The Verbal-Quantitative Differential as an Indicator of Personality Maladjustment

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THE VERBAL-QUANTITATIVE DIFFERENTIAL AS AN INDICATOR OF PERSONALITY MALADJUSTMENT

by

Robert W. Spencer

A thesis submitted in partial fulfillment of the requirements for the degree of MASTER OF SCIENCE in Psychology

Approved:

UTAH STATE UNIVERSITY
Logan, Utah

1965
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INTRODUCTION

Counseling centers at many universities are constantly trying to improve their value to the universities by identifying the students who have problems, and by making known to students the services that are available. Since many counseling centers are in direct contact with large numbers of students during the admissions testing program, it would seem that data gathered at this time should be carefully examined for clues that would aid a student in making a healthy and profitable adjustment to his university environment.

It has been observed by some counselors that students who seek counseling often have a wide difference between their measured Verbal and Quantitative abilities. Other clinical observations have suggested that students with a higher Quantitative than Verbal score often seem more disturbed than those whose Verbal ability exceed their Quantitative ability. In either case, regardless of which ability was high, it has appeared to some counselors that the wider the discrepancy between the two abilities, the more often a problem existed. From the above observations the present study was conceived and undertaken in an attempt to see if differences between Verbal and Quantitative ability scores might serve as a tool in identifying students with problems.

Since children normally learn verbal proficiency before acquiring quantitative skills, it was reasoned that if an individual has a high quantitative ability, he should, under normal developmental circumstances, also have an equally developed verbal ability. Therefore, in cases where the Quantitative score is high and the Verbal score is low,
it was assumed that somewhere along the developmental growth process the individual may have been deterred, discouraged, or in some way blocked so as to hinder his verbal proficiency.

A study by Smith and Triggs (1950) suggested that a student's linguistic skill affects the extent to which he can make use of his quantitative ability. Smith and Triggs' study, along with the untested observations and hypothetical assumptions suggested above formed the basis for the present study.

Purpose and Hypotheses

The purpose of the present study was to explore the possibilities of identifying students with problems on the basis of their Verbal-Quantitative ability differences and the direction of those differences. The study was designed to test the following hypotheses:

1. Students with a discrepancy between their Verbal-Quantitative abilities as measured by the School and College Ability Test (SCAT) will differ significantly on the Minnesota Multiphasic Personality Inventory (MMPI) from students whose Verbal-Quantitative abilities are relatively equal. The wider the difference between the Quantitative-Verbal scores, the greater will be the probability of measurable personality differences.

2. Students whose Quantitative scores are higher than their Verbal scores will be more likely to have personality traits on the MMPI indicative of some type of personal problem, than will those whose Verbal scores exceed their Quantitative scores.
3. Students whose Verbal and Quantitative T scores on the SCAT differ by 15 points or more will have a significantly larger number of students exceeding a T score of 70 on the MMPI than will those whose Verbal-Quantitative score differences are 5 points or less.

**Definitions and Abbreviations of Terms**

Abbreviations of tests and other terms used throughout this study follow.

**MMPI**

Minnesota Multiphasic Personality Inventory. This is a measure of personality characteristics and is used to assess personal adjustment.

**SCAT**

The School and College Ability Test, Form 1A. This is a scholastic aptitude test yielding scores of Verbal and Quantitative reasoning ability as well as a Total score, which combines the two sub-scores.

**ACE**


**ACT**

American College Testing Program.

**USU**

Utah State University of Agriculture and Applied Sciences located in Logan, Utah.
BYU

Brigham Young University located in Provo, Utah.

**T Score**

A Standard score on the MMPI of or above 70, or in other words, a score two standard deviations above the MMPI Mean of 50.

**Q-group or Q-score**

All subjects whose Quantitative score was higher than their Verbal score on the SCAT. (Q-score = Quantitative score)

**V-group or V-score**

All students whose Verbal score was higher than their Quantitative score on the SCAT. (V-score = Verbal score)

**M**

Male subjects

**F**

Female subjects
REVIEW OF THE LITERATURE

Relatively few studies have been reported associating personality characteristics to a Verbal-Quantitative differential, even though a large number of colleges and universities require entering students to take an examination that is reported and interpreted in terms of Verbal-Quantitative scores. Some of the tests in use today that report scores for Verbal and Quantitative abilities include: (1) The College Entrance Examination Board. The authors of the scholastic aptitude test report a Mathematic Aptitude test score (MAT) and a Verbal Aptitude test score (VAT); (2) The Army General Classification Test used during World War II is reported in terms of a Linguistic score and a Quantitative score; (3) The American Council on Education Psychological Examination (ACE) used by many universities for years as their entrance examination is reported in a Linguistic score and a Quantitative score; (4) The School and College Ability Test (SCAT) is reported in terms of Verbal and Quantitative ability. The conviction of many test publishers that these two abilities are indeed separate factors is apparent.

This review of literature will begin with those studies which have the least similarity to the present study and will conclude with those which bear directly on the Verbal-Quantitative differential as they relate to personality.

Ellis (1948) reported what he considered to be minimum standards that must be considered when one is relating personality inventory results to other psychological tests. He stated that correlating or relating personality measures to other psychological data was useless
unless:

1. The testing instruments are reasonably valid.

2. The tests employed are to be used on groups similar to those on which the test was standardized.

3. The results that are compared are from similar groups using similar instruments.

4. Test conditions and motives of the subjects taking the test must be taken into consideration.

**Studies Associating Personality to Intelligence and Achievement**

Haggard (1957) and Roberts (1962) did studies relating the importance of personality and social variables to under-achievement. In both studies the researchers identified students whom they considered to be gifted and who were under achieving. Positive results were reported relating environmental determinants, such as parental status and the under-achieving student's self concept, to the degree of achievement obtained as compared to the expected achievement based on measured ability.

Trumbull (1953) reported a study relating personality to intelligence using the Minnesota Multiphasic Personality Inventory (MMPI) and the Chicago Primary Mental Abilities Test. His subjects included males and females attending high school and a group of college females. No relationships were found between factors of intelligence and personality in any one group that was duplicated by either of the other two groups. He concluded that:
1. There were sex differences in intellectual factors.

2. There were sex differences in personality factors when of clinical derivation, i.e. when clinical classifications were used.

   A. Girls showed more depression and hysteria reactions, and were more neurotic than boys.

   B. Girls were more masculine than boys were feminine.

   C. Boys with a high verbal ability tended to score higher on the hypocondriasis scale of the MMPI than did the females.

3. There were sex differences in personality when factors were analyzed and defined as characteristic responses in daily life, i.e. girls were more agreeable etc.

4. Age differences were indicated but there were too many unknown variables to make an interpretation.

5. There were significant relationships between factors of intelligence and personality.

6. There were suggestions of conflict where sex traits associated to one sex by society were possessed by the other sex.

7. Numerical ability did not prove to be a significant sex difference.

   Winfield (1953) reported little or no relationships existing between I.Q. and various MMPI scales. Brower (1947) had earlier reported a significant negative correlation between the Weschler-Bellevue and the same MMPI scales used by Winfield. Indications pointed to their reported differences as resulting from the different sample populations.
Fisher (1961) and Field (1960) did studies on a group of adolescent sociopaths and a group of adult sociopaths, respectively, testing for significant differences in their performance as opposed to their Verbal I.Q.'s. Fisher reported significantly higher performance I.Q.'s for his group of adolescent sociopaths while Field reported higher Verbal I.Q.'s for his group of adult sociopaths.

Jensen (1952) related personality traits to academic success. Using the American Council on Education Psychological Examination (ACE) and the Minnesota Multiphasic Personality Inventory (MMPI), Jensen concluded that students of low scholastic ability are at a disadvantage in non-intellectual areas of college life. He also concluded that gifted students had fewer adjustment problems.

Studies Associated Verbal or Quantitative Ability to Personality

Heim and Watts (1961) developed a vocabulary test using a combination of multiple choice, creative answer techniques, and subjects' self assessment scales to assess personality. They reported significant findings relating personality to vocabulary, i.e. students with higher vocabulary scores were more self confident, tolerant and intellectual.

Lyle (1961) studying the personality of "trainable" children in relation to Verbal ability, concluded that personality had little bearing on the predictions of verbal ability or on group differences in verbal ability, such as between mongoloids and other trainable groups.

Lambert (1960) attempted to relate mathematical ability and interest to masculinity. He compared college male and female mathematics majors, who had taken considerably more course work in this subject, to
college males and females of other majors and interests. The two groups were compared on the Masculinity-Femininity (MF) scale of the Minnesota Multiphasic Personality Inventory (MMPI) with no significant differences reported between male mathematic and non-mathematic majors. There was a significant difference between the female groups, with the mathematic majors being significantly more feminine than their non-major counterparts.

Studies Associating Verbal-Quantitative Differential to Personality

Pemberton (1951) used the ACE subscores and reported significant relationships between Quantitative and Verbal scores to areas of the Kuder Preference Record, the Allport-Vernon Study of Values, and the Thurstone Temperament Schedule. Pemberton's subjects consisted of male business executives. He found that the male executive group whose Linguistic score was one standard deviation above their Quantitative score had significantly higher scores on the Kuder Literary scale, Thurstone's Reflective Factor, and on the Allport-Vernon Social Scale.

