

Research & Statistical Analysis

CHAPTER CONTENTS

- RELIABILITY
- VALIDITY
- INTERCORRELATIONS
- DEVELOPMENT OF THE T-JTA ATTITUDE SCALE
- RELIABILITY & VALIDITY OF THE T-JTA ATTITUDE SCALE

RELIABILITY

The reliability of the nine bipolar scale scores has been estimated with test-retest correlation coefficients, with split-half correlations, and with Hoyt's² analysis of variance approach as presented by B. J. Winer.³

Stability

Estimates of stability were computed twice. The first estimate was based on the scores of a group of 81 subjects retested after a two-week interval. The analysis is presented in Table I.

The second estimate of stability involved a group of 50 subjects retested after one to three weeks. (See Table II.) Note that the correlations with age are consistent and insignificant.

The second estimate of stability was also computed using the Sten scores of the group of 50 persons. The results are given in Table III. The generally lower coefficients reflect the reduced range of the Sten scale (a reduction from 41 points to 10 points).

² C. Hoyt, "Test Reliability Obtained by Analysis of Variances," *Psychometrika*, 6:153-60, 1941.

³ B.J. Winer, *Statistical Principles in Experimental Design*, New York: McGraw-Hill Book Co., 1962.

Consistency

The internal consistency of the nine bipolar scales was estimated by split-half and analysis of variance techniques. Table IV presents the split-half reliability coefficients computed for a group of 1,138 persons included in the norming group. There were 477 males and 661 females in the group. The average age was 32.6 with a standard deviation of 12.06. The male group and the female group were analyzed separately. The results are presented in Table V.

The analysis of variance approach to estimation of reliability yielded the results presented in Tables VI and VII. The subjects were selected from more than 1,900. The 1,900 were stratified by sex and age. A total of 100 men and 100 women were selected at random. The median age for the men was 39.2 with a mean age of 40.1 and a standard deviation of 10.29. For the women, the median age was 39.8 with a mean and standard deviation of 40.3 and 10.19 respectively.

Table VI presents the reliability coefficients for a subsample of 200 men and women. Table VIII presents the reliability estimates for the 200 men and women separately. Also in the table are the results of tests of significance for the differences between the means of the two sexes. Table VIII presents the various reliability coefficients for ready comparison of data from Tables I-VII.

Standard Error of Measurement

For the convenience of the user Table IX presents the estimated standard error of measurement in both raw score units and sten score units. The data of Tables II and III were used in the computations for Table IX.

Table I
Reliability for a Two-Week Interval (N = 81)

Scale	Pretest		Posttest		Correlation
	Mean	S.D.	Mean	S.D.	
A Nervous	12.16	6.997	10.89	7.836	.82
B Depressive	9.58	7.986	8.42	8.404	.85
C Active-Social	29.09	6.449	30.25	7.293	.79
D Expressive-Responsive	27.79	5.705	29.32	6.180	.83
E Sympathetic	32.57	4.995	33.28	5.353	.71
F Subjective	12.15	7.059	11.01	7.511	.75
G Dominant	23.25	6.880	23.27	7.319	.84
H Hostile	9.78	6.682	8.81	7.636	.79
I Self-disciplined	23.78	8.874	23.62	9.197	.87

Table II
Reliability of Raw Scores Over a One to Three-Week Interval (N = 50)

Scale	Pretest		Posttest		Correlations		
	Mean	S.D.	Mean	S.D.	Retest	Pretest	Posttest
						With Age	With Age
A Nervous	12.2	7.55	11.6	8.22	.88	-.21	-.27
B Depressive	10.3	8.21	10.6	9.33	.90	-.12	-.15
C Active-Social	28.2	7.41	29.2	7.82	.88	-.20	-.11
D Expressive-Responsive	27.5	6.36	28.2	7.04	.89	-.05	-.03
E Sympathetic	32.7	4.92	33.2	6.37	.74	-.05	.12
F Subjective	13.1	7.58	12.0	8.13	.79	-.17	-.21
G Dominant	21.6	7.24	21.2	7.68	.89	.13	.13
H Hostile	9.8	7.26	9.0	7.57	.84	-.04	-.16
I Self-disciplined	23.1	8.35	22.9	9.52	.87	.19	.21
Age	22.8	4.95	----	----			

