The Relationship between Achievement of the Wechsler Memory Scale and the Wechsler-Bellevue Intelligence Test for a Heterogeneous Group of Mental Patients

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THE RELATIONSHIP BETWEEN ACHIEVEMENT OF THE WECHSLER MEMORY SCALE AND THE WECHSLER-BELLEVUE INTELLIGENCE TEST FOR A HETEROGENEOUS GROUP OF MENTAL PATIENTS

by

Lennart Charles Johnson

A Thesis Submitted to the Faculty of the Graduate School of Loyola University in Partial Fulfillment of the Requirements for the Degree of Master of Arts

February 1952
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He has had two articles published: "Wernicke-Bellevue Pattern Analysis in Schizophrenia", in the Journal of Consulting Psychology, 1949, 13, 32-33, and "Review of Certain Lobotomy Processes", in Diseases of the Nervous System, 1951, 12, 236-240.
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CHAPTER I

STATEMENT OF PROBLEM

It is the purpose of this investigation to evaluate the relationship which exists between achievement on the Wechsler-Bellevue Intelligence Test, Form I,\(^1\) (W-B) and achievement on the Wechsler Memory Scale, Form I,\(^2\) (WMS) for a heterogeneous group of mental patients.

Wechsler\(^3\) contends that memory quotients (MQ's) obtainable with the WMS "are directly comparable to the subject's intelligence quotient" (IQ). The present study is an empirical investigation designed to compare the MQ's and IQ's obtained from a group of mental patients. It is not an attempt to validate Wechsler's standardization since he used a normal population to obtain his norms.

The information supplied by this study should provide a basis for a better understanding of the limitations and possibilities of the WMS in its relationship to the W-B.

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2 David Wechsler, "A Standardized Memory Scale for Clinical Use", *J. Psychol.*, 1945, 19, 87-95.

The WMS is properly used in conjunction with the W-B, but in the interests of economy is not infrequently used alone to derive an estimate of IQ or as an index of mental efficiency. This type of violation becomes most flagrant when the WMS norms are indiscriminately applied to groups other than normals; the results of the present experiment should serve to define the broad limits wherein the norms may be safely converted to such a purpose.

The thesis herein proposed seems to be a pilot study. As far as the writer can determine from a perusal of the published literature, there has been no similar investigation undertaken.

Several studies that have a remote bearing on the present problem may be defined to clarify the frame of reference which the writer intends to assume.

Cohen reports the results of investigating groups of psychoneurotic, organic and schizophrenic patients with the WMS and the W-B. These groups were equated for age and IQ and compared on a scale of fifteen derived scores. No significant differences were found among the groups. This finding provides some indication of the uniformity of memory function for different mental conditions and thereby lends indirect support for the use of a heterogeneous group of mental patients for the present study. Stone used both forms of the WMS to study the effects of electro-convulsive shock on two groups of male and


female patients with varied functional illnesses. An incidental finding in this study was that scores from the Wechsler Memory Scales were highly correlated with scores from the Army Alpha tests of intelligence given at corresponding times. It is this type of correlation which the present writer plans to investigate, although with the use of the W-B.

Andersen⁶ published a study of the personality changes following prefrontal lobotomy in a case of severe psychoneurosis. He used the WMS along with other psychometric tests to measure pre- and post-operative efficiency. The MQ's were identical before and after the operation. Perhaps the WMS measures abilities that are not appreciably affected by lobotomies. It may be that in prefrontal surgery, as Stone⁷ suggests for electro-convulsive therapy, we are concerned with a generalized alteration of cognitive functions, of which memory functions are only an integral part. This might hold true also in the case of mental changes resulting from mental illness.

Howard⁸ hypothesized that the WMS will discriminate successfully between matched groups of psychotic–organic and psychotic–non-organic patients when brain damage tends to be of a gross nature. This experiment was based on an analysis of subtests and touches only peripherally on the proposed thesis problem, but results seem to suggest that the WMS is not very discriminatory in mild organic conditions.