McCarthy (1953), studying the Quantitative-Verbal ability differential, attempted to relate those sub-scale scores to various factors including interests, values, and personality characteristics. She found that the greatest differences, for subjects with wide Verbal-Quantitative differences, existed in the area of interest, rather than in the area of values or personality characteristics.

Smith and Triggs (1950) published a study relating educational success and failure of students to high Quantitative and low Linguistic scores on the American Council on Education Psychological Examination.
tion (ACE). They indicated that even though prediction was not possible or feasible from the obtained Quantitative scores, students with large Quantitative-Verbal differences were permitted to enter colleges every year. They suggested that as a result of this practice, counselors should know more about the Quantitative-Linguistic differential. Their study suggested that the level of a student's linguistic skill affects the extent to which he can apply his quantitative ability, and that this level varies with the type of course work taken by the student. They also stated that "over learning" in the verbal area may bring profitable results, if reward from successful college work is worth the extra effort, and that motivation and patterns of behavior can also be studied in reference to those findings.

Wells (1946) did two case studies bearing directly on the Verbal-Quantitative problem. He felt that deficiency in the Quantitative ability is a result of one's basic attitude, i.e. they are repelled by the rigidity and precision necessary for success in that area. He also stated that a student's "general adjustment," whether his ability is Verbally or Quantitatively oriented, is co-equal; but that the verbalist would be more in accord with the norms of cultural prestige, such as good speaking, clear writing, etc. He characterized the Quantitative individuals as being more self-sufficient. Wells concluded that the Verbal group seeks security in social relations and that "general adjustment" is not related to the V-Q discrepancy.

Bendig (1958) did a study using Maudsley's Personality Inventory (MPI) and the Manifest Anxiety Scale (MAS), the latter because of its correlation to Eysenck's Neuroticism Scale (ENS), correlating them with verbal abilities such as are found on the ACE test. For this study he
used a modified cooperative vocabulary scale. Correlations were non-significant and negative, indicating that the subjects, selected on the basis of extreme extroversion and neuroticism scores, did not differ significantly in their verbal ability. The low correlations also suggested that measures of "personal maladjustment" such as those represented by the Manifest Anxiety Scale and Eysenck's Neuroticism Scales are not related to verbal ability measures.

Sanders, Mefford and Bown (1960) in attempting to find how Verbal-Quantitative differences affect personality and physiological characteristics, found that both have identifiable traits for the Verbal-Quantitative dichotomy. Their test measures included the University of Texas admissions test, which reports both Quantitative and Verbal scores, the Edwards Personal Preference Schedule, and the McGuen Quick Check Test. They reported the following characteristics for each group.

1. V-Q equal resulted in good adjustment, drive energy, comfortable with self, etc.

2. V higher than Q resulted in a person being idealistic, subjective, imaginative, intuitive, little need for affiliation, customs, or conventionalism, a high level of aspiration, and a low level of physical activity.

3. V lower than Q: the person was described as introspective, objective, systematic, perseverant, factual, perceived self as ambivalent and dependent, and let others lead and set the pace.

A series of studies by W. D. Altus (1952) have dealt directly with the Quantitative-Linguistic discrepancy and its effect on personality. Altus used female subjects to find personality characteristics associa-
ted with the Q-L differences on the ACE. He concluded that Q higher than L women were prim, conventional, immature, anxious, and resentful. Forty-three selected MMPI items were used to make this determination. His findings, though falling short of the .01 level of confidence, suggested strong trends. Spika and Kimble (1958) repeated Altus's 1952 study and obtained virtually the same results.

Later, Altus (1958) did the same type of study but substituted males for females. His hypotheses were: (1) That Q higher than L college males would be more masculine (have a lower Mf score on the MMPI) than the L higher than Q college male; and (2) That L higher than Q college males should appear somewhat more sophisticated and mature on certain kinds of answers than the Q higher than L group. The reasoning Altus used for hypothesis #1 was that men generally tend to do better on Quantitative tests than do women; therefore, men who excel other men in this sex-biased variable should show more of those attitudes culturally associated with masculinity. The reasoning for his second hypothesis was derived from his first study, wherein the women with L higher than Q scores were more mature and sophisticated in the answers which discriminated them (on the L scale of the MMPI) from the Q higher than L women.

Altus's 1958 sample consisted of 200 college males to whom he administered the ACE and specific items from the MMPI. Two groups of 100 with comparable Q-L scores were formed, arranged according to the direction of their Q-L discrepancy then quartiled according to this direction. Only two scales, the Mf and L scale produced significant differences between the experimental groups. The Q higher than L males scored significantly higher on the MMPI L scale than did the L
higher than Q males. The results were significant at the .01 level of confidence. The L higher than Q subjects produced higher means on the Mf scale than the Q higher than L subjects, reaching a .001 level of confidence. No other scales yielded any significant differences. Altus (1961) used this latter point to verify the conclusions of Wells (1946) and Monroe (1946) that "general adjustment" is not related to variations in Quantitative and verbal abilities. He characterized the various groups in the following ways: (1) Both male and female students with high Quantitative scores appear to be less forward, less aggressive, and less sure of themselves in social situations. (2) High verbal students seemed to be more sophisticated, self insightful, socially dominant, possessed more literary qualities, and were less orthodox in religion. Social dominance and leadership showed a more than chance linkage to the L higher than Q abilities.

Altus (1959) again followed up his previous studies by attempting to correlate a personality questionnaire (specific answers) to students with a Verbal-Quantitative discrepancy. Using 1,092 incoming college students, Altus administered a 100 item questionnaire, 25 items of which he hypothesized would differentiate between the Verbal-Linguistic discrepancy for both sexes. The 25 items were scored as was presumed a more verbal person would score them. Altus obtained significant correlations between the prescored items and results from the tests of subjects with higher Verbal than Quantitative scores. He characterized the Verbal higher than Quantitative subjects as being more interested in writing, more mature, and more sophisticated, while at the same time being less concerned over requirements of social convention. He concluded that they would tend to enjoy better relationships with their
immediate families but find large gatherings less to their taste.

Research with the American Council on Education
Psychological Examination (ACE) and the
School and College Ability Test

The ACE has been used for years as the entrance examination for hundreds of universities and colleges across the United States. From its initial use in 1924, Traxler (1956) estimates that 50,000 freshmen yearly have contributed to the national norms of the test. The test has been used widely in many and various research projects in an attempt to improve and contribute more knowledge to the ever-present problem of university success or failure.

After the 1954 printing of the ACE, the Educational Testing Service published the School and College Ability Test (SCAT), which had been designed to replace the older instrument. The new test was an attempt to measure "school-learned abilities" directly. The advisory committee members based their position on three observations that were shared unanimously by each member.

1. The best single predictor of how well a student is likely to succeed in his school work next year is how well he is succeeding this year.

2. A certain few school-learned abilities appear to be critical prerequisites to subsequent steps in learning throughout the range of general education; they include skills in reading and in handling quantitative information.

3. School-learned abilities usually can be discussed with students and parents in a more objective way than can such emotionally
loaded characteristics as "intelligence" or "mental ability."

Traxler (1956) compared the American Council on Education Psychological Examination (ACE) and the School and College Ability Test (SCAT), to see if the SCAT could qualify as a replacement for the older, better-known ACE, which had a wealth of accumulated research data available. He concluded that the relative difficulty of the ACE and the SCAT, according to the distribution of scores he obtained from the sample subjects, was fairly equal. The SCAT Quantitative sections appeared to be easier than the corresponding section of the ACE; however, the Verbal section of the ACE was not as difficult as the same section on the SCAT. Traxler's final judgment was that, for all practical purposes, the tests were equally difficult. He found that the prediction value for college grades was slightly higher for the SCAT, which reached a .52 correlation compared to .48 for the ACE.

North (1956), in comparing the two tests, reported results that slightly favored the ACE. Correlations between the sub-scores within the two tests in question ranged from .53 to .56. However, the reliability of the differences between the scores on the two major parts was greater for the ACE, indicating that possibly the ACE scores provided a more reliable foundation from which to make predictions of college success in either a Quantitative or Linguistic oriented program. Correlations between the subscores of the two tests, i.e. between the SCAT Verbal and the ACE Linguistic, and between the SCAT Quantitative and the ACE Quantitative, ranged from .78 to .85. These correlations compared favorably with other measures of academic ability.

Weeks (1959) compared the predictive abilities for the ACE and SCAT, with results indicating a significant advantage of the SCAT for
predicting college grades from the Quantitative subscores. Although the difference between the SCAT Verbal and the ACE Linguistic scores was not statistically significant, the results favored the SCAT. Weeks concluded that the SCAT was as good as, or better than, the ACE in predicting college success or grade points.

In summary, the SCAT appeared to be at least as effective as the ACE for use in colleges and universities. The high correlations between the two tests allowed for certain generalizations on the basis of the vast research data available from the ACE, for application to the SCAT.

The Minnesota Multiphasic Personality Inventory (MMPI)

The MMPI was published by the Psychological Corporation in 1945. Although the test has been criticized since its inception, thousands of researchers have used it widely in various kinds of research projects. Because of the amount and diverse nature of the many studies using the MMPI, the present review will be limited to those studies relating more closely to the purpose and use of the MMPI in the present study.

MMPI as a Diagnostic Tool

Hathaway and McKinley (1951), caution users of the MMPI against making blind diagnosis from the test results alone, against using the test alone without additional aids, and against inexperienced persons interpreting the results.

