

SELECTED CURRICULAR CHOICES AND PERSONALITY
TENDENCIES AS MEASURED BY THE MINNESOTA
MULTIPHASIC PERSONALITY INVENTORY

by

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B. S. Kansas State College
of Agriculture and Applied Science, 1949

A THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

Department of Education and Psychology

KANSAS STATE COLLEGE
OF AGRICULTURE AND APPLIED SCIENCE

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INTRODUCTION AND PURPOSE OF THE RESEARCH

Educational advisement has long been an important, if not the most important, part of a college counseling or guidance program. Many students for various reasons have come to such agencies for help and guidance in changing their curricular or educational objectives. They come seeking help toward establishing an educational objective and the resulting occupational goal which will most adequately meet their own personal needs.

It has been known for some time that included in the needs of students are the areas of interest, scholastic ability, and special aptitudes and that the limitations set by these areas should be considered in the establishment of an educational goal. However, relatively little is known of the part which personality tendencies should play in the selection of educational objectives, or if indeed they should play any part.

This study is concerned with the relationship of personality tendencies to curricular choices or educational objectives.

More specifically this study is concerned with discovering whether personality tendencies as measured by The Minnesota Multiphasic Personality Inventory are related to curricular choices of students and to determine, if the above is true, what specific personality tendencies are related to what curricular choices.

MATERIAL USED

The instrument selected as the personality measuring device for this study was The Minnesota Multiphasic Personality Inventory, hereafter referred to as the M.M.P.I. This choice was made primarily for three reasons. The first was because a part of the normal population on which it was standardized was a college population similar to the one used in this study. The second was due to the number of personality traits which it measures. And finally, because of all the personality measuring devices in use at this institution, the M.M.P.I. has been the most widely given, assuring the maximum probability of obtaining the number of cases regarded as desirable for the sample used in this study.

The M.M.P.I., as developed by Hathaway and McKinley (5) at the University of Minnesota, yields quantitative scores on four validating scales and nine personality scales. The four validating scales are a question or (?) scale, a lie or (L) scale, a validity or (F) scale and a test attitude or (K) scale. The (K) scale was not used in this study because all of the cases did not have scores for this scale due to its later addition to the M.M.P.I. The personality scales are those for Hypochondriasis (H_g), Depression (D), Hysteria (Hy), Psychopathic Deviate (Pd), Interest (Mf), Paranoia (Pa), Psychasthenia (Pt), Schizophrenia

(Sc), and Hypomania (Ma). A brief description of all twelve scales follows.

The question scale (?): The question scale is a validating scale consisting of the total number of items put in the "cannot say" category, which is one of three categories; the other two are "true" and "false". The significance of the other scales are affected by the size of this score.

The lie scale (L): The lie scale is also a validating scale that gives a measure of the degree to which the testee may be trying to falsify his scores by choosing the response which always places him in the most acceptable light.

The validity scale (F): The validity scale serves as a check on the validity of the whole record. If the F scale is high, the other scales are likely to be invalid either because the subject was careless or unable to comprehend the item, or because someone made extensive errors in entering the items on the record sheet.

The Hypochondriasis Scale (H_g): The H_g scale is a measure of the amount of abnormal concern over bodily functions.

The Depression Scale (D): The D scale measures the depth of the clinically recognized symptom complex, depression.

The Hysteria Scale (Hy): The Hy scale is a measure of the degree to which the testee is like patients who have developed conversion-type hysteria symptoms.

The Psychopathic Deviate Scale (Pd): The Pd scale measures

the similarity of the testee to a group of persons whose main difficulty lies in their absence of deep emotional response, their inability to profit from experience and their disregard for social mores.

The Interest Scale (Mf): This scale measures the tendency toward masculinity or femininity of interests or interest patterns; a high score indicates interests corresponding to those of the opposite sex.

The Paranoia Scale (Pa): The Pa scale was derived by contrasting normal persons with a group of clinic patients who were characterized by suspiciousness, oversensitivity, and delusions of persecution.

The Psychasthenia Scale (Pt): The Pt scale is a measure of the similarity of the testee to psychiatric patients who are troubled with phobias or compulsive behavior.

The Schizophrenia Scale (Sc): The Sc scale measures the similarity of the testee's responses to those patients characterized by bizarre and unusual thoughts or behavior and to those characterized by being withdrawn.

The Hypomania Scale (Ma): The Ma scale is a measure of the personality factor characteristic of persons with marked over-productivity in thought and action.

PLAN OF PROCEDURE

The subjects used in this study were taken from four broad but homogeneous curricular groups. These four groups were established by the writer and are as follows: Group I, Biological Science, Physical Science; Group II, Option B (Social Sciences), Business Administration; Group III, Engineering, and Group IV, Agriculture. The claimed homogeneity of these groups is based in part upon work done with the Strong Vocational Interest Blank by Crissy and Daniel (2) and in part upon the curricular groupings as found in the General Catalogue of Kansas State College, 1949-1950. Crissy and Daniel have named the four factors about which interest rotates on the Strong Vocational Interest Blank "Interest in Male Association", "Interest in People", "Interest in Language", and "Interest in Science". There has been much discussion as to the many names given to these factors and even to the doubtful value of imparting to them any names at all. However, in helping to establish the rationale for the groupings used by the writer, it was felt that the naming of these factors would facilitate a clearer understanding of the four groups used in this study. Using Crissy and Daniel's classification these four groups are as follows: Group I, "Interest in Science"; Group II, "Interest in People" and "Interest in Language"; Group III, "Interest in Male Association" and "Interest

in Science", and Group IV, "Interest in Male Association" coupled with a lack of "Interest in Language".