⁷ Ibid., 214.
⁸ Alvin R. Howard, "Diagnostic Value of the Wechsler Memory Scale with Selected Groups of Institutionalized Patients", J. Consult. Psychol., 1960, 14, 276-280.
Patients with varied organic conditions are included in the present study, but it may be speculated that a reduction in mental efficiency will affect the results on both the WMS and the W-B since the WMS is standardized in terms of the W-B. Although a group of mixed organic and functional patients is used, the outer limits of the correspondence within which the different relationships will vary could be reflected. Other studies could be carried out to determine the relationship in achievement on the two tests for patients in special psychiatric categories.
CHAPTER II

PROCEDURE

The WMS MQ was correlated with the W-B Total Scale, Verbal and Performance Scale IQ's for a group of fifty heterogeneous mental patients, 25 males and 25 females, from the Chicago State Hospital who had these two tests administered to them simultaneously.

Wechsler equated his memory scores only against the weighted scores of the Total IQ, but a comparison with the other scales seemed rewarding since the WMS is predominantly verbal in nature and since the study utilizes a population different from Wechsler's.

The individual subtests of the two experimental tests are not designed to be comparable and Wechsler discovered in his initial exploratory experimentation with normal subjects that the most tenable method for equating achievement on the two tests was one of using only the Total IQ in its relationship to the MQ. Individual subtest scatter was therefore not considered in this treatment.

Subjects in various psychiatric classifications were used so that the essential stability of the obtained relationships would be reflected under multiple personality conditions. All subjects had eight years or more of formal education in the United States. Only white subjects free of language handicaps were selected. An attempt to eliminate the variable of mental deficiency
was made by choosing only patients with Total IQ's of 80 and over. The age variable is essentially obviated since score corrections for age are used routinely in both tests. The mean age for the full sample was 38 ± 9.65; the mean age for the males was 41.1 ± 9.6 and for the females, 35.4 ± 7.85. The mean education for the males was 9.6 years, with a range from 8 to 18 years of formal schooling; the mean education for the females was 10.6 years with a range of 8 to 12 years.

The test data used for the experiment was obtained from several examiners. A subjective check was made that the author excluded data which he felt might be contaminated by the unreliability of certain psychological examiners. The scoring was checked by the author. It may be argued that the norms originally established for the two tests made use of data collected by multiple examiners. This argument provides a certain precedent for this procedure.

Correlations were found by the Pearson Product-Moment method and the standard errors were computed. Means and sigma's of the various IQ's and IQ's were calculated to determine the type of dispersion present within the different groups.

To provide additional insight into the nature of the population and as a partial investigation of the problem of heterogeneity, the entire sample was dichotomized into a functional and an organic group. Thirty-two cases could be classified as functional, sixteen as organic. Two patients classified as Psychosis, Unclassified Type, were omitted from this distribution because of their indeterminate status. Patients classified as Without
Psychosis, Chronic Alcoholism, were assigned to the functional group since toxic residuals are usually negligible in this type of patient by the time psychological tests are administered. The more lasting and severe conditions produced by alcohol—Delirium Tremens, Pathological Intoxication, and Alcoholic Psychosis with Intellectual Deterioration—were included in the organic group.

$R_{10}$ between Total IQ and MQ was calculated for the functional and organic groups in an effort to estimate their differential contributions to the obtained product-moment correlations. It must be observed, however, that we are dealing with gross variables in this area and since both experimental groups are so mixed and since there is such a numerical disparity between the groups. Under these conditions, the achievement of significant correlations in the same direction should be sufficient to establish the adequate comparability of the groups and to justify the use of a heterogeneous sample in the main experiment.
CHAPTER III

RESULTS

The tabular results of the study are presented in Table I and II. In Table I the most important comparison is the Full Sample correlation between the WMS MQ's and the Total IQ's since Wechsler equated the two tests on the basis of these two scores. It can readily be seen that a r .g. correspondence exists between memory achievement and Total IQ for a heterogeneous group of mental patients.