Hunt, et al. (1948) studied the differential diagnostic efficiency of the MMPI. Their conclusions, based on the results of their study of
89 sample cases, were as follows:

1. Blind profile analysis is not satisfactory.
2. The K scale did not significantly improve the diagnostic potency of the test.
3. The K scale did not reduce the false negative answers.
4. It was decided that more proper and discriminating use should be expected when using the MMPI than has been the case in the past.

Meehl and Hathaway (1946) reported results that conflict with the previously cited study by Hunt et al. (1948). Meehl, by blind diagnostic sorting and rapid inspection of profiles, was able to categorize correctly approximately 2/3 of the abnormal profiles. They further reported that the danger of the test was not in falsely accusing normal patients of abnormality, but rather, in failing to identify those who were abnormal.

Borko (1952), using a Q-technique did a factor-analytic study on the MMPI. He reported findings of 12 clear factors such as ego strength, anxiety, and dependency, etc. He concluded from his study that the MMPI distinguishes between traits in such a way that it makes it possible for the test user to give dynamic personality description of a subject, and still make a relatively accurate diagnosis.

Hewitt and Rosenberg (1962) used the MMPI as a screening device in an academic setting. They concluded that the test had no value in predicting the success or failure of a student in a classroom. Even when peaks and critical scores were considered carefully, no positive results were obtained.
Hampton (1947) used the MMPI to help in identifying and diagnosing personality disorders among college students. Students who had one or more T scores above 70 were listed as deviates with either actual or potential personality disturbances. Ninety-six of 407 students were identified. Hampton concluded that the MMPI proved most helpful, and did in fact identify 96 students who did need help. Most of the 96 students received help at the counseling center during the year.

Clark (1954), Brown (1948) and Sopchok (1952) reported MMPI norms for college populations. Based on their studies the following conclusions were reached:

1. College groups were "normal" according to the test publishers norms.
2. Women were closer to a T score of 50 than were the males.
3. T scores were not typically below 50 as had been reported by other studies.
4. Males tended to score high on the Ma, Mf, and Pt scales of the MMPI, while scoring lowest on the Pa scale. Females scored high on the Ma, Sc, and Hy scales and were lowest on the Da scale of the MMPI.
5. Both sexes were higher on the Hy scale of the MMPI as opposed to the D scale reported in other investigations.
6. More males than females scored above a T score of 70 on the MMPI.
7. Scores are more alike in close geographical areas than when compared to more distant regions.
Reliability for the MMPI

The MMPI test publishers report a test-retest reliability for 6 of the scales ranging from .57 to .83. Rosen (1952) using 10 scales obtained a test-retest reliability ranging from .55 to .88, with a mean of .77. Other studies have yielded similar reliability findings which would appear to be satisfactory for this kind of test when compared to other tests available.

It seems that the MMPI, if treated properly, could be a useful tool in identifying, diagnosing, and describing various personality characteristics.
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METHODS AND PROCEDURES

Subjects

Sample Population

The students used in this study included most of the freshman entering Utah State University and the Brigham Young University in the fall of 1959. All of the subjects were given the Minnesota Multiphasic Personality Inventory (MMPI) and the School and College Ability Test (SCAT) as a part of their admissions test battery. The sample included 1,215 females and 1,163 males for a total of 2,378 students. Entering freshmen of both schools who had not completed the test battery were not included in the study.

Grouping of Subjects

All of the raw scores obtained from the School and College Ability Test (SCAT) were changed to T scores, with a mean of 50 and a standard deviation of 10. On the basis of their T scores, the subjects were arranged into two major groups: (1) the Quantitative Group (Q-group) consisted of all of the students whose Quantitative T scores were higher than their Verbal T scores on the SCAT; and (2) the Verbal Group (V-group) included all of the students whose Verbal T scores were higher than their Quantitative T scores on the SCAT.

In order to gain a better knowledge of the sample populations, the two major groups were further divided into several sub groups according to sex, school populations, and, finally, according to the amount of difference between the subject's Verbal and Quantitative T scores on
the SCAT. The sub groups and the N for each group were as follows:

**Verbal groups** (Verbal score higher than Quantitative score)

<table>
<thead>
<tr>
<th>Group</th>
<th>Verbal Score</th>
<th>Males</th>
<th>Females</th>
<th>Total N</th>
</tr>
</thead>
<tbody>
<tr>
<td>V1</td>
<td>1 to 5 points higher</td>
<td>211</td>
<td>257</td>
<td>468</td>
</tr>
<tr>
<td>V2</td>
<td>6 to 10 points higher</td>
<td>123</td>
<td>234</td>
<td>357</td>
</tr>
<tr>
<td>V3</td>
<td>11 to 15 points higher</td>
<td>66</td>
<td>135</td>
<td>201</td>
</tr>
<tr>
<td>V4</td>
<td>16 to 20 points higher</td>
<td>23</td>
<td>58</td>
<td>81</td>
</tr>
<tr>
<td>V5</td>
<td>21 or more points higher</td>
<td>13</td>
<td>45</td>
<td>58</td>
</tr>
</tbody>
</table>

**Quantitative groups** (Quantitative score higher than Verbal score)

<table>
<thead>
<tr>
<th>Group</th>
<th>Quantitative Score</th>
<th>Males</th>
<th>Females</th>
<th>Total N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td>1 to 5 points higher</td>
<td>220</td>
<td>235</td>
<td>455</td>
</tr>
<tr>
<td>Q2</td>
<td>6 to 10 points higher</td>
<td>243</td>
<td>152</td>
<td>395</td>
</tr>
</tbody>
</table>
Q3 Quantitative score 11 to 15 points higher than Verbal score

Males 163
Females 73
Total N 236

Q4 Quantitative score 16 to 20 points higher than Verbal score

Males 69
Females 21
Total N 91

Q5 Quantitative score 21 or more points higher than Verbal score

Males 32
Females 5
Total N 37

Variables

The School and College Ability Test (SCAT)

This test contains 110 items arranged into 4 sub-tests. Two of
the sub-tests are combined to yield a Verbal score, with the other two
sub-tests combined to yield a Quantitative score. According to the
test publisher, the SCAT was designed to test school-like abilities
in these two areas of learning, and requires a total working time of
70 minutes.

The Minnesota Multiphasic Personality Inventory (MMPI)

The MMPI consists of 14 scales containing a total of 566 test items.
Four scales make up the validity scales, 9 are referred to as basic
scales, and the last, the Si scale, was designed to measure social in-
troversion or extroversion. A brief description of each of the 13
scales of the test follows. The descriptions have been condensed from
the MMPI Handbook (Dahlstrom and Welsh 1960), with emphasis given to
the interpretations used to describe "normal" subjects.
L scale

The L scale content involves aggressive feelings, bad thoughts, temptations, and lack of conformity. High scores reflect a tendency to cover up personality deviations, and for the person to deny his personal inadequacies. Low scores are indicative of perceptive, socially responsive, and self-reliant individuals.

F scale

This scale includes items dealing with peculiar thoughts and beliefs, apathy, lack of interest in things, or denial of social ties. High scores indicate possible confusion in thinking, carelessness, or indifference. Lower scores are associated with personal attributes such as sincere, calm, dependable, and unpretentious.

K scale

The K scale was developed as a measure of test-taking attitudes, involving personal defensiveness, inadequacies, defects, and troubles. A high K indicates an attempt on the part of the subject to make a favorable impression. Subjects scoring high are described as even-tempered, accepting, patient, self-reliant, optimistic, and conscientious. They are also considered to be aggressive, energetic, and socially comfortable, usually taking an ascendent role in relation to others. Low scoring subjects are described as awkward, cautious, retiring, shallow, and submissive and compliant in respect to authority. They tend to exaggerate their faults and are critical of themselves and others.
Hypocondriasis scale (Hs)

Subjects scoring high are described as sociable, enthusiastic, and having wide interests. They are considered to be good-tempered, responsive, frank, verbal, and orderly. The subjects scoring low are described by their peers as having narrow interests, of being well balanced, and conventional. Other low score descriptions include alertness, quickness to adjust, and being cheerful.

Depression scale (D)

High scorers are characterized as aloof, apathetic, conventional, dull, indifferent, painstaking, retiring, submissive, and withdrawn. Low scores suggest adjectives such as active, aggressive, alert, egotistical, enthusiastic, outgoing, responsible, and self confident.

Hysteria scale (Hy)

Subjects with high scores are described as clever, enterprising, enthusiastic, imaginative, and able to think for themselves. Low scores suggest a person who is cold, changeable, conventional, masculine, and in the case of males, as having narrow interests.

Psychopathic deviate scale (Pd)

Adjectives used to describe high scorers on this scale are aggressive, sociable, frank, individualistic, and wide interests. The females were considered to be emotional and assertive in addition to the other characteristics attributed to the high score characteristics. Low scoring subjects are described as submissive, unconventional, possessed narrow interests, cheerful, obliging, and persistent.
Masculine-feminine scale (Mf)

High scoring males are characterized as sensitive, idealistic, ambitious, clear-thinking, clever, curious, imaginative, having good judgment, and possessing wide and aesthetic interests. High scoring females, however, are described as adventurous, possessing physical strength, having masculine interests, and being logical. Low scoring males lack originality, are stereotyped in their approach to problems and have a rather narrow range of interests. They are described as adventurous, reckless and as having much strength and endurance. The low scoring females are described as sensitive and idealistic. On this scale, a high T score represents interests which are more typically in the direction of the opposite sex, with low T scores reflecting interests of one's own sex.

