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ABSTRACT

A study was designed in which a battery of 11 selected instruments was given to 320 professional students (four classes) at the University of Illinois College of Veterinary Medicine to measure a variety of parameters of brain function and cognitive ability. Results were to be used to develop ability or competency profiles, to compare scores, to identify abilities and skills that contribute to success, and to build a database of information about students' information-processing skills. The primary conclusion reached after reviewing all the scores is that, in spite of the national concern over a perceived weakness in female performance in the sciences, females in the study population were equal on every measure to their male counterparts, as shown by their average scores. Too little information was available to draw any conclusions about minority students. It was also observed that students' progress in the preclinical portion of the curriculum could be enhanced by students' having a more detailed view of their learning-related abilities and by instructors' understanding and appreciation of the competencies that contribute to academic achievement. Thirty-seven figures illustrate study findings. (Contains 18 references.) (SLD)

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Uses of Measurement of Students' Potential for Professional Development in Veterinary Medicine

Nancy Bailey, Frank Maglione, Susan Beebe, John Wight

ED 371 003

While a need for determining the relevant variables which contribute to professional students' success both in their academic programs and in their professional development has always been present, a variety of factors impacting on veterinary medical educational programs have increased the necessity for understanding what those variables are and how they interact. For example, the national initiative for changing pre-clinical curricula in veterinary professional programs away from an instructional emphasis on rote learning and memorization toward the development of critical thinking and life-long learning skills has engendered an enhanced interest in the identification and matching of students' learning styles with changes in the delivery of the curriculum. Another national initiative in veterinary medical education, aggressive recruitment and proactive programs for retention of minority students into veterinary professional programs makes it necessary to understand more about each individual student's abilities and their relevance to success in the profession. Finally, the dramatic shift in the gender balance of students in the classrooms in veterinary medical professional programs over the last decade has caused veterinary medical educators to wonder whether or not adjustments need to be made to the professional education programs in order to accomodate this change in the demographics of the

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student population.

Other relevant issues include: faculty perception of a decline in the quality of applicants (thought by some to be a result of the recent dramatic shift in the gender balance of the student population from male to female); increase in the average age of veterinary students; the increasing scientific sophistication of curriculum content; and the diversification of opportunities for veterinarians to serve society. (Pritchard 1989) Each of these factors contributes to our need for a better understanding of the complex combination of cognitive and neuropsychological factors which play a role both in students' academic success in our programs as well as in students' long term success at building upon their professional education during a lifetime of career development.

While standard test scores, preveterinary grade point averages, and other elements used in the process of admitting students to veterinary professional programs have long been available for enhancing our understanding of students' abilities, it has become increasingly evident that additional quantitative data which reflect the profile of specific learning related skills and abilities that students bring to veterinary medical education programs would increase veterinary educators' abilities to provide more positive and proactive learning environments.

In 1986, a study was begun to address our need at the University of Illinois College of Veterinary Medicine to have a more precise picture of students' strengths and weaknesses in four broad categories of neuropsychological and cognitive functioning.

It was felt that information acquired from such a study could be a critical component of a developing program designed to address the needs of students who were failing in the curriculum, for analyzing whether or not our admissions process was providing the best possible screening of candidates with potential for long term success in the program and in the profession, and for determining whether or not the impact of a dramatic shift in the demographics of the student body might justify changes in the traditional patterns of curriculum and instruction.

Later it was realized that the information gathered in such a study might also be useful for assessing the potential of our students (selected on the basis of success in undergraduate curricula which largely reward memorization of facts) for adapting to modes of instruction calling for analytical and critical thinking processes and to the necessity for developing the skills for life-long learning beyond the formal academic curriculum.

Given the national climate of change in veterinary medical education and the local need to quantify our understandings about students' specific learning abilities, a study was designed in which a battery of 11 selected instruments was given to 320 (four classes of 80) professional students at the University of Illinois College of Veterinary Medicine for the purpose of measuring a variety of parameters of brain function and cognitive abilities and for using the results: 1) to develop ability or competency profiles of various cohorts of the students tested which would include gender comparisons of students' scores on each instrument by class; 2) to compare the mean scores and the

range of scores of all students on the tests across the full battery of 11 instruments in order to determine whether or not the population of students tested displayed relative strengths and weaknesses; 3) to find and map (if any) the specific aptitudes, abilities, and skills which might contribute to an individual student's success (or lack of it) in the professional program and to use that information as a basis for individual student's academic and career advising; and 4) to build a data base of information about the students' information processing skills sufficient in size to look for patterns or clusters of aptitudes which might be predictive of success in the academic program and in specific career choices.

An additional use for the results of the study which could be construed as relevant to the development of skills and abilities for critical thinking, life-long learning, and adjustment to a rapidly changing economic, social, and cultural environment could be:

5) the identification of relative amounts of *crystallized and fluid learning abilities* represented within the student population. (Lohman 1993)

Since in educational assessment it is not possible to be certain when an individual is using more than one ability when responding to a particular test item or to know the contribution of an individual's background or his or her intrapsychic state at the time of the test to the test's outcome, a wide variety of instruments was included in the test battery. (Engelhard 1988) The competencies revealed by the instruments fell into four categories and were spread throughout the battery. The four categories of cognitive and neuropsychological functioning covered by the instruments used in this study

were 1) *verbal and non-verbal reasoning and concept development abilities*, 2) *psychomotor skills*, 3) *memory*, and 4) *attention*. The instruments were administered both just prior to and during students' first semester in the four year professional program.

Methods/Data Source

After completing a pilot study conducted with a group of students who had been selected at random from across the four years of the professional program, 11 instruments for use in constructing profiles of students' abilities were identified for the study and all members of four classes of students beginning with the graduating Class of 1991 (students admitted to the professional program in the fall of 1987) were administered the battery of selected tests. Four of the instruments were given to students individually or in small groups as "paper and pencil" exercises completed during their admissions interview; the remaining seven tests were administered by a clinical neuropsychologist in individual sessions scheduled during the fall semester of each student's first year in the program. As a result of the pilot study the Minnesota Multiphasic Personality Inventory was discarded from the original test battery.

The location within the instruments of the four categories of cognitive and neuropsychological functioning originally sought in the study - *Reasoning/ Verbal and Non-Verbal; Psychomotor Skills; Memory; and Attention* - are indicated in the following descriptions by *italics*.

The instruments used in the study were:

I. Paper and pencil:

- A. Miner Vocabulary Test - a baseline vocabulary test consisting of 20 items with four multiple-choice synonyms. Tests *memory* as well as discrimination, ability to generalize, education (timed - 7 minutes);
- B. Army General Classification Test - this study utilized only the 50 block counting items from the original test given to over 10 million men involved with the armed services from 1940 -'45. Requires concentration (*attention*), visual/spatial abilities, (*non-verbal reasoning*), basic math skills, speed, and accuracy (timed -15 minutes);
- C. Terman Concept Mastery - Part I: Synonyms and Antonyms - a highly discriminating test of vocabulary and Part II: Analogies - a test of *verbal reasoning* and concept analysis skills. Terman devised this test to retest the subjects who attained scores of 140 and above on the original Stanford-Binet Intelligence test when they were children (untimed);
- D. Ravens Progressive Matrices - test consists of progressively complex designs with one piece missing - the correct completion piece is selected from six or eight choices provided. Requires spatial skills, recognition of design, abstract skills, and the ability to recognize numerical and spatial relationships/ *non-verbal reasoning* (timed - 40 minutes)

II. Individually administered:

- A. WAIS Digit Span - a test of short term *memory*, *attention span*, ability to concentrate, freedom from distractibility and anxiety. In this test, pairs of numbers in series are given which must be repeated in the same order starting with a series of three digits and working up to nine digits. In addition, seven pairs of the series are repeated in reverse order from that given. Score is the total number of successful trials repeated. (One of six tests on Wechsler Adult Intelligence Scale (WAIS-R) which produce the Verbal IQ) (untimed);
- B. WAIS Block Design - a test of ability to organize visual-spatial material using visual-motor integration (*psychomotor skills*) , and visual (*non-verbal*) reasoning, speed, and *attention*. (one of five tests which produce the Wechsler Performance IQ) (timed);
- C. Rhythm Test - a subtest of the Seashore tests of Musical Talent; tests alertness, sustained *attention*, short-term auditory *memory*.
Consists of 30 pairs of rhythmic beats which must be differentiated from one another as to similarities or differences (untimed);
- D. Tactual Performance Test (including *memory*, localization, and dominant, non-dominant, and both hands times) - Used a modification of the Sequin-Goddard form board. Blindfold obscures form board and blocks from test taker. Task includes fitting blocks into the proper space on the board using preferred hand, nonpreferred hand, and both hands. Time is the sum of all three trials. Measures *psychomotor skills* including tactile

form discrimination, kinesthetic ability, manual dexterity, and spatial visualization ability (timed);

- E. Halstead Category Test - measures concept formation abilities including postulating hypotheses that appear reasonable with respect to recurring similarities and differences in the stimulus material and testing hypotheses with respect to positive or negative reinforcement; indicates ability to learn in area of nonverbal concept formation. Score represents total number of errors. Provides a measure of *non-verbal reasoning*, *attention*, and ability to learn (timed);

- F. Alpha Task - requires subject to recite the alphabet as quickly as possible while putting a successively higher number in front of each letter. It requires the ability to integrate two common lists at the same time with few errors. Measures *memory*, *attention*, mental agility, accuracy. Score represents number of seconds; adjusted alpha time represents an added penalty by adding 0.5 of the standard deviation of the group time for each error (timed);

- E. Subtraction Task - Subject is asked to count down from 100 by sevens until stopped (at 51). Reflects *memory*, *attention*, speed, accuracy. Errors are added to the time in seconds as with the Alpha Task by adding 0.5 standard deviation of the group time for each error (timed).

(The Category Test, Rhythm Test, and Tactual Perception Test are a part of the Halstead-Reitan Neuropsychological Test Battery.)

In the following chart the same four categories (**Reasoning/Verbal & NonVerbal, Memory, Attention, & Psychomotor Skills**) are shown in relation to the specific instruments which were used to determine the students' competencies in these areas:

	<u>Reason(V)</u>	<u>Reason(NV)</u>	<u>Memory</u>	<u>Attention</u>	<u>PsySkills</u>
<u>Vocabulary:</u>	<i>Reason (V)</i>		<i>Memory</i>		
<u>Concept</u>					
<u>Mastery:</u>	<i>Reason(V)</i>				
<u>Digit Span:</u>			<i>Memory</i>	<i>Attention</i>	
<u>Seashore:</u>			<i>Memory</i>	<i>Attention</i>	
<u>AGCT:</u>		<i>Reason(NV)</i>		<i>Attention</i>	
<u>Block</u>					
<u>Design:</u>		<i>Reason(NV)</i>		<i>Attention</i>	<i>Psy/Skills</i>
<u>Category:</u>		<i>Reason(NV)</i>		<i>Attention</i>	
<u>Ravens:</u>		<i>Reason(NV)</i>			
<u>Tactual</u>					
<u>Percept:</u>			<i>Memory</i>		<i>Psy/Skills</i>
<u>Alpha/Task:</u>			<i>Memory</i>	<i>Attention</i>	
<u>Subtr Task:</u>			<i>Memory</i>	<i>Attention</i>	

Results

During the analysis of the full complement of data, three additional measures for each of the tested students, undergraduate ("prevet") gpa, score on the Veterinary Aptitude Test (VAT), and the end of the second year gpa (basic sciences coursework in the professional program) were added to the profiles. (Figures 0.0 - 0.1) To date the results of the study have been used: 1) to develop profiles of each classes' raw and converted percent scores on each instrument with gender comparisons; 2) to compare the performance of all students on the 11 different instruments with gender comparisons; 3) to provide feedback to individual students on their test performance for their use in facilitating their success in the curriculum; and 4) as a basis for considering the development of longitudinal studies of the tested students' professional development.

It was hoped that specific individual instruments chosen for the study might stand out as predictive of various kinds of academic performance in the professional program but so far that has not been found to be the case.

Class Profiles/ Gender Comparisons:

Using average raw scores and percent scores, analysis of the full complement of data (scores of students in the classes of 1991, '92, '93, and '94 on all test instruments plus preveterinary gpa, VAT, and end of the 2nd year gpa) shows a high congruence from class to class of female and male students' scores on each measure (Figures 1.0 -2.3); a similar congruence of frequency distributions compared by gender for each

measurement for the entire test population, (Figures 3.0 -3.21); and a virtual congruence of the average raw and converted percent scores of the entire test population on all measures across the four classes (Figures 4.0 - 4.1).

Whole Population Profile/Gender Comparisons:

Using averages of both raw scores and percent scores for each measure, comparison of the genders across the entire population shows a very high congruence of performance for females and males on each of the instruments administered in the study as well as on the two grade point averages included in the data and on the VAT (Figures 5.0 - 5.1).

Multiple Instrument Comparison:

A comparison of the range and average scores of all students using percent scores for the 11 different instruments shows that with the exception of verbal reasoning abilities as demonstrated by their scores on the Terman Concept Mastery, both male and female students display high abilities in non-verbal reasoning, memory, attention, and psychomotor skills. At this point, there is no immediately obvious explanation for the pervasive low performance of students of both genders in all four class cohorts on the Terman Concept Mastery compared to their performance on other instruments (Figures 6.0 - 6.2) and no way of knowing whether or not another measure of verbal reasoning would produce a different performance profile on this competency.

It is possible, however, that the Terman Concept Mastery instrument suffers from the same shortcomings as the SAT which has been shown to measure cultural advantage

rather than ability. (Fish 1993)

When the Terman scores (both male and female) are compared to the students' grade point averages, both prevet and professional, their performance on the non-verbal reasoning measures (AGCT, Block Design, Category, and Ravens Progressive Matrices), and the Tactual Perception Test, it does seem clear that overall the admissions process used at the University of Illinois College of Veterinary Medicine selects for students whose strengths lie in the areas of nonverbal reasoning and psychomotor skills and that introduction of curricular content calling for high levels of verbal reasoning would have to be done with a great deal of support for students who were admitted to the professional program using the same criteria as was used to select the test population.

The data, therefore, may be suggesting that there is a necessity to search for an additional admissions criteria which would select for students with more strength in the area of verbal conceptual analysis. This issue is relevant to attempts to move the basic sciences portion (first two years) of the program away from an instructional emphasis on rote learning and toward the introduction of concept analysis and problem-solving exercises.

Feedback to Individual Students:

Each year at the end of the testing cycle (when all students in a class had been tested and their scores recorded), the students met as a class and were given their individual

profiles, the total number of possible points for each instrument, the mean and range test scores for their class, and information on how to understand and use their personal profiles for enhancing their learning experiences in the program. For example, students whose Tactual Perception, AGCT, and Block Design scores were high relative to their Vocabulary, Digit Span, and Seashore could expect to be more comfortable using their spatial reasoning competencies and experiencing hands-on learning in the clinical portion of the curriculum than they would be in the more abstract, verbally based lecture courses.

As a result of learning the outcome of their performances on the study instruments, students were encouraged to minimize concern about moderate performance in courses which challenged areas in which they were relatively weak (e.g., if their low grades in surgery courses corresponded to low performance on the Tactual Perception Location and Block Design tests), to approach studying differently on the basis of their relative strengths and weaknesses (e.g., audio taping of lectures for future reference if scores of auditory memory and attention on the Seashore and Digit Span were low), and to anticipate good performance in courses which related to their strengths.

As the testing progressed over the four years of the study, two students were counseled out of the professional program on the basis of both their performance in the curriculum and their test score profiles and in several instances reluctant faculty were persuaded to give students an opportunity for reexamination (using a different

testing methodology) in failed courses on the basis of the students' strong performances on relevant study instruments.

In the cases where faculty were persuaded to give students reexaminations using alternate means of evaluation, the ability to quantify the student's learning abilities independent of their scores on prior course examinations provided a quantitative basis for making decisions about how best to proceed in supporting those students' professional development. (In one case, a student who was a participant in a special access program for minority students was retested and retained on the basis of her test scores which were all above the averages for her class). See Figures 7.0 - 7.3 for examples of individual ability profiles.

Longitudinal Studies: Our intention is to begin in 1996 with a "five year out" review of the career status of the Class of 1991 and to continue collecting relevant career information on members of the four classes at regular intervals. The concept of learning abilities located along a continuum of crystallized to fluid abilities as first described in Cattell's (1963) work is very relevant to the necessary changes away from veterinary medical curricula which emphasize rote learning in the basic science (pre-clinical) portion of the program toward the development of preclinical courses which foster problem-solving skills and life-long learning attitudes among an increasingly diverse cohort of veterinary students. (Lohman 1993) For example, it would be especially interesting to determine whether or not there is a relationship between male and female students' scores along the crystallized/fluid ability continuum and

their development as leaders in the profession.

Since the instruments used in this study could be categorized in a range from tests of crystallized abilities to assessments of fluid abilities, we may have an opportunity to see where the tested students' strengths and weaknesses lie along this continuum. Crystallized abilities are measured by tests which have little or no informational content but require the ability to see relationships (e.g., Ravens Progressive Matrices); fluid abilities are measured by tests of acquired knowledge such as vocabulary. (Goldstein 1990)

At present the plan for the longitudinal study is that the scores on the Terman Concept Mastery/Synonyms and Antonyms and the Miner Vocabulary would be used as measurements of crystallized abilities and the scores on the Terman Concept Mastery/Analogies, Halstead Category, and Ravens Progressive Matrices as measures of fluid abilities.

Conclusions

The primary conclusion reached after reviewing all of the scores generated by the study is that in spite of the national concern for a perceived weakness in female performance in the sciences, as reflected by their average scores, female students in the population tested were equal on every measure to their male counterparts. Since veterinary medicine is essentially an applied biomedical science, this finding is an important response to those teaching faculty who felt that the influx of women students

into the professional program was causing a significant decline in the quality of the profession. This finding is also significant in light of the lower overall average salaries of women veterinarians which some have cited as proof of the weaker abilities of women to be veterinarians.

The number of minority students participating in the study was too small (7) to make a similar statement about that cohort of students. However it could be hypothesized on the basis of the one case cited that the scores of minority students who have been admitted to veterinary medical professional programs would not be significantly different than the average of the entire population.

During the course of the study it was observed that individual student's progress in the pre-clinical portion of the professional curriculum could be enhanced by students' having a more detailed view of their learning-related abilities as measured by the study instruments and by instructors' understanding and appreciation of the complex matrix of competencies which contribute to an individual's academic achievement.

These findings are important to the veterinary medical profession because its educational programs, the sole source of new professionals, have the responsibility to meet the needs of a rapidly changing society by educating a diverse group of veterinarians who can successfully adapt and enlarge their fund of knowledge and skills in order to continue to serve society long after graduation. As the diversity of the student population increases at a faster rate than the diversity of the teaching faculty,

information used in making decisions about individual student's potential for success in the curriculum and in the profession must be based on more than the intuition or previous experience of the instructor.

With the rising costs of professional education, the increased time spent in pre-professional educational preparation, the unknowns introduced by the changing demographics of the student body, and the need of the profession for developing life-long learners, "life experience" and trial and error learning are no longer acceptable as the sole sources of information available to students' for discovering their potential for success in professional academic programs and in their veterinary careers.

In addition, the results of measurements of students' cognitive and neuropsychological aptitudes made in this study have enhanced our ability to understand the impact of the influx of women into the professional programs in terms of their abilities on a variety of relevant learning competencies, to provide a more positive professional learning environment based on those understandings, and to develop a professional program which can attempt to meet students' actual rather than perceived needs.

Finally, it is anticipated that these results will also provide an important baseline from which to develop longitudinal studies of participants' career trajectories, patterns of commitment to life-long learning, long term professional adaptation to social and economic change, and commitment to their professional development as veterinarians.