M.M.P.I. scores were obtained for fifty subjects in each of the four groups making a total of two hundred cases for the study. The method of obtaining this sample was as follows: cards were pulled alphabetically from both the active and inactive files of the Kansas State College Counseling Bureau, and each card was examined to see if the student had taken the M.M.P.I. and if so, his curriculum was ascertained and his name entered into the proper group classification. The curriculum of the subject was ascertained in the following manner: student directories from 1945-1946 to 1949-1950 were used and each subject was checked for his curricular listing in each of the directories until he either dropped out of school or was graduated. This was done in order to discover if the subject had changed curriculums, in which case, the latter choice was used. A double check on curricular listing was obtained from the subject's cumulative record folder. After the cumulative record folders were pulled, the subject's M.M.P.I. scores were entered on a table for his particular group, with the T scores being used rather than the raw scores because of the necessity of comparing scores. These tables containing the raw data described above may be found in the appendix. Only male subjects were used due to the impossibility of obtaining an equal distribution of men and women in each of the four groups.

That this sample was not a random one is acknowledged by the writer. There were two factors causing this. First was the fact that the sample was drawn alphabetically, which in the case of some of the groups meant that the fifty cases were obtained before the entire alphabet was used, thus not giving all students an equal chance to be included in the sample. However, while this particular method was not random it would be difficult to state with any substantiating evidence that it caused the sample to be biased. The second factor contributing to this sample not being a random one was the fact that M.M.P.I. scores used were of those who had already taken the test, and since the M.M.P.I. is not given to all students as a part of the freshman examinations or at any other time, it resulted in the establishment of a dichotomy. This dichotomy consisted of those who came to the counseling bureau as the result of some problem and were given the M.M.P.I.; or of those who came to the bureau for testing as a result of the Veterans' Administration Vocational Advisement Program as opposed to those who did not come to the counseling bureau. This second factor could have definitely made the sample a biased one, although at the time it was not clearly understood in what way or in what direction it would cause a bias.

The statistical procedures used to express the relationship between personality tendencies and curricular choices were mean, standard deviation, critical ratio, and the comparison of the number of cases falling above 60 and below 45 on the M.M.P.I.

profile chart. In this, there are four ways in which the above mentioned relationship can be expressed. In finding the mean and standard deviation, ungrouped data and the corresponding formulas were used rather than grouped data or a frequency distribution approach. This was done because it was felt that in a sample this small (200 total cases) ungrouped data methods would yield a more valid analysis of the data.

REVIEW OF RELATED RESEARCH

The research related to this study may be divided into two groups. The first group includes those studies which compare personality tendencies with various occupational or vocational groups. The second group of studies is concerned with comparison of personality tendencies and curricular groupings.

Harmon and Wiener (4) used the M.M.P.I. and its measurement of personality traits as part of the vocational advisement program in a Veterans' Administration, Vocational Rehabilitation and Education Division. Their findings, the outgrowth of clinical experience rather than the statistical results of controlled experiments, were that the M.M.P.I., as a part of a test battery, gave invaluable information for the setting up of limits concerning the choice of and possible success in vocations requiring different personality traits.

Occupations and personality traits were studied by Vernisaud (8) who, using the M.M.P.I., made a comparison of 97 women in

three occupations who were clerical workers, department store saleswomen and optical workers. She found differences large enough to indicate occupational differences in personality, but cautioned that these differences must be interpreted in view of the particular occupational setting or environment.

Wiener (9), using the M.M.P.I., has compared the personalities of successful and unsuccessful trainees in four job categories, with successful being defined as completion of the training course and unsuccessful being defined as discontinuance of the training course. The four job categories were clerical, electrical, shop and bench jobs. The results of Wiener's study seemed to indicate that the unsuccessful trainees were slightly higher on all scales of the M.M.P.I. than were the successful trainees. The greatest amount of difference appeared on the scales for Schizophrenia and Hypomania where those unsuccessful seemed to be less oriented to practical situations and more independent in thought and action than those successful. In general, the bench work trainees were closest to the norms of the M.M.P.I., probably reflecting selective counseling, since the bench work might deter the nervous veteran thus causing his advisor to avoid suggesting it.

Lough (6) made use of the M.M.P.I. to determine if there were any significant differences between those enrolled in the General Curriculum (preparation for elementary school teaching) and those enrolled in the music teaching curriculum at a New York State Teachers College, and also to see if there were any

significant differences between both groups of these students and the general population upon which the M.M.P.I. was standardized. There were no significant differences found between those enrolled in the General Curriculum and those enrolled in the music curriculum, but there was a slight tendency toward hypomania on the part of both of these groups when compared to the general population.

Blum (1) made a comparative study of students preparing for five selected professions, which were education, law, medicine, journalism, and mechanical engineering. For measuring personality traits he used the M.M.P.I. and found no statistically significant differences in personality traits between the students of any of the above groups, although there were slight correlations between personality traits and interests as measured by the Strong Vocational Interest Blank.

Stagner (7) sought to analyze the selective effect of different courses at the University of Wisconsin, wanting to discover if students tend to select a given course because of a certain trend in personality traits. Using the Bernreuter Personality Inventory, he presented data for 317 women and 335 men divided into nine curricular groupings. Some rather well defined differences between groups appeared for the women, but the only trait showing a statistically reliable difference for the men was the trait for self-sufficiency.

Dashiell (3), in order to study the question of the relationship between personality traits and professional school enrolled

in, sent a questionnaire to 18 professors in five professional schools at the University of North Carolina. Each professor was asked to rank the 10 personality traits listed on the questionnaire in order of their importance for their particular profession. There was little demonstrated agreement as to what personality traits were desirable by the professors within a given profession and even less agreement between those of different professional schools.

ANALYSIS OF DATA

Means and standard deviations for each of the four groups used in this study are reported in Table 1. The formulas which were used in obtaining these statistical measures are as follows:

$$m = \frac{\sum X}{N}$$

and

$$s.d. = \sqrt{\frac{\sum X^2}{N}}$$

In the foregoing formulas, m stands for mean, X means the sum of the individual case scores, $s.d.$ means standard deviation, and N stands for the number of cases.