Paranoid scale (Pa)

Subjects scoring high are considered to be sensitive, emotional, soft hearted, energetic, industrious, insightful, with a wide range of interests. Low scorers are described as mild, self-centered, with narrow interests, and a lacking in self-confidence.

Psychosthenia scale (Pt)

High scoring males are found to be dull, formal, and unemotional. They also tend to be immature and quarrelsome. High scoring females tend to be shy, poor socializers, and lacking in ingenuity. Low scoring males appear to emphasize success and productive achievement as a means of gaining status or recognition. They are efficient, capable, and able to mobilize their resources. Low scoring females are self-confident, placid, and have a wide range of interests.
Schizophrenia scale (Sc)

Males scoring high are described as moody, stubborn, withdrawn, prone to worry, verbal, enthusiastic, and as having some major internal conflicts. The females are judged to be sensitive and high strung. Low scoring males are submissive and compliant, conservative, steady, and obliging. The low females are contented, cheerful and sensitive.

Hypomania (Ma)

The high scorers are described as sensitive, thoughtful, unfriendly, and deceitful. They are considered to be frank, courageous and idealistic. The low scoring subjects are characterized as mature, reasonable, conscientious, simple, sincere, and as having good common sense.

Social introversion scale (Si)

Subjects who score high are judged to be modest, rigid in thought and action, overly controlled, and inhibited. In their personal relations they lack poise and social presence. Low scores are characterized as being sociable, warm, talkative, comfortable, and enthusiastic.

Statistical Analysis

Critical ratio (CR)

This statistical concept is used for determining the significance of a difference between means. In the present study critical ratios were calculated to compare the following groups on each scale of the MMPI:

1. The Quantitative group was compared to the Verbal group.
2. The males and females of the Quantitative group were compared to members of the same sex in the Verbal group.

3. The males in the Verbal and Quantitative groups were compared to the females in those same groups.

4. Brigham Young University and Utah State University students in the Quantitative group were compared to students from their respective schools in the Verbal group.

**Analysis of variance**

Garrett (1958) states that the analysis of variance statistic is most valuable in problems where the significance of the difference among several means is required. In the present study this statistical method was used to compare 20 groups on each scale of the MMPI. The 20 groups were defined at the beginning of the present chapter and were separated according to sex for each group comparison.

**Chi-square**

This statistical concept is used to determine the relationship between obtained or observed phenomena to results expected according to some hypothesis. In the present study, a 2x2 contingency table was used to determine the significance of difference between the number of students in each group who scored two standard deviations above the mean on the MMPI scales. Yates' correction (Garrett 1958) was used for cells in the contingency table which had a total number smaller than 5. Chi-squares were calculated for comparisons between the following groups on each scale of the MMPI:

1. The Quantitative group was compared to the Verbal group.

2. Group V5 males and females were compared to Group Q5 males
and females. (i.e. groups with a V-Q difference of 20 points or more.)

3. The Group V1 males and females were compared to the Group Q1 males and females. (i.e. groups with a V-Q difference of 1 to 5 points.)

4. The combined Verbal group having a V-Q difference of 15 points or more was compared with Group V1 (1 to 2 point V-Q difference).

5. The combined Quantitative group having a Q-V difference of 15 points or more was compared with Group Q1 (1 to 5 point difference).

All of the statistical comparisons made were based on T scores for both the Minnesota Multiphasic Personality Inventory and for the School and College Ability Test. The T scores were based on a mean of 50 and a standard deviation of 10.
RESULTS AND DISCUSSION

The findings resulting from the statistical comparisons made in this study are reported in the same order as they were discussed in the previous chapter, and because of the numerous data obtained, only those results which were statistically significant are reported in the tables that follow. Since the subjects were compared on all of the MMPI scales except the Question (?) scale, absence of data for various scales in the reported results indicate that no significant differences were found for those scales.

Critical Ratio Comparisons

Total Verbal Group Compared to the Total Quantitative Group

Table 1A shows the significant results that were obtained between the Verbal group and the Quantitative group. Four scales were found to distinguish between the two groups compared. As can be seen from Table 1A, the Verbal group obtained significantly higher scores on the K, Pd, and Pa scales of the MMPI while the Quantitative group scored significantly higher on the Mf scale. Interpreting the results according to Dahlstrom and Welsh (1960) as described in the previous chapter, the Verbal group would be characterized as more even tempered, accepting of self and others, self reliant, optimistic and more aggressive than would the Quantitative group. They would also tend to be more sociable, possess a wider range of interests, be more industrious and more sensitive than the Quantitative subjects, who would tend to be
more shallow, mild, submissive, self critical, and more limited in their range of interests. The Quantitative group scored significantly higher on the Mf scale. However, since the results of Table 1A are reported with males and females combined, the implication of the elevated Mf is obscured. Clarification of this difference between V and Q groups is made in reference to Table 1B which reports similar comparisons according to sex.

Table 1A. Total Verbal Group (V) compared to total Quantitative Group (Q) on the MMPI.

<table>
<thead>
<tr>
<th>Groups Compared</th>
<th>Signif. Scales</th>
<th>Critical Ratios</th>
<th>Level of Signif.</th>
<th>Direction of Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>V-group vs Q-group</td>
<td>K</td>
<td>3.86</td>
<td>.01</td>
<td>V higher than Q</td>
</tr>
<tr>
<td></td>
<td>Pd</td>
<td>2.31</td>
<td>.05</td>
<td>V higher than Q</td>
</tr>
<tr>
<td></td>
<td>Mf</td>
<td>5.87</td>
<td>.001</td>
<td>Q higher than V</td>
</tr>
<tr>
<td></td>
<td>Pa</td>
<td>3.05</td>
<td>.01</td>
<td>V higher than Q</td>
</tr>
</tbody>
</table>

Total Verbal group compared to the total Quantitative group according to sex

The results obtained by comparing the Verbal and Quantitative groups according to sex were recorded in Table 1B. The males differed significantly on two scales, Pd and Mf, while the females were significantly different on the same four scales shown in Table 1A. The males in the Verbal group were higher than those in the Quantitative group on both scales that were significant. The Verbal males would, therefore, be characterized as more aggressive, sociable, individualistic, idealistic, more imaginative, and as possessing a wider and more aesthetic group of interests than would be found in the Quantitative males. The Quantitative males would tend to be more submissive, mild, with a lack of ori-
ginality, but somewhat more reckless and masculine in terms of physical strength and endurance. The females in the Quantitative group were significantly higher on the Mf scale than those in the Verbal group. According to Dahlstrom and Welsh (1960), the Quantitative females would tend to be more masculine in terms of interests, have more physical strength and endurance, have a narrower range of interests, to be cold, and somewhat less sensitive than the females in the Verbal group. When the sexes were combined (Table 1A), the Quantitative group was significantly higher than the Verbal group on the Mf scale. Results from Table 1B show the Verbal males and Quantitative females to be higher on that scale. These findings point out the necessity for taking into account the sex difference when comparing groups on the various MMPI scales. Interpretation of the Mf scale with the sexes combined would result in an error that would contradict and contaminate interpretations for the various groups being compared.

Table 1B. Total Verbal groups compared (according to sex) to the total Quantitative groups on the MMPI.

<table>
<thead>
<tr>
<th>Groups Compared</th>
<th>Signif. Scales</th>
<th>Critical Ratios</th>
<th>Level of Signif.</th>
<th>Direction of Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>V-males vs Q-males</td>
<td>Pd</td>
<td>2.00</td>
<td>.05</td>
<td>V higher than Q</td>
</tr>
<tr>
<td></td>
<td>Mf</td>
<td>3.73</td>
<td>.01</td>
<td>V higher than Q</td>
</tr>
<tr>
<td>V-females vs Q-females</td>
<td>K</td>
<td>2.02</td>
<td>.05</td>
<td>V higher than Q</td>
</tr>
<tr>
<td></td>
<td>Pd</td>
<td>2.07</td>
<td>.05</td>
<td>V higher than Q</td>
</tr>
<tr>
<td></td>
<td>Mf</td>
<td>5.60</td>
<td>.001</td>
<td>Q higher than V</td>
</tr>
<tr>
<td></td>
<td>Pa</td>
<td>2.27</td>
<td>.05</td>
<td>V higher than Q</td>
</tr>
</tbody>
</table>
Males compared to females within the Verbal and Quantitative groups

The comparisons made between the sexes within the same group do not have a direct relationship to the hypotheses being tested in the present study. Therefore, the findings of Table 1C are not discussed here. They are reported merely to identify the MMPI scales that yielded sex differences in order that these differences could be taken into account in the Analysis of Variance comparisons below. As can be seen from Table 1C, eight scales yielded significant differences between the males and females in the Quantitative group while seven scales indicated significant differences for the sexes in the Verbal group. The Analysis of Variance results, to be reported in the following portion of this chapter, were obtained by separating the various groups compared according to sex before making any statistical calculations.

Table 1C. Males compared to females within the Verbal and Quantitative groups on the MMPI.

