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Extended
report

A brief report appears in J. consult. Psychol.

Intraindividual Verbal-Numerical Discrepancies and Personality

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Intraindividual differences in verbal and numerical abilities have been observed since the inception of appropriate measuring instruments. That such variation has meaning in terms of predictable college academic success is recognized. Questionable, however, are relationships between intraindividual verbal and numerical variation and personality characteristics and/or psychopathology.

There have been three major directions to past research: comparison of difference scores derived from separate verbal and numerical measures with specific symptoms of psychopathology (Himmelweit, 1945); development of MMPI scales from verbal-numerical differentials (Aitkus, 1952; Spilka and Kable, 1958); and comparison of verbal-numerical differentials with personality variables as measured by the Rorschach and the MMPI (Dana, Dahlke and Mueller, 1959; Munroe, 1946; Pemberton, 1951). It is the third direction of research to which this paper addresses itself, in an attempt to hold the evidence within a conceptual framework useful to the high school or college counselor.

Munroe (1946) initiated these studies by comparing verbal-numerical differentials with Rorschach variables for female college subjects. Extreme "verbal" and "numerical" groups were formed on the basis of the Linguistic (L) and Quantitative (Q) components of the American Council of Education Psychological Examination (ACE). Eighty per cent of the Rorschach protocols of the subjects were correctly identified as verbal or numerical by an independent examiner. Statistically significant differences of F%, A, and form accuracy between the two groups were interpreted by Munroe as a more "subjective" orientation on the part of the verbal group as opposed to a rather literal construction of objective reality by the numerical group.

Pemberton (1951), administering the ACE along with several personality and interest inventories to male executives, extended Munroe's results to a male population. The extreme verbal group was significantly more reflective and socially introverted, with higher literary, esthetic, and theoretical interests, while the extreme numerical group was more extroverted and socially conforming, feeling more general pressure for overt activity.

Dana et al (1959) administered the School and College Abilities Test (SCAT) and the MMPI to new Freshman at the University of Nevada. In addition to the extreme verbal and numerical groups, they formed "control" verbal and numerical groups, composed of subjects with smaller difference scores. Groups were compared on 22 MMPI scales by means of t-tests. Only 14 of 176 were significantly different and no estimation of expected number under the null hypothesis was given. A blind analysis of the group profiles indicated a more subjective orientation, greater use of repression and projection, and more distorted thinking for the extreme verbal subjects, both male and female.

These studies are somewhat consistent in labeling the extreme verbal groups as more subjectively oriented and introverted, but certain difficulties pertain to all of them. Percentile difference scores were used with no control for inequality of percentile units. Contrasting particular personality variables

(which in most cases are correlated) rather than entire profiles renders determination of chance expectation difficult, if not impossible.

The first difficulty can be overcome, while still maintaining percentile scores, by careful selection of groups. The second difficulty can be overcome by using a split-plot analysis of variance design, suggested for repeated measurement situations by Block, Levine, and McNemar (1951), Edwards (1960), and Federer (1955). Analysis of variance offers the additional advantage of more effective utilization of the available data. Through an examination of orthogonal contrasts information relevant to several questions can be obtained within the same conceptual framework.

The present study, implementing the above suggestions, asks whether the hypothesis of previous studies that verbal-numerical discrepancies will be reflected in personality will continue to receive support or whether past results can be due to inadequate methodology.

Method

The MMPI and the SCAT were administered to entering male Freshman (N=425) at the University of Nevada. SCAT records were scored. Verbal (V) and Quantitative (Q) scores were converted to percentiles. The percentile distribution for V scores was divided into three parts: a range from 0 to 29 was designated as "verbal-low" (VL), from 30 to 70 as "verbal-middle" (VM), and from 71 to 100 as "verbal-high" (VH). Similar division was carried out for the percentile distribution of Q scores resulting in groups QL, QM, and QH. Combinations of these divisions resulted in six classifications with the verbal percentile higher than the numerical percentile and six classifications with the numerical percentile higher than the verbal percentile. These classifications were designated as "high verbal" (VL-QL; VM-QM; VH-QH), "higher verbal" (VH-QM; VM-QL), "extreme verbal" (VH-QL), "high numerical" (QL-VL; QM-VM; QH-VH) "higher numerical" (QH-VM; QM-VL), and "extreme numerical" (QH-VL).

Five subjects were selected randomly from each of these twelve groups, resulting in an experimental sample of 60 subjects. MMPI records were scored for the usual validity and clinical scales: L, F, K, Hysteria (HY), Depression (D), Hypochondriasis (Hs), Psychopathic Deviate (Pd), Masculinity-Femininity (Mf), Paranoia (Pa), Psychasthenia (Pt), Schizophrenia (Sc), Hypomania (Ma), and Social Introversion-Extroversion (Sie). Appropriate scales were K-corrected and all scores were transformed into T-scores.