Table III
Reliability of Sten Scores Over a One to Three-Week Interval (N = 50)

Scale	Pretest		Posttest		Correlations		
	Mean	S.D.	Mean	S.D.	Retest	Pretest	Posttest
						With Age	With Age
A Nervous	5.7	2.06	5.4	2.26	.88	-.25	-.32
B Depressive	5.5	2.12	5.5	2.26	.86	-.09	-.15
C Active-Social	5.9	2.42	6.3	2.63	.87	-.19	-.11
D Expressive-Responsive	5.3	1.81	5.7	2.40	.64	.00	-.03
E Sympathetic	5.8	2.00	6.2	2.38	.62	-.07	.09
F Subjective	5.7	1.99	5.4	2.24	.78	-.19	-.21
G Dominant	5.3	2.07	5.3	2.24	.88	.07	.09
H Hostile	5.3	1.92	5.0	2.12	.80	-.05	-.14
I Self-disciplined	5.3	2.04	5.3	2.31	.86	.16	.15
Total Mid	5.3	1.93	5.5	1.96	.73	.15	-.05
Age	22.8	4.95	----	----			

Table IV
Split-Half Reliability Coefficients (N = 1,138)

Scale	First Half		Second Half		Spearman-Brown Corrected Correlation	Guttman's Estimated Minimums
	Mean	S.D.	Mean	S.D.		
A Nervous	5.569	3.9078	5.316	4.0144	.80	.80
B Depressive	5.578	4.4782	3.358	3.8365	.86	.86
C Active-Social	14.116	4.2425	13.440	3.3266	.77	.76
D Expressive-Responsive	15.265	3.7249	13.250	3.3886	.74	.74
E Sympathetic	15.026	3.0315	17.030	3.0620	.71	.71
F Subjective	5.980	3.6684	5.296	3.9073	.75	.75
G Dominant	10.979	3.7532	11.692	4.1635	.76	.76
H Hostile	5.055	4.0530	4.901	3.3528	.79	.78
I Self-disciplined	13.871	4.2812	10.926	4.5540	.82	.82

Table V
Split-Half Reliabilities for Sexes Separately (N = 1,138)

Scale	Males					Females				
	First Half		Second Half		Corrected Correlation	First Half		Second Half		Corrected Correlation
	Mean	S.D.	Mean	S.D.		Mean	S.D.	Mean	S.D.	
A Nervous	5.2	4.3	3.1	3.7	.85	5.8	4.6	3.6	3.9	.87
B Depressive	5.2	3.9	5.2	3.9	.90	5.8	3.9	5.4	4.1	.79
C Active-Social	13.6	4.4	13.3	3.5	.81	14.4	4.1	13.5	3.2	.74
D Expressive-Responsive	14.7	3.9	13.0	3.5	.77	15.7	3.5	13.4	3.3	.72
E Sympathetic	14.1	3.1	16.2	3.3	.73	15.6	2.8	17.6	2.7	.65
F Subjective	5.7	3.5	4.9	3.8	.71	6.1	3.8	5.6	4.0	.77
G Dominant	12.0	3.5	13.0	3.7	.72	10.3	3.8	10.7	4.2	.76
H Hostile	5.6	4.2	5.2	3.7	.82	4.6	3.9	4.6	3.4	.75
I Self-disciplined	13.7	4.4	10.8	4.6	.82	14.0	4.2	11.0	4.6	.83

Table VI
Reliability Estimated by Analysis of Variance (N = 200)

Scale	Mean	S.D.	Coefficients
A Nervous	11.16	8.382	.85
B Depressive	10.72	9.549	.90
C Active-Social	26.12	7.732	.79
D Expressive-Responsive	29.90	8.352	.86
E Sympathetic	31.85	6.196	.77
F Subjective	10.56	7.497	.82
G Dominant	22.92	7.411	.76
H Hostile	10.03	7.610	.82
I Self-disciplined	24.96	8.387	.82

Table VII

Reliability Estimated by ANOVA for Males and Females and Differences Between the Sexes (N = 200)