TABLE I

PEARSON CORRELATION AND STANDARD ERROR BETWEEN
WMS MQ'S AND W-B IQ'S FOR 50 HETEROGENEOUS
MENTAL PATIENTS

<table>
<thead>
<tr>
<th></th>
<th>FULL SAMPLE</th>
<th>MALE</th>
<th>FEMALE</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL SCALE</td>
<td>.75</td>
<td>.63</td>
<td>.85</td>
</tr>
<tr>
<td>VERBAL</td>
<td>.71</td>
<td>.59</td>
<td>.78</td>
</tr>
<tr>
<td>PERFORMANCE</td>
<td>.51</td>
<td>.25</td>
<td>.76</td>
</tr>
</tbody>
</table>

The sex differences obtained are interesting. It is clearly seen that the female group maintains a r . g . , . r . a . stability of achievement between MQ and Total IQ than the male group. The male group shows only a moderate cor-
relation while the female group shows a marked correlation. This greater
stability for the female group obtains throughout the comparison of the MQ
with the Verbal Scale and Performance Scale IQ’s.

All correlations for both groups show a substantial relationship
between the MQ and the three IQ’s (significant at the 1 per cent level of
confidence) with the exception of the male group MQ as compared to the Per-
formance Scale IQ; this latter correlation is not significant. Inspection
of the data soon reveals that one atypical individual accounts for this lack
of significance. When he is eliminated and a new distribution run, the cor-
relation jumps to .45, thus becoming moderately significant. This particular
patient was a 48 point discrepancy between his MQ and his PIQ in favor of the
latter (MQ: 87; PIQ: 135). The closest approach to this discrepancy between
scores among other male patients occurs in two patients with 21 point dis-
crepancies; one with a functional and one with an organic condition. The
official diagnosis of the patient with the 48 point discrepancy is Psychosis
with Organic Brain Disease, possible Post-Encephalitis.

This atypical patient’s achievement is unique because of his su-
perior performance abilities. This is shown also in the relationship of his
two W-B scores (VIQ: 111; PIQ: 135). The question of education may be impor-
tant here, yet it would seem that higher education would increase his verbal
rather than his performance abilities. He spent approximately six years in
college and has an A.B. degree in Engineering from Cornell. No other male
in the group had more than a high school education. He has held a number of
responsible executive engineering positions but at least one year prior to
This hospitalization he was living the life of a bum and stealing pennies from newsstands. Recently this patient was transferred to the Galesburg State Research hospital where they have as yet been unable to verify the diagnosis of Organic Brain Disease.

It is notable that the greatest agreement occurs between memory achievement and Total IQ. This relationship is thus most constant for mental patients as well as normals. It must be observed, however, that the agreement between memory scores and the Verbal IQ closely approximates the agreement between MQ and Total IQ. Also important is the high degree of constancy w.r.t. the female group demonstrates in all of the comparisons.

**TABLE II**

**MEANS AND SIGMAS OF W-B IQ'S AND WMS MQ'S FOR 50 HETEROGENEOUS MENTAL PATIENTS**

<table>
<thead>
<tr>
<th></th>
<th>FULL SAMPLE</th>
<th>MALE</th>
<th>FEMALE</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL SCALE</td>
<td>103.1</td>
<td>11</td>
<td>102.1</td>
</tr>
<tr>
<td>VERBAL</td>
<td>103.1</td>
<td>11.4</td>
<td>104.5</td>
</tr>
<tr>
<td>PERFORMANCE</td>
<td>103.3</td>
<td>13</td>
<td>99.7</td>
</tr>
<tr>
<td>MQ</td>
<td>99.9</td>
<td>18.5</td>
<td>103.0</td>
</tr>
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</table>

Table II points up the general tendency for the Total IQ to be higher than its comparable MQ. This is less true for the females whose memory scores tend to be higher than their IQ's. More variability is shown for the female group both in memory and intelligence scores. The scatter,
However, is uniformly much greater for the MQ's than the IQ's in all the groups. This suggests that the MQ is a less stable measure than the IQ. This is perhaps to be expected since it samples fewer abilities than the intelligence test. It may provisionally be inferred that some common factors are reflected in the high degree of relationship that is obtained between the two tests. The discrepancies in relationship and variability suggest that the commonality of the tests is imperfect and show that different individuals produce markedly fluctuating patterns of achievement. It becomes difficult, therefore, to predict the correspondence between memory achievement and intelligence for any single individual.