Discussion of the Means and Standard Deviations

It was felt that both an intra-group comparison and an inter-group comparison of means and standard deviations would be helpful in comprehending the differences of the four groups in relation

Table 1. Means and standard deviations for scales of Minnesota Multiphasic Personality Inventory for each of four groups.

Group ¹	?	L	F	Hs	D	Hy	Pa	Mf	Pa	Pt	Sc	Ma
I												
m ²	50.0	51.52	53.08	50.8	53.4	56.86	50.74	55.9	51.6	53.78	52.12	55.04
sd ²	.00	3.59	4.75	8.3	10.2	7.83	8.66	8.51	7.08	10.75	8.78	9.67
II												
m	50.0	50.68	53.5	51.88	53.28	56.62	54.94	55.98	51.0	55.8	54.78	57.64
sd	.00	2.21	5.43	9.13	8.45	8.84	10.46	9.14	7.07	10.56	11.07	9.76
III												
m	50.0	52.32	53.52	52.92	55.54	57.92	53.6	55.84	52.46	54.24	53.52	55.58
sd	.00	5.31	6.00	9.36	12.34	7.27	10.24	10.16	8.88	9.42	10.22	9.32
IV												
m	50.02	52.42	51.44	51.66	50.28	57.1	53.5	56.04	51.9	52.76	51.8	55.32
sd	.00	3.92	2.43	8.49	9.07	6.77	9.8	10.41	6.14	8.5	6.64	10.06

¹Group I - Biological Science, Physical Science
 Group II - Option B, Business Administration
 Group III - Engineering
 Group IV - Agriculture
²m = mean; sd = standard deviation

to the scales on the M.M.P.I. These comparisons will deal only with the nine personality scales of the M.M.P.I. and not the three validating scales.

For Group I, the biological and physical sciences, it is noted that the Hy scale is the greatest distance from the mean of the normal population, which is 50.00, and also that there is less variation for this scale than for the others with the exception of the Pa scale. Since scores on these scales must be of 70 or higher to be diagnostic, merely a description of the subjects, or group in this case, can follow. These descriptions which will be given throughout are the result of observation and thought upon the part of clinicians and as yet there is little in the literature concerning them. With these points in view, it appears that for Group I there is a trend toward psychological immaturity and a lack of ability to face problems squarely and to be overconcerned about social approval. Scales Mf and Ma are also somewhat high for Group I indicating a trend toward sympathy to others or "tender-mindedness", and productivity of thought and action. There is less variation among the subjects composing Group I for the Mf scale than for the Ma scale.

For Group II, Option B and business administration majors, the highest elevation is on the Ma scale with the Hy, Mf and Pt scales also being quite high. There is considerable variation shown among the subjects on the Pd, Pt, and Sc scales. This group could probably be best characterized by saying they tend

to avoid meeting situations or problems squarely, to be overconcerned about social approval, to have more sympathetic interests, tend to worry and have difficulty in concentrating, and tend to be highly productive in thought and action.

Group III, engineering students, has its highest elevation on the Hy scale with the D, Mf, and Ma scales also relatively high. Considerable variation is noted on the D scale, and also on the Pd, Mf, and Sc scales. This group appears to be characterized by tending to avoid meeting problems or situations fully and by being overconcerned about social approval, by not being very optimistic, having more sympathetic interests and by being productive in thought and action.

Group IV, agriculture students, has as its highest scale that of Hy with the Mf and Ma also high. The most variation is shown on the Mf and Ma scales. The pattern for this group, when considering elevation is essentially the same as that for Group I, shown above.

Using intergroup comparison, it is noted that for the Ha scale none of the groups vary to a great extent from the norm mean of 50.00, with Group I having the least variance and Group III the most. For the D scale the greatest differences appear between Groups III and IV with Group IV having a mean almost equivalent to that of the normal population. Also for the D scale there is considerable difference in the variations among the members of each group; the greatest variation appear-

ing for Group III and the least, for Group II. On the Hy scale all four groups are considerably higher than the norm mean with Groups III and IV only slightly higher than Groups I and II and similarly there is little difference in the variation among the members of any one group as compared to another one. The Pd scale shows Group I to be the closest to the norm mean with the other three groups being somewhat higher, especially Group II. The standard deviations, or variations, are greater for Groups II and III than for Groups I and IV on this particular scale. For the Mf scale all four groups are considerably above the norm mean with little difference between the groups. The variation is greater for Groups III and IV than for I and II. From Table 1 it is noted that there is little difference between the groups on the Pa scale except for Group III which is slightly higher than the others. The difference in variation is slight except between Groups III and IV with Group III having the greater variation. For the Pt scale, Group II lies the farthest from the norm mean and Group IV the nearest, with the other two groups falling in between. The variations for Groups I and II are greater than for Groups III and IV. The Sc scale shows some difference between Groups II and IV with Groups I and III falling in between. There is considerable difference in variation between Groups II and IV and Groups III and IV with Group IV being relatively small in comparison to the others. The Ma scale is relatively high for all four groups, when considering the means, with Group II the

highest. There is very little difference in variations between the groups.

Table 2 shows the mean of the four group means for each trait. From this, it is interesting to note that on all of the nine personality scales, the mean for the subjects used in this study is higher than that for the population upon which the M.M.P.I. was standardized.

Table 2. Means of the four group means for each scale.

Scale	:	Mean
?	:	50.00
L	:	51.73
F	:	52.88
Hs	:	51.81
D	:	53.15
Hy	:	57.12
Pd	:	53.19
Mf	:	55.94
Pa	:	51.74
Pt	:	54.14
Sc	:	53.05
Ma	:	55.89

Discussion of the Number of Cases with Scores of Sixty and Above and Those with Scores of Forty-five and Below

Another method of showing differences is by comparing the number of cases with scores of 60 and above, and the number of cases with scores of 45 and below, on the M.M.P.I. Tables 3

and 4 on page 18 give a tabulation of these data. In discussing the data shown by these tables only those instances where one group shows at least two times as many such deviations as another will be noted.