Scale	Males			Females			Z for Difference Between Means	Level of Confidence
	Mean	S.D.	Reliability Coefficients	Mean	S.D.	Reliability Coefficients		
A Nervous	9.84	7.606	.82	12.48	8.936	.86	2.25	98%
B Depressive	9.56	9.556	.91	11.87	9.449	.89	1.72	95%
C Active-Social	25.37	8.542	.83	26.86	6.790	.73	1.37	83%
D Expressive-Responsive	27.96	9.141	.88	31.83	7.008	.82	3.36	99%
E Sympathetic	30.71	6.886	.80	32.98	5.211	.71	2.63	99%
F Subjective	9.97	7.237	.81	11.15	7.740	.82	1.11	86%
G Dominant	23.61	7.771	.79	22.23	7.003	.73	1.32	90%
H Hostile	9.42	7.267	.81	10.64	7.927	.83	1.13	74%
I Self-disciplined	25.83	8.439	.83	24.09	8.287	.81	1.47	93%

Table VIII

Summary of Reliabilities from Tables I-VII

Scale	Stability		Split-Half			Consistency		
	2 Weeks	1-3 Weeks	Males	Females	Combined	Analysis of Variance		
						Males	Females	Combined
A Nervous	.82	.88	.80	.79	.80	.82	.86	.85
B Depressive	.85	.90	.85	.87	.86	.91	.89	.90
C Active-Social	.79	.88	.81	.74	.71	.83	.73	.79
D Expressive-Responsive	.83	.89	.77	.72	.74	.88	.82	.86
E Sympathetic	.71	.74	.73	.65	.71	.80	.71	.77
F Subjective	.75	.79	.71	.77	.75	.81	.82	.82
G Dominant	.84	.89	.72	.76	.76	.79	.73	.76
H Hostile	.79	.84	.82	.75	.79	.81	.93	.82
I Self-disciplined	.87	.87	.82	.83	.82	.83	.81	.82

Table IX

Standard Errors of Measurement
Computed from Data on Tables II-III

Scale	Raw Score Units	Sten Score Units
A Nervous	2.6	.71
B Depressive	2.6	.79
C Active-Social	2.6	.87
D Expressive-Responsive	2.1	1.09
E Sympathetic	2.5	1.24
F Subjective	3.5	.94
G Dominant	2.4	.72
H Hostile	2.9	.86
I Self-disciplined	3.0	.76

VALIDITY

The ideal method of determining a test's validity, or the extent to which a test measures what it purports to measure, is to compare the obtained results with certain pure measures of the variables involved. This method, however, poses a problem in the evaluation of most personality traits, since such "pure" criteria are not available. It was therefore necessary to use other means of assessing the validity of the T-JTA scales.

Empirical validity of the T-JTA was first determined by using professional clinical ratings as substitutes for pure criterion measures. Psychologists were asked to rate clients who were under their care. They were asked to select only those individuals whose personality dynamics were thoroughly familiar to them. The T-JTA was subsequently administered to these individuals, and their scores were then compared with the psychologists' ratings. In most cases the predictions were closely duplicated by the T-JTA results; in others, there were only slight variations on a few traits. Another validating procedure was to compare "self-rated" T-JTA results with "other-rated" - Criss-Cross - T-JTA results. Significant positive correlations were found in all cases, except those involving severe marital discord, where several correlations were negative due to antagonistic feelings.

A study completed by W. Lee Morrison, Assistant Director of Research at Clarion State College, provided substantial support for the placement of the shaded zones on the T-JTA Shaded Profile. The following is a statement of his findings:

The Dept. of Public Instruction, Commonwealth of Pennsylvania, has been conducting an on-going study of desirable "terminal behaviors," i.e. end results of teacher training, for the graduates of the State's teacher training programs.⁴ In connection with this study, Dr. William J. Page, Director of Student Teaching, Clarion State College, Clarion, Pennsylvania,

⁴ For "Personal qualities which appear to distinguish teachers selected to be 'high' and 'low' with respect to overall classroom behavior," see *Characteristics of Teachers*, (Ryans, 1960 p. 360-361).

requested that the cooperating elementary teachers in the area be polled concerning the personality characteristics of the "ideal" young teacher.