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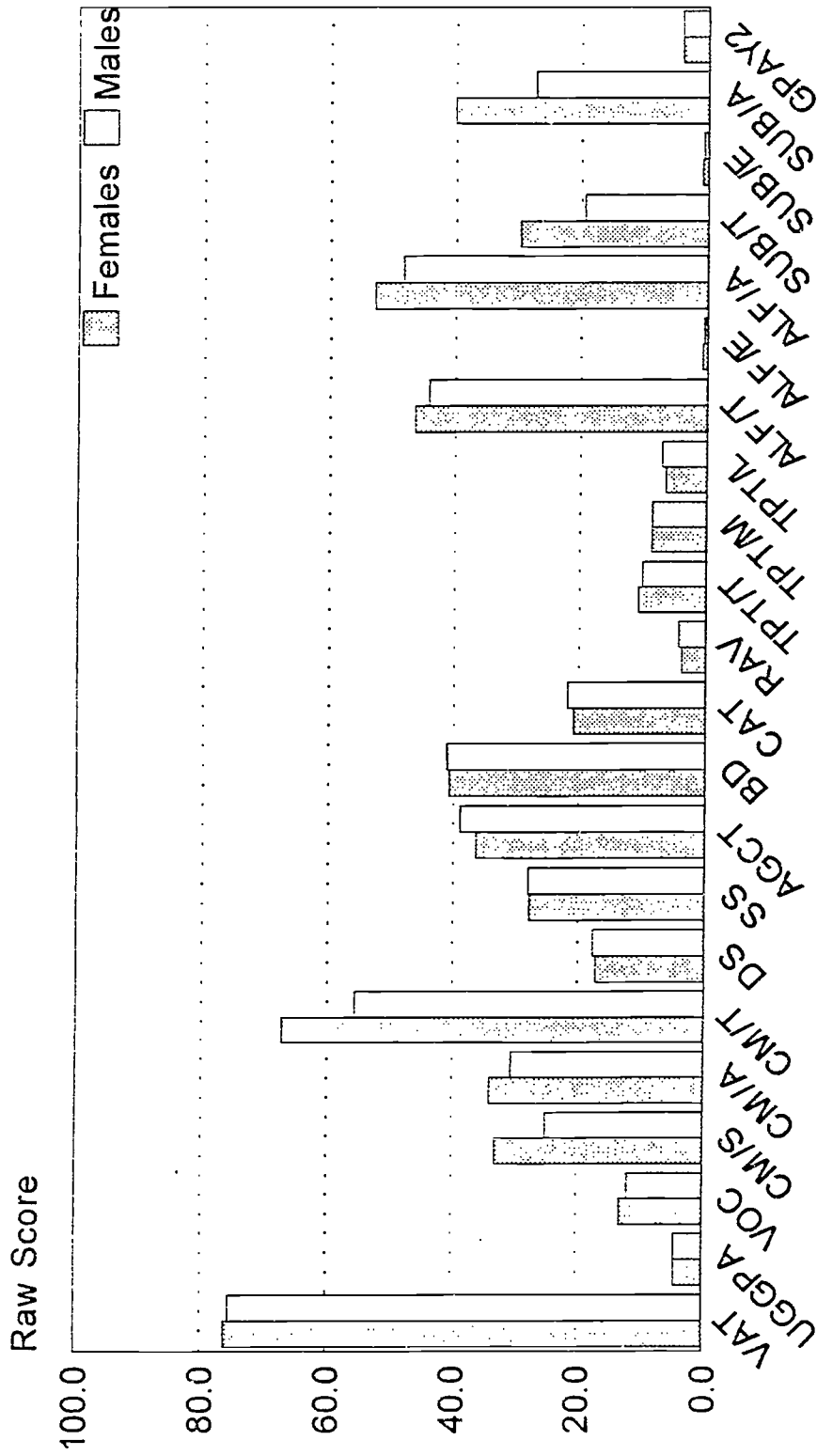
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Comparison of Gender Average Scores

Within Each Instrument - Class of '91

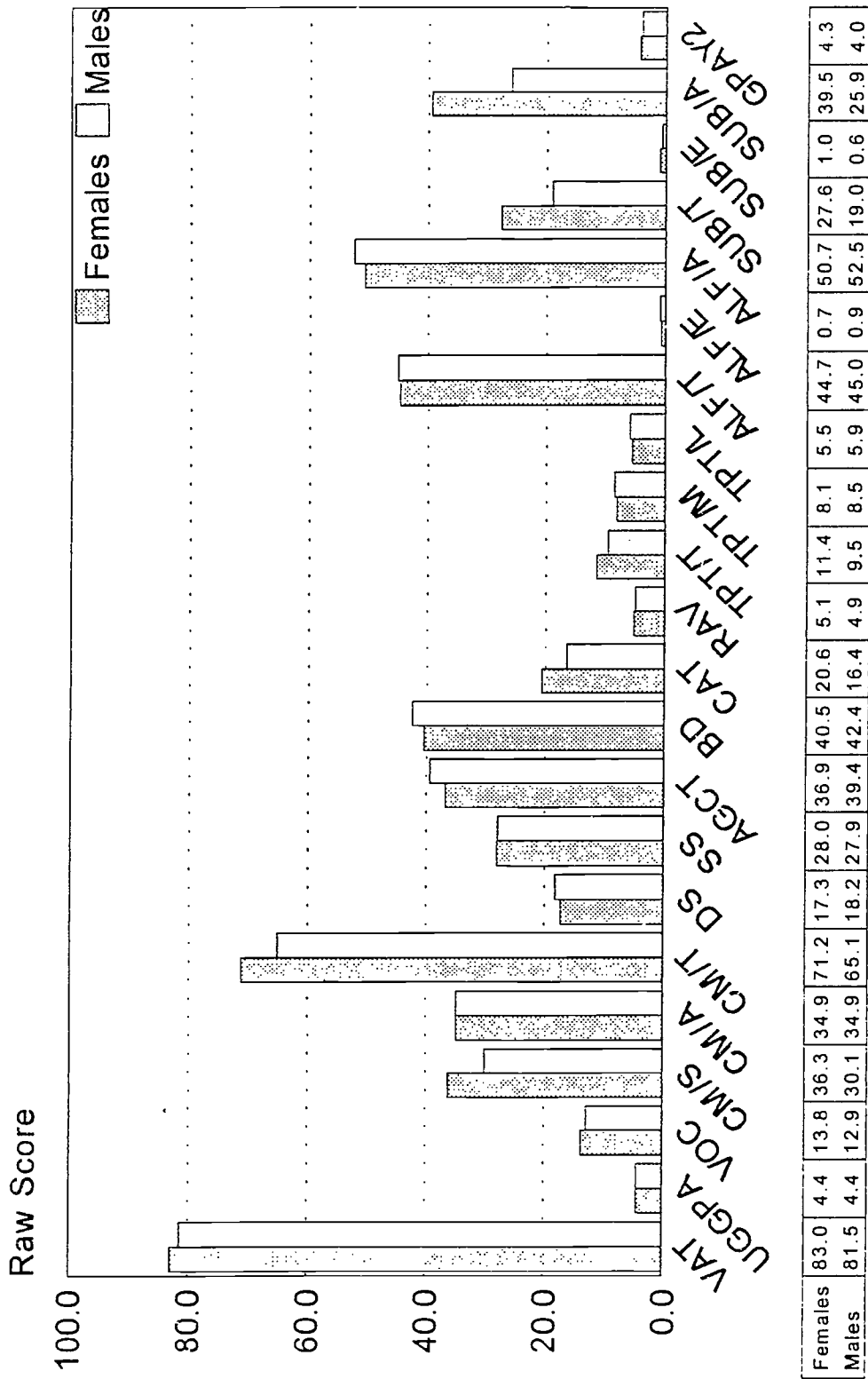


Instrument	Females	Males
VAT	76.2	4.4
UGPA	75.5	4.5
VOC	13.1	11.9
CM/S	33.1	25.0
CM/A	34.1	30.6
CM/T	67.2	55.6
DS	17.2	17.6
SS	27.7	27.9
AGCT	36.4	38.9
BD	40.7	41.0
CAT	20.8	21.7
RAV	3.8	4.3
TPTT	10.7	10.0
TPTM	8.6	8.5
TPTL	6.4	7.0
ALFT	46.3	44.1
ALFE	0.8	0.5
ALF/A	52.8	48.3
ALF/I	29.6	19.4
SUBT	0.9	0.6
SUB/E	40.1	27.2
SUB/A	4.0	4.1
GPAY2		

Figure 1.0

Comparison of Gender Average Scores

Within Each Instrument - Class of '92

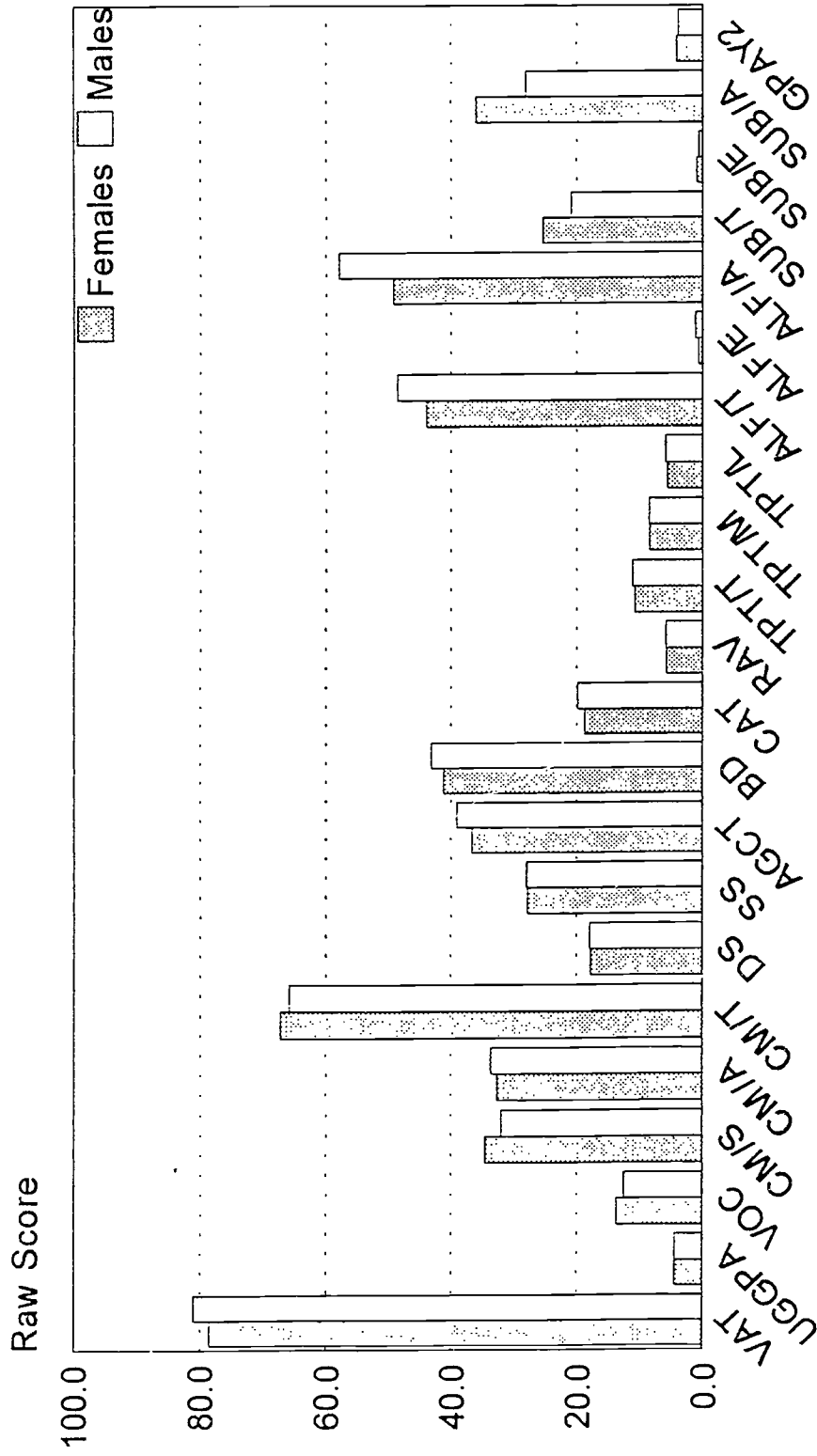


Instrument

Figure 1.1

Comparison of Gender Average Scores

Within Each Instrument - Class of '93

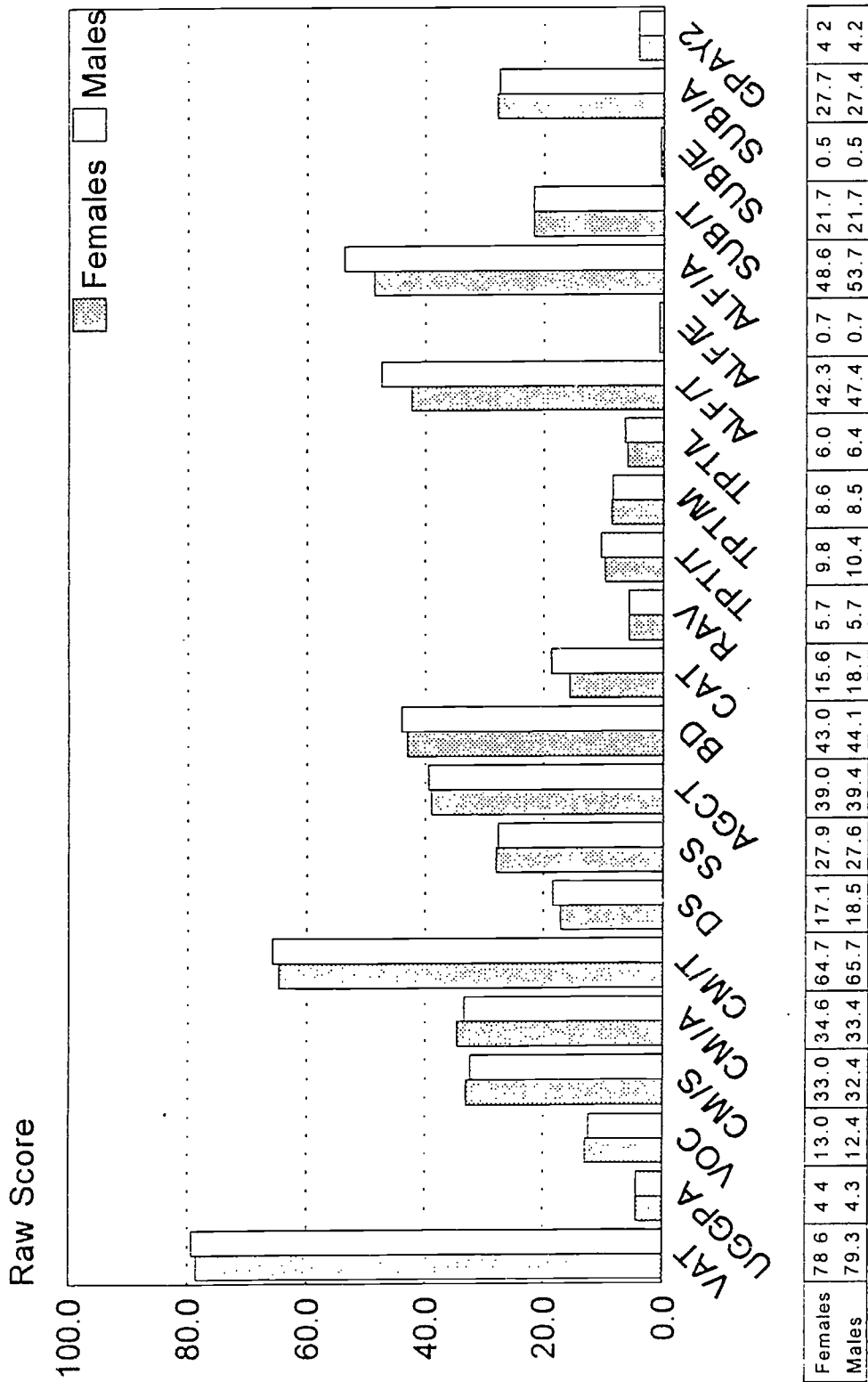


Instrument	Females	Males
VAT	78.5	4.4
UGPA	4.4	4.4
VOC	13.6	12.4
CMIS	34.6	32.1
CMIA	32.7	33.7
CMT	67.3	65.8
DS	17.7	17.9
SS	27.8	27.9
AGCT	36.7	39.0
BD	41.2	43.1
CAT	18.7	19.8
RAV	5.7	5.8
TPTT	10.7	11.1
TPTM	8.4	8.5
TPTL	5.6	5.9
ALFT	43.9	48.4
ALFE	0.6	1.1
ALFIA	49.2	57.9
SUBT	22.3	20.9
SUBE	0.9	0.6
SUBIA	36.0	28.0
GPAY2	4.1	3.9

Figure 1.2

Comparison of Gender Average Scores

Within Each Instrument - Class of '94

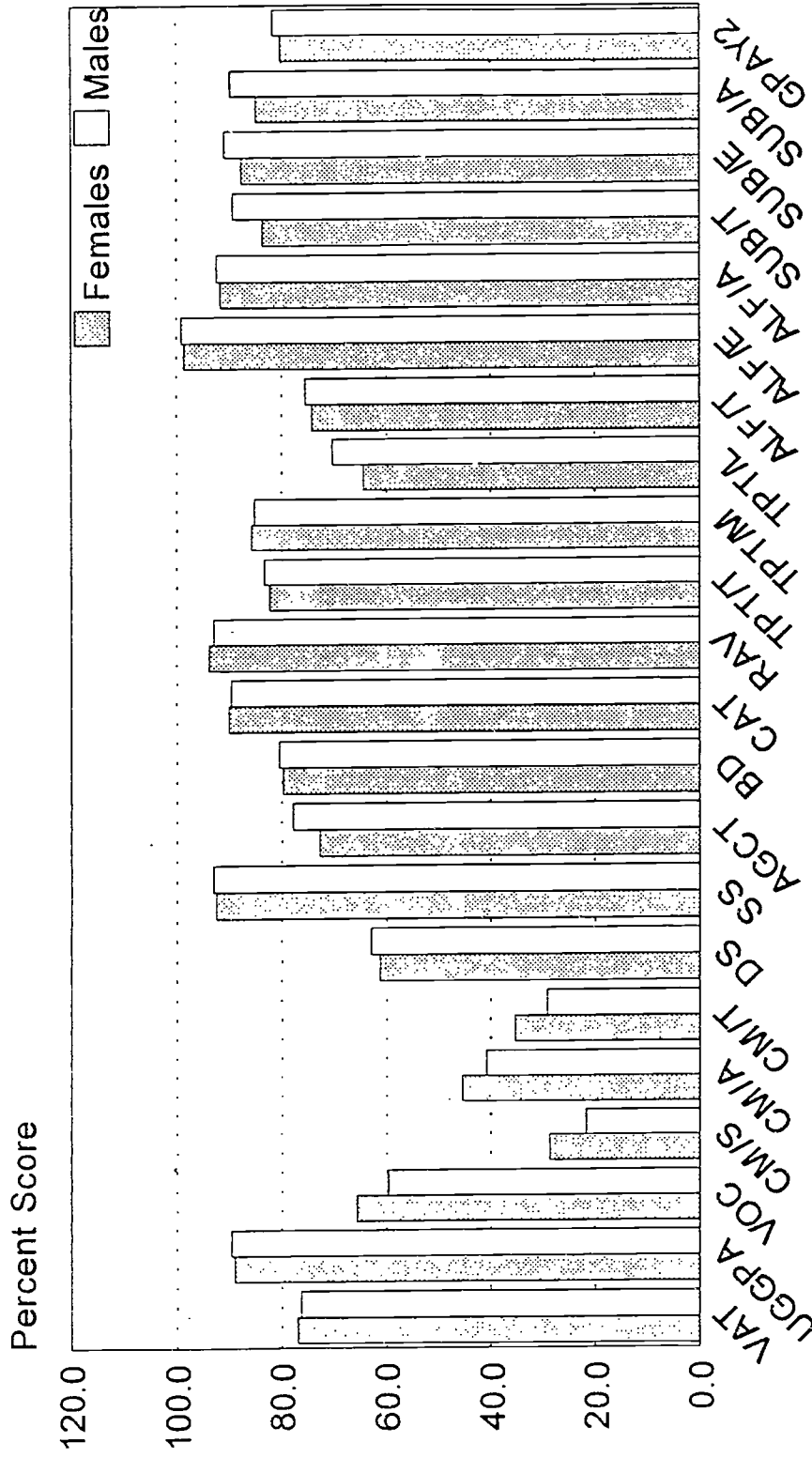


Instrument

Figure 1.3

Comparison of Gender Average Scores

Within Each Instrument - Class of '91

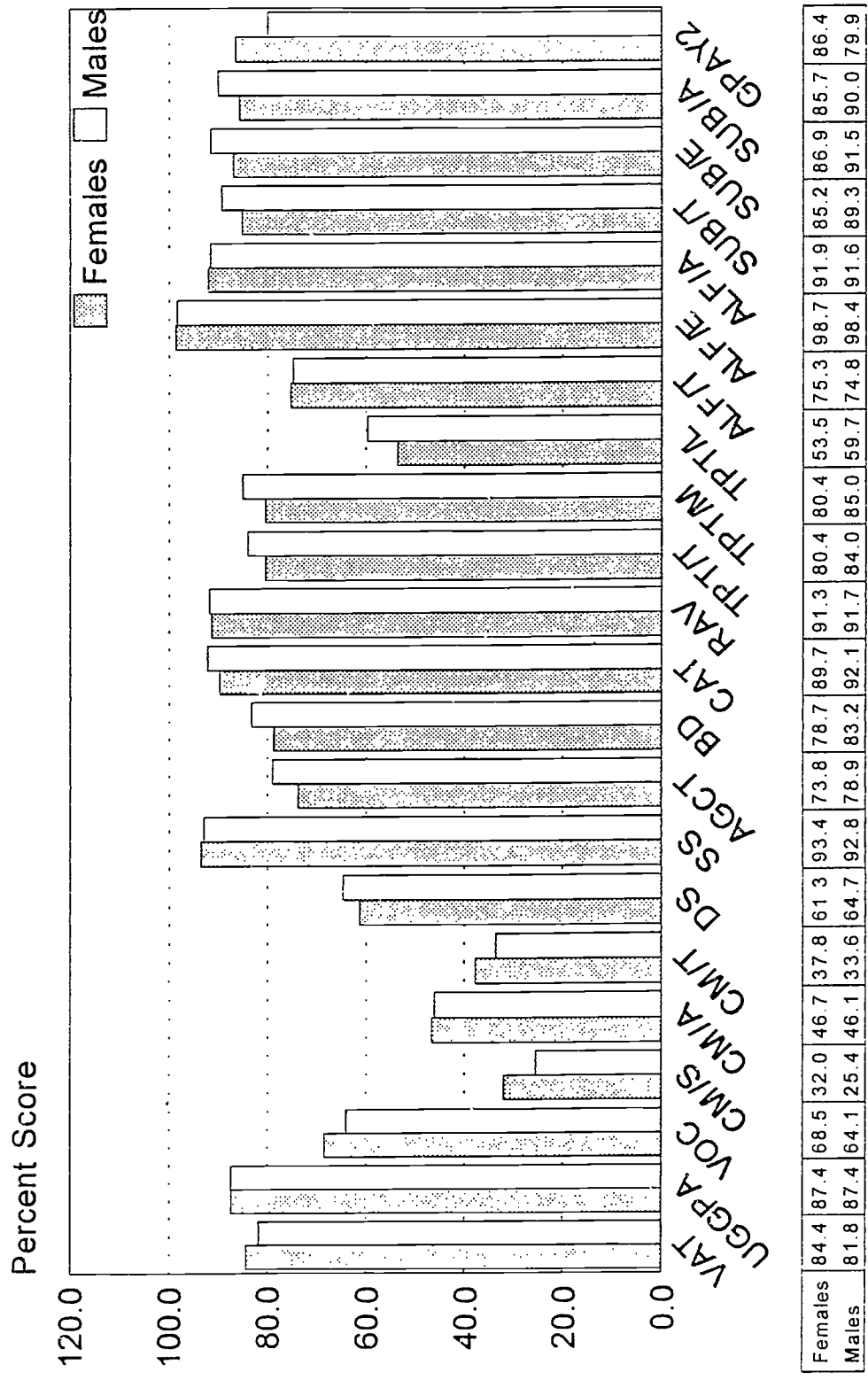


Females	77.0	89.0	65.7	28.8	45.5	35.4	61.3	92.4	72.8	79.7	90.0	93.7	82.2	85.7	64.3	74.3	98.5	91.5	83.6	87.6	84.8	80.2
Males	76.3	89.5	59.7	21.7	40.9	29.3	62.9	92.9	77.9	80.5	89.5	92.8	83.3	85.2	70.3	75.5	99.1	92.3	89.2	90.8	89.7	81.6