Results

The 3 Validity and 10 Clinical scales were analyzed as separate profiles. Sources of variance and degrees of freedom from each analysis are shown in Table 1. The ratio of the Between Groups mean square to the Subjects within Groups mean square is interpreted as testing for differences in profile heights. The ratio of the Groups x Scales mean square to the Subjects x Scales within Groups mean square is interpreted as testing for differences in profile shapes.

Source of Variance	Degrees of Freedom	
	Validity	Clinical
Between Individuals	59	59
Between Groups	11	11
Subjects within Groups	48	48
Within Groups	120	540
Between Scales	2	9
Groups x Scales	22	99
Subjects x Scales within Groups	96	432
Total	179	599

Table 1
Major Components of Variance in the Split Plot Design

Utilizing as much of the information as possible, the Between Groups sum of squares was broken down into a set of orthogonal contrasts (Table 2) involving comparisons (1) between extreme verbal and numerical groups; (2) and (3) between higher verbal and numerical groups; (4) between extreme groups and higher groups; (5) between high verbal in the upper percentile range and high verbal in the lower percentile range; (6) between high numerical in the upper percentile range and high numerical in the lower percentile range; (7) between high verbal and high numerical in the middle percentile range; (8) between the high groups and the extreme plus the higher groups.

Each contrast was tested by the Subjects within Groups mean square. Degrees of freedom, mean squares, and F-tests for this set are shown in Table 2. None of the contrasts approached significance except the first for the clinical scales: the extreme verbal profile is slightly higher than the extreme numerical profile ($p < .10$).

The Groups x Scales sums of squares was broken down into Scales x each of the contrasts of the above set. Degrees of freedom, mean squares, and F-tests for this new set are shown in Table 3. Each component was tested by the Scales x Subjects within Groups mean square. The validity profiles of the higher verbal and numerical groups are significantly different in shape ($p < .025$) as illustrated in Fig. 1. The difference in shape of the clinical profiles for these groups approaches significance ($p < .10$). The difference in shape between the extreme verbal and numerical groups also approaches significance ($p < .10$).

Further inspection of Table 3 shows a highly significant difference ($p < .005$) between both the validity and clinical profiles of the high numerical group in the upper percentile range and the high numerical group in the lower percentile range. These results are illustrated in Fig. 2.

Source of Variation	Validity Scales			Clinical Scales		
	df	MS	F	df	MS	F
(1) VHQL vs QHVL	1	22.53	<1	1	1014.00	3.380*
(2) VHQM vs QHVM	1	2.70	<1	1	110.25	<1
(3) VMQL vs QMVL	1	2.70	<1	1	734.41	2.448
(4) (1) vs (2) + (3)	1	8.03	<1	1	144.50	<1
(5) VHQH vs VLQL	1	132.30	1.593	1	181.50	<1
(6) QHVH vs QLVL	1	56.03	<1	1	28.09	<1
(7) VMQM vs QMVM	1	17.64	<1	1	0.98	<1
(8) High vs Others	1	11.24	<1	1	285.66	<1
(9) Group Residual	3	50.14	--	3	266.30	--
(10) Subjects within Groups	48	83.05	--	48	300.00	--

*p < .10

Table 2
Differences in Profile Heights

Source of Variation	Validity Scales			Clinical Scales		
	df	MS	F	df	MS	F
(1) VHQL vs QHVL	2	3.74	<1	9	115.07	1.69 ^a
(2) VHQM vs QHVM	2	174.40	3.82 ^b	9	127.11	1.87 ^a
(3) VMQL vs QMVL	2	0.90	<1	9	72.65	1.07
(4) (1) vs (2) + (3)	2	36.07	<1	9	50.96	<1
(5) VHQH vs VLQL	2	81.70	1.790	9	59.18	<1
(6) QHVH vs QLVL	2	334.94	7.339 ^c	9	219.41	3.23 ^c
(7) VMQM vs QMVM	2	0.23	<1	9	80.13	1.18
(8) High vs Others	2	47.54	1.042	9	47.63	<1
(9) Group Residual	6	40.45	--	27	6.13	--
(10) Subjects x Scales within Groups	96	45.64	--	432	68.00	--