The Hs, D, Mf, and Ma scales show no differences between the groups of two times or greater for cases with scores of 60 and above. The Pd scale shows Group II, Option B, and business administration as having two times as many cases with scores of 60 and above as those of Group I, biological and physical sciences. On this same scale it is noted that 2.25 times as many cases were at 60 or above for Group III, engineering, as for Group I. For the Pa scale it is seen that Group III, engineering, has 2.20 times as many scoring 60 and above as Group I, biological and physical sciences, and also Group III has 2.75 times as many scoring 60 and above as does Group IV. Group I has two times as many cases with 60 and above on the Pt scale as does Group IV. The Sc scales show both Groups I and III as having 3.33 times as many cases scoring 60 and above as Group IV, with Group II having 4.66 times as many cases scoring 60 and above as Group IV.

From the above and with use of descriptive terms instead of diagnostic, one can obtain certain personality patterns in a manner similar to those obtained by using Table 1. Group I is characterized primarily by a tendency toward worry and difficulty in concentration. Group II is characterized by a tendency toward the inability to profit from experience and the inability

Table 3. Number of cases with scores of 60 and above on the Minnesota Multiphasic Personality Inventory.

Group	Hs	D	Hy	Pd	Mf	Pa	Pt	Sc	Ma
I	8	11	20	8	15	5	20	10	13
II	9	11	17	16	18	6	17	14	21
III	12	17	18	18	16	11	12	10	15
IV	10	9	17	12	18	4	10	3	12

Table 4. Number of cases with scores of 45 and below on the Minnesota Multiphasic Personality Inventory.

Group	Hs	D	Hy	Pd	Mf	Pa	Pt	Sc	Ma
I	16	7	5	17	3	10	15	15	9
II	14	9	7	10	7	10	11	12	7
III	11	7	1	15	9	13	8	12	9
IV	13	14	3	10	10	9	11	10	10

to look at situations realistically. Group III appears to show a trend toward the inability to profit from experience and toward being over-sensitive. Group IV, primarily from its low number of cases scoring at 60 and above, appears to be characterized by being less sensitive than the others and more realistic and less withdrawn. All four groups, by having a relatively high number of cases with scores of 60 and above on the Hy, Mf, and Ma scales, are characterized by concern about social approval, sympathy toward others or "tender-mindedness" and productivity of thought and action.

Regarding the number of cases with scores of 45 and below, (Table 4) there is little difference shown between the groups for scales Hs, Hy, Pd, Pa, Pt, Sc, and Ma. For the D scale, Group IV has two times as many scoring at or below 45 as do both Groups I and III. For the Mf scale, Group II has 2.33 times as many with scores of 45 or below as does Group I. Group III has three times as many as Group I, and Group IV, 3.33 times as many as Group I for this scale.

From the above it appears that Group IV, agriculture, is characterized by an optimistic attitude and it is interesting to note, by referring to Table 3, that Group IV also had the fewest number of cases scoring at or above 60 on this same scale (D). By its low number of cases with scores of 45 and below, in relation to the other groups, Group I, biological and physical sciences, would seem to be more sympathetic, or less "hard-boiled", than the others.

Discussion of the Critical Ratios

Table 5 gives the critical ratios for the scales of the M.M.P.I., comparing each group with each other group. The formula used for deriving critical ratios was as follows:

$$C.R. = \frac{D}{\sqrt{s.d._1^2 + s.d._2^2}}$$

In this formula, C.R. means critical ratio, D means difference between the mean, and s.d. means standard deviation. Tables showing the derivation of these critical ratios are given in the appendix.

From Table 5, it is noted that the largest critical ratio for any of the twelve scales is .38 which definitely does not denote any statistically significant differences.

SUMMARY AND CONCLUSIONS

The purpose of this section is to bring together the results of the analysis of the data and to present it in a concise way so as to elicit a clearer understanding of the entire study.

Table 5. Critical Ratios for scales of Minnesota Multiphasic Personality Inventory comparing four groups; each group with each other group.

Group ¹ :	I	L	F	Hs	D	Hy	Pd	Mf	Pa	Pt	Sc	Ma
I-II C.R. ²	.00	.20	.06	.09	.01	.02	.31	.00	.06	.13	.18	.19
I-III C.R.	.00	.12	.05	.17	.13	.10	.21	.00	.07	.03	.10	.04
I-IV C.R.	.00	.17	.31	.07	.22	.02	.21	.01	.04	.07	.03	.02
II-III C.R.	.00	.28	.00	.03	.15	.11	.09	.01	.13	.11	.03	.15
II-IV C.R.	.00	.38	.35	.01	.23	.04	.10	.00	.09	.22	.23	.15
III-IV C.R.	.00	.01	.32	.10	.33	.03	.00	.01	.05	.11	.14	.02

¹Groups I and II, Biological Science, Physical Science and Option B, Business Administration

Groups I and III, Biological Science, Physical Science and Engineering

Groups I and IV, Biological Science, Physical Science and Agriculture

Groups II and III, Option B, Business Administration and Engineering

Groups II and IV, Option B, Business Administration and Agriculture

Groups III and IV, Engineering and Agriculture

²C.R. = Critical Ratios

Summary of the Analyzed Data

1. It appeared from analysis of the means and standard deviations and by a comparison of those scoring 60 and above and those scoring 45 and below on the M.M.P.I., that there was some difference in personality tendencies among subjects enrolled in four different curricular groups.

2. From an analysis of the data by the use of the critical ratio, there were no differences between personality tendencies and curricular choices which were statistically reliable or significant.

Conclusions

The small critical ratios found in this study support, to a large extent, previous findings that in general there is little difference between personality traits and curricular groupings as revealed by the M.M.P.I..

From this study it is concluded that there is no evidence to show that the M.M.P.I. should be included as a part of a test battery, playing a large role in determining to what curriculum a student should be advised to enter.

SUGGESTIONS FOR FUTURE RESEARCH

The following are suggested as projects for which this study might serve as a pattern.

