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# RELATION OF DIVERGENT-PRODUCTION ABILITIES TO VERBAL AND NONVERBAL IQS

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## Abstract

Semantic, divergent-production (DP) tests have been known to correlate higher with IQS, and to show greater incidence of triangular scatter plots (some very low DP scores with high IQS but no very high DP scores with low IQS) than do visual-figural tests. The two kinds of DP tests were studied in relation to both verbal and nonverbal IQS from the Lorge-Thorn-dike scale, Level III, with children. Only slight tendencies were found for stronger relationships between tests and IQS with similar contents--semantic and visual-figural. This result was attributed in part to lack of clear-cut distinction made by the two IQS and to possible higher-order factors cutting across the four kinds of tests.

Since methods for assessment of creative potential were developed during the past quarter century, the question of the relation of that hypothetical construct to intelligence has been investigated a number of times. Creative potential has usually been represented by one or more tests of divergent-production (DP) abilities. Operationally, the index of intelligence has usually been an IQ from some standard scale. In order to carry the operational view further, it is more exact to speak of DP abilities rather than creative potential, as appears in the title to this paper.

The immediate occasion for the minor study that led to this report was a finding of Guilford and Christensen (1973). Their investigation followed up an earlier one by Guilford and Hoepfner (1966). In this earlier study, 45 different tests of DP abilities were correlated with IQS from the California Test of Mental Maturity, at the ninth-grade level. The average correlations were .37 for semantic (verbal) tests, and .22 for visual-figural DP tests, from a sample of about 200. An examination of the bivariate plots frequently showed an unusual form, deviating from the customary elliptical distribution.

The typical deviant pattern was triangular in form. There were some low DP scores for students with the highest IQS, unmatched by high DP scores for students with the lowest IQS.

#### THE PROBLEM:

This tendency was more apparent for semantic-DP tests than for figural-DP tests, which prompted the hypothesis that a low IQ indicates a deficiency of semantic information in memory storage, and this puts an upper limit on what can be produced in DP tests, particularly semantic-DP tests. The dominance of semantic abilities represented by common IQS may account for both the higher correlation with semantic-DP tests and also the greater incidence of triangular bivariate distributions.

The later study was done with children in grades 4 through 6. The IQS in one school were derived entirely from verbal tests, and in the other school from the Lorge-Thorndike IQ scale, Level III. There were 10 DP tests, 5 semantic and 5 visual-figural, in a battery known as Creativity Tests for Children, Form A (Guilford, et al., 1971)<sup>1</sup> The chief interest was the incidence of triangular scatter plots in relation to these two kinds of DP tests to the IQs.

In general, the triangular plots did appear quite commonly with the entirely verbal IQ, for the semantic-DP tests, but not at all for the figural-DP tests. The Lorge-Thorndike IQ, however, gave as many triangular plots for the figural tests as for the semantic ones. This was attributed in part to the fact that there are some visual-figural tests in the Lorge-Thorndike scale. A new study was done in which the L-T verbal and nonverbal IQs were treated separately.

#### Method

An opportunity arose incident to the development of Form B of the Creativity Tests for Children. There were sufficient numbers of children involved who had previously taken the L-T tests, at the fourth-grade level, to make possible the needed correlational studies. In grades 4, 5, and 6 in the St. Lawrence Martyr School in Redondo Beach, California, there

were 44, 58, and 49 cases, respectively.<sup>2</sup> In grade 6 of the Metcalf School at the Illinois State University, Normal, Illinois, there were 39 usable cases.<sup>3</sup> Such samples are smaller than one should like for the purpose, yet they provide useful information. The data were treated within grade and class groups rather than in one combined sample, because of systematic age differences in test scores. The uses of IQs as measures can be defended on the grounds that they are known to remain relatively stable, at least for two or three years, and in their use, chronological age is controlled.

### The Divergent-Production Tests

The 11 divergent-production tests covered all six of the structure-of-intellect (SI) abilities in the semantic-content area, and all except DFR (divergent production of figural relations) in the visual-figural area. The tasks in these tests are briefly described as follows:

Names for Stories: List suggested titles for given short stories (for the SI ability DMU--divergent production of semantic units).

What To Do With It: List unusual uses for familiar objects (DMC--DP of classes).

Similar Meanings: List alternative words that mean about the same as given words (DMR--relations).

Writing Sentences: Given five familiar words, write sentences, each containing two or three of those words (DMS--systems).

Picture Writing: Draw alternative pictures that might represent each of several given words (DMT--transformations).

Kinds of People: List occupations or kinds of work that a pictorial symbol may imply (DMI--implications).

<sup>1</sup>The "et al" includes coauthors Paul R. Christensen, Arthur Gershon, Sheldon Gardner, and Philip R. Merrifield, in various