Figure 2.0

Comparison of Gender Average Scores

Within Each Instrument - Class of '92

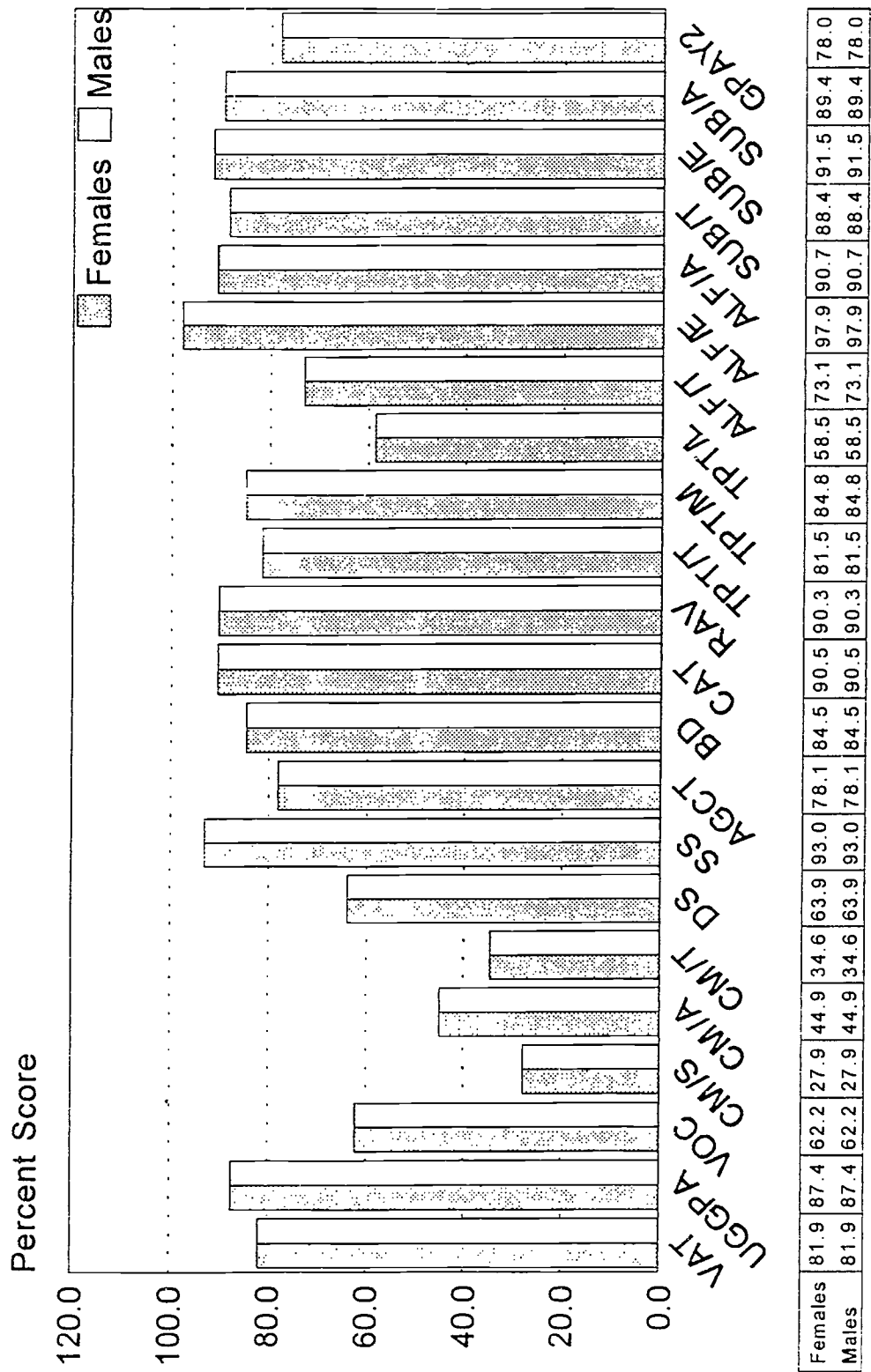


Instrument

Figure 2.1

Comparison of Gender Average Scores

Within Each Instrument - Class of '93

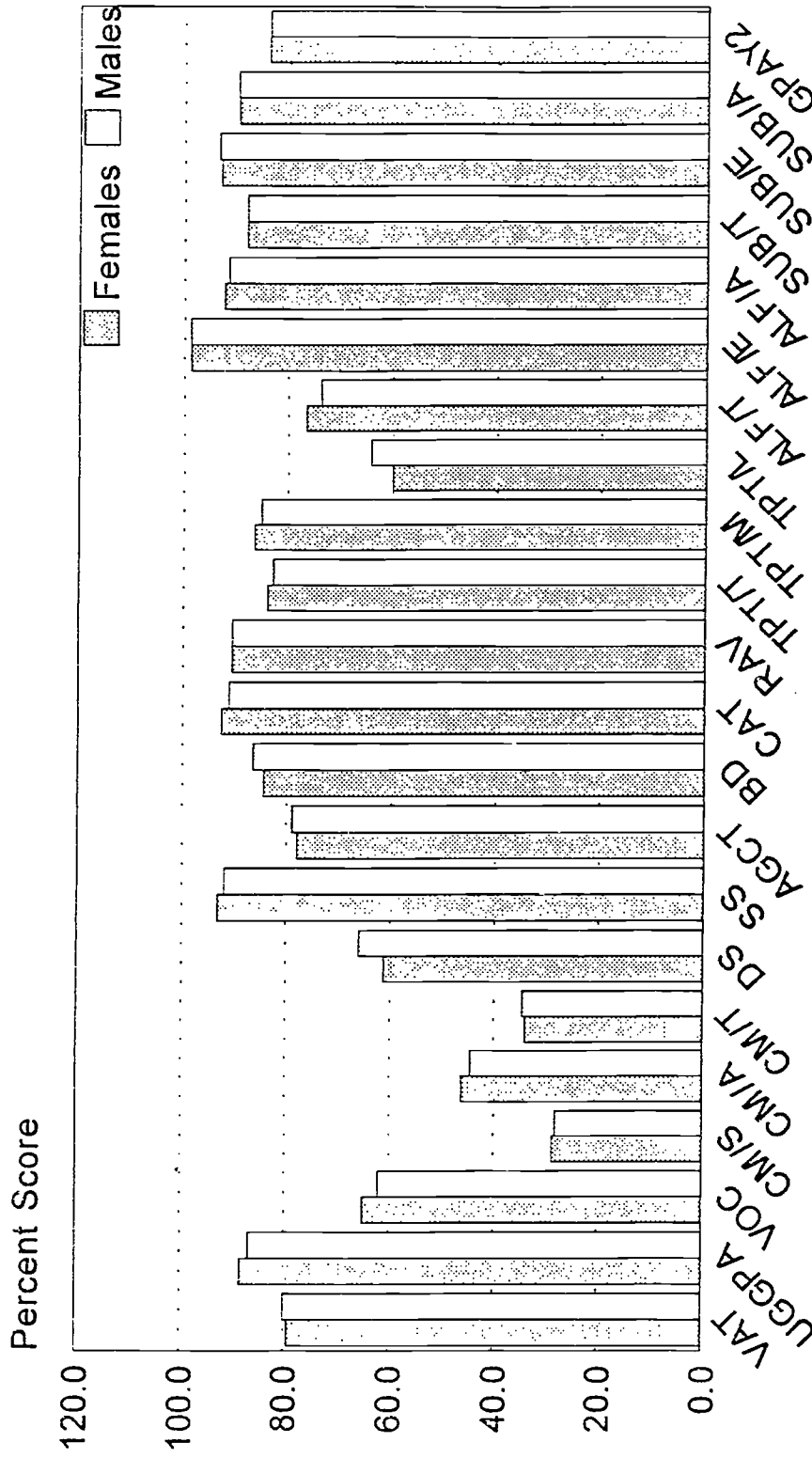


Instrument

Figure 2.2

Comparison of Gender Average Scores

Within Each Instrument - Class of '94



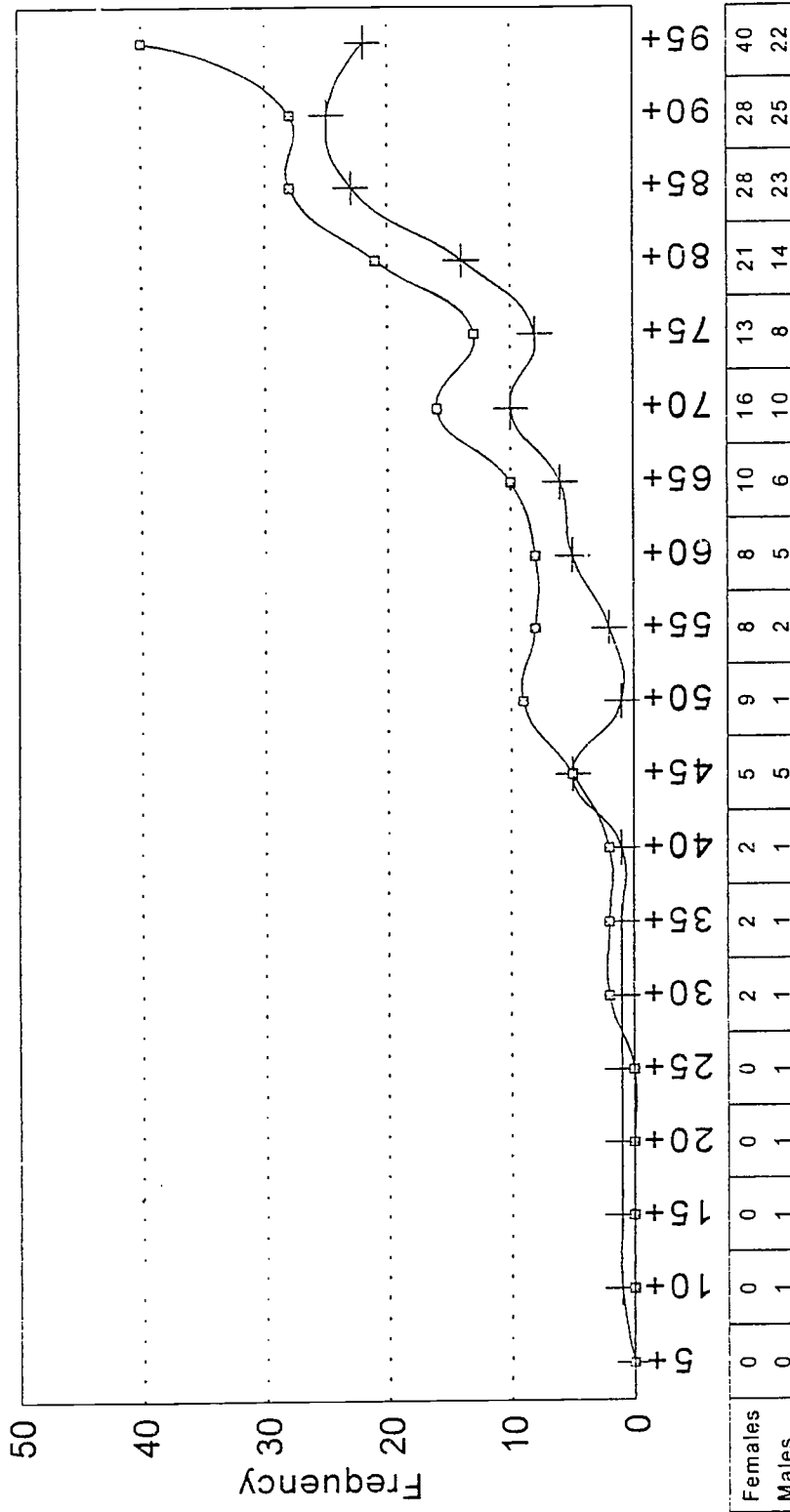
Females	79.4	88.5	65.0	28.7	46.2	34.1	61.2	93.0	77.9	84.4	92.5	90.5	83.7	86.3	60.0	76.5	98.6	92.2	87.9	92.9	89.5	83.8
Males	80.1	86.8	62.1	28.1	44.5	34.6	66.0	91.9	78.9	86.4	91.0	90.4	82.7	85.0	64.1	73.6	98.6	91.4	87.9	93.3	89.6	83.7

Instrument

Figure 2.3

Veterinary Aptitude Test

Frequency Distribution - Raw Scores



Score (Range 0-99)

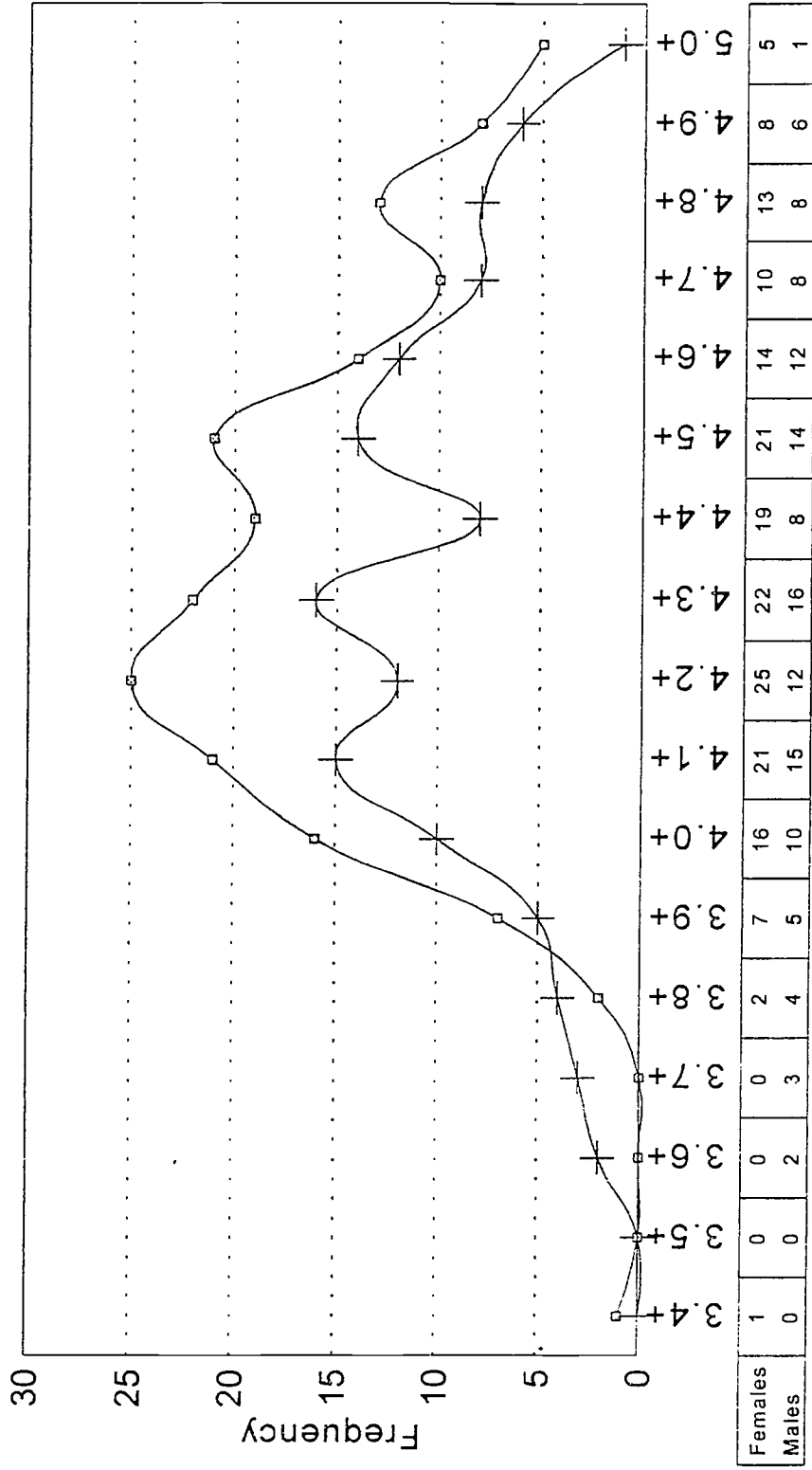
□ Females + Males

41

Figure 3.00

Undergraduate Grade Point Average

Frequency Distribution



Score (Range 0 - 5.0)