(a) $p < .10$ (b) $p < .025$ (c) $p < .005$

Table 3
Differences in Profile Shapes

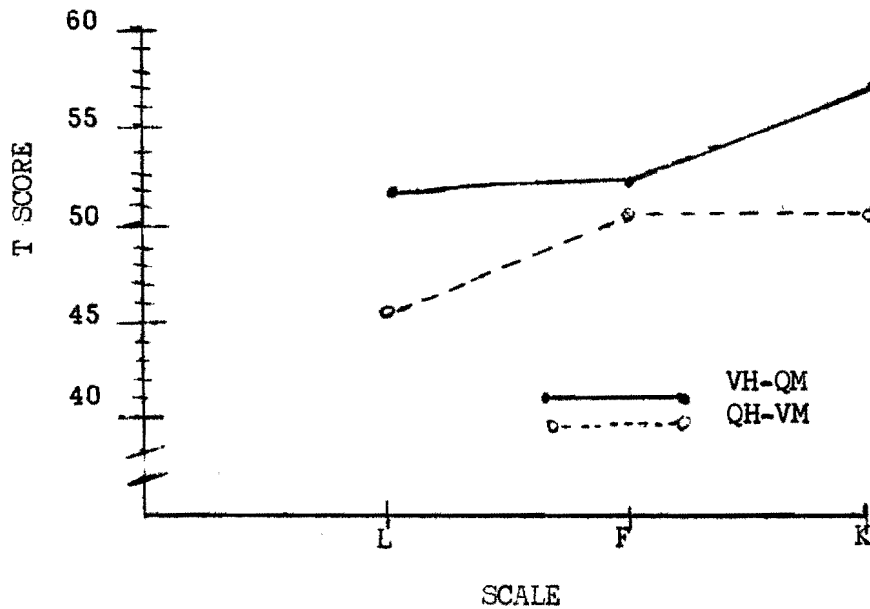


Fig. 1. MMPI validity profiles for the higher verbal (VH-QM) and higher numerical (QH-VM) groups.

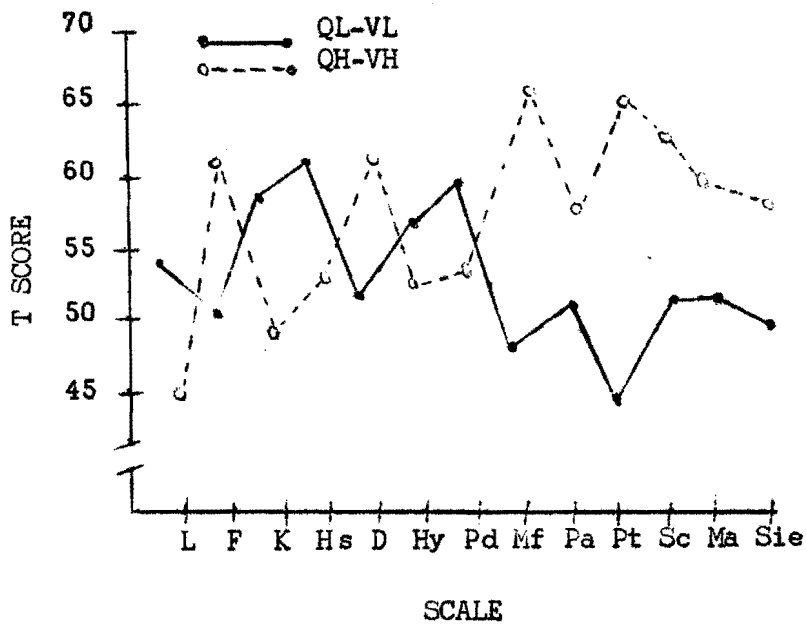


Fig. 2. MMPI validity and clinical profiles for the high numerical group in the upper percentile range (QH-VH) and the high numerical group in the lower percentile range (QL-VL).

Paralleling previous studies, the extreme verbal and numerical profiles were subjected to a blind analysis. The verbal groups was found to be more introverted and subjectively oriented. This is consistent with previous studies. Further, the profiles were correctly identified as to their respective verbal and numerical classifications.

Discussion

The general expectation from previous studies that verbal-numerical discrepancies would be reflected in personality appears to receive some support from the profile differences found between the extreme verbal and numerical groups as well as the differences found between the higher verbal and numerical groups and the blind analysis of profiles.

It might be argued that these results could be explained by the absolute standing of the verbal percentile and not the difference scores because of the strongly significant difference ($p < .005$) in profile shapes between QH-VH and QL-VL. This would suggest, however, that we find a similar difference between VH-QH and VL-QL, since these two groups again represent an example of the two numerical percentile extremes, even though in this case the verbal percentiles are higher. The lack of such a significant difference, allowing one result of high vs low V percentile when $V > Q$ and another result when $Q > V$, argues more strongly for a difference score hypothesis.

Although the sample used in this study was of adequate size and representation to allow generalization to the population from which it was drawn, it should be pointed out that its size inhibits broader generalization. It is felt, however, that the data suggest support for previous studies and that the utilization of a design which makes more efficient use of available information is demonstrated.

Summary

The hypothesis that verbal-numerical discrepancies will be reflected in personality was investigated by means of a split-plot analysis of variance design. The SCAT and the MMPI were administered to 60 University of Nevada subjects. Varying degrees of the verbal-numerical differential were represented by subgroups and contrasted by means of orthogonal comparisons.

The data provide some support for the results of previous studies which found verbal-numerical differentials reflected in personality, the extreme verbal group being more subjectively oriented and introverted than the extreme numerical group.

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