1. A study using the M.M.P.I. or some other personality measurement in which more discrete curricular groupings are employed and in which the subjects chosen for the study are given the test or inventory thus avoiding one of the biases present in this study.

2. A study in which successful and unsuccessful students are compared with respect to personality tendencies and curricular choices.

ACKNOWLEDGMENT

The writer wishes to express his gratitude to Professor Paul Torrance for providing a source of constant inspiration and guidance, to his wife for her unselfish and patient assistance with the gross statistical work and to all others, who by their constructive criticisms and comments, were of assistance.

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Scale:	(s.d.) ₁	(s.d.) ₂	m ₁	m ₂	se of diff.	D	C.R.
?	0.00	0.00	50.00	50.0	0.0	0.00	0.00
L	3.59	2.21	51.52	50.68	4.2	.84	.20
F	4.75	5.43	53.08	53.50	7.1	.42	.06
Hs	8.30	9.13	50.80	51.88	12.3	1.08	.09
D	10.20	8.45	53.40	53.28	13.2	.12	.01
Hy	7.83	8.84	56.86	56.62	11.8	.24	.02
Pd	8.66	10.46	50.74	54.94	13.5	4.20	.31
Mf	8.51	9.14	55.90	55.98	12.6	.08	.00
Pa	7.08	7.07	51.60	51.00	9.9	.60	.06
Pt	10.75	10.56	53.78	55.80	15.0	2.02	.13
Sc	8.78	11.07	52.12	54.78	14.1	2.66	.18
Ma	9.67	9.76	55.04	57.64	13.7	2.60	.19

Table 7. Derivation of critical ratios for scales of the Minnesota Multiphasic Personality Inventory comparing Groups I and III.

Scale:	(s.d.) ₁	(s.d.) ₂	m ₁	m ₂	se of diff.	D	C.R.
?	.00	.00	50.00	50.00	0.0	0.00	0.00
L	3.59	5.31	51.52	52.32	6.4	.81	.12
F	4.75	6.00	53.08	53.52	7.7	.44	.05
Hs	8.30	9.36	50.80	52.92	12.5	2.12	.17
D	10.20	12.34	53.40	55.54	16.0	2.14	.13
Hy	7.83	7.27	56.86	57.92	10.5	1.06	.10
Pd	8.66	10.24	50.74	53.60	13.4	2.86	.21
Mf	8.51	10.16	55.90	55.84	13.2	.06	.00
Pa	7.08	8.88	51.60	52.46	11.3	.86	.07
Pt	10.75	9.42	53.78	54.24	14.3	.46	.03
Sc	8.78	10.22	52.12	53.52	13.5	1.40	.10
Ma	9.67	9.32	55.04	55.58	13.4	.54	.04

Table 8. Derivation of critical ratios for scales of the Minnesota Multiphasic Personality Inventory comparing Groups I and IV.

Scale:	(s.d.) ₁	(s.d.) ₂	m ₁	m ₂	se of diff.	D	C.R.
?	0.00	0.00	50.00	50.02	0.0	0.00	.00
L	3.59	3.92	51.52	52.42	5.3	.90	.17
F	4.75	2.43	53.08	51.44	5.3	1.64	.31
Hs	8.30	8.49	50.80	51.66	11.3	.86	.07
D	10.20	9.07	53.40	50.38	13.6	3.02	.22
Hy	7.33	6.77	56.86	57.10	10.2	.24	.02
Pd	8.66	9.80	50.74	53.50	13.1	2.76	.21
Mf	8.51	10.41	55.90	56.04	13.4	.14	.01
Pa	7.08	6.14	51.60	51.90	6.3	.30	.04
Pt	10.75	8.50	53.78	52.76	13.7	1.02	.07
Sc	8.78	6.64	52.12	51.80	11.0	.32	.03
Ma	9.67	10.06	55.04	55.32	14.0	.28	.02

Table 9. Derivation of critical ratios for scales of the Minnesota Multiphasic Personality Inventory comparing Groups II and III.

Scale:	(s.d.) ₁	(s.d.) ₂	m ₁	m ₂	se of diff.	D	C.R.
?	0.00	0.00	50.00	50.00	0.0	0.00	.00
L	2.21	5.31	50.68	52.32	5.7	1.64	.28
F	5.43	6.00	53.50	53.52	8.1	.02	.00
Hs	9.13	9.36	51.88	52.92	13.0	1.04	.08
D	8.45	12.34	53.28	55.54	14.9	2.26	.15
Hy	8.84	7.27	56.62	57.92	11.4	1.30	.11
Pd	10.46	10.24	54.94	53.60	14.6	1.34	.09
Mf	9.14	10.16	55.98	55.84	13.7	.14	.01
Pa	7.07	8.88	51.00	52.46	11.3	1.46	.13
Pt	10.56	9.42	55.80	54.24	14.1	1.56	.11
Sc	11.07	10.22	54.78	53.52	15.1	1.26	.08
Ma	9.76	9.32	57.64	55.58	13.5	2.06	.15

Table 10. Derivation of critical ratios for scales of the Minnesota Multiphasic Personality Inventory comparing Groups II and IV.

Scale:	(s.d.) ₁	(s.d.) ₂	m ₁	m ₂	se of diff.	D	C.R.
?	0.00	0.00	50.00	50.02	0.0	0.00	.00
L	2.21	3.92	50.68	52.42	4.5	1.74	.38
F	5.43	2.43	53.50	51.44	5.9	2.06	.35
Hs	9.13	8.49	51.88	51.66	12.4	.22	.01
D	8.45	9.07	53.28	50.38	12.4	2.90	.23
Hy	8.84	6.77	56.62	57.10	11.1	.48	.04
Pd	10.46	9.80	54.94	53.50	14.3	1.44	.10
Mf	9.14	10.41	55.98	56.04	13.9	.06	.00
Pa	7.07	6.14	51.00	51.90	9.3	.90	.09
Pt	10.56	8.50	55.80	52.76	13.5	3.04	.22
Sc	11.07	6.64	54.78	51.80	12.9	2.98	.23
Ma	9.76	10.06	57.64	55.32	14.1	2.12	.15

Table 11. Derivation of critical ratios for scales of the Minnesota Multiphasic Personality Inventory comparing Groups III and IV.