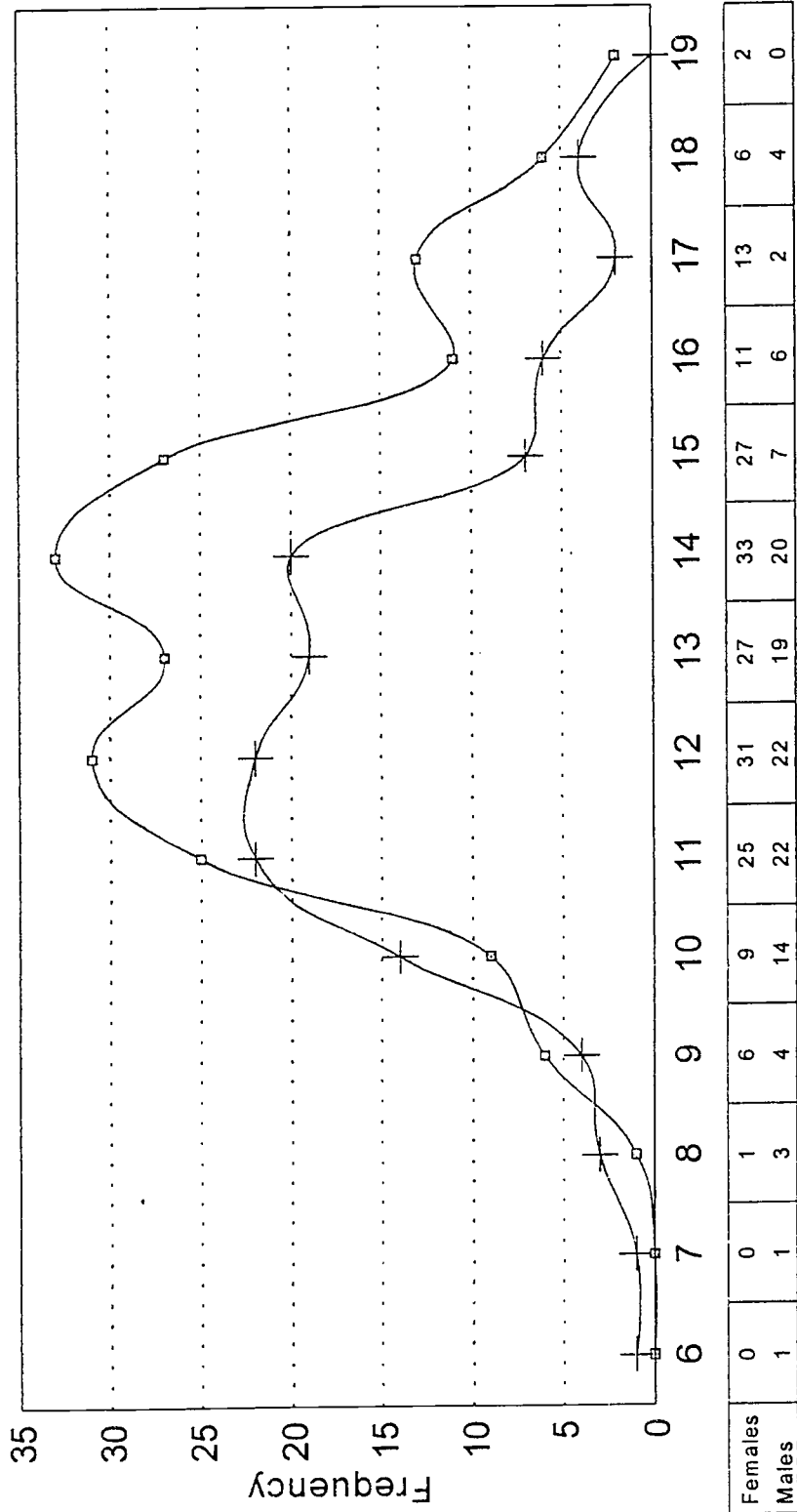
43

□ Females + Males

Figure 3.01

Vocabulary Test

Frequency Distribution - Raw Scores

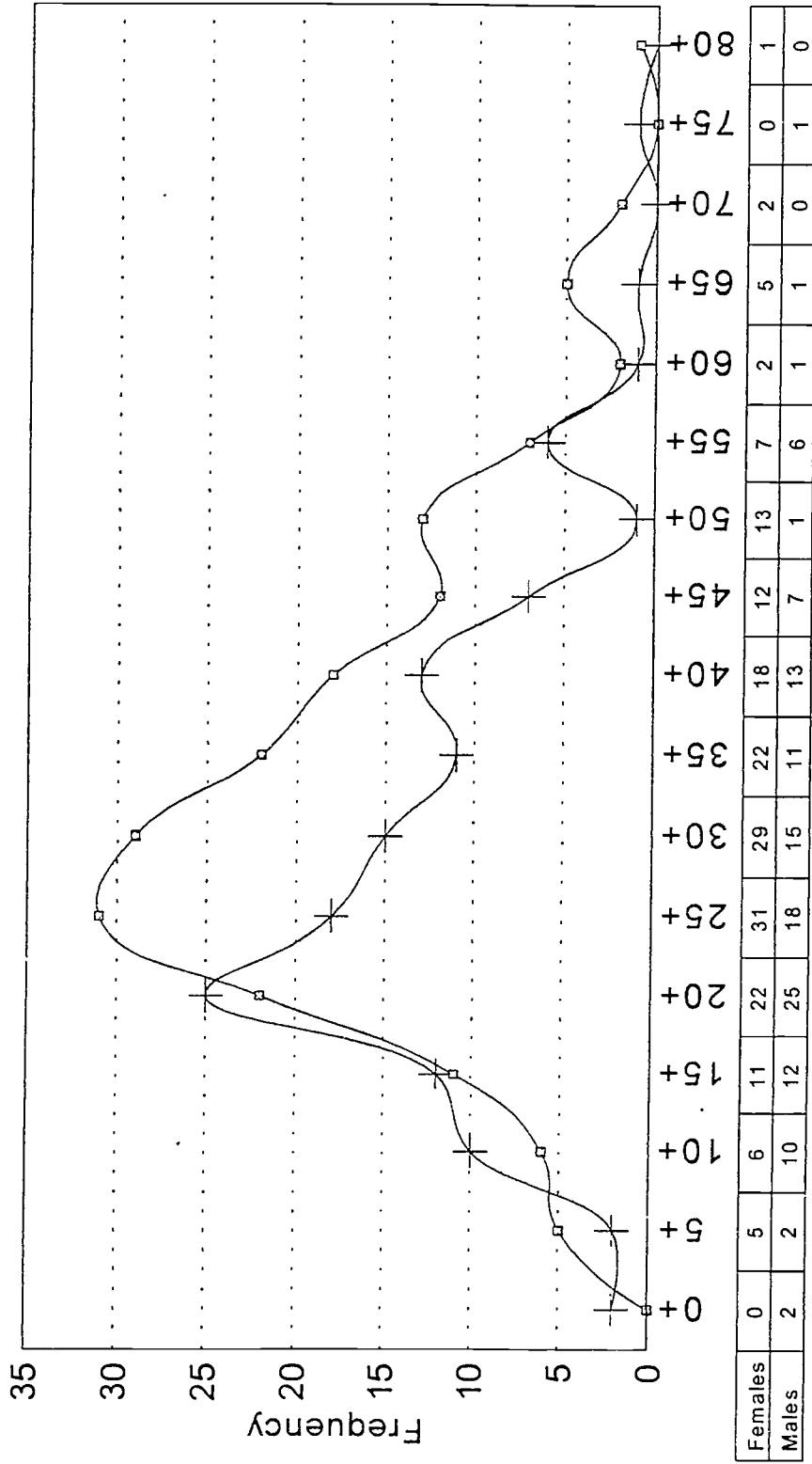


Score (Range 0 - 20)

-□- Females + Males

Terminology Concept Mastery (Synonyms)

Frequency Distribution - Raw Scores



Scores (Range 0 - 115)

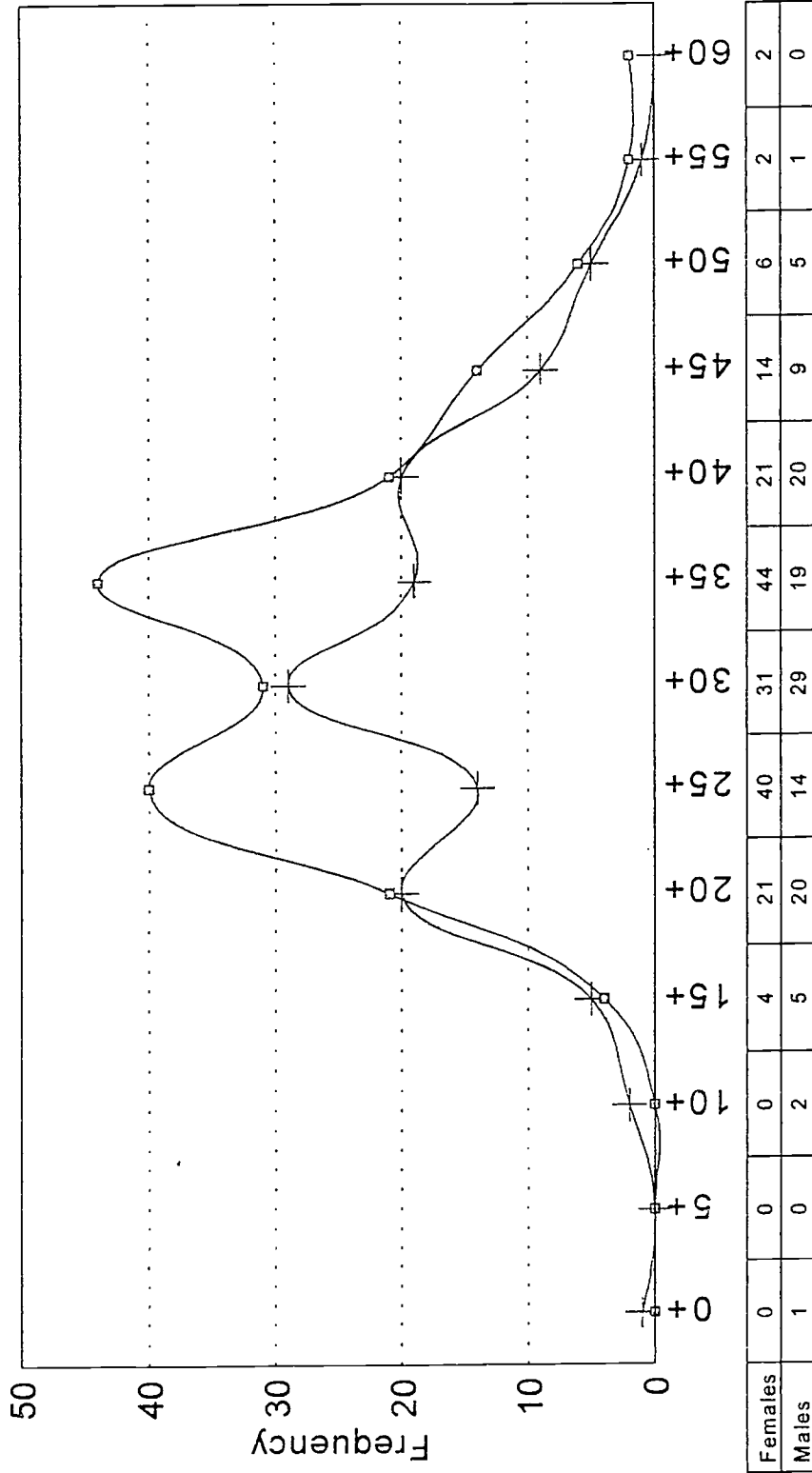
47

□ Females + Males

Figure 3.03

Terman Concept Mastery (Analogies)

Frequency Distribution - Raw Scores

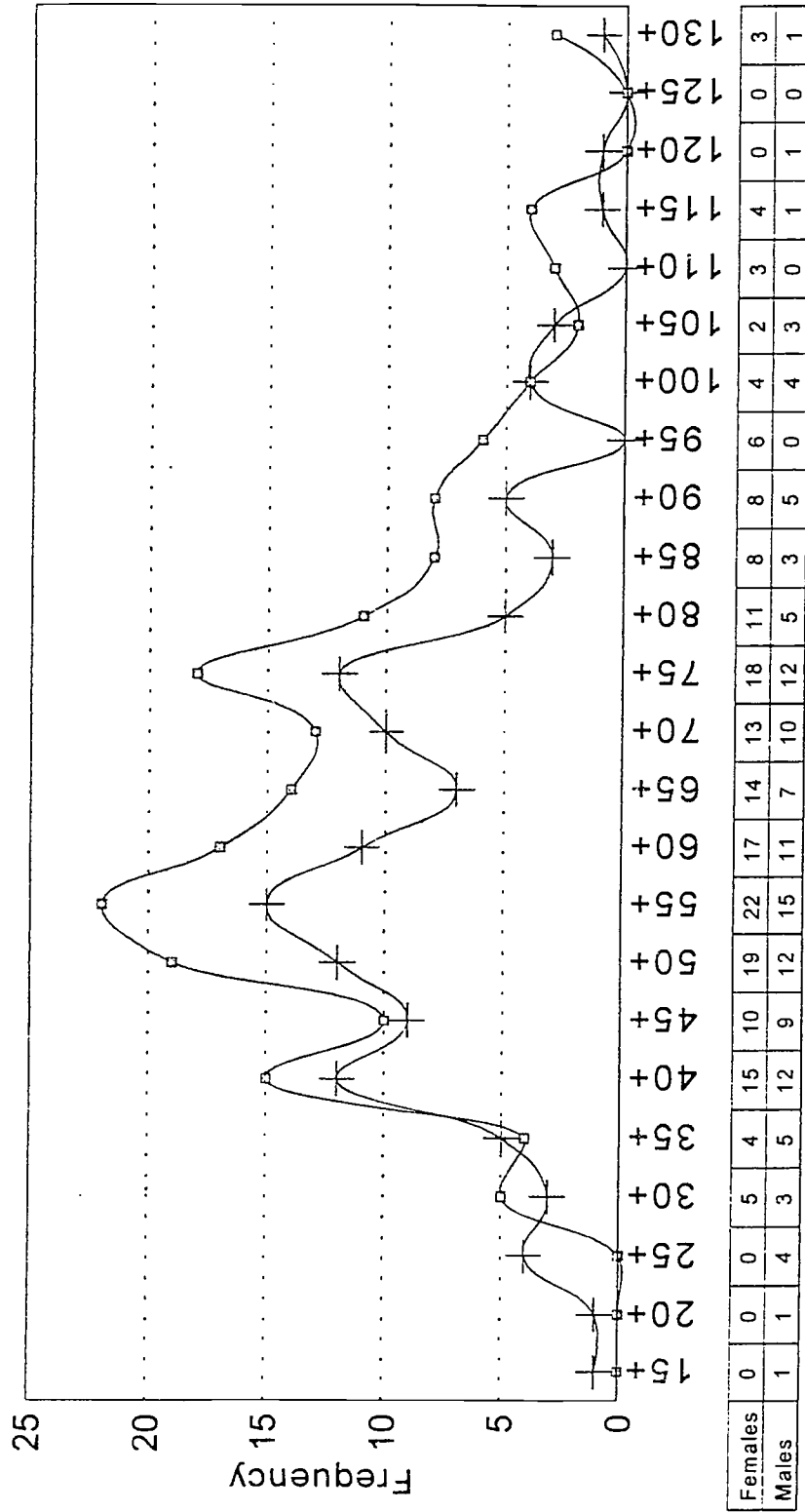


Scores (Range 0 - 75)

□ Females + Males

Terman Concept Mastery (Total)

Frequency Distribution - Raw Scores

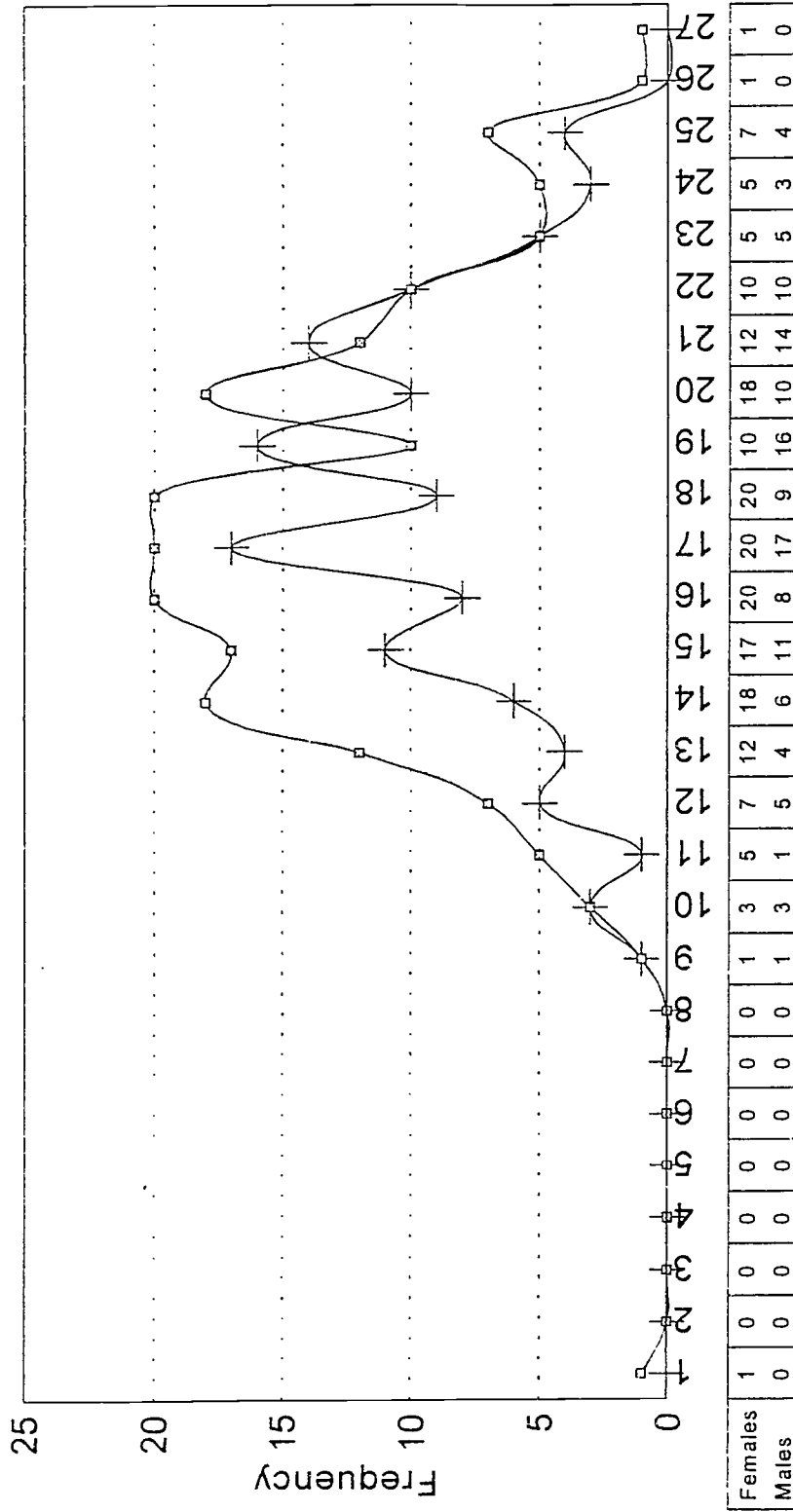


Scores (Range 0 - 190)

□ Females
+ Males

Digit Span

Frequency Distribution - Raw Scores



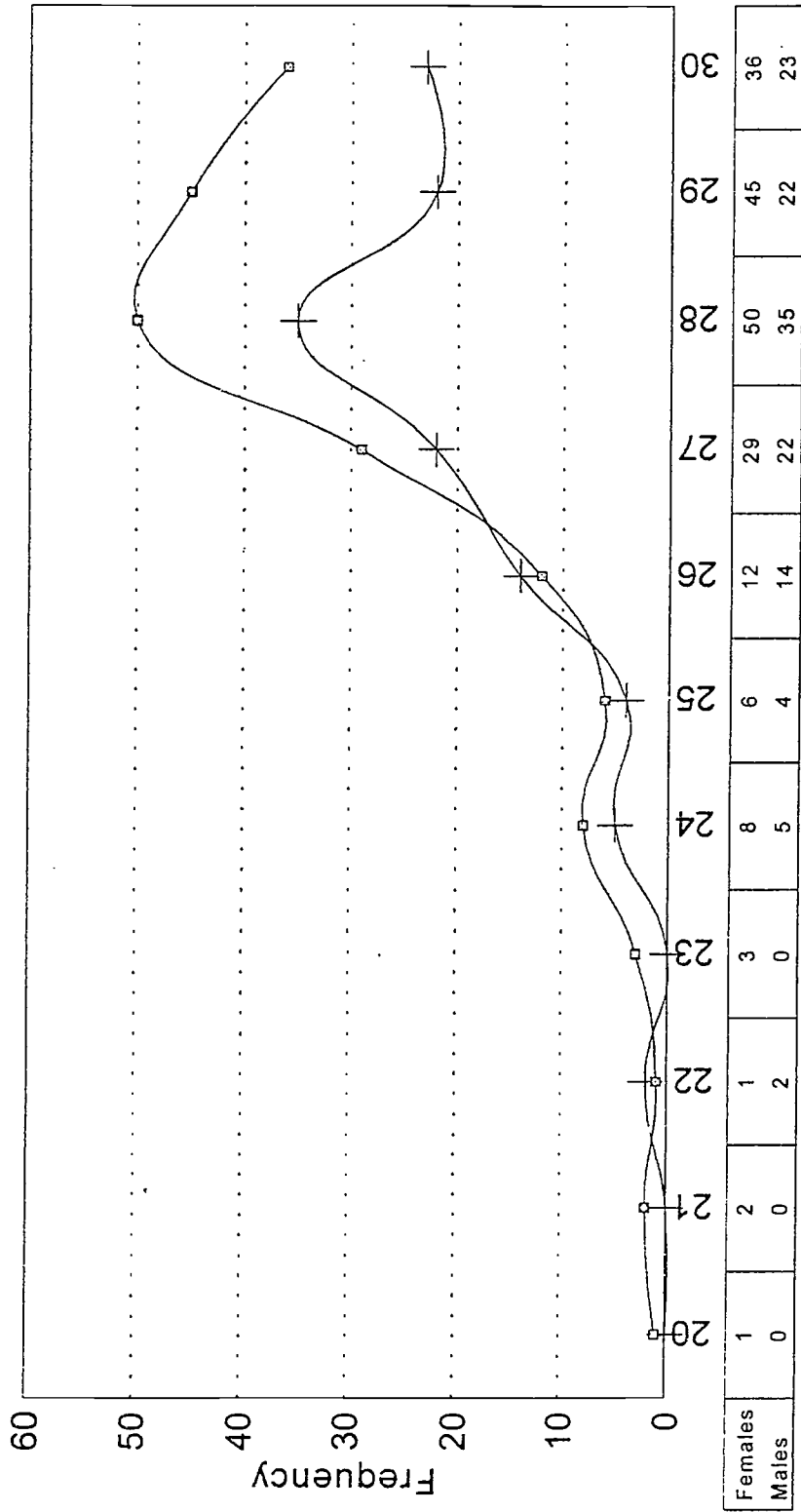
Score (Range 0 - 28)

□ Females + Males

Figure 3.06

Rhythm Test (Seashore)

