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THE RELATIONSHIP BETWEEN ALTITUDE—I.Q. DISCREPANCY AND ANXIETY*

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INTRODUCTION

Recently there has been increasing interest in the use of intra-individual test discrepancies as a measure of functioning efficiency. One of the major problems in establishing scatter patterns has been that of finding a suitable internal reference point. The three reference points most commonly employed are the mean or IQ, the vocabulary score, and the altitude or maximum score. Psychologists who believe that the G factor is an ability argue for the use of the IQ as a reference point while those who believe that it is a capacity use altitude as a reference point. In regarding intelligence as a capacity or potentiality rather than an ability, vocabulary and altitude proponents consider that test scores falling significantly below the potentiality indicate mental inefficiency⁽¹⁾ or personality disorganization⁽⁵⁾.

Wechsler⁽¹¹⁾, Magaret⁽⁶⁾, and Rapaport⁽⁷⁾ have utilized means as reference points in studying scatter on the Wechsler-Bellevue. For Wechsler and Magaret this mean is the average of all of the individual's sub-tests while Rapaport utilized deviations from a modified verbal mean and from the performance mean. All of these serve as fairly stable reference points because they are average scores. Jastak⁽⁸⁾ points out, however, that the averaging of such heterogenous measures results in a psychologically ambiguous score.

Vocabulary test scores have been used as reference points by Babcock⁽⁴⁾ and Rapaport⁽⁷⁾. Use of vocabulary has been claimed advantageous in that it is relatively unaffected by mental disorganization. The major disadvantage in its use is that a verbal test underestimates the intelligence level of persons who do better on performance tests than on verbal.

Jastak introduced the concept of altitude as a reference point for scatter analysis. He believes that clinical experience has shown the top score rather than the mean score to be most closely related to the individual's native endowment. He states that persons of "normal" personality structure tend to adjust to life at a level commensurate with the highest score. Wide deviations occurring between the capacity and the functioning ability (for example, considerable discrepancy between altitude and other subtest scores on the Wechsler) indicate maladjustment.

Whiteman⁽¹²⁾ further studied the feasibility of using altitude as a reference point in the derivation of scatter patterns. He found significant differences in the subtest deviations from altitude between a group of schizophrenics and a group of nurse applicants.

The hypothesis that anxiety produces disturbance in test performance has been tested in various ways. Rashkis and Welsh⁽⁸⁾ made up a list of signs which appeared to differentiate, in terms of performance on the Wechsler, between those cases in which anxiety was judged to be a prominent feature and those in which anxiety was not declared essentially contributory. These signs consisted of "temporary inefficiency" on any of the Wechsler subtests. Shoben⁽⁹⁾ gave Wechslers to a group of thirty-five college men. Eighteen of these men had standard scores of sixty-five or above on the neurotic triad of the Minnesota Multiphasic Personality Inventory

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(hereafter MMPI). These men made up the "anxious" group. The remaining seventeen subjects were judged to be "nonanxious." No significant differences were found between the groups with regard to the Rashkis-Welsh anxiety signs. The present authors question the use of the neurotic triad as an indicator of anxiety since one of the scales, the Hy scale, does not seem particularly relevant to the detection of anxiety.

Rapaport⁽⁷⁾ suggested two Wechsler-Bellevue signs which would distinguish between anxious and non-anxious patients: (a) a Digit Span score much below the Vocabulary level and/or the mean Verbal level is mainly indicative of the presence of anxiety, (b) "Impaired efficiency on the Object Assembly subtest may be a reflection of depressive or anxiety trends or both." Gilhooly⁽⁸⁾ attempted to validate these signs with a group of fifty-two psychoneurotics in whom anxiety was a primary feature and another group of neurotics in whom anxiety was not important. Neither of these hypotheses was substantiated.

Warner⁽¹⁰⁾ attempted to determine (a) whether anxiety neurotics differ significantly from normals with respect to interest variability, (b) whether anxiety neurotics differ significantly from normals with respect to the difference between verbal and performance subtest scores, and (c) whether there are any subtest patterns that allow differentiation between groups of anxiety neurotics and groups of normals. He found significant differences between the psychometric pattern of a group of normals and the anxiety neurotic group. His findings indicated that anxiety neurotics do better on concrete tasks, in comparison with more abstract ones, than do normals. He was unable to find a significant difference between normals and anxiety neurotics with regard either to interest variability or to difference between verbal and performance subtest scores.

In view of the previous lack of success it was decided to try a new approach which would utilize a more global measure of scatter. For purposes of this study, the authors are explicitly accepting the assumption that altitude is an index of intellectual potential. The central hypothesis of this study is that there is positive rectilinear relationship between altitude-IQ discrepancy scores and degree of anxiety as indicated by the MMPI. A second hypothesis is that there will be a positive rectilinear relationship between altitude-IQ discrepancy scores and overall degree of personality disturbance as measured by the MMPI. A third hypothesis is that a technique for calculating discrepancy scores which takes into account possible "natural" differences between verbal and performance capacities will yield a significantly higher correlation than one which does not. The latter hypothesis is based upon a factor analysis of the Wechsler-Bellevue⁽²⁾ which demonstrated that the two factors appearing most consistently throughout a wide age range were a verbal and a performance factor.

PROCEDURE

The subjects used were 82 patients seen at the Veterans Administration Hospital in Lincoln, Nebraska, the Psychological Clinic at the University of Nebraska, and the Veterans Administration Mental Hygiene Clinic in Omaha, Nebraska, within a two year period (January 1949 to January 1951). All of the subjects had been administered both the Wechsler-Bellevue test and the MMPI within a two week period. The subjects were unselected as far as diagnostic classification is concerned. However the population from which they were drawn consisted largely of diagnosed psychoneurotics. Those who showed evidence of organic brain damage were not included as the study is concerned only with the "functional" disorders. Several subjects were also eliminated on the basis of invalid MMPI profiles as determined by the F-K criterion where the difference is larger than ten.