Scale:	(s.d.) ₁	(s.d.) ₂	m ₁	m ₂	se of diff.	D	C.R.
?	0.00	0.00	50.00	50.02	0.0	0.00	.00
L	5.31	3.92	52.32	52.42	6.6	.10	.01
F	6.00	2.43	53.52	51.44	6.4	2.08	.32
Hs	9.36	8.49	52.92	51.66	12.6	1.26	.10
D	12.34	9.07	55.54	50.38	15.3	5.16	.33
Hy	7.27	6.77	57.92	57.10	9.9	.82	.08
Pd	10.24	9.80	53.60	53.50	14.2	.10	.00
Mf	10.16	10.41	55.84	56.04	14.5	.20	.01
Pa	8.88	6.14	52.46	51.90	10.8	.56	.05
Pt	9.42	8.50	54.24	52.76	12.7	1.48	.11
Sc	10.22	6.64	53.52	51.80	12.2	1.72	.14
Ma	9.32	10.06	55.58	55.32	13.7	.26	.02

Table 12. Biological Science, Physical Science, Group I.

Case: ?	L	F	Hs	D	Hy	pd	Mf	Pa	Pt	So	Ma
1	50	50	40	53	67	45	65	53	39	41	57
2	50	50	58	65	49	45	67	41	63	56	39
3	50	50	53	53	73	37	43	53	46	45	54
4	50	60	62	70	60	70	63	53	66	67	61
5	50	50	51	56	65	53	57	53	60	57	57
6	50	50	44	65	58	63	82	67	66	63	39
7	50	50	42	58	62	53	55	56	41	37	45
8	50	50	53	46	71	55	55	53	45	53	48
9	50	60	49	63	58	48	59	53	62	55	38
10	50	50	44	34	47	40	35	38	45	41	66
11	50	50	54	48	47	53	67	53	64	67	53
12	50	62	49	51	58	67	59	47	60	53	48
13	50	50	47	58	44	50	53	44	61	55	57
14	50	50	62	65	47	42	49	50	64	57	70
15	50	50	56	56	60	45	47	41	53	47	57
16	50	50	40	46	47	45	47	44	43	43	50
17	50	50	49	48	56	60	55	50	56	50	58
18	50	50	44	44	55	45	51	50	36	46	68
19	50	50	53	51	64	63	69	53	67	65	68
20	50	50	49	48	55	47	61	59	39	45	63
21	50	50	47	41	40	62	49	38	46	47	63
22	50	64	70	80	70	60	57	70	77	67	68
23	50	50	44	56	44	35	55	44	48	44	41
24	50	56	76	53	82	63	63	70	59	52	59
25	50	60	53	70	56	55	67	56	63	68	66
26	50	50	51	46	45	32	53	44	45	41	50
27	50	53	42	29	56	45	49	41	43	45	61

Table 12. (concl.).

Case:	?	L	P	Is	D	Hy	Pd	Mf	Pa	Pt	Sc	Ma
28	50	50	50	58	46	60	55	49	50	53	51	63
29	50	50	58	70	60	58	55	73	53	71	67	60
30	50	60	50	57	58	62	57	57	50	54	57	50
31	50	50	53	49	46	53	40	65	50	46	53	45
32	50	50	53	49	65	58	57	57	47	62	48	43
33	50	50	50	47	51	47	48	67	53	54	53	50
34	50	50	64	57	68	60	47	49	56	61	55	63
35	50	58	55	60	56	67	47	63	50	67	57	63
36	50	60	53	40	56	49	50	51	53	60	48	63
37	50	53	55	44	44	40	47	49	44	53	49	63
38	50	56	50	44	34	62	55	47	47	39	45	57
39	50	50	50	52	53	51	53	61	53	52	61	50
40	50	50	50	40	51	56	40	49	53	45	41	32
41	50	53	50	49	58	62	47	51	53	41	43	54
42	50	53	50	42	58	60	63	43	50	39	48	57
43	50	50	60	60	51	65	63	57	67	70	61	75
44	50	50	50	49	53	51	55	51	62	56	50	55
45	50	50	50	44	51	56	45	55	53	48	44	48
46	50	50	50	40	41	58	45	57	53	39	43	48
47	50	50	50	47	46	55	48	61	56	60	57	78
48	50	50	50	51	46	53	53	47	50	48	44	52
49	50	50	68	62	77	53	67	61	53	75	76	45
50	50	70	50	44	48	60	42	53	50	39	48	54

Table 13. Option B, Business Administration, Group II.