Frequency Distribution - Raw Scores



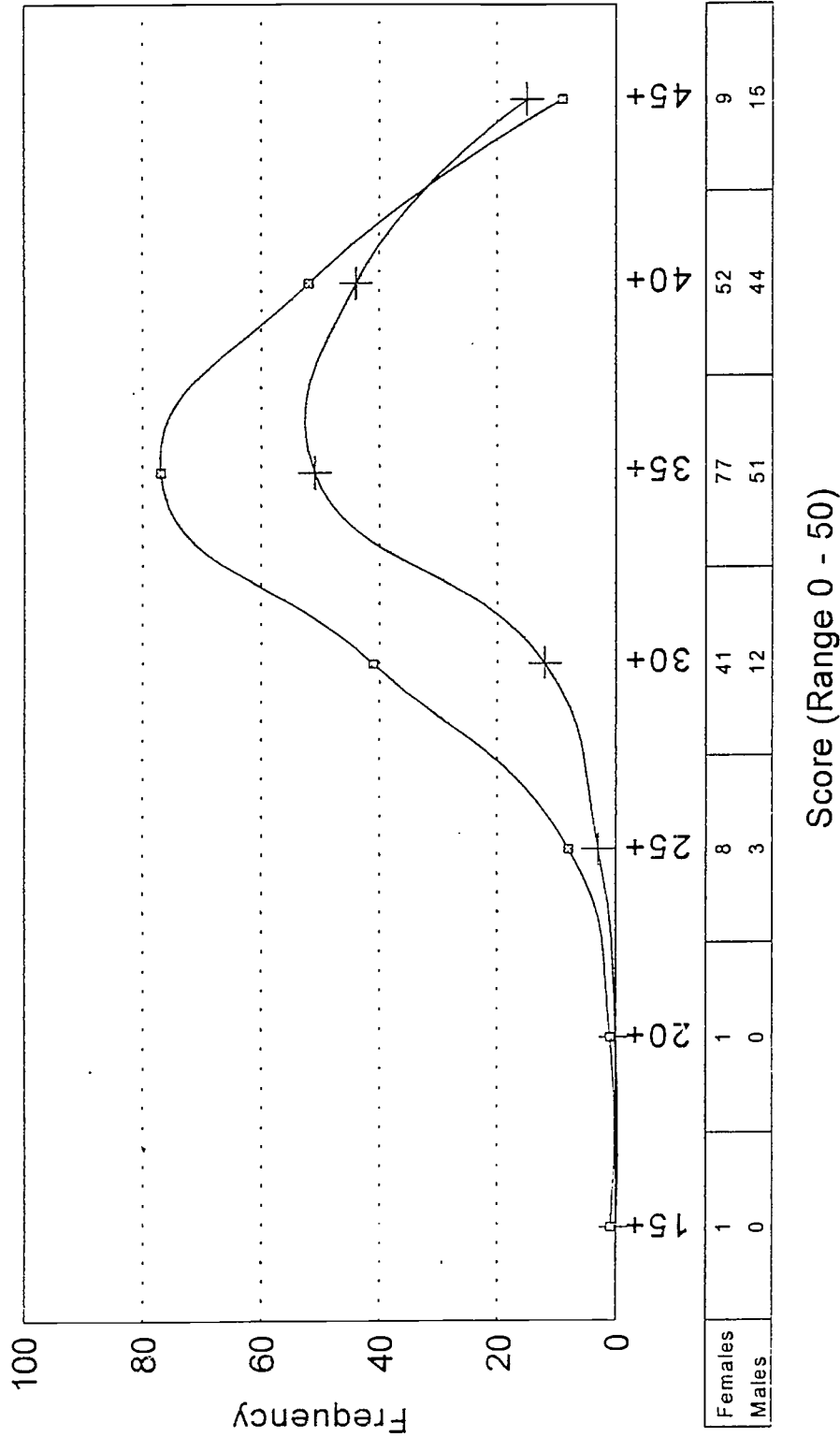
Score (Range 0 - 30)

□ Females
+ Males

Figure 3.07

Army General Classification Test

Frequency Distribution - Raw Scores

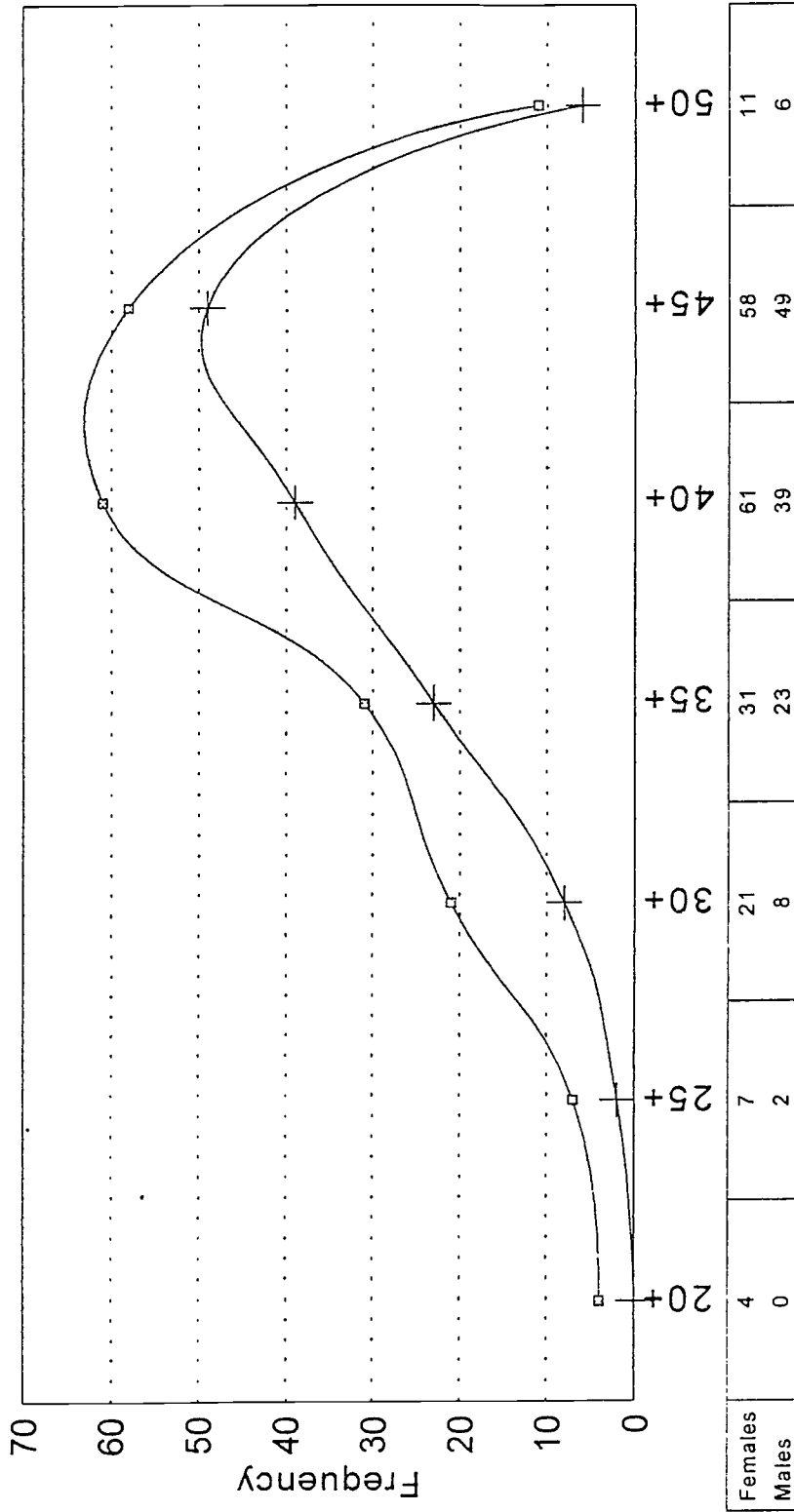


□ Females + Males

Figure 3.08

WAIS Block Design

Frequency Distribution - Raw Scores



Score (Range 0 - 51)

59

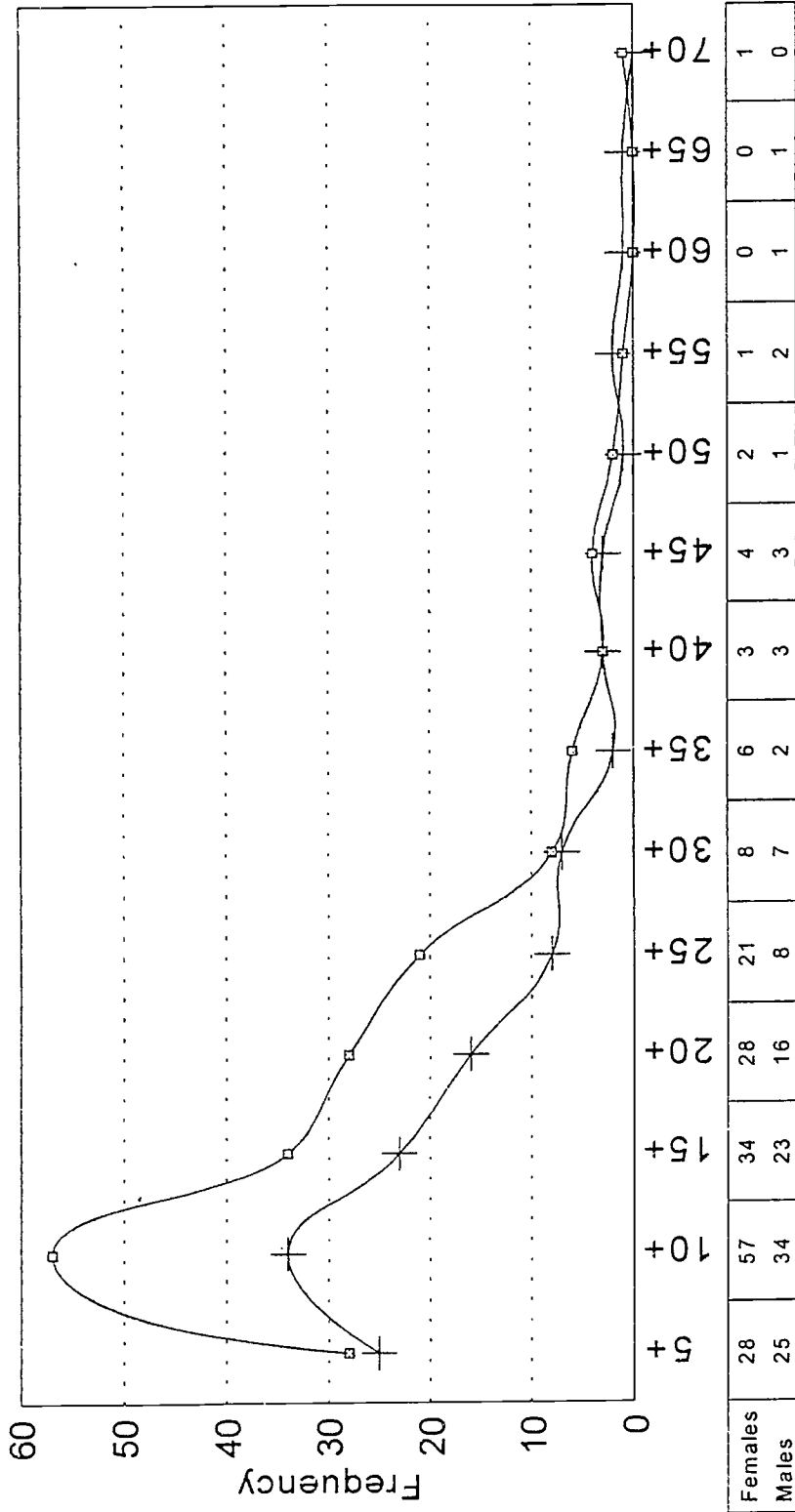
-□- Females + Males

Figure 3.09

6.1

Halstead Category Test

Frequency Distribution - Raw Scores



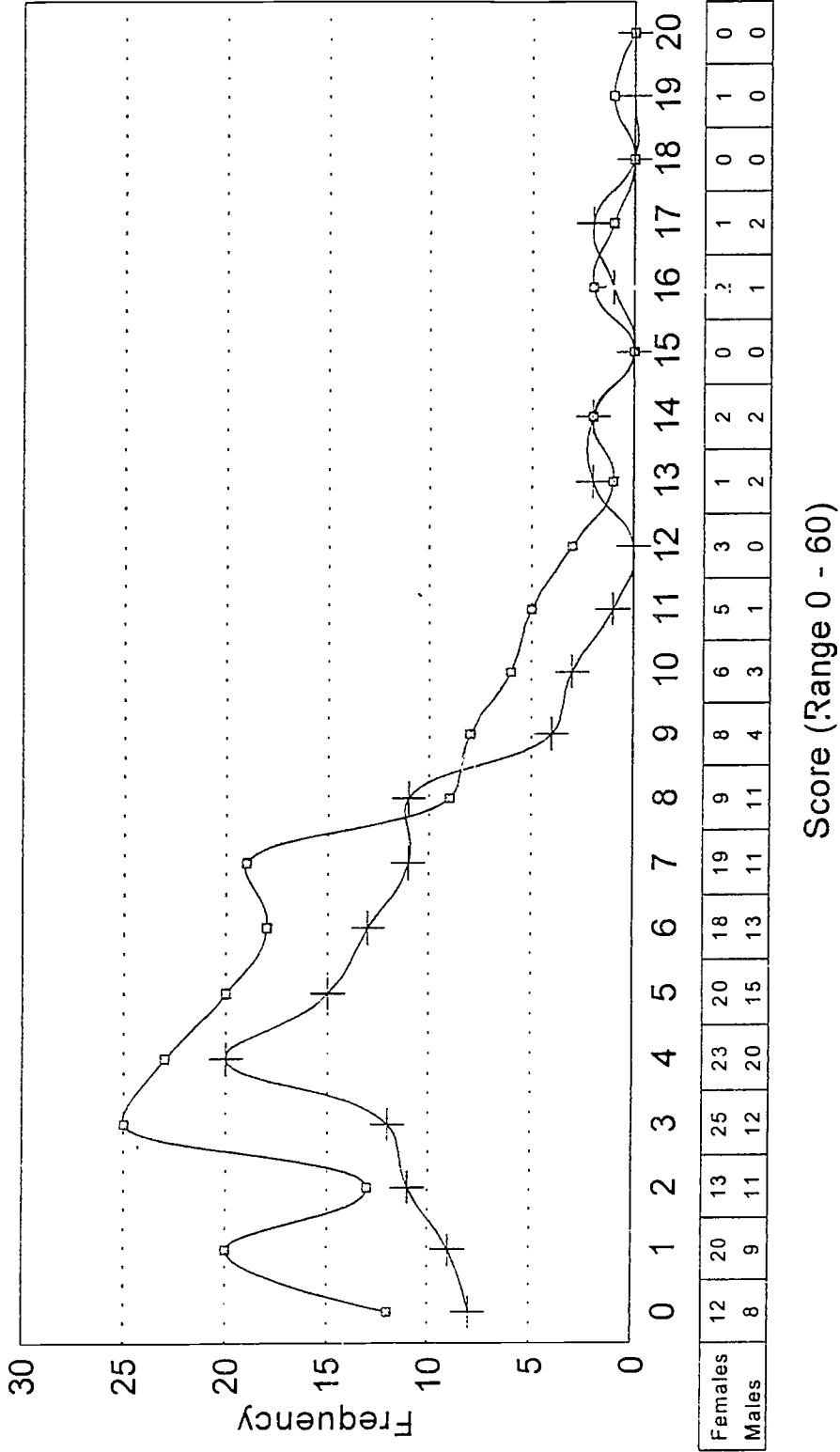
Score (Range 0 - 208)

□ Females + Males

Figure 3.10

Ravens Progressive Matrices

Frequency Distribution - Raw Scores



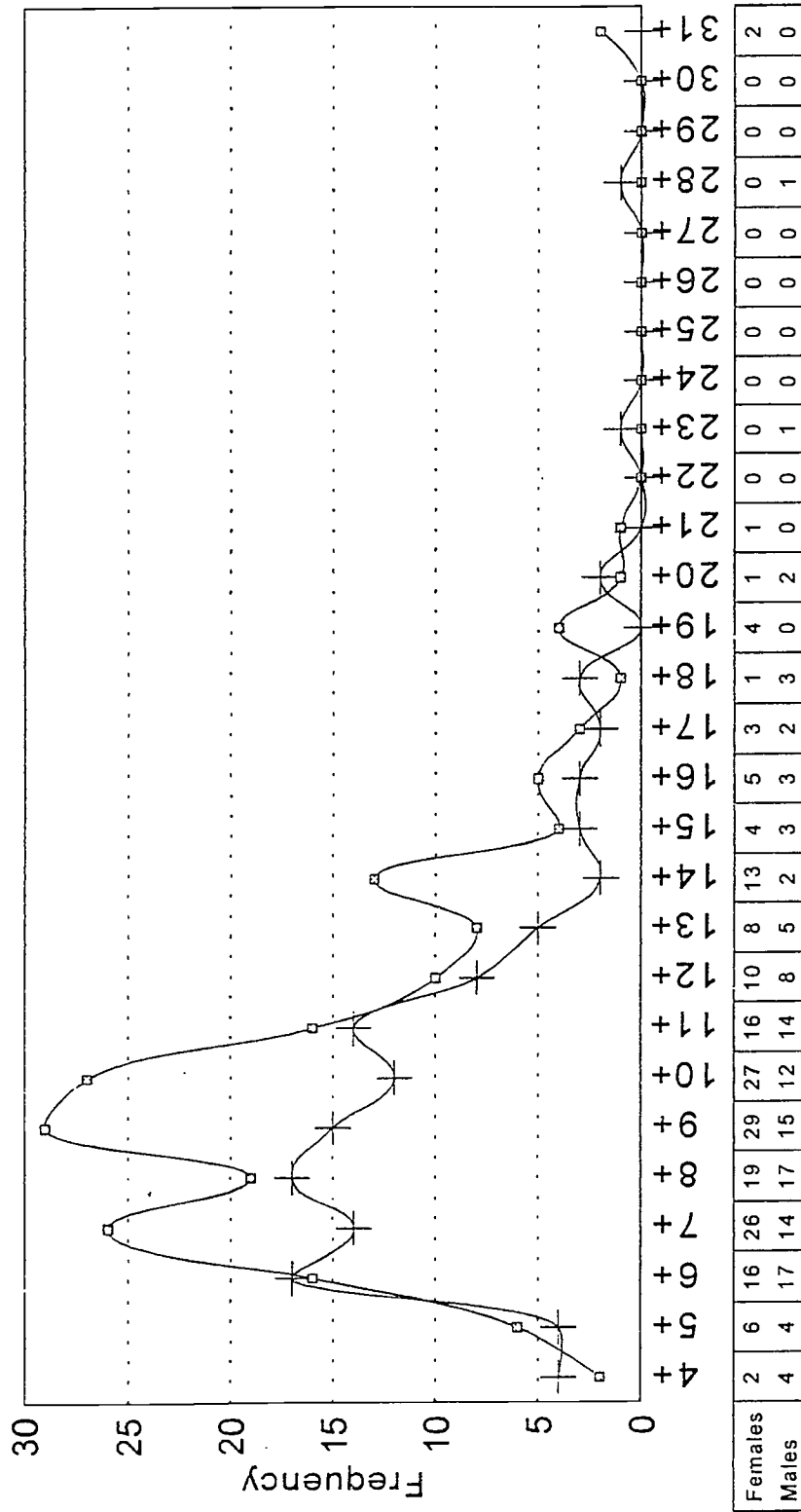
63

□ Females + Males

Figure 3.11

Tactical Performance Test (Time)

Frequency Distribution - Raw Scores

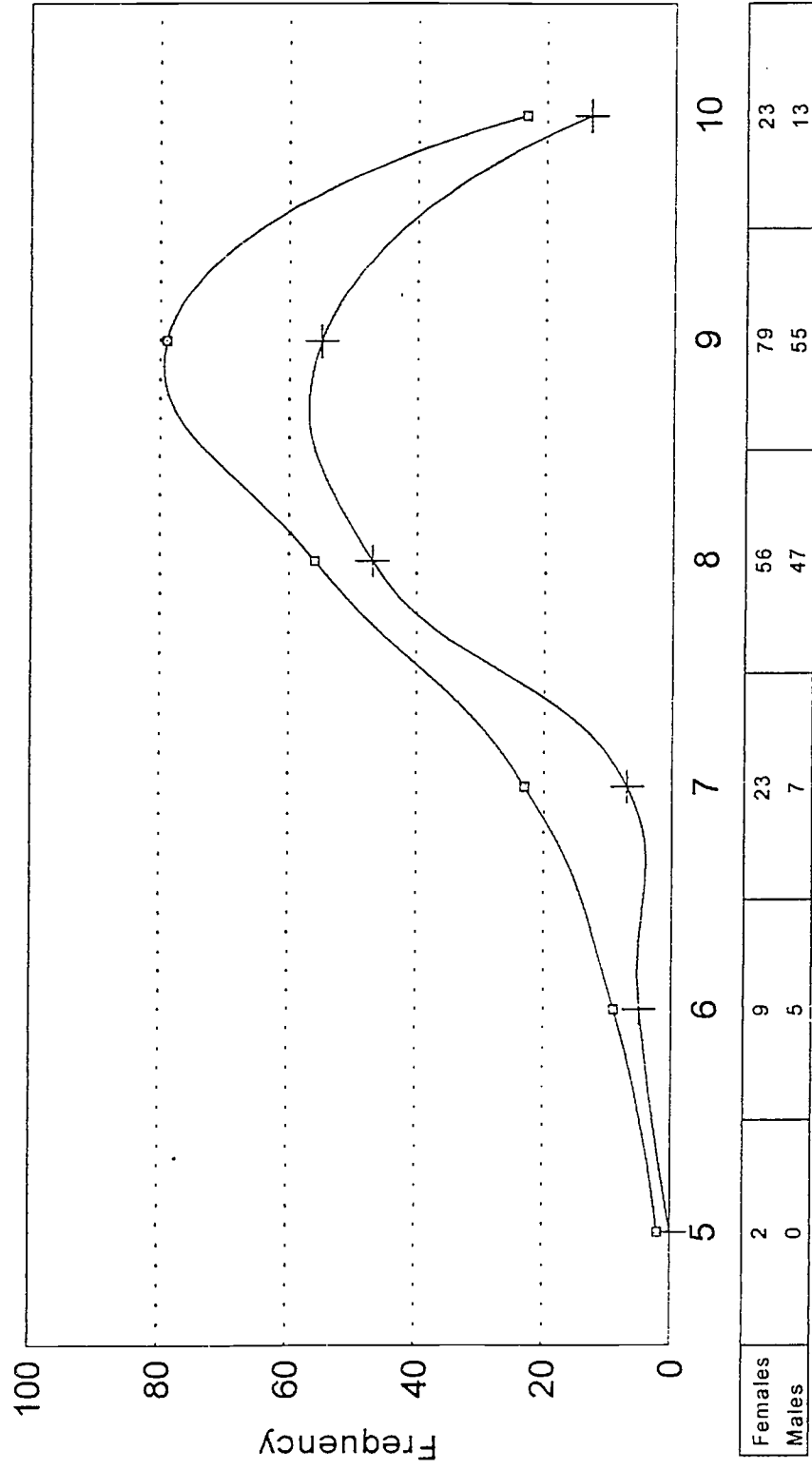


Score (Range 0 - 60 Minutes)