<table>
<thead>
<tr>
<th>Groups Compared</th>
<th>Signif. Scales</th>
<th>Critical Ratios</th>
<th>Level of Signif.</th>
<th>Direction of Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q-males vs L</td>
<td>L</td>
<td>5.25</td>
<td>.001</td>
<td>Q-F higher than Q-M</td>
</tr>
<tr>
<td>Q-females</td>
<td>F</td>
<td>2.37</td>
<td>.05</td>
<td>Q-M higher than Q-F</td>
</tr>
<tr>
<td></td>
<td>K</td>
<td>3.12</td>
<td>.01</td>
<td>Q-F higher than Q-M</td>
</tr>
<tr>
<td></td>
<td>Hs</td>
<td>2.35</td>
<td>.05</td>
<td>Q-M higher than Q-F</td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>2.25</td>
<td>.01</td>
<td>Q-M higher than Q-F</td>
</tr>
<tr>
<td></td>
<td>Mf</td>
<td>13.30</td>
<td>.001</td>
<td>Q-M higher than Q-F</td>
</tr>
<tr>
<td></td>
<td>Pt</td>
<td>3.95</td>
<td>.01</td>
<td>Q-M higher than Q-F</td>
</tr>
<tr>
<td></td>
<td>Ma</td>
<td>2.71</td>
<td>.01</td>
<td>Q-M higher than Q-F</td>
</tr>
<tr>
<td>V-males vs L</td>
<td>L</td>
<td>2.89</td>
<td>.01</td>
<td>V-F higher than V-M</td>
</tr>
<tr>
<td>V-females</td>
<td>F</td>
<td>2.76</td>
<td>.01</td>
<td>V-M higher than V-F</td>
</tr>
<tr>
<td></td>
<td>K</td>
<td>2.89</td>
<td>.01</td>
<td>V-F higher than V-M</td>
</tr>
<tr>
<td></td>
<td>Hs</td>
<td>2.16</td>
<td>.05</td>
<td>V-M higher than V-F</td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>2.60</td>
<td>.01</td>
<td>V-M higher than V-F</td>
</tr>
<tr>
<td></td>
<td>Mf</td>
<td>19.58</td>
<td>.001</td>
<td>V-M higher than V-F</td>
</tr>
<tr>
<td></td>
<td>Pa</td>
<td>2.21</td>
<td>.05</td>
<td>V-F higher than V-M</td>
</tr>
</tbody>
</table>
BYU and USU Quantitative groups compared to respective Verbal groups

The students from USU in the Quantitative group were compared to those in the Verbal group. Table 1D contains the results from this comparison. Three scales, the D, Mf, and Pt, yielded significant differences, with the Quantitative group scoring higher on all three scales. High scorers on the D and Pt scales, according to Dahlstrom and Welsh (1960), would be characterized as apathetic, aloof, conventional, dull, painstaking, submissive and withdrawn. The Mf scale cannot be interpreted because the sexes were combined for this comparison and the tendency for the Quantitative females to score high on this scale would bias the interpretation.

Similar comparisons were made between the BYU Quantitative and Verbal groups. Those groups were significantly different on five of the MMPI scales including the K, Hy, Pd, Mf, and Pa scale. As can be seen from Table 1D, the Verbal group was significantly higher on every comparison with the exception of the Mf scale. The Verbal group would be described as more aggressive, socially capable, individualistic, clever, imaginative, self confident, and as possessing a wider range of interests than would be found in the Quantitative group.

Even though different scales yielded significant results for the BYU and USU groups, the Verbal groups from both schools received the more favorable interpretation; the USU Verbal group because the Quantitative group scored higher on scales with unfavorable characteristics for high scorers, the BYU Verbal group because they scored higher on scales with favorable characteristics attached to high scorers.
Table 1D. USU and BYU Quantitative groups compared to their respective Verbal groups on the MMPI.

<table>
<thead>
<tr>
<th>Groups Compared</th>
<th>Signif. Scales</th>
<th>Critical Ratios</th>
<th>Level of Signif.</th>
<th>Direction of Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>USU Q-group vs</td>
<td>D</td>
<td>2.64</td>
<td>.01</td>
<td>Q higher than V</td>
</tr>
<tr>
<td>USU V-group</td>
<td>Mf</td>
<td>3.45</td>
<td>.01</td>
<td>Q higher than V</td>
</tr>
<tr>
<td></td>
<td>Pt</td>
<td>2.50</td>
<td>.05</td>
<td>Q higher than V</td>
</tr>
<tr>
<td>BYU Q-group vs</td>
<td>K</td>
<td>2.85</td>
<td>.01</td>
<td>V higher than Q</td>
</tr>
<tr>
<td>BYU V-group</td>
<td>Hy</td>
<td>2.46</td>
<td>.05</td>
<td>V higher than Q</td>
</tr>
<tr>
<td></td>
<td>Pd</td>
<td>3.60</td>
<td>.01</td>
<td>V higher than Q</td>
</tr>
<tr>
<td></td>
<td>Mf</td>
<td>4.69</td>
<td>.001</td>
<td>Q higher than V</td>
</tr>
<tr>
<td></td>
<td>Pa</td>
<td>4.24</td>
<td>.001</td>
<td>V higher than Q</td>
</tr>
</tbody>
</table>

Analysis of Variance Comparisons

This statistical procedure was used in an attempt to find any significant differences between groups that would result as the Verbal-Quantitative differences increased. It was determined that several of the MMPI scales yielded sex differences (see Table 1C page 31). Much of the data that were significant in the Analysis of Variance comparisons, resulted from the sex biases and could not be used. In Tables 2A and 2B comparisons were not made between males and females since the MMPI scales reported in these two tables were found to have sex bias. For the Si scale comparisons in Table 2C the males and females were compared since the Si scale was not found to be biased by sex. All of the group means, and tables containing the Analysis of Variance results for the 20 groups compared on the MMPI scales can be found in the Appendix. Only the results that were significant at the .05 or .01 level of confidence were recorded. Abbreviations for the various groups will be used in the discussion below (see pages 20-25).
The F scale did not yield differences between the groups that were significant but a comparison of the means for the various groups on this scale did indicate a tendency for the groups with the wider V-Q difference to score higher. For example, the mean for the group Q1 males was 53.71. The means for the group Q2, Q3, and Q5 males respectively were 54.04, 54.86 and 54.94. The group V1 males had a mean of 54.20 while the group V4 and V5 males had means of 56.22 and 57.31 respectively. None of these differences were significant at either the .05 or .01 level of confidence. The higher score on this scale suggests moodiness, non-conformity and a more unstable confidence in self.

The groups having the wider V-Q difference tended to score higher on the D scale. For example, the group V1 males had a mean of 51.14, the group V2 males of 51.69, the group V3 males of 52.33, and the group V4 males were significantly higher than all three groups with a mean of 59.83. The differences between the group V4 males and the other three groups were significant at the .01 level of confidence. High scorers on this scale are characterized as apathetic, dull, submissive, shy and cold.

The Mf scale comparisons yielded results that lend support to two of the hypotheses under consideration. For example, the Verbal groups including both male and female groups scored higher and lower respectively on the Mf scale than the Quantitative male and female groups. The high scoring males on this scale are characterized as sensitive, idealistic, sociable and curious, and as having wide general aesthetic interests. The high scoring females on the Mf scale would be described as adventurous, having physical strength and endurance, and as having narrow and masculine interests. As can be seen from the comparisons
in Table 2A, the Quantitative females scored higher than the Verbal females. The Verbal males scored higher than the Quantitative males. In both the male and female groups, the Verbal groups received the more favorable interpretation on the Mf scale. Within the Quantitative group comparisons, the groups having the least amount of V-Q difference received the more favorable Mf scale interpretation. For example, when the group Q1 male was compared to the group Q3 male (Table 2A), the group Q1 male was significantly higher. The group Q2 males were significantly higher than the group Q3 males, etc.

It can also be seen from Table 2A, that as the amount of V-Q difference increases or decreases between the groups being compared, the T-Values tend to increase or decrease accordingly. For example, when the group Q1 females were compared to the group V2 females, the T-Value was 2.10. When the group Q1 females were compared to the group V3 females, the T-Value increased to 2.85. The group Q1 females compared to the group V5 females shows a T-Value of 4.29. This suggests that as the V-Q difference increases, the significance of the difference between the groups being compared tends to increase. Therefore, support is given to the hypothesis stating that the wider the V-Q difference, the more measurable will be the personality characteristics indicative of some type of personal problem.

One of the findings reported above challenges a conclusion reached by Lambert (1960) where he compared female mathematic and non-mathematic majors on the Mf scale of the MMPI. Lambert reported that the female mathematic majors were significantly more feminine than were the females who were not mathematic majors. Although the present study utilized a measured Quantitative ability, as opposed to mathematics majors or non-
Table 2A. Mf scale Analysis of Variance results for the 20 groups corrected for sex bias.