The results of computing rank correlations for the functional and organic samples appear to justify the use of a heterogeneous group of mental patients for the thesis project. It must be observed that we are dealing with gross variables in this area since the experimental groups are only crudely comparable. Both the functional and organic groups contain a variety of nosological entities and there is a sizable numerical disparity between the groups (32 functional and 16 organic patients). A correlation of .82 with a SE of .058 was obtained between the WMS MQ and the W-B IQ for the functional group; a correlation of .50 with a SE of .195 was obtained between the WMS MQ and the W-B IQ for the organic group. The attainment of these positive correlations in such diverse groups seems to warrant the combination of these two groups into one population for the express operational purpose of comparing test scores for a mixed group. It seems clear that both the organic and functional groups contributed substantially to the product-moment correlations that were obtained for the total heterogeneous population.
CHAPTER IV

SUMMARY AND CONCLUSIONS

A group of 50 heterogeneous mental patients, 25 males and 25 females, were given the Wechsler Memory Scale and the Wechsler-Bellevue Intelligence Test to determine the relationship which exists between the two tests. Wechsler found that the memory quotients obtainable with the WMS were directly comparable to the subjects' intelligence quotients for normal subjects.

He equated his memory scores only against the weighted scores of the Total IQ and didn’t consider sex differences. It was felt by the present writer that a comparison of memory achievements with the other IQ scales and a consideration of sex differences might prove rewarding.

It was found that a substantial relationship exists between WMS memory achievements and the three IQ's (significant at the 1 per cent level of confidence)--with the exception of the male group MQ as compared to the Performance Scale IQ; this correlation was not significant. A single individual was responsible for this lack of significance, however, and when a new
correlation was run with this individual eliminated, the r became moderately significant (.45).

The greatest agreement occurred between memory achievement and Total IQ and was thus most constant for mental patients as well as normals. It should be observed, too, however, that the agreement between MQ and the Verbal IQ's closely approximated the agreement between MQ and Total IQ for the full sample.

A greater stability of achievement between memory scores and all of the W-B IQ's was shown for the female group as compared to the male group. For example, the male group showed only a moderate relationship (.63) while the female group showed a marked relationship (.85) between MQ and Total IQ. Even here it is reasonable to suppose, however, that this discrepancy would be somewhat minimized by the exclusion of the one atypical male since his performance score would reduce the Total IQ score.

There is a general tendency for the Total IQ to be higher than its comparable MQ although this is less true for the female group. The scatter, too, is uniformly much greater for the MQ's in all the groups. This suggests that the MQ is a less stable measure than the IQ. It may probably be inferred that some common factors are reflected in the two tests by the high degree of relationship that exists between them, but this can only remain a tentative assumption.

Some justification for the practice of using the WMS
alone to derive an estimate of IQ seems warranted since there is a substantial correlation between the two tests; the agreement is imperfect, however, especially as regards sex differences, and inferences from one to the other must be made discreetly. The procedure is more questionable with male mental patients since the correlation and variability of the scores leave something to be desired. It should be added that the extension of one score to the other for any single individual is attended with some degree of peril. The wisdom of reasoning from one to the other must depend upon the amount of accuracy required in a particular circumstance; it can never be completely sanctioned. It is probably most safe to assume that an MQ is going to be somewhat lower than its comparable IQ, but the wide range of achievement for both male and female groups makes it perilous to predict IQ from MQ with any great degree of confidence.