□ Females + Males

Tactual Performance Test (Memory)

Frequency Distribution - Raw Scores



Score (Range 0 - 10)

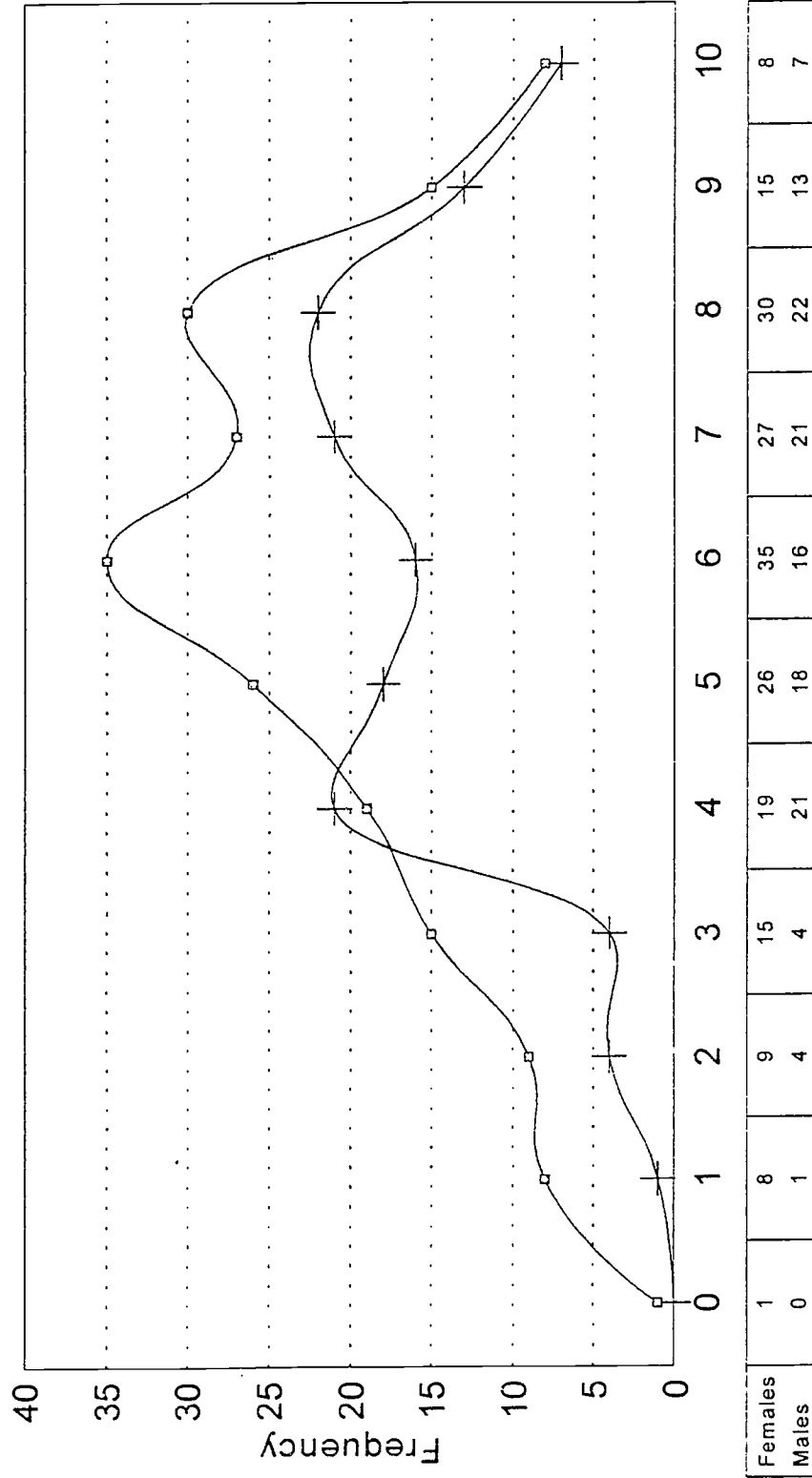
□ Females + Males

67

Figure 3.13

Tactual Performance Test (Location)

Frequency Distribution - Raw Scores



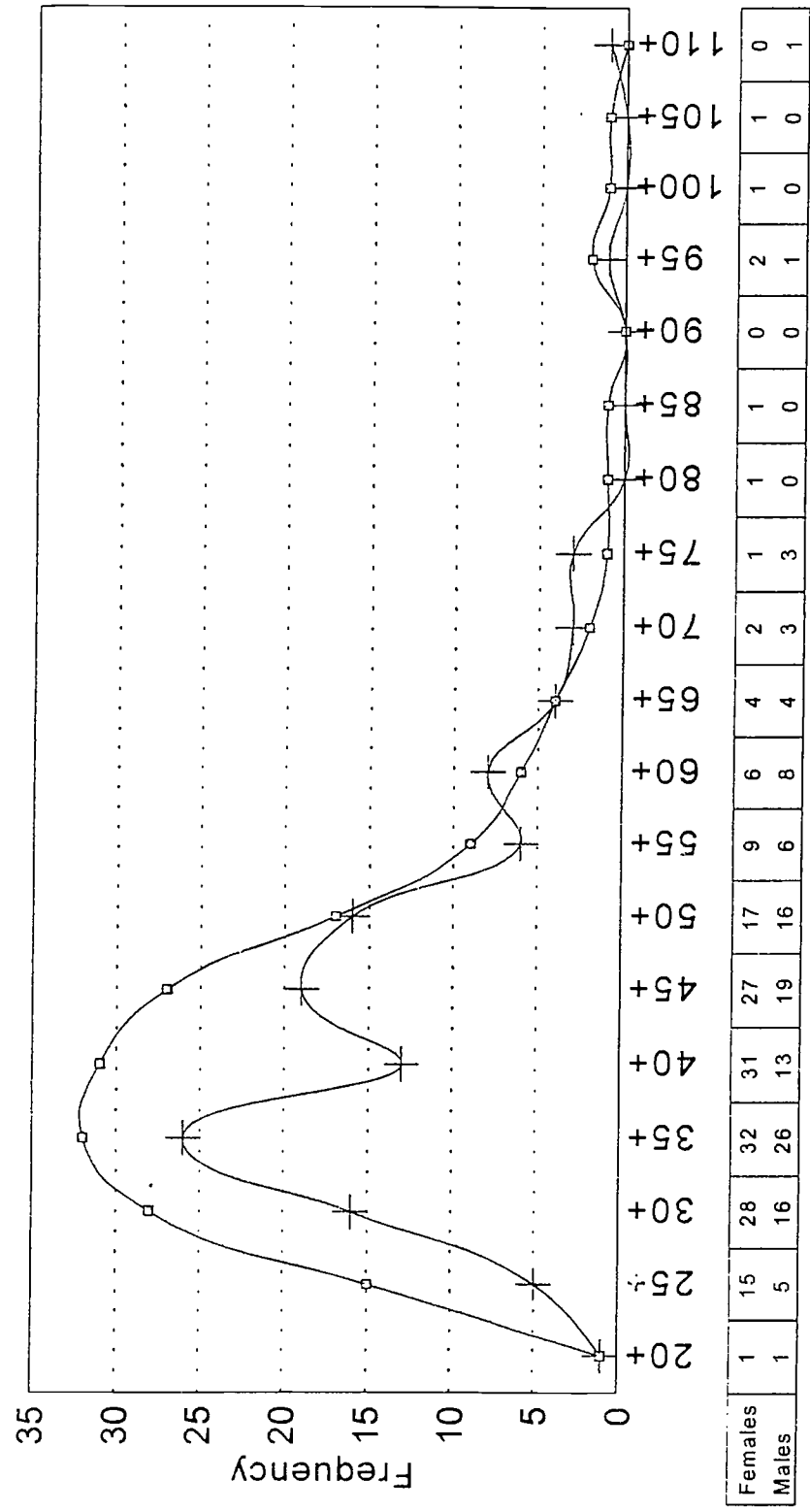
Score (Range 0 - 10)

□ Females
+ Males

Figure 3.14

Alphabet/Count (Time)

Frequency Distribution - Raw Scores

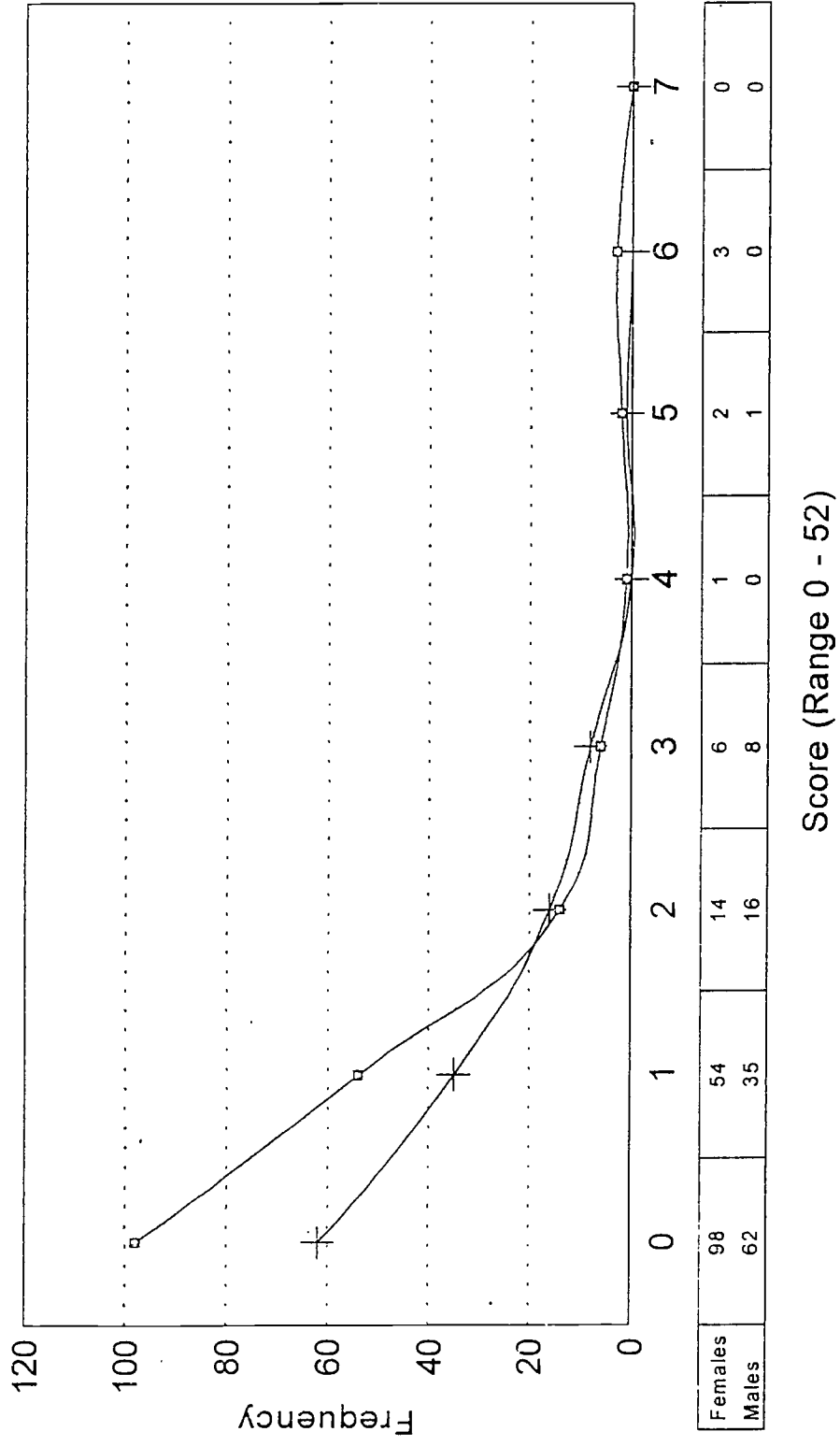


Score (0 - 180 Seconds)

□ Females + Males

Alphabet/Count (Error)

Frequency Distribution - Raw Score

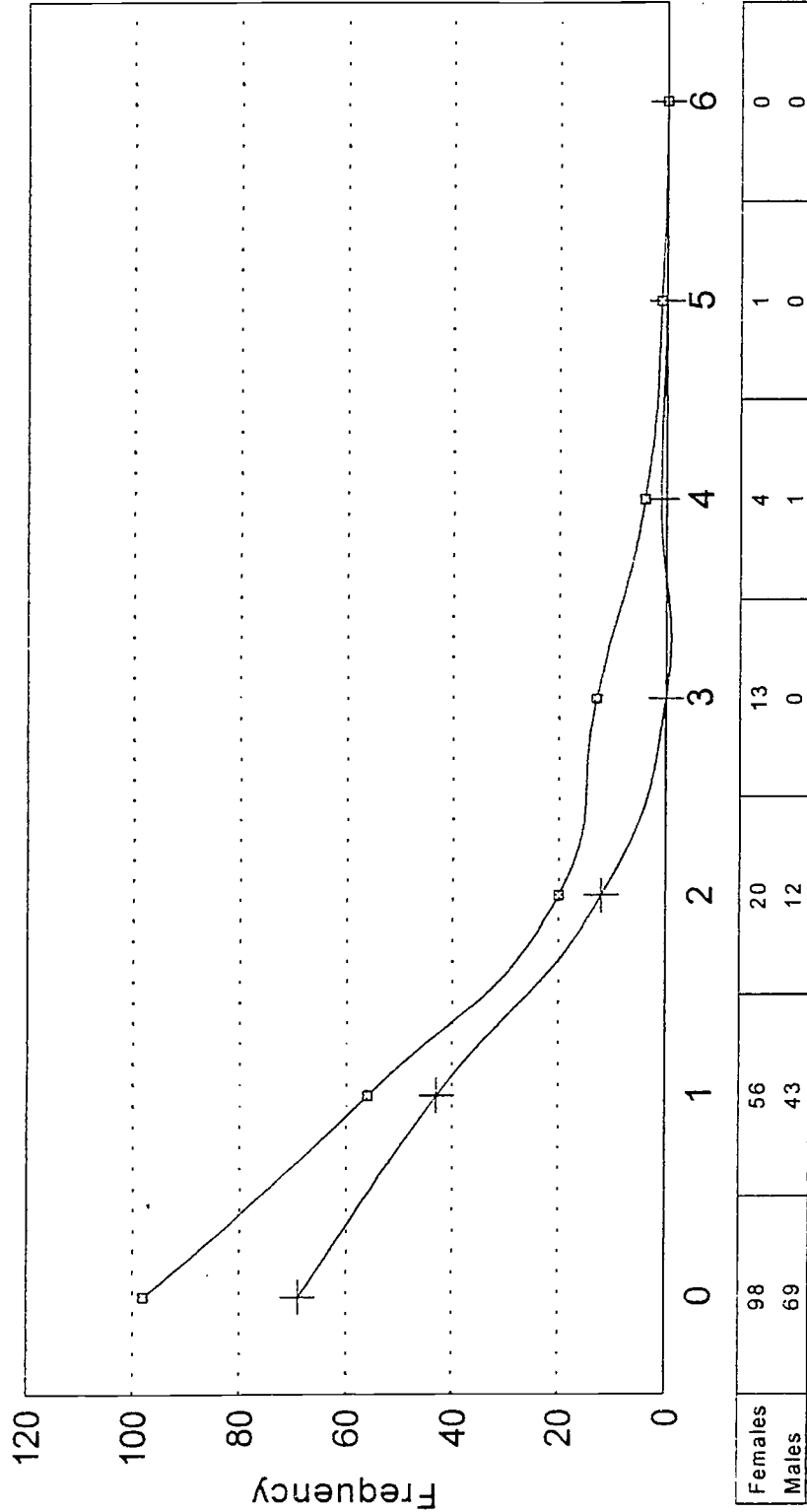


□ Females
+ Males

Figure 3.16

Subtract Task (Error)

Frequency Distribution - Raw Score



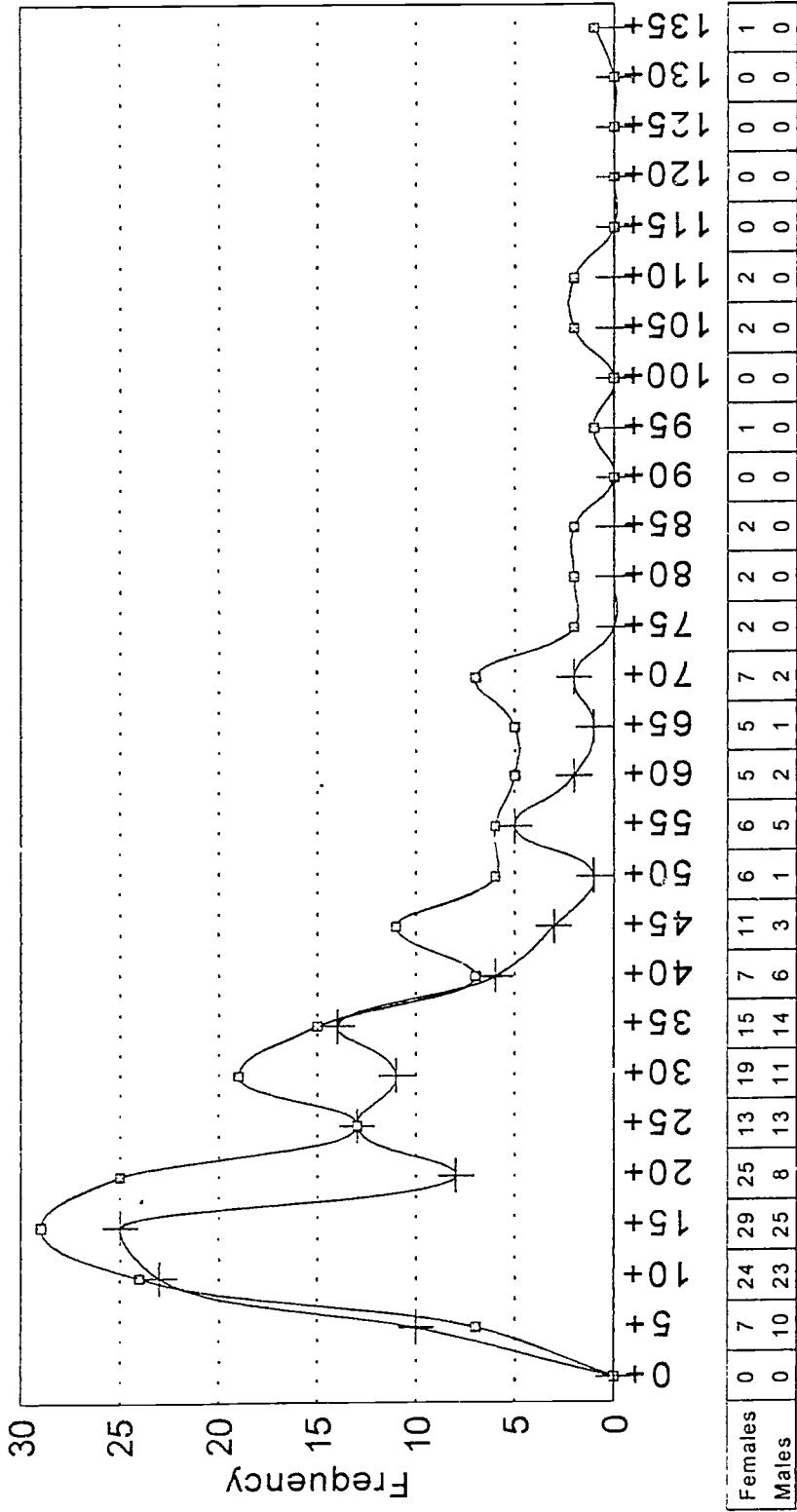
Score (0 - 7)

□ Females + Males

Figure 3.19

Subtract Task (Adjusted)

