00	0.00	0.00	0.03	0.00
Sierra Club	0.00	0.00	0.00	0.00	0.03	0.00
Skateboarder	0.00	0.00	0.00	0.00	0.03	0.00
Snowboarder	0.00	0.00	0.00	0.02	0.03	0.04
Snowgoer	0.00	0.00	0.00	0.00	0.03	0.00

Magazine	Relative Frequency of Magazines Read by the Groups					
	UMTY M	UMTY F	SCSU M	SCSU F	CAMB M	CAMB F
Soccer	0.00	0.00	0.00	0.00	0.00	0.04
Soldier of Fortune	0.00	0.00	0.00	0.00	0.03	0.00
Spin	0.00	0.00	0.00	0.00	0.05	0.00
Sports Illustrated	0.05	0.00	0.22	0.00	0.11	0.00
Sports News	0.00	0.00	0.02	0.00	0.00	0.00
Stereo Review	0.00	0.00	0.00	0.00	0.03	0.00
Swim World	0.00	0.00	0.02	0.00	0.00	0.00
Swimming	0.00	0.00	0.00	0.02	0.00	0.00
Team and Trail	0.00	0.00	0.00	0.00	0.00	0.04
Teen	0.00	0.10	0.00	0.24	0.00	0.24
Teen Quest	0.00	0.00	0.00	0.04	0.00	0.00
Tennis	0.00	0.10	0.05	0.06	0.00	0.00
Theater Art	0.00	0.10	0.00	0.00	0.00	0.00
Thrasher	0.00	0.00	0.00	0.02	0.05	0.00
Time	0.20	0.00	0.19	0.06	0.03	0.04
Tugline	0.00	0.00	0.00	0.00	0.00	0.04
US Cavalry	0.00	0.00	0.00	0.00	0.05	0.00
US News & World Report	0.00	0.10	0.03	0.00	0.00	0.00
Utne Reader	0.00	0.10	0.00	0.00	0.00	0.00
Vox	0.00	0.00	0.00	0.00	0.03	0.00
Watchtower	0.00	0.00	0.02	0.00	0.00	0.00
Windows	0.00	0.00	0.02	0.00	0.03	0.00
Wired	0.00	0.00	0.02	0.00	0.00	0.00
Wizard	0.00	0.00	0.02	0.00	0.05	0.00
Young and Modern	0.00	0.20	0.00	0.52	0.00	0.44
Young Miss	0.00	0.20	0.00	0.00	0.00	0.00
Totals	1.85	2.50	1.86	2.22	1.95	2.52