In view of the fluctuating patterns of achievement, the practice of estimating mental efficiency from the WMS alone is even more dubious than estimating the IQ from the MQ. There is a considerable degree of individual variation in the scores achieved despite the significant correlations obtained. It must be remembered that we are dealing with group results so that we cannot use them to predict the scores of any single individual. We have noted that there is much more variability among the MQ scores than among the IQ scores. This serves to caution us
against the tendency to make wild assumptions from the WMS regarding
the efficiency of mental functioning. Sex differences in test achievements add another variable to be considered. It could be that a random sampling error contributes to this result but provisionally it seems as if the female patients are more consistent in their mnemonic and intelligence attainments. Suggestive data emerge from the breakdown of the population into functional and organic groups; the groups were not matched, yet the appreciably higher correlation obtained by the functional group suggests that personality variables may be important and urges discretion until more evidence is accumulated in this area of investigation.

Naturally the findings presented here are tentative and bound by the limitations of the experimental design. Perhaps the most outstanding criticism that can be offered revolves around the use of a heterogeneous group of mental patients. It isn't possible to say precisely in which direction this factor has disguised the agreement between the two tests, but the results do seem to provide certain broad limits wherein a more secure statement of confidence can be proposed. This type of investigation certainly recommends itself to duplication with special classifications of psychiatric disorders.

The division of the population into unmatched functional and organic samples provides some suggestive evidence in this direction and hints that more variability exists among organic
patients. Nevertheless, the use of this arbitrary dichotomy can only serve as an incidental aside at this time since it was used as an expedient measure to provide insight into the relative contributions of these two broad classifications.

The following conclusions emerge from the study:

1. A high correspondence exists between WMS memory achievement and W-B Total IQ, and between memory achievement and the W-B Verbal IQ for a heterogeneous group of mental patients.

2. The MQ is a less stable measure than the IQ in that the variability of the MQ is uniformly much greater than that of the IQ.

3. Sex differences appear in the form of a more consistent level of achievement for the females. More variability is shown for the female group, however, both in memory and intelligence scores.

4. The improper practice of estimating IQ from the WMS MQ has a moderate degree of justification as prescinded from group trends, but is attended with peril and can never be completely sanctioned. It seems more valid for the females.

5. The use of the WMS MQ as an index of mental efficiency is more dubious than estimating IQ from the MQ.
BIBLIOGRAPHY

II. SECONDARY SOURCES

A. BOOKS


B. ARTICLES


Wechsler, David, "A Standardized Memory Scale for Clinical Use", *J. Psychol.*, 1945, 87-95.

APPENDIX I

PSYCHIATRIC CLASSIFICATIONS OF THE EXPERIMENTAL POPULATION

<table>
<thead>
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<th>Classification</th>
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<td></td>
<td>Males</td>
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<tr>
<td>Without Psychosis</td>
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<tr>
<td>Schizophrenia, Paranoid Type</td>
<td>3</td>
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<tr>
<td>Schizophrenia, Undetermined Type</td>
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</tr>
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<td>Involutional Psychosis, Depressed Type</td>
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<td>Psychoneurosis, Mixed Type</td>
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<td>Psychoneurosis, Hysterical Type</td>
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</tr>
<tr>
<td>Without Psychosis, Chronic Alcoholism</td>
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<tr>
<td>Alcoholic Psychosis, Delirium Tremens, Recovered</td>
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<td>----------------------------------------------------</td>
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<tr>
<td>without Psychosis, Epilepsy</td>
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</table>
The thesis submitted by Lennart Charles Johnson has been read and approved by three members of the Department of Psychology.

The final copies have been examined by the director of the thesis and the signature which appears below verifies the fact that any necessary changes have been incorporated, and that the thesis is now given final approval with reference to content, form, and mechanical accuracy.

The thesis is therefore accepted in partial fulfillment of the requirements for the Degree of Master of Arts.

Jan. 14, 1952
Date

Signature of Adviser