Frequency Distribution - Raw Score



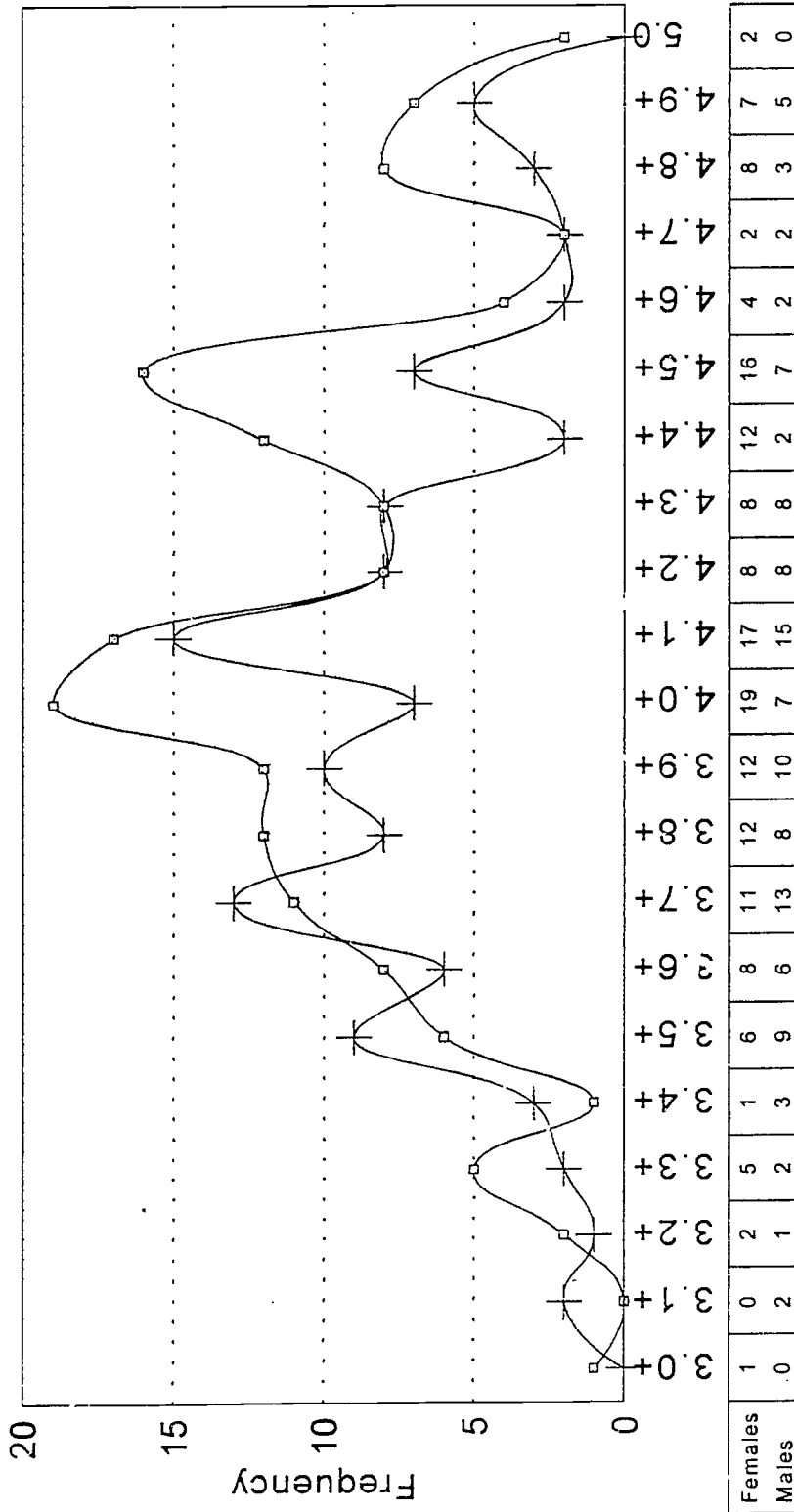
Score (Range 0 - 264.66(Time+(Err*0.5SD)))

□ Females + Males

Figure 3.20

Cumulative GPA after Year Two

Frequency Distribution - Raw Scores



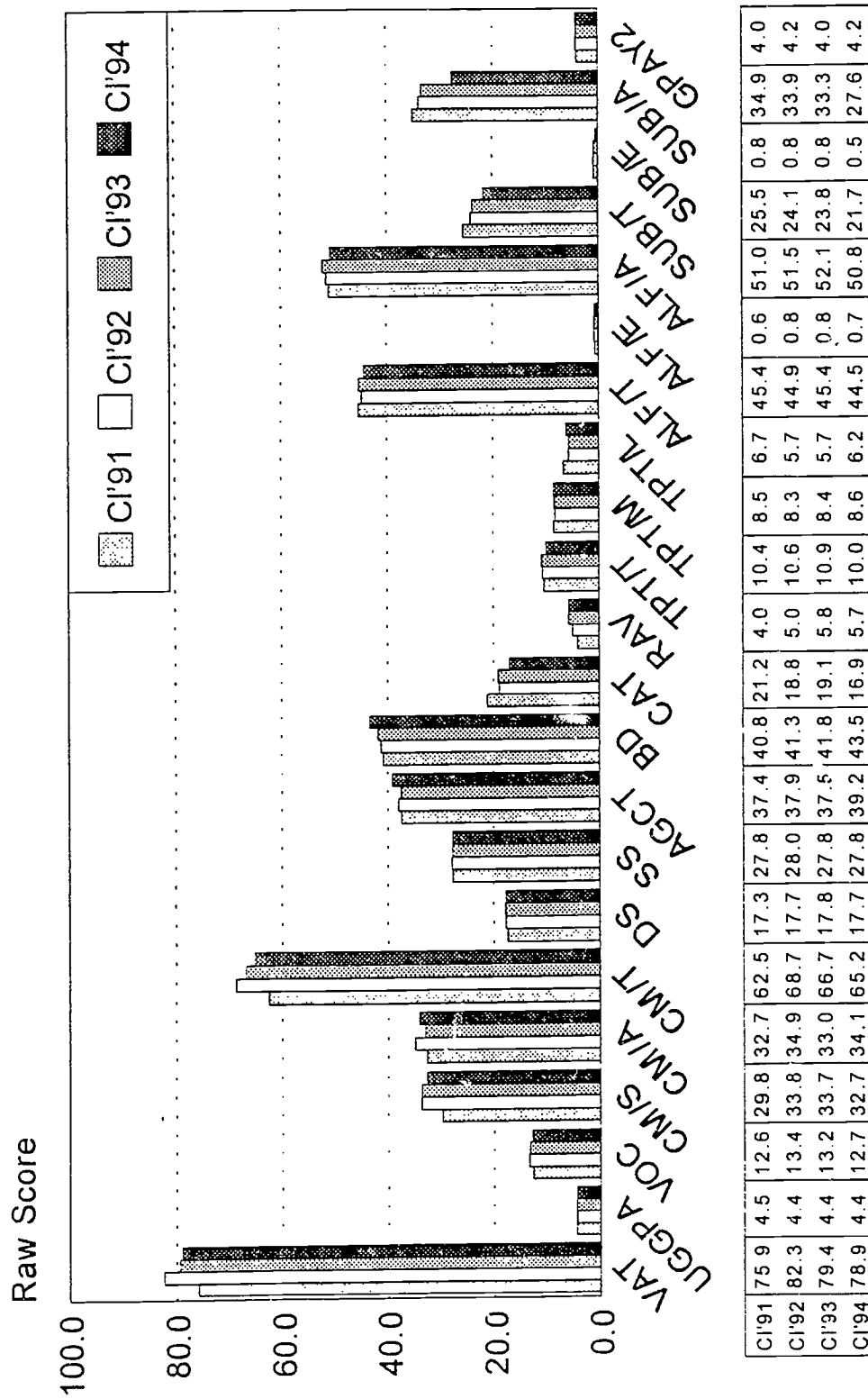
GPA (Range 0 - 5.0)