<table>
<thead>
<tr>
<th>Groups Compared</th>
<th>Degrees of Freedom</th>
<th>T-Values</th>
<th>Level of Significance</th>
<th>High Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1 M vs Q3 M</td>
<td>381</td>
<td>2.19</td>
<td>.05</td>
<td>Q1 M</td>
</tr>
<tr>
<td>Q1 M vs V4 M</td>
<td>241</td>
<td>3.66</td>
<td>.01</td>
<td>V4 M</td>
</tr>
<tr>
<td>Q1 M vs V3 M</td>
<td>284</td>
<td>4.76</td>
<td>.01</td>
<td>V3 M</td>
</tr>
<tr>
<td>Q1 F vs V2 F</td>
<td>467</td>
<td>2.10</td>
<td>.05</td>
<td>Q1 F</td>
</tr>
<tr>
<td>Q1 F vs V4 F</td>
<td>291</td>
<td>2.61</td>
<td>.01</td>
<td>Q1 F</td>
</tr>
<tr>
<td>Q1 F vs V3 F</td>
<td>368</td>
<td>2.85</td>
<td>.01</td>
<td>Q1 F</td>
</tr>
<tr>
<td>Q1 F vs V5 F</td>
<td>278</td>
<td>4.39</td>
<td>.01</td>
<td>Q1 F</td>
</tr>
<tr>
<td>Q2 M vs Q3 M</td>
<td>404</td>
<td>2.42</td>
<td>.05</td>
<td>Q2 M</td>
</tr>
<tr>
<td>Q2 M vs V4 M</td>
<td>264</td>
<td>3.94</td>
<td>.01</td>
<td>V4 M</td>
</tr>
<tr>
<td>Q2 M vs V3 M</td>
<td>307</td>
<td>5.08</td>
<td>.01</td>
<td>V3 M</td>
</tr>
<tr>
<td>Q2 F vs V2 F</td>
<td>384</td>
<td>3.64</td>
<td>.01</td>
<td>Q2 F</td>
</tr>
<tr>
<td>Q2 F vs V1 F</td>
<td>407</td>
<td>3.65</td>
<td>.01</td>
<td>Q2 F</td>
</tr>
<tr>
<td>Q2 F vs V4 F</td>
<td>208</td>
<td>3.80</td>
<td>.01</td>
<td>Q2 F</td>
</tr>
<tr>
<td>Q2 F vs V3 F</td>
<td>285</td>
<td>4.38</td>
<td>.01</td>
<td>Q2 F</td>
</tr>
<tr>
<td>Q2 F vs V5 F</td>
<td>195</td>
<td>5.34</td>
<td>.01</td>
<td>Q2 F</td>
</tr>
<tr>
<td>Q3 M vs V1 M</td>
<td>372</td>
<td>2.20</td>
<td>.05</td>
<td>V1 M</td>
</tr>
<tr>
<td>Q3 M vs V2 M</td>
<td>284</td>
<td>2.52</td>
<td>.05</td>
<td>V2 M</td>
</tr>
<tr>
<td>Q3 M vs V4 M</td>
<td>184</td>
<td>5.13</td>
<td>.01</td>
<td>V4 M</td>
</tr>
<tr>
<td>Q3 M vs V3 M</td>
<td>227</td>
<td>6.62</td>
<td>.01</td>
<td>V3 M</td>
</tr>
<tr>
<td>Q3 F vs V4 F</td>
<td>129</td>
<td>2.49</td>
<td>.05</td>
<td>Q3 F</td>
</tr>
<tr>
<td>Q3 F vs V3 F</td>
<td>206</td>
<td>2.62</td>
<td>.01</td>
<td>Q3 F</td>
</tr>
<tr>
<td>Q3 F vs V5 F</td>
<td>116</td>
<td>3.86</td>
<td>.01</td>
<td>Q3 F</td>
</tr>
<tr>
<td>Q4 M vs V4 M</td>
<td>91</td>
<td>3.93</td>
<td>.01</td>
<td>V4 M</td>
</tr>
<tr>
<td>Q4 M vs V3 M</td>
<td>134</td>
<td>4.76</td>
<td>.01</td>
<td>V3 M</td>
</tr>
<tr>
<td>Q4 F vs V2 F</td>
<td>253</td>
<td>2.12</td>
<td>.05</td>
<td>Q4 F</td>
</tr>
<tr>
<td>Q4 F vs V1 F</td>
<td>276</td>
<td>2.31</td>
<td>.05</td>
<td>Q4 F</td>
</tr>
<tr>
<td>Q4 F vs V4 F</td>
<td>77</td>
<td>2.70</td>
<td>.01</td>
<td>Q4 F</td>
</tr>
<tr>
<td>Q4 F vs V3 F</td>
<td>154</td>
<td>2.83</td>
<td>.01</td>
<td>Q4 F</td>
</tr>
<tr>
<td>Q4 F vs V5 F</td>
<td>64</td>
<td>3.59</td>
<td>.01</td>
<td>Q4 F</td>
</tr>
<tr>
<td>Q5 M vs V4 M</td>
<td>53</td>
<td>3.26</td>
<td>.01</td>
<td>V4 M</td>
</tr>
<tr>
<td>Q5 M vs V3 M</td>
<td>96</td>
<td>3.67</td>
<td>.01</td>
<td>V3 M</td>
</tr>
<tr>
<td>V1 M vs V4 M</td>
<td>232</td>
<td>3.30</td>
<td>.01</td>
<td>V4 M</td>
</tr>
<tr>
<td>V1 M vs V3 M</td>
<td>275</td>
<td>4.31</td>
<td>.01</td>
<td>V3 M</td>
</tr>
<tr>
<td>V1 F vs V5 F</td>
<td>300</td>
<td>3.78</td>
<td>.01</td>
<td>V1 F</td>
</tr>
<tr>
<td>V2 M vs V4 M</td>
<td>144</td>
<td>2.70</td>
<td>.01</td>
<td>V4 M</td>
</tr>
<tr>
<td>V2 M vs V3 M</td>
<td>187</td>
<td>3.35</td>
<td>.01</td>
<td>V3 M</td>
</tr>
<tr>
<td>V2 F vs V5 F</td>
<td>277</td>
<td>2.98</td>
<td>.01</td>
<td>V2 F</td>
</tr>
<tr>
<td>V3 M vs V5 M</td>
<td>77</td>
<td>2.57</td>
<td>.05</td>
<td>V3 M</td>
</tr>
<tr>
<td>V3 F vs V5 F</td>
<td>178</td>
<td>2.51</td>
<td>.05</td>
<td>V3 F</td>
</tr>
<tr>
<td>V4 M vs V5 M</td>
<td>34</td>
<td>2.17</td>
<td>.05</td>
<td>V4 M</td>
</tr>
</tbody>
</table>

See pages 20 and 21 for definition of groups.
majors, the results from the present study seem to contradict the conclusions reported by Lambert. The issue is raised because of the more favorable interpretation (more feminine) rendered to the lower Mf score for females according to Dahlstrom and Welsh (1960). The observation that high scoring (Quantitative) females are more masculine, both in interests and in physical strength and endurance, more conventional and dull, as opposed to the more sensitive, responsive, idealistic and feminine (Verbal) females, suggests a more fertile area from which personal problems could originate.

The results of the Analysis of Variance comparisons for the 20 groups on the Ma scale reported in Table 2B lend further support to the hypothesis stating that the wider the difference in the Verbal-Quantitative abilities, the more measurable will be the differences indicative of some type of personality problem on the MMPI. No male vs male comparisons were significant at either the .05 or .01 level of confidence on this scale of the MMPI. As can be seen in Table 2B, the female groups having the greater amounts of V-Q difference, tended to score higher on the Ma scale than the groups in which this difference was more nearly equal. For example, when the group Q1 females were compared to the group Q5 females, the latter group scored significantly higher. When the group V1 females were compared to the group V2 females, the group V2 females attained significantly higher scores, etc. The female Quantitative groups tended to score higher than the female Verbal groups on this scale. For example, the group Q5 females scored significantly higher than the group V5 females (Table 2B). High scoring subjects are described as frank, unfriendly, deceitful and thoughtful. Lower scoring subjects are characterized as mature, reasonable and as
having good judgment and common sense.

Table 2B. Ma scale Analysis of Variance results for the 20 groups corrected for sex bias.

<table>
<thead>
<tr>
<th>Groups Compared</th>
<th>Degrees of Freedom</th>
<th>T-Values</th>
<th>Level of Significance</th>
<th>High Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1 F vs Q5 F</td>
<td>238</td>
<td>2.04</td>
<td>.05</td>
<td>Q5 F</td>
</tr>
<tr>
<td>Q1 F vs V4 F</td>
<td>291</td>
<td>2.31</td>
<td>.05</td>
<td>V4 F</td>
</tr>
<tr>
<td>Q3 F vs Q5 F</td>
<td>76</td>
<td>2.50</td>
<td>.05</td>
<td>Q5 F</td>
</tr>
<tr>
<td>Q3 F vs V2 F</td>
<td>305</td>
<td>2.10</td>
<td>.05</td>
<td>V2 F</td>
</tr>
<tr>
<td>Q3 F vs V4 F</td>
<td>129</td>
<td>3.05</td>
<td>.01</td>
<td>V4 F</td>
</tr>
<tr>
<td>Q5 F vs V1 F</td>
<td>260</td>
<td>2.48</td>
<td>.05</td>
<td>Q5 F</td>
</tr>
<tr>
<td>Q5 F vs V3 F</td>
<td>138</td>
<td>2.31</td>
<td>.05</td>
<td>Q5 F</td>
</tr>
<tr>
<td>Q5 F vs V5 F</td>
<td>48</td>
<td>2.07</td>
<td>.05</td>
<td>Q5 F</td>
</tr>
<tr>
<td>V1 F vs V2 F</td>
<td>489</td>
<td>2.51</td>
<td>.05</td>
<td>V2 F</td>
</tr>
<tr>
<td>V1 F vs V4 F</td>
<td>313</td>
<td>3.31</td>
<td>.01</td>
<td>V4 F</td>
</tr>
<tr>
<td>V2 F vs V3 F</td>
<td>367</td>
<td>2.07</td>
<td>.05</td>
<td>V3 F</td>
</tr>
<tr>
<td>V3 F vs V4 F</td>
<td>191</td>
<td>2.94</td>
<td>.01</td>
<td>V4 F</td>
</tr>
</tbody>
</table>

See pages 20 and 21 for definition of groups.