Case :	?	:	L	:	P	:	Es	:	D	:	Hy	:	Pd	:	Mr	:	Pa	:	Pt	:	Sc	:	Ma
1	50	:	50	:	62	:	53	:	56	:	58	:	73	:	71	:	65	:	70	:	76	:	58
2	50	:	50	:	55	:	54	:	51	:	58	:	64	:	67	:	53	:	56	:	59	:	58
3	50	:	50	:	50	:	44	:	44	:	62	:	37	:	37	:	50	:	39	:	41	:	43
4	50	:	50	:	50	:	42	:	46	:	46	:	45	:	45	:	53	:	47	:	47	:	61
5	50	:	50	:	50	:	58	:	63	:	69	:	47	:	49	:	38	:	50	:	48	:	57
6	50	:	63	:	50	:	47	:	44	:	65	:	50	:	53	:	53	:	42	:	44	:	57
7	50	:	50	:	50	:	49	:	48	:	61	:	65	:	61	:	56	:	57	:	49	:	63
8	50	:	50	:	50	:	36	:	41	:	49	:	50	:	41	:	44	:	44	:	42	:	70
9	50	:	53	:	50	:	42	:	58	:	58	:	47	:	47	:	39	:	44	:	39	:	39
10	50	:	53	:	50	:	40	:	48	:	53	:	50	:	49	:	53	:	40	:	38	:	50
11	50	:	50	:	50	:	62	:	51	:	56	:	45	:	57	:	44	:	52	:	45	:	59
12	50	:	50	:	50	:	51	:	46	:	67	:	47	:	55	:	53	:	42	:	44	:	48
13	50	:	50	:	50	:	47	:	70	:	45	:	40	:	51	:	47	:	33	:	59	:	57
14	50	:	50	:	50	:	47	:	44	:	47	:	50	:	51	:	47	:	48	:	41	:	61
15	50	:	50	:	50	:	65	:	53	:	45	:	45	:	57	:	49	:	68	:	48	:	52
16	50	:	50	:	50	:	72	:	41	:	58	:	50	:	59	:	62	:	67	:	68	:	63
17	50	:	50	:	68	:	67	:	65	:	67	:	62	:	65	:	59	:	69	:	80	:	60
18	50	:	53	:	64	:	72	:	44	:	71	:	47	:	49	:	47	:	50	:	55	:	70
19	50	:	50	:	58	:	59	:	58	:	53	:	57	:	67	:	44	:	71	:	69	:	75
20	50	:	50	:	50	:	58	:	46	:	60	:	55	:	51	:	44	:	45	:	49	:	52
21	50	:	50	:	60	:	56	:	63	:	69	:	81	:	69	:	67	:	74	:	65	:	66
22	50	:	50	:	50	:	39	:	44	:	53	:	43	:	49	:	47	:	38	:	38	:	48
23	50	:	50	:	55	:	62	:	41	:	58	:	55	:	59	:	53	:	54	:	59	:	70
24	50	:	50	:	55	:	44	:	56	:	56	:	63	:	61	:	47	:	49	:	45	:	61
25	50	:	50	:	50	:	51	:	58	:	69	:	55	:	61	:	47	:	56	:	52	:	50
26	50	:	50	:	50	:	40	:	46	:	49	:	37	:	47	:	53	:	38	:	37	:	45
27	50	:	56	:	53	:	57	:	53	:	67	:	74	:	47	:	53	:	63	:	67	:	50

Table 13. (concl.).

Case:	?	:	:	L	:	:	F	:	:	Hs	:	:	D	:	:	Hy	:	:	Pd	:	:	Mf	:	:	Pa	:	:	Pt	:	:	So	:	:	Ma
28	50	:	:	50	:	:	58	:	:	44	:	:	50	:	:	44	:	:	53	:	:	61	:	:	55	:	:	67	:	:	67	:	:	50
29	50	:	:	50	:	:	50	:	:	42	:	:	48	:	:	56	:	:	65	:	:	65	:	:	47	:	:	43	:	:	48	:	:	61
30	50	:	:	50	:	:	50	:	:	51	:	:	48	:	:	60	:	:	59	:	:	64	:	:	60	:	:	58	:	:	59	:	:	40
31	50	:	:	50	:	:	58	:	:	49	:	:	48	:	:	42	:	:	45	:	:	49	:	:	50	:	:	54	:	:	48	:	:	59
32	50	:	:	50	:	:	50	:	:	50	:	:	60	:	:	65	:	:	47	:	:	59	:	:	50	:	:	48	:	:	47	:	:	45
33	50	:	:	50	:	:	58	:	:	57	:	:	56	:	:	40	:	:	67	:	:	48	:	:	53	:	:	69	:	:	69	:	:	60
34	50	:	:	50	:	:	50	:	:	67	:	:	58	:	:	75	:	:	64	:	:	72	:	:	59	:	:	66	:	:	73	:	:	77
35	50	:	:	56	:	:	58	:	:	65	:	:	75	:	:	55	:	:	81	:	:	59	:	:	59	:	:	73	:	:	70	:	:	77
36	50	:	:	50	:	:	50	:	:	44	:	:	60	:	:	55	:	:	68	:	:	39	:	:	35	:	:	57	:	:	48	:	:	63
37	50	:	:	50	:	:	50	:	:	54	:	:	56	:	:	53	:	:	55	:	:	57	:	:	50	:	:	58	:	:	59	:	:	55
38	50	:	:	50	:	:	50	:	:	44	:	:	65	:	:	40	:	:	50	:	:	45	:	:	56	:	:	69	:	:	65	:	:	48
39	50	:	:	50	:	:	73	:	:	58	:	:	56	:	:	47	:	:	63	:	:	41	:	:	32	:	:	68	:	:	76	:	:	70
40	50	:	:	50	:	:	53	:	:	51	:	:	51	:	:	44	:	:	55	:	:	52	:	:	41	:	:	63	:	:	49	:	:	61
41	50	:	:	50	:	:	50	:	:	44	:	:	56	:	:	49	:	:	55	:	:	57	:	:	50	:	:	61	:	:	55	:	:	61
42	50	:	:	50	:	:	52	:	:	44	:	:	46	:	:	56	:	:	57	:	:	80	:	:	53	:	:	64	:	:	67	:	:	91
43	50	:	:	50	:	:	50	:	:	53	:	:	48	:	:	60	:	:	45	:	:	63	:	:	47	:	:	53	:	:	56	:	:	45
44	50	:	:	50	:	:	50	:	:	47	:	:	58	:	:	47	:	:	48	:	:	59	:	:	50	:	:	52	:	:	53	:	:	50
45	50	:	:	50	:	:	53	:	:	52	:	:	46	:	:	55	:	:	48	:	:	61	:	:	53	:	:	48	:	:	53	:	:	50
46	50	:	:	50	:	:	55	:	:	47	:	:	53	:	:	56	:	:	64	:	:	45	:	:	41	:	:	54	:	:	63	:	:	53
47	50	:	:	50	:	:	50	:	:	39	:	:	56	:	:	51	:	:	43	:	:	61	:	:	56	:	:	46	:	:	42	:	:	45
48	50	:	:	50	:	:	53	:	:	67	:	:	72	:	:	64	:	:	63	:	:	61	:	:	53	:	:	71	:	:	63	:	:	68
49	50	:	:	50	:	:	50	:	:	51	:	:	44	:	:	53	:	:	53	:	:	57	:	:	41	:	:	53	:	:	52	:	:	61
50	50	:	:	50	:	:	64	:	:	59	:	:	68	:	:	53	:	:	55	:	:	67	:	:	50	:	:	71	:	:	67	:	:	55

Table 14. Engineering, Group III.