T-JTA Question Booklets and Answer Sheets were mailed during the month of May, 1967, to 112 cooperating elementary teacher supervisors in western Pennsylvania. They were asked to "answer the questions for the 'ideal' young teacher". The first 80 returns were used to derive a Composite Profile of the Ideal Young Teacher (Figure 1, page 42). There were 72 female and 8 male Supervisors with a mean age of 42.50 years (S.D.=11.09), all of whom specified that they were answering the questions for a female teacher. The statistical data below gives the mean raw scores and standard deviations for the nine bipolar T-JTA categories; and Figure 1 shows the Profile based on Female General Adult Norms.

Correlations with Other Scales

Construct Validity was estimated by correlating the T-JTA with other personality tests; and the correlations can be cited as evidence that it measures the same general areas of behavior as the other tests. (However, the overall correlations with any one test should be moderate, since high correlations would indicate unnecessary duplication - Anastasi, 1965, p. 146.) The tests selected for comparison with the T-JTA were the Sixteen Personality Factor Questionnaire (16PF) and the Minnesota Multiphasic Personality Inventory (MMPI).⁵

16PF Study: The 16PF is a multidimensional set of sixteen questionnaire scales measuring primary personality factors. In order to compare the 16 traits measured by the 16PF with the 9 traits measured by the T-JTA, 45 undergraduate males and 84 females (N=129) responded to both instruments. Table X gives the intercorrelations between the two sets of results.

T-JTA Trait A, Nervous, is associated with 16PF factors C-Emotionally unstable, L-Suspicious, O-Apprehensive, and Q4-Tense. T-JTA Trait B, Depressive, is associated with C-Emotionally

⁵ A study comparing the T-JTA with the Edwards Personal Preference Schedule (EPPS) was included in the 1967 edition of the Manual.

unstable, H-Shy, O-Apprehensive, and Q4-Tense. T-JTA Trait C, Active-Social, is associated with A-Outgoing, F-Happy-go-lucky, H-Venturesome, and Q2-Group-dependent. T-JTA Trait D, Expressive-Responsive, is associated with C-Emotionally stable, F-Happy-go-lucky, H-Venturesome, and Q2-Group-dependent. T-JTA Trait E, Sympathetic, is associated with E-Accommodating, and I-Tender-minded. T-JTA Trait F, Subjective, is associated with C-Emotionally unstable, H-Threat-sensitive, L-Suspicious, O-Apprehensive, Q1-Conservative, Q3-Undisciplined, and Q4-Frustrated. T-JTA Trait G, Dominant, is associated with E-Assertive, H-Venturesome, I-Tough-minded, and O-Self-assured. T-JTA Trait H, Hostile, is associated E-Assertive, L-Suspicious, and Q4-Tense. T-JTA Trait I, Self-disciplined, is associated with Q3-Controlled. The matrix of intercorrelations was factor analyzed using the principle component solution with the Varimax rotation. Table XA gives the salient factor loadings.

The findings of this study show that the T-JTA concurs in a manner to be expected with the 16PF.

“Ideal Young Teacher”

Mean Raw Scores and Standard Deviations for the Nine Bipolar T-JTA Categories

Trait	A	B	C	D	E	F	G	H	I
Mean	3.56	2.49	33.93	33.88	35.25	2.99	27.43	3.64	32.91
S.D.	3.94	3.00	5.02	3.78	2.55	3.01	5.35	3.22	5.84

See Figure 1, page 42

MMPI Study: A study was also done comparing the T-JTA and the MMPI. Although the MMPI was designed to measure abnormalities in personality, its scales have also been shown to have meaning within the normal range of behavior (Dahlstrom & Welsh, 1960, p. 3).

Two hundred (200) subjects were asked to complete both the T-JTA and the MMPI. The majority of the subjects were college students enrolled in a lower division Sociology course in Marriage. The remainder were vocational counsees. All subjects were living in Los Angeles and surrounding communities. The age range was 17 to 39; and the mean age was 20.0 years with a standard deviation of 3.34 years.

Table XI presents the means, standard deviations, and correlations between the variables of the T-JTA and the MMPI. The correlations were calculated by using the T-JTA raw scores and MMPI raw scores not corrected for K.⁶

Significant correlations are indicated: in general, the directions of the correlations conform to the descriptions of the traits being measured.