The data reported in Table 2C reinforced the findings reported in Tables 2A and 2B concerning the significance of the wider V-Q differential. The groups having the largest amount of V-Q difference tended to score higher on the Si scale than did the groups whose V-Q differences were more nearly equal. For example, group Q3 females scored higher than the group Q1 males, the group V4 males were higher than the group Q3 males, and the group V5 females scored significantly higher than the group V4 females, etc. When the group Q3 females were compared to the group Q3 males, the females scored higher, suggesting that the females whose Quantitative scores are high tend to be more introverted than the
Table 2C. Si scale Analysis of Variance results for the 20 groups.  
(No sex bias present)

<table>
<thead>
<tr>
<th>Groups Compared</th>
<th>Degrees of Freedom</th>
<th>T-Values</th>
<th>Level of Significances</th>
<th>High Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1 M vs Q3 F</td>
<td>291</td>
<td>2.04</td>
<td>.05</td>
<td>Q3 F</td>
</tr>
<tr>
<td>Q1 M vs V4 M</td>
<td>241</td>
<td>2.28</td>
<td>.05</td>
<td>V4 M</td>
</tr>
<tr>
<td>Q1 M vs V5 F</td>
<td>263</td>
<td>2.65</td>
<td>.01</td>
<td>V5 F</td>
</tr>
<tr>
<td>Q1 F vs V4 M</td>
<td>256</td>
<td>2.13</td>
<td>.05</td>
<td>V4 M</td>
</tr>
<tr>
<td>Q1 F vs V5 F</td>
<td>278</td>
<td>2.41</td>
<td>.05</td>
<td>V5 F</td>
</tr>
<tr>
<td>Q2 M vs Q3 F</td>
<td>314</td>
<td>2.00</td>
<td>.05</td>
<td>Q3 F</td>
</tr>
<tr>
<td>Q2 M vs V4 M</td>
<td>264</td>
<td>2.27</td>
<td>.05</td>
<td>V4 M</td>
</tr>
<tr>
<td>Q2 M vs V5 F</td>
<td>286</td>
<td>2.64</td>
<td>.01</td>
<td>V5 F</td>
</tr>
<tr>
<td>Q2 F vs V5 F</td>
<td>195</td>
<td>2.00</td>
<td>.05</td>
<td>V5 F</td>
</tr>
<tr>
<td>Q3 M vs Q3 F</td>
<td>234</td>
<td>2.14</td>
<td>.05</td>
<td>Q3 F</td>
</tr>
<tr>
<td>Q3 M vs V4 M</td>
<td>184</td>
<td>2.41</td>
<td>.05</td>
<td>V4 M</td>
</tr>
<tr>
<td>Q3 M vs V5 F</td>
<td>206</td>
<td>2.77</td>
<td>.01</td>
<td>V5 F</td>
</tr>
<tr>
<td>Q3 F vs V1 M</td>
<td>282</td>
<td>2.07</td>
<td>.05</td>
<td>Q3 F</td>
</tr>
<tr>
<td>Q3 F vs V3 M</td>
<td>134</td>
<td>2.11</td>
<td>.05</td>
<td>Q3 F</td>
</tr>
<tr>
<td>V1 M vs V4 M</td>
<td>232</td>
<td>2.24</td>
<td>.05</td>
<td>V4 M</td>
</tr>
<tr>
<td>V1 M vs V5 F</td>
<td>254</td>
<td>2.63</td>
<td>.01</td>
<td>V5 F</td>
</tr>
<tr>
<td>V1 F vs V4 M</td>
<td>278</td>
<td>2.15</td>
<td>.05</td>
<td>V4 M</td>
</tr>
<tr>
<td>V1 F vs V5 F</td>
<td>300</td>
<td>2.46</td>
<td>.05</td>
<td>V5 F</td>
</tr>
<tr>
<td>V2 M vs V4 M</td>
<td>144</td>
<td>2.26</td>
<td>.05</td>
<td>V4 M</td>
</tr>
<tr>
<td>V2 M vs V5 F</td>
<td>166</td>
<td>2.50</td>
<td>.05</td>
<td>V5 F</td>
</tr>
<tr>
<td>V2 F vs V5 F</td>
<td>277</td>
<td>2.16</td>
<td>.05</td>
<td>V5 F</td>
</tr>
<tr>
<td>V3 M vs V4 M</td>
<td>87</td>
<td>2.30</td>
<td>.05</td>
<td>V4 M</td>
</tr>
<tr>
<td>V3 M vs V5 F</td>
<td>109</td>
<td>2.60</td>
<td>.05</td>
<td>V5 F</td>
</tr>
<tr>
<td>V4 M vs V4 F</td>
<td>79</td>
<td>2.26</td>
<td>.05</td>
<td>V4 M</td>
</tr>
<tr>
<td>V4 F vs V5 F</td>
<td>101</td>
<td>2.38</td>
<td>.05</td>
<td>V5 F</td>
</tr>
</tbody>
</table>

See pages 20 and 21 for definition of groups.

males with a similar V-Q difference. High scorers on the Si scale (Table 2C) are described as modest, shy, rigid in thought and action, overly controlled and inhibited, and uncomfortable in social situations or around groups of people. They also lack poise and social presence in their personal relations. Low scoring subjects are characterized as
being sociable, warm, talkative, comfortable around people, and enthusiastic. The groups with the least amount of V-Q difference would rate a more favorable interpretation on the Si scale than would the groups where the V-Q difference was large.

**Chi-Square Comparisons**

The chi-square was used in the present study to compare the study groups in terms of the number of subjects with MMPI scores above 70 (T scores of 70 = two standard deviations above the mean). Table 3A contains all of the results from the chi-square comparisons that were significant. As can be seen from Table 3A, the Quantitative group had a significantly larger number of subjects with "clinical" scores (above 70), and these were on the Pt and Ma scales. They also had more of their group scoring high on the F, D, Sc, and Si scales, but the differences were not significant. These results support, to a strong degree, the hypothesis that the Quantitative subjects would be more prone to show measured personal problems than would the subjects whose Verbal abilities were highest. Interpretation of the scales on which the Quantitative groups were high, according to Dahlstrom and Welsh (1960), suggest feelings of inadequacy, lack of self confidence, a tendency for the subjects to worry, and strong feelings of anxiety and ambivalence, both towards self and in making decisions.

When the Quantitative and Verbal groups with a 1 to 5 point V-Q difference were compared, the results were the same except that the Verbal group had significantly more subjects scoring high on the K scale, indicating a tendency for the Verbal subjects to hide or deny their weaknesses in an attempt to make a good impression on people.
Table 3A. Cell frequencies of Chi Square comparisons among Verbal and Quantitative groups in terms of number of subjects with MMPI scales above a T score of 70.

<table>
<thead>
<tr>
<th>Groups Compared</th>
<th>Size of Sample</th>
<th>L</th>
<th>F</th>
<th>K</th>
<th>Hs</th>
<th>D</th>
<th>Hy</th>
<th>Pd</th>
<th>Mf</th>
<th>Pa</th>
<th>Pt</th>
<th>Sc</th>
<th>Ma</th>
<th>Si</th>
</tr>
</thead>
<tbody>
<tr>
<td>V group vs Q group</td>
<td>1166</td>
<td>20</td>
<td>45</td>
<td>51</td>
<td>46</td>
<td>48</td>
<td>50</td>
<td>139</td>
<td>99</td>
<td>100</td>
<td>130</td>
<td>117</td>
<td>130</td>
<td>47</td>
</tr>
<tr>
<td>Total V group vs Total Q group</td>
<td>1214</td>
<td>23</td>
<td>57</td>
<td>25</td>
<td>50</td>
<td>61</td>
<td>43</td>
<td>133</td>
<td>81</td>
<td>98</td>
<td>180**</td>
<td>137</td>
<td>164*</td>
<td>56</td>
</tr>
<tr>
<td>V1 group vs Q1 group</td>
<td>468</td>
<td>7</td>
<td>20</td>
<td>21</td>
<td>21</td>
<td>18</td>
<td>18</td>
<td>60</td>
<td>26</td>
<td>41</td>
<td>47</td>
<td>39</td>
<td>42</td>
<td>16</td>
</tr>
<tr>
<td>V5 group vs Q5 group</td>
<td>455</td>
<td>9</td>
<td>21</td>
<td>9*</td>
<td>19</td>
<td>21</td>
<td>19</td>
<td>43</td>
<td>30</td>
<td>35</td>
<td>67*</td>
<td>49</td>
<td>64*</td>
<td>18</td>
</tr>
<tr>
<td>V4 &amp; V5 groups vs V1 group</td>
<td>139</td>
<td>3</td>
<td>5</td>
<td>9</td>
<td>7</td>
<td>7</td>
<td>11</td>
<td>16</td>
<td>15</td>
<td>21</td>
<td>22</td>
<td>23</td>
<td>16</td>
<td>7</td>
</tr>
<tr>
<td>Q4 &amp; Q5 groups vs Q1 group</td>
<td>128</td>
<td>3</td>
<td>6</td>
<td>0</td>
<td>8</td>
<td>9</td>
<td>8</td>
<td>8</td>
<td>11</td>
<td>7</td>
<td>21</td>
<td>21</td>
<td>21</td>
<td>6</td>
</tr>
</tbody>
</table>

* Significant at .05 level.
** Significant at .001 level.
The Ma scale was the only scale producing a significant difference when the extreme Verbal and Quantitative groups were compared (i.e. those with a V-Q difference of 20 points or more). In this latter comparison, the Quantitative group was again high, lending support to the interpretations given in the previous paragraph.