Case:	t	L	F	Hs	D	Hy	Pd	Mr	Pa	Pt	Sc	Ma
1	50	50	50	42	51	53	55	59	62	43	48	59
2	50	56	62	62	77	67	65	69	65	60	59	39
3	50	53	58	53	60	53	53	51	56	57	51	57
4	50	50	50	44	53	56	47	49	53	45	38	57
5	50	53	70	62	68	56	65	67	65	68	68	63
6	50	50	50	44	44	56	37	47	50	48	45	63
7	50	50	55	56	63	56	55	57	44	63	55	66
8	50	50	50	47	36	58	45	78	65	46	49	57
9	50	50	50	49	51	58	47	61	44	46	45	54
10	50	50	66	78	94	69	73	37	56	67	71	66
11	50	53	50	47	60	47	45	57	38	48	53	61
12	50	50	53	53	48	60	68	53	56	66	61	81
13	50	53	50	42	41	51	40	43	53	39	40	50
14	50	50	58	67	58	56	50	69	62	66	70	52
15	50	60	50	49	60	65	58	59	65	56	51	43
16	50	50	50	42	58	49	42	34	44	42	44	45
17	50	50	55	49	46	64	63	59	56	53	61	54
18	50	50	42	42	53	51	45	41	35	47	40	48
19	50	50	50	60	53	53	50	45	35	64	57	45
20	50	56	50	44	65	56	53	63	62	54	47	45
21	50	50	53	57	48	49	45	41	53	50	69	56
22	50	50	50	42	48	49	45	49	41	50	45	54
23	50	50	60	56	36	64	75	57	52	74	67	70
24	50	50	50	55	56	56	42	53	44	49	48	54
25	50	60	50	74	70	67	47	51	53	59	48	48
26	50	50	50	62	51	53	50	45	62	57	57	61
27	50	70	50	49	46	62	50	63	53	54	51	55

Table 14. (concl.).

Case:	?	L	F	Ha	D	Hy	Pd	Mr	Pa	Pt	Se	Ma
28	50	50	50	49	34	53	42	59	59	59	57	50
29	50	50	60	62	46	67	63	63	41	41	55	68
30	50	50	50	65	46	64	67	73	53	52	57	50
31	50	50	58	47	58	45	42	53	53	53	52	52
32	50	50	50	80	58	78	67	71	56	50	55	63
33	50	50	70	70	68	60	81	55	70	79	92	70
34	50	50	50	51	46	51	63	35	41	49	45	75
35	50	50	64	56	60	53	45	51	53	53	70	43
36	50	50	73	53	75	49	65	73	62	74	70	61
37	50	70	53	56	56	75	53	59	56	42	45	50
38	50	50	50	47	56	69	55	51	53	43	41	50
39	50	50	50	42	51	55	42	49	56	46	47	57
40	50	73	55	44	72	58	50	43	38	45	44	54
41	50	56	50	52	53	58	30	61	50	50	50	48
42	50	50	50	49	56	69	65	56	56	45	53	45
43	50	50	50	51	82	55	58	57	33	66	59	45
44	50	50	50	49	44	55	53	67	53	56	53	57
45	50	50	50	47	58	64	55	63	53	48	41	52
46	50	50	50	47	32	49	43	53	62	51	48	68
47	50	50	50	51	46	53	47	69	41	48	52	75
48	50	53	50	60	70	65	42	51	53	57	52	50
49	50	50	53	49	46	53	40	65	50	46	53	45
50	50	50	50	44	60	64	60	49	50	54	47	48

Table 15. (concl.).

Case:	?	L	F	Hs	D	Hy	Pd	Mf	Pa	Pt	Se	Ma
28	50	53	50	40	53	53	37	61	50	41	40	45
29	50	60	55	47	41	53	50	63	47	54	57	55
30	50	50	50	57	60	67	57	69	56	50	50	48
31	50	50	55	49	44	62	70	61	53	57	59	68
32	50	53	50	47	53	69	55	47	50	42	44	54
33	50	50	53	67	65	69	64	67	62	66	59	53
34	50	50	55	69	60	53	53	43	59	75	65	79
35	50	50	55	62	44	69	68	53	56	63	59	70
36	50	50	50	41	41	47	50	65	44	48	44	58
37	50	50	50	41	46	53	55	49	47	54	48	68
38	50	50	50	52	46	58	55	57	65	60	50	50
39	50	50	50	57	53	55	50	59	44	58	50	65
40	50	53	53	70	48	65	55	51	56	66	57	58
41	50	50	53	54	65	51	62	71	38	58	59	48
42	50	56	50	49	41	60	53	61	53	44	53	53
43	50	50	55	47	80	44	75	74	56	73	68	63
44	50	50	50	52	41	53	46	45	44	48	50	53
45	50	60	54	54	44	62	48	65	56	52	59	70
46	50	56	50	42	44	53	53	59	53	41	37	57
47	50	53	50	40	29	51	42	41	50	41	40	54
48	50	50	50	52	48	58	62	49	50	46	46	53
49	50	50	50	60	60	64	55	43	44	46	51	57
50	50	50	50	49	56	67	65	53	56	49	49	39

Date Due

Jul 19 '51B

Jul 9 '55Y

Oct 3 '56H

May 18 '560 !

Dec 15 '562

Apr 11 '58T

23 Oct '59W

JAN 14 1986