It might be noted that the comments relative to the differences in responses of men and women in the Manual, in the section on Reliability, are supported by the data from the MMPI study. Since women received a high average score on certain T-JTA scales, a positive correlation would be expected between their scores on these scales and the MMPI Mf scale. This expectation was confirmed for scales A, B, E, and F. Where men averaged higher scores on the T-JTA scales, a negative correlation with the Mf scale would be expected; this expectation was confirmed for scales G and I. The scales comprising the T-JTA Anxiety Pattern (high scores on Nervous, Depressive, Subjective, and often, Hostile) showed high correlations with several MMPI scales: Hs (Hypochondriasis), D (Depression), Pd (Psychopathic Deviate), Pt (Psychasthenia), and Sc (Schizophrenia). As was expected, the scales comprising the T-JTA Withdrawal Pattern (low scores on Active Social, Expressive Responsive, Dominant, and a high score on Subjective) correlated significantly with the MMPI Si (Social I.E.) scale, which aims to measure the tendency to withdraw from social contact.

The correlations in Table XI were subjected to a Principal Components Factor Analysis. The results indicated that the Sympathetic scale and the Self-disciplined scale each stands as a relatively unique measure, loading its own factor in a rotated matrix: the Sympathetic scale loaded its factor .82; the Self-disciplined scale loaded its factor .83. The Anxiety Pattern was found as a factor loading T-JTA Nervous .46, Depressive .38, Subjective .30; and MMPI F .64, K .72, Hs .47, D .38, Pd .52, Pt .74, Sc .79, and Ma .70. However, the Anxiety Pattern

⁶ Correlations were also computed using MMPI scores which were corrected for K. With the correlation factor included, the magnitudes of the correlations decreased by approximately .2. For example, a correlation of .6 was reduced to a correlation of .4.

was also found as a factor loading T-JTA Nervous .55, Depressive .60, Subjective .75, and Hostile .81, indicating that Hostile is sometimes part of the pattern. The Withdrawal Pattern was found as a factor loading T-JTA Active Social (Quiet) .82,

Expressive Responsive (Inhibited) .70, Dominant (Submissive) .81, and MMPI Si .72.

The above findings further substantiate the constructs underlying not only the individual T-JTA scales, but also the T-JTA trait patterns.

Table X
Correlations Between the T-JTA and the 16PF Variables (N = 129)

T-JTA Variable	16PF															
	A	B	C	E	F	G	H	I	L	M	N	O	Q1	Q2	Q3	Q4
A Nervous	.04	-.13	-.53	-.05	-.10	.09	-.21	.00	.37	-.02	-.15	.59	-.14	.00	-.21	.57
B Depressive	-.14	.05	-.54	-.06	-.29	.00	-.46	.06	.29	.13	-.09	.70	-.15	.21	-.18	.55
C Active-Social	.32	-.02	.21	.12	.42	.21	.60	-.12	-.06	-.12	.02	-.23	.07	-.48	.23	.01
D Expressive-Responsive	.29	-.04	.37	.04	.36	.19	.62	.06	-.18	.06	.15	-.28	.14	-.35	.11	-.16
E Sympathetic	.12	.02	.10	-.31	-.14	.18	.06	.34	-.14	-.05	.04	.16	-.11	-.25	.05	-.02
F Subjective	-.17	-.10	-.43	-.19	-.14	-.02	-.39	.05	.31	-.04	-.18	.59	-.33	.16	-.38	.53
G Dominant	.08	-.09	.10	.60	.33	-.05	.46	-.37	.11	.12	-.04	-.38	.26	-.02	.20	-.04
H Hostile	-.01	-.17	-.24	.51	.25	-.20	.13	-.26	.37	.13	-.04	.13	.03	.11	-.07	.32
I Self-disciplined	.24	.15	.08	.05	-.14	.26	.17	-.01	-.07	-.18	.11	-.13	.02	-.12	.58	-.05

*Significance .05 level = .17; for 125 degrees of freedom .01 level = .23

Table XA
Salient Factor Loadings for T-JTA and 16PF Variables

Factor	A	B	C	D	E	F	G	H	I	C	E	F	H	I	O	Q3	Q4
General Anxiety	.84	.83				.70				-.66					.81		.79
Extraversion			.78	.79			.51					.60	.74				
Dominant-Aggressive							.50	.74			.57			-.45			
Self-Control									.87							.78	

Table XI
Correlations Between the T-JTA and the MMPI Variables (N = 200)