Table 3B. Chi Square values for significant cells of Table 3A.

<table>
<thead>
<tr>
<th>Group Comparison</th>
<th>Significant Scale</th>
<th>$\chi^2$</th>
<th>Level of Significance</th>
<th>Direction of Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal vs Pt</td>
<td>18.41</td>
<td>.001</td>
<td>Q higher than V</td>
<td></td>
</tr>
<tr>
<td>Quantitative</td>
<td>5.88</td>
<td>.05</td>
<td>Q higher than V</td>
<td></td>
</tr>
<tr>
<td>V1 vs Q1</td>
<td>4.60</td>
<td>.05</td>
<td>V higher than Q</td>
<td></td>
</tr>
<tr>
<td>Pt</td>
<td>4.67</td>
<td>.05</td>
<td>Q higher than V</td>
<td></td>
</tr>
<tr>
<td>Ma</td>
<td>5.88</td>
<td>.05</td>
<td>Q higher than V</td>
<td></td>
</tr>
<tr>
<td>V5 vs Q5</td>
<td>4.43</td>
<td>.05</td>
<td>Q higher than V</td>
<td></td>
</tr>
<tr>
<td>V4 and V5 vs V1</td>
<td>3.88</td>
<td>.05</td>
<td>V4 &amp; 5 higher than V1</td>
<td></td>
</tr>
<tr>
<td>Pt</td>
<td>4.66</td>
<td>.05</td>
<td>V4 &amp; 5 higher than V1</td>
<td></td>
</tr>
<tr>
<td>Pa</td>
<td>4.71</td>
<td>.05</td>
<td>V4 &amp; 5 higher than V1</td>
<td></td>
</tr>
<tr>
<td>Sc</td>
<td>7.88</td>
<td>.05</td>
<td>V4 &amp; 5 higher than V1</td>
<td></td>
</tr>
</tbody>
</table>

See pages 20 and 21 for definition of groups.

The third hypothesis, stating that the groups with a V-Q difference of 15 points or higher would have significantly more subjects scoring above the critical score than those with a lesser difference, seemed to hold true only in the groups that had a higher Verbal than Quantitative ability. Table 3A shows that four scales, the Hy, Mf, Pa, and Sc, yielded significant differences when the V4 and V5 groups were combined and compared to the V1 group. According to Dahlstrom and Welsh (1960), scores above 70 on these four scales suggest a tendency for the extreme
Verbal subjects to be immature, to avoid facing their problems, to view people with caution (suggesting feelings of insecurity and a need for approval), to have feelings of inadequacy in regards to sex, to be pessimistic, and to feel alone and unwanted in the world.

There were no significant differences when the two Quantitative groups were compared with each other, suggesting that the amount of difference is not as important in Quantitative groups as it is in Verbal groups. It seems, instead, that the direction of the difference—that is, the fact that the Quantitative ability is higher than the Verbal ability, may be the more significant determinant of personal adjustment among Quantitative subjects.

Summary

The Verbal group tended to score higher than the Quantitative group on the scales of the MMPI that described them as being more decisive, self confident, mature, sensitive, aggressive, sociable, verbal, imaginative, industrious, energetic, and as having a wider and more aesthetic range of interests. The Quantitative group, on the other hand, was described as being more stereotyped, cool, ambivalent, submissive, conventional, anxious, more prone to worry, and lacking self confidence, particularly in social situations. The Quantitative group had a significantly greater number of subjects than the Verbal group who scored above 70 on two scales of the MMPI, and those scales tended to support the previous descriptions attributed to the Quantitative group. The amount of V-Q difference seemed to be significant only in the groups where the Verbal ability was higher than the Quantitative ability.
For the Quantitative groups, the direction of V-Q difference appeared to be more significant than the amount of difference in determining the personality characteristics attributed to Quantitative subjects.
SUMMARY AND CONCLUSIONS

Summary

Counselors are continuously interested in identifying students who may be in need of the services provided in their centers. It has been observed by some counselors that students seeking help quite often have extremely wide differences between measured Verbal and Quantitative abilities. A preliminary survey of literature disclosed the fact that relatively few studies have been reported associating Verbal and Quantitative abilities to personality measures.

The purpose of the present study was to determine whether or not the direction or amount of a Verbal-Quantitative differential would yield significant differences on a measure of personality.

Students from the Brigham Young University and Utah State University were given the School and College Ability Test (SCAT) and the Minnesota Multiphasic Personality Inventory (MMPI). The total number of students included in the sample was 2,378 including 1,217 females and 1,161 males.

The subjects were grouped according to the direction and amount of V-Q difference resulting from their scores on the SCAT. Students whose Verbal scores exceeded their Quantitative scores were identified as the Verbal (V) group while those whose Quantitative scores were higher than their Verbal scores were called the Quantitative (Q) group. These two major groups were also broken down according to sex, school, and amount of the V-Q difference. Appropriate statistical comparisons
were then made among the various groups in terms of the subjects' MMPI scores. All of the MMPI scales were used for the comparisons except the ? scale. Chi-square, critical ratio, and analysis of variance were used to test for significant differences resulting from the various group comparisons.

The results of the study indicated a tendency for the verbal group to score higher on the scales of the MMPI which had more positive and favorable interpretations associated with them. These were the K, Pd, Pa and Mf scales. The Quantitative groups scored higher on the scales which suggested some confusion, lack of self confidence, and probable difficulty associated with social interaction. These included the D, Pt, Ma, Sc and Si scales on the MMPI. The amount of V-Q difference was more significant for the Verbal than for the Quantitative groups. The results of the chi-square comparisons indicated significant differences on four MMPI scales when Verbal groups with a wide V-Q difference were compared to Verbal groups with smaller V-Q differences. Similar comparisons between Quantitative groups with wide versus small V-Q differences resulted in no scales yielding significant differences between the Quantitative group. The Quantitative groups had more subjects scoring above the critical score (70) on the Ma and Pt scales of the MMPI than did the Verbal groups, suggesting possible proneness of those in the Quantitative groups toward some personality problems. Results obtained from the analysis of variance comparisons on the Si, Ma, and Mf scales indicated a tendency for the groups with the wider V-Q difference to obtain scores resulting in unfavorable interpretations when compared to groups having smaller V-Q differences.
The results and findings of the present study support all three of the hypotheses presented in the first chapter and provide a basis for the following conclusions.

Conclusions

This study suggests:

1. The V-Q differential does produce significant and measurable personality differences on the MMPI with the amount of V-Q difference being somewhat related to the elevation of the MMPI scales. In this study subjects with wider V-Q differences tended to have personality measures that were suggestive of personality problems.

2. The subjects identified as the Quantitative groups had characteristics that were more negative in interpretation than did the Verbal subjects. Quantitative subjects also appeared more likely to have personality disorders of a more serious nature.

3. The experimental groups whose V-Q differences were 15 T points or more contained a greater number of subjects with scores indicating maladjustment than did the groups in which the V-Q differences were more nearly equal; however, this characteristic was only true for subjects whose Verbal ability was higher than their Quantitative ability.

4. The results of the study suggest that the V-Q differential would be helpful in identifying students with potential problems.
BIBLIOGRAPHY


Munroe, R. L. 1946. "Rorschach findings on college students showing different constellations of subscores on the ACE." *Journal of Consulting Psychology* 10:301-316.


Table 4. Means for the 20 individual group scores on each scale of the MMPI used in the analysis of variance.

<table>
<thead>
<tr>
<th>L Scale</th>
<th>Hs Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1 M 48.87</td>
<td>V1 M 52.93</td>
</tr>
<tr>
<td>Q1 F 50.50</td>
<td>V1 F 51.89</td>
</tr>
<tr>
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| Q1 F vs V4 M   | 256                | 3.85    | .01                   | V4 M       |
| Q2 M vs V4 M   | 264                | 2.86    | .01                   | V4 M       |
| Q2 F vs Q3 M   | 313                | 1.97    | .05                   | Q3 M       |
| Q2 F vs Q5 M   | 182                | 2.14    | .05                   | Q5 M       |
| Q2 F vs V4 M   | 173                | 4.22    | .001                  | V4 M       |
| Q2 F vs V4 F   | 208                | 2.11    | .05                   | V4 F       |
| Q3 M vs V1 F   | 418                | 2.23    | .05                   | Q3 M       |
| Q3 M vs V4 M   | 184                | 2.27    | .05                   | V4 M       |
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| Q5 M vs V1 F   | 287                | 2.36    | .05                   | Q5 M       |</p>
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