□ Females + Males

Figure 3.21 83

Comparison of Class Average Scores

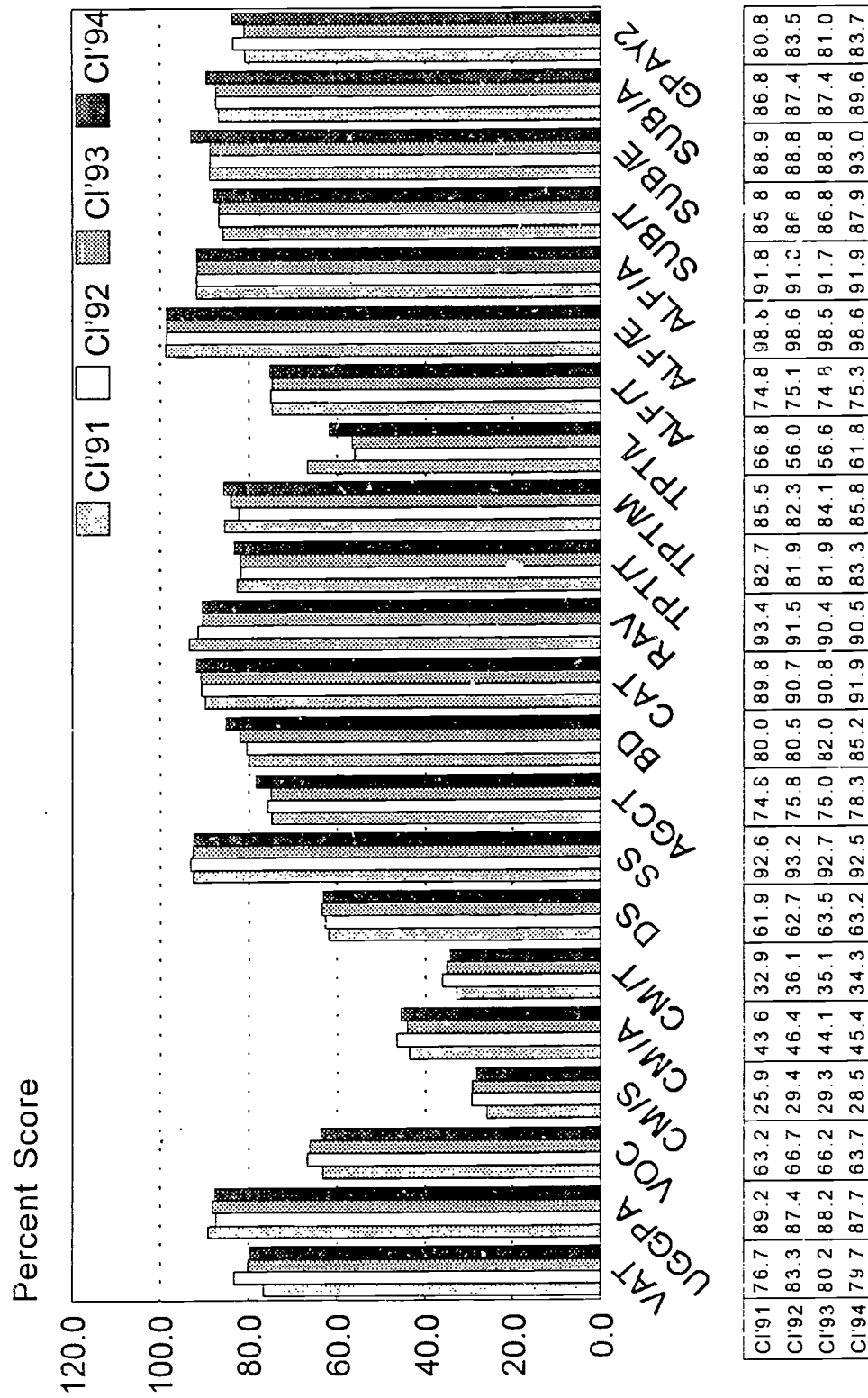
for Each Instrument



Instrument

Comparison of Class Average Scores

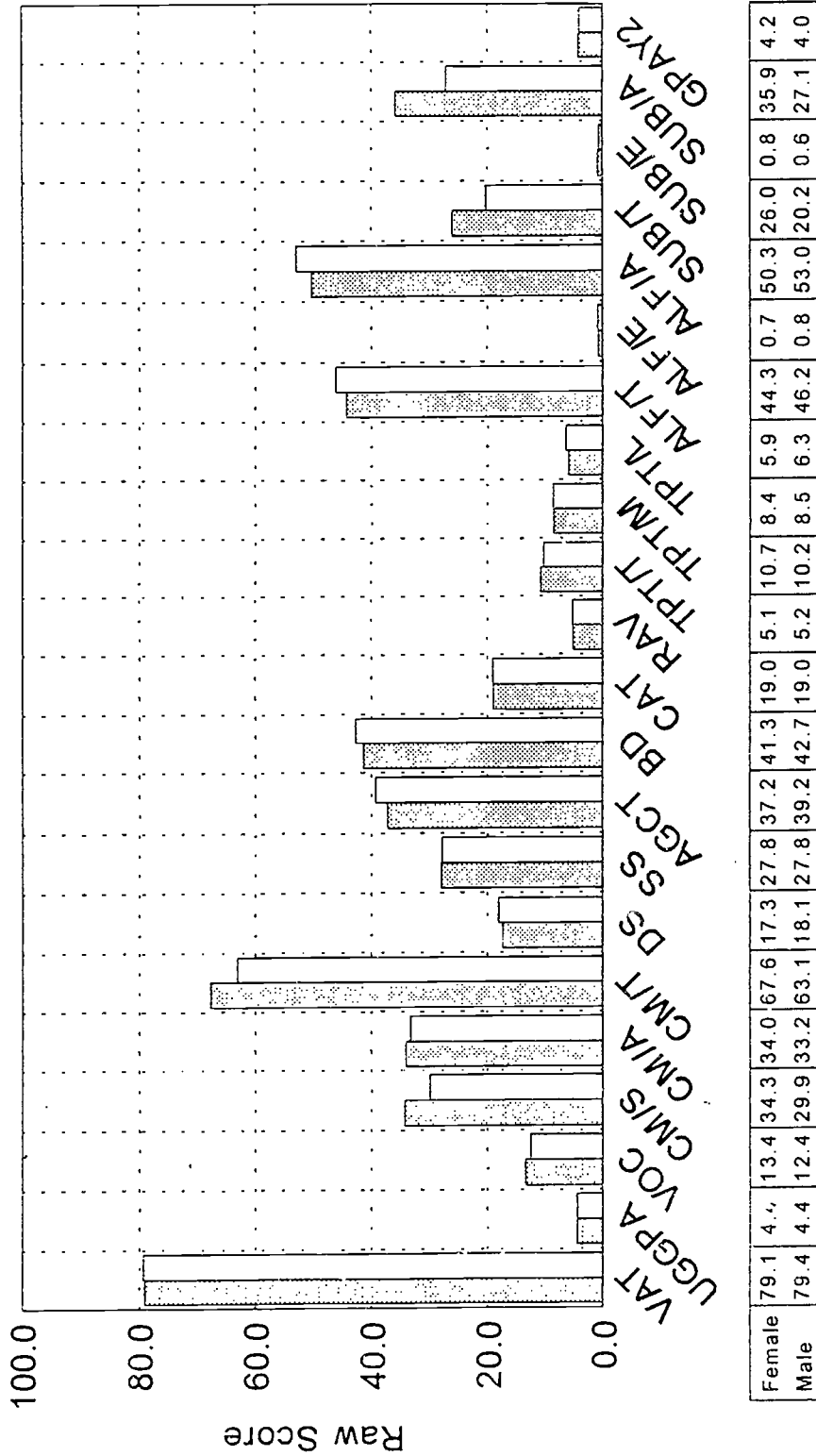
for Each Instrument



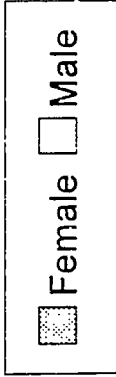
Instrument

Comparison of Gender Average Scores

for Each Instrument - All Students



Instrument

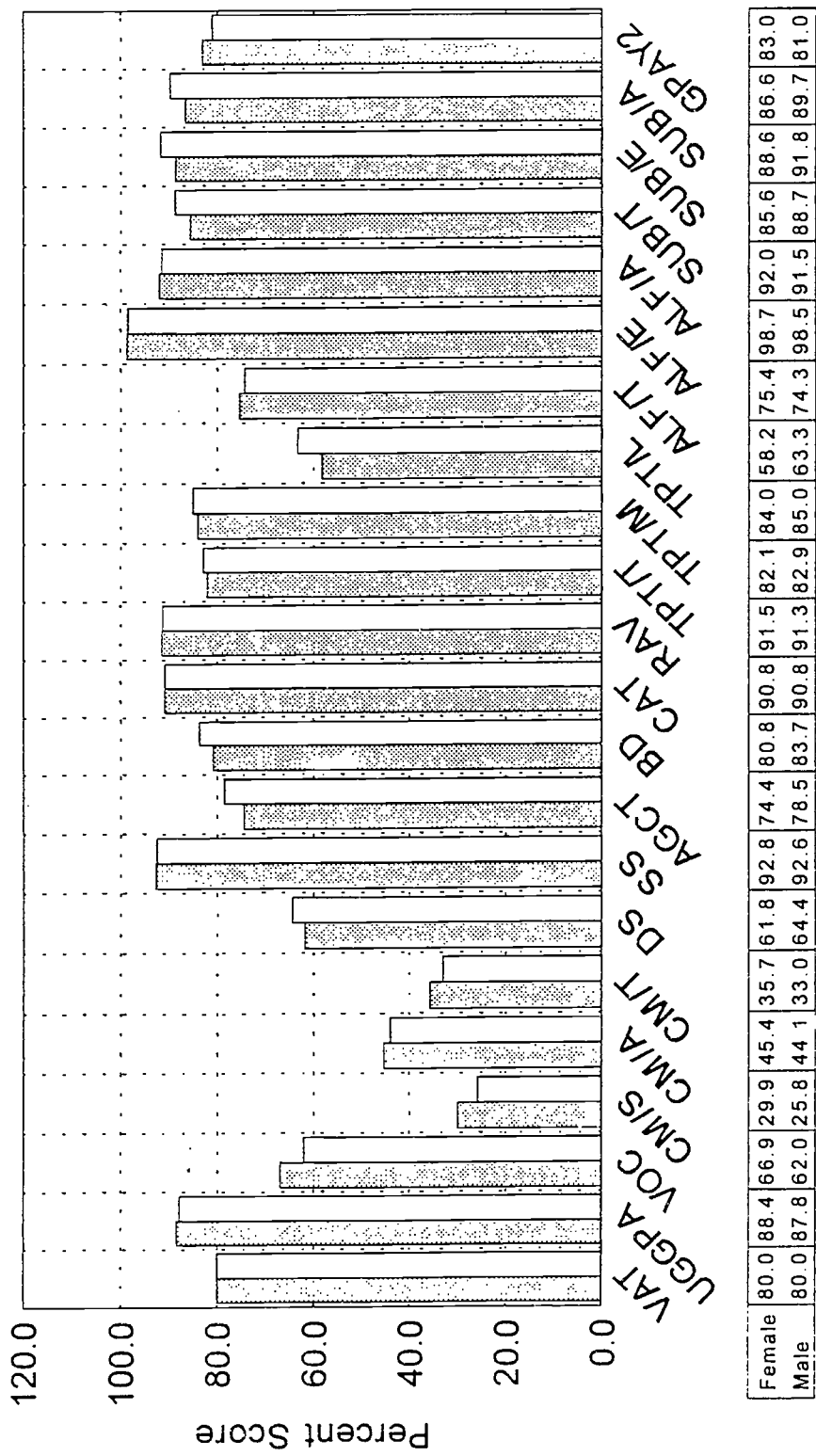


89

Figure 5.0

Comparison of Gender Average Scores

for Each Instrument - All Students

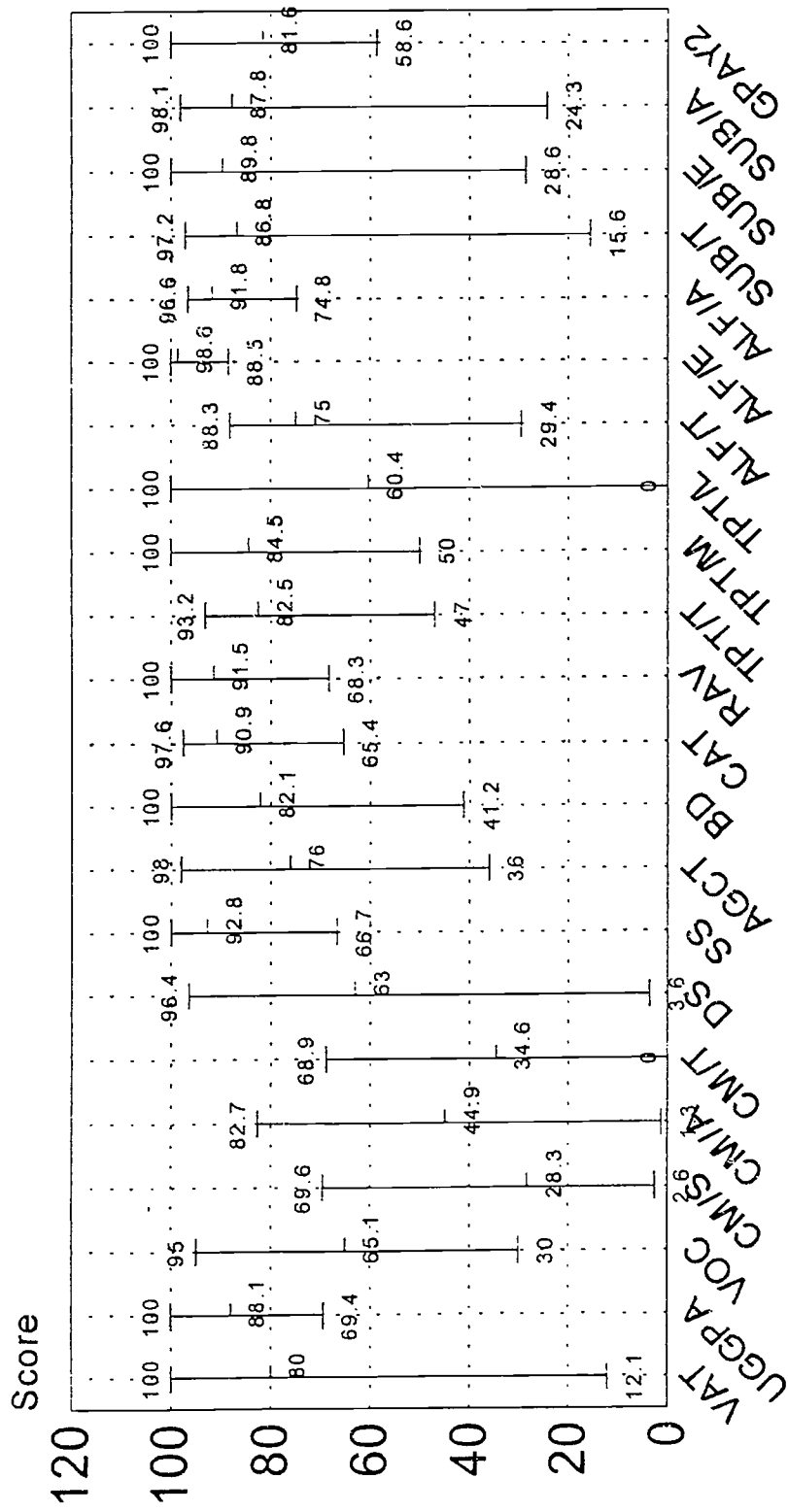


Female Male

Instrument

Multiple Instrument Comparison

Range and Average Percent Scores - All Students



Instrument

I High I Low - Average

Figure 6.0

Multiple Instrument Comparison

Range and Average Percent Scores - Female Students

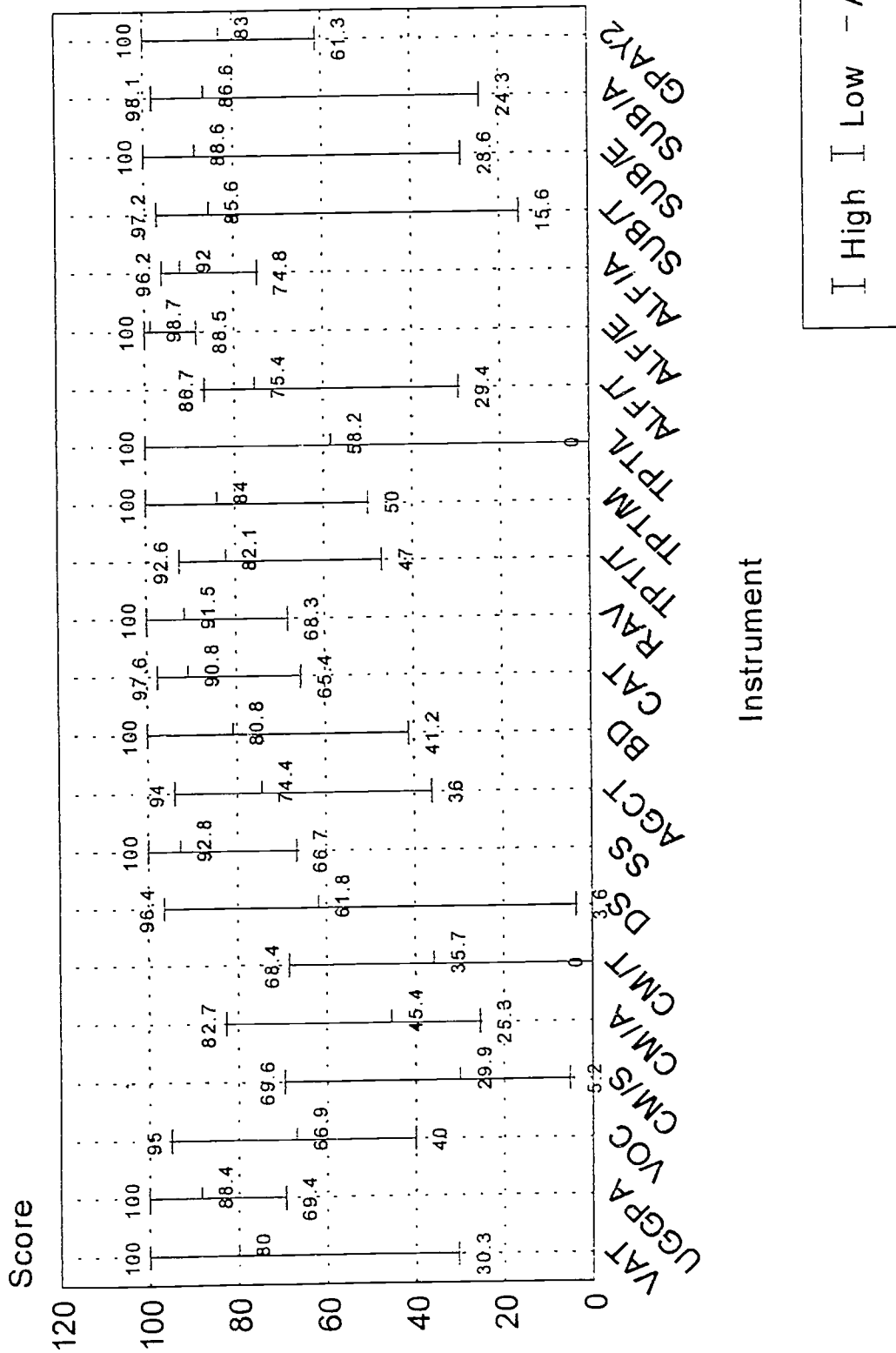
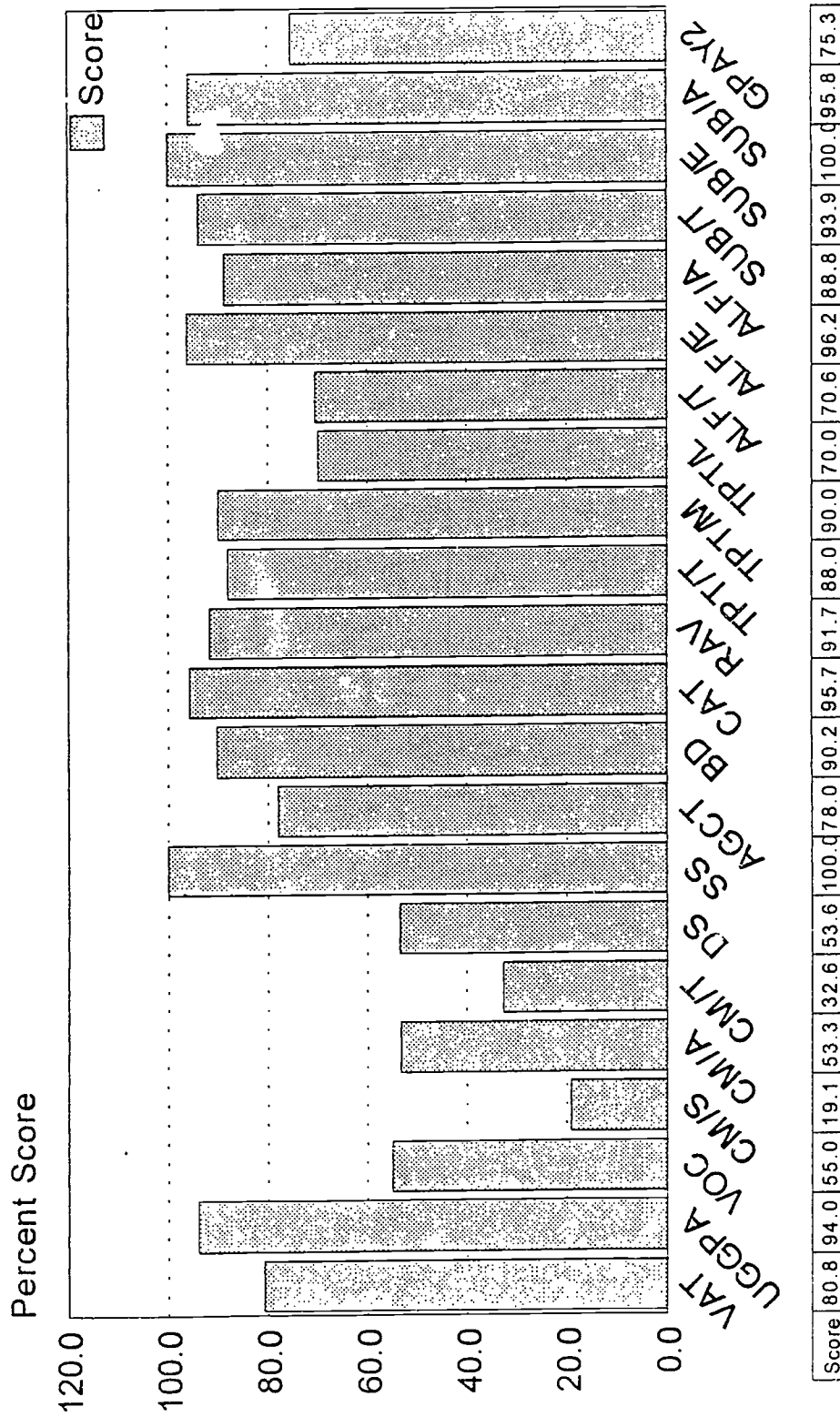


Figure 6.1 97

OBS 2096

Test Score Profile

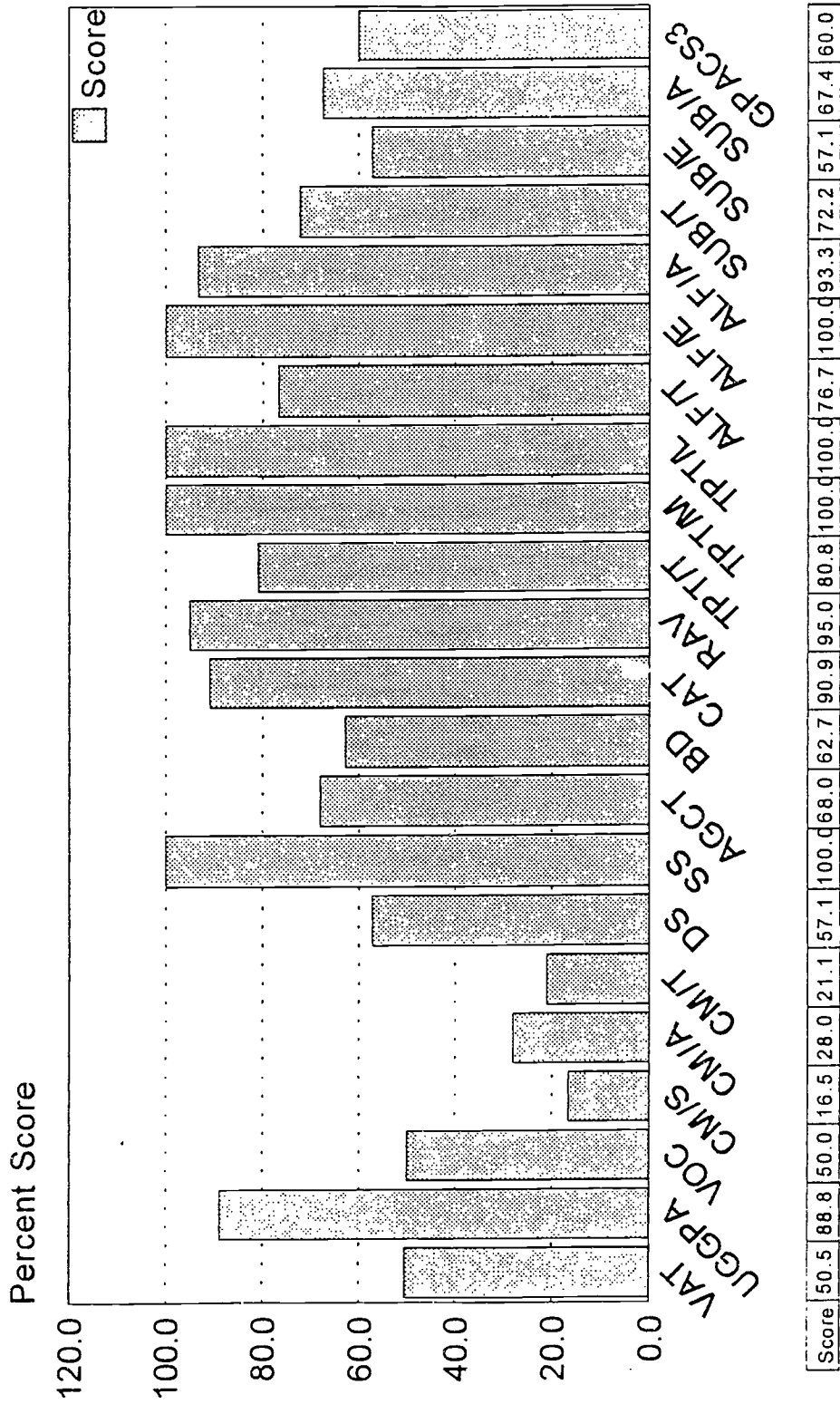


Instrument

Figure 7.0

OBS 2059

Test Score Profile

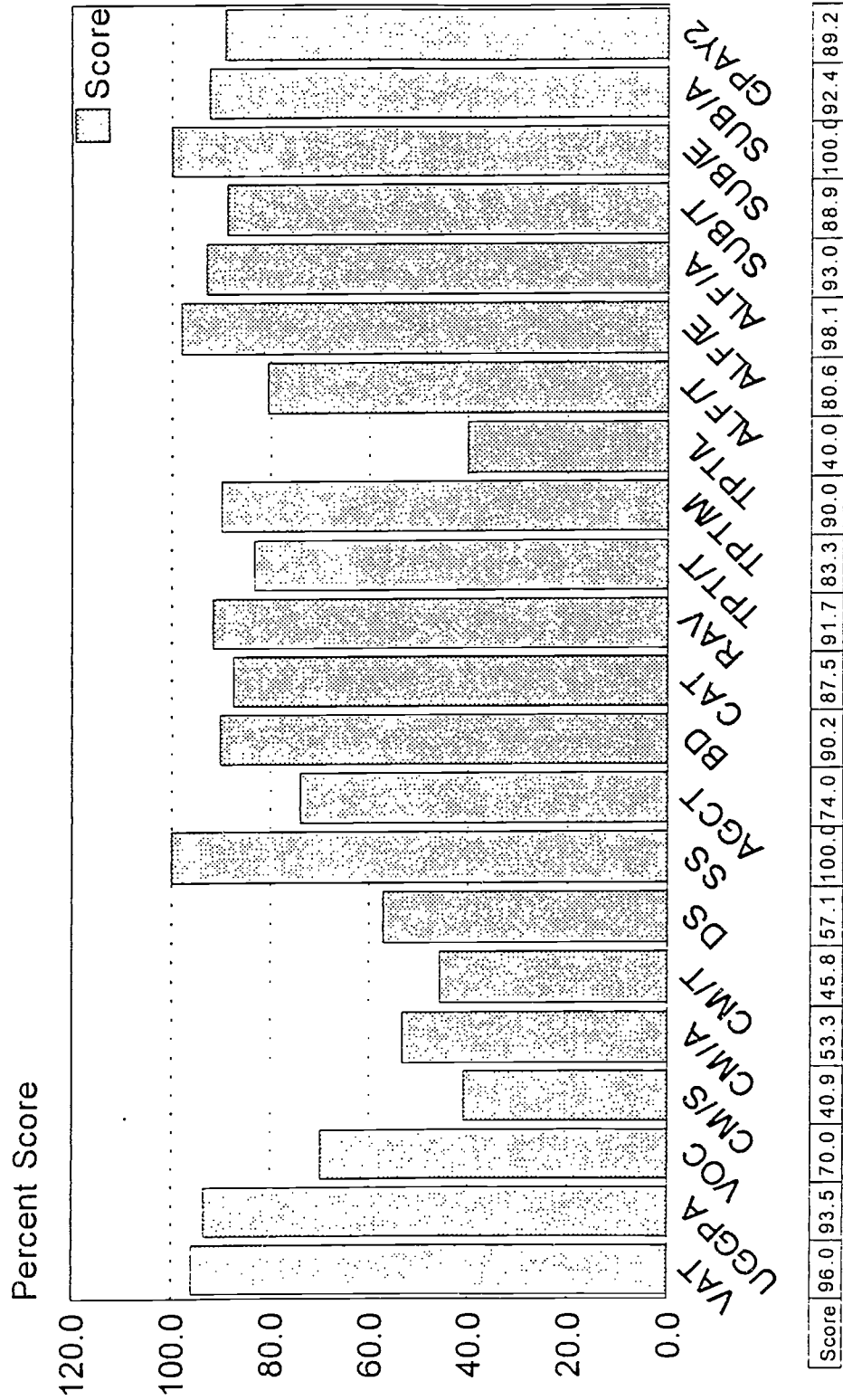


Instrument

Figure 7.1 101

OBS 2076

Test Score Profile



Instrument

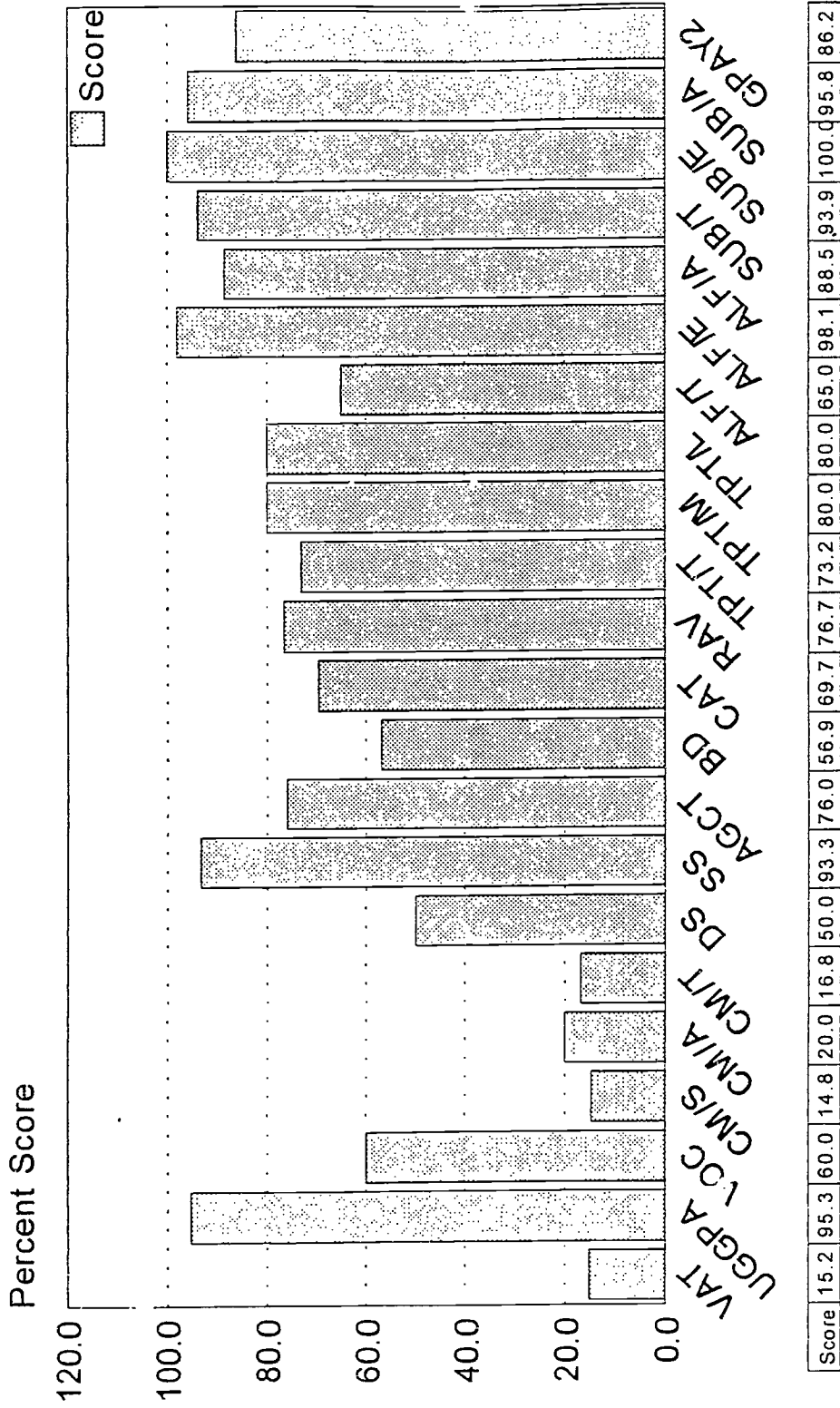
104

103

Figure 7.2

OBS 2124

Test Score Profile



Instrument

Figure 7.3