Discrepancy scores on the Wechsler-Bellevue were calculated by the following procedures: (a) Using a method similar to that of Whiteman⁽¹²⁾ the highest subtest weighted score was multiplied by five, the second highest by three, and the third highest by two to provide the equivalent of ten subtest scores and to weight the scores at the ceiling of the individual's achievement. The quotients were then found

in the usual manner in Wechsler's Full Scale tables. The subject's Full Scale IQ was then subtracted from this altitude quotient yielding a discrepancy score. (b) A second discrepancy score was then computed by using a combination of top verbal and top performance scores. This was done to rule out the possible effect of any "natural" differences in the verbal and performance capacities of the subjects. In this second method, the two top verbal scores and the two top performance scores were added together and multiplied by 2.5 so that their sum would be comparable to the total weighted score of the Wechsler-Bellevue scale. Quotients were also found for these scores in the usual manner and again the Full Scale IQ was subtracted from this altitude quotient to yield a discrepancy score.

In order to obtain a somewhat objective measure of anxiety the MMPI scale measurements of Hypochondriasis, Depression and Psychasthenia were used. These three scales were chosen, because, of the four so-called "neurotic" scales, these three are the most likely to measure the vague fears, overconcern and worry characteristic of an anxiety reaction⁽⁴⁾. Arbitrary weights were assigned to the MMPI scale heights as follows: A height of 60 to 69 was given a weight of one, 70 to 79 a weight of two, 80 and above a weight of three. Treating each scale as equal in importance gave us a range of nine points for our estimations of the degree of anxiety. This value was then plotted on a scatter diagram against the discrepancy scores. The relationship was found to be rectilinear and Pearson *r*'s between the anxiety scores and the discrepancy scores (a) and (b) were computed.

In order to obtain an overall estimate of "degree of disturbance" the weighted scale height scores for all of the MMPI scales, using the same weighting system, were summed and the resulting scores plotted. These scores were also found to be rectilinearly related and again Pearson *r*'s were computed. The entire MMPI profile was used in this measurement in order to define degree of disturbance broadly enough to include all behavioral deviations measured by the MMPI under the assumption that those deviations are produced by an emotional disturbance of some type.

RESULTS

As can be seen in Table 1, of the two correlations between discrepancy scores and anxiety, one is significant at the 1% level of confidence and one at the 5% level. The correlations between discrepancy scores and *all* MMPI scales were somewhat lower, suggesting that anxiety was a primary variable in producing altitude-IQ discrepancies. To verify this the correlation between discrepancy scores and all MMPI scales excluding the anxiety trio was calculated. The test of significance of the difference between the correlation obtained using the anxiety scales and that obtained using the remaining six MMPI scales yielded a *t* of 2.57 (significant at the 2% level of confidence).

TABLE 1. SHOWING CORRELATIONS AND THEIR SIGNIFICANCES BETWEEN DISCREPANCY SCORES (CALCULATED BY METHODS A AND B) AND VARIOUS MEASURES BASED ON MMPI SCORES.

Method	Hs, Pt, D Scales		all 9 MMPI Scales		All scales except Hs, D, Pt	
	<i>r</i>	Signif.	<i>r</i>	Signif.	<i>r</i>	Signif.
A	.24	5%	.14	no	.01	no
B	.31	1%	.22	5%	.08	no

While the use of method (B) results in a slightly higher correlation than the use of (A), the difference does not reach the 5% level of confidence.

DISCUSSION

Although a correlation of .31 cannot be used for individual predictive purposes it suggests that there is a reliable relationship between our measure of anxiety and

scatter as measured by the altitude method. Further work in this area may suggest appropriate cutting scores to indicate efficiency of functioning.

Some of the limitations of this study are as follows: First, the criterion measure of anxiety was imperfect. Scales derived as specific anxiety indicators may be better. These were unavailable to the experimenters. Second, the fact that the Wechsler tests were administered by different examiners left another variable uncontrolled. Similarly no attempt was made to see whether the subjects falling in different anxiety categories were matched on other possibly significant variables such as age. Fourth, although the concept of altitude as a potential may be a valid one, the Wechsler-Bellevue test, because of the nature of its material, may be relatively insensitive to impairment of intellectual functioning as compared to some of the projective devices. Fifth, and this is particularly pertinent to the present study, the range of subjects used was quite narrow, consisting mainly of diagnosed neurotics. Therefore it is encouraging that in spite of this attenuating factor the method yielded a significant relationship. It seems apparent, in view of the foregoing discussion, that for a less homogenous population there may be an even more significant relationship than the correlation reported here suggests.

CONCLUSIONS

1. There is a significant rectilinear relationship between degree of anxiety and altitude-IQ discrepancy score.

2. With regard to the second hypothesis, anxiety, rather than overall degree of disturbance, seems to be a primary variable in reducing functioning efficiency among this group of neurotics.

3. When possible intraindividual differences in verbal and performance capacities are taken into account the correlation between discrepancy scores and anxiety is somewhat higher, although the difference between the two methods does not reach the 5% level of confidence.

4. This study indirectly lends support to Jastak's assumption that altitude score is a better indication of an individual's intellectual potential than is the Wechsler IQ.

5. It seems likely that the correlation reported above is a conservative estimate of the true relationship in view of the uncontrolled factors involved. The fact that it is a significant correlation is an encouraging sign for the new technique of exploring relationships between subtest scatter and anxiety.

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