Variable	Mean	S.D.	L	F	K	Hs	D	Hy	Pd	Mf	pa	Pt	Sc	Ma	Si
A Nervous	11.33	7.24	-.20†	.38†	-.44†	.53†	.45†	.16*	.40†	.15*	.16*	.63†	.50†	.28†	.38†
B Depressive	8.4	7.13	-.26†	.46†	-.48†	.44†	.54†	.01	.42†	.16*	.31†	.66†	.59†	.17*	.51†
C Active-Social	27.5	7.11	.03	-.28†	.09	-.10	-.23†	.07	-.14*	-.03	-.13	-.23†	-.22†	.18*	-.53†
D Expressive-Responsive	31.0	5.77	.11	-.35†	.25†	-.19†	-.34†	.12	-.23†	-.03	-.18*	.35†	-.35†	.04	-.56†
E Sympathetic	32.2	4.88	.20†	-.11	.11	-.05	.02	.08	-.08	.25†	.08	-.04	-.15*	-.07	-.14*
F Subjective	11.1	6.34	-.28†	.38†	-.53†	.34†	.41†	-.11	.24†	.23†	.20†	.58†	.52†	.19†	.52†
G Dominant	20.0	6.49	.03	-.16*	.09	-.11	-.26†	.04	.01	-.17*	-.07	-.25†	-.18*	.16*	-.50†
H Hostile	9.1	6.06	-.31†	.30†	-.41†	.25†	.22†	-.03	.31†	.02	.06	.36†	.38†	.20†	.23†
I Self-disciplined	22.6	7.51	.22†	-.29†	.24†	-.25†	-.17†	.01	-.20†	-.17*	-.09	-.32†	-.31†	-.24†	-.17*
Mean			3.0	3.8	15.9	4.7	19.8	22.1	15.7	34.6	9.9	12.2	10.9	16.9	24.4
S.D.			1.94	2.75	4.32	3.63	4.53	4.27	4.21	6.65	2.49	7.41	6.95	4.43	8.38

standard deviation of 8.92; the mean K score for women was 60.2 with a standard deviation of 8.34.

The individual K score for each of the subjects was correlated with his or her response to each of the 180 T-JTA questions. These correlations were used as the basis for selecting 57 items for further examination. The 18 best predictors were then chosen by a multiple regression analysis. The 18 items were drawn from 8 of the T-JTA scales.

RELIABILITY AND VALIDITY OF THE T-JTA ATTITUDE SCALE

To determine the reliability (internal consistency) of the T-JTA Attitude Scale, the T-JTA was administered to 1,215 subjects (585 men and 630 women) with a mean age of 42.5 years and a standard deviation of 7.49. Reliability was .83, computed by analysis of variance.

These same 1,215 subjects were administered the MMPI Scale; and the correlation of Attitude Scale scores and K scores was .72. The mean of the Attitude scores was 25.5 with a standard deviation of 7.48; and the mean of the K scores was 59.7 with a standard deviation of 8.74. The correlation with age was .37 for the Attitude scores, and .24 for the K scores.

Table XIV
Distribution of Ages and K Scores
Among Sample Used for Developing the
Attitude Scale (N = 657)

K Scores		Ages	
Score	Frequency	Age	Frequency
31-39	7	15-19	35
40-49	91	20-29	157
50-59	212	30-39	128
60-69	259	40-49	113
70-79	87	50-59	133
80-81	1	60-69	73
		70-79	16
		80-81	2

The functions of the MMPI K Scale and the T-JTA Attitude Scale are in many ways similar, in that both purport to measure defensiveness against psychological weakness at the high end of the scale, and self-deprecation at the low end of the scale. Table XV indicates the average K score corresponding to each T-JTA Attitude Scale Sten score.

A further validity study on the T-JTA Attitude Scale was reported in 1968 by Clinton E. Phillips, Ph.D., Director of Counseling, American Institute of Family Relations. The results of this study indicate a “high correlation; marked relationship” between the scores of 105 subjects on the T-JTA Attitude Scale and the MMPI K Scale.

Table XV
Table of Mean K Scores
Predicted from T-JTA Attitude Scores
(N =1,215) (Mean = 59.71)

Sten	Mean K Score
10	69.41
9	68.50
8	67.06
7	64.82
6	62.80
5	58.26
4	54.40
3	50.82
2	46.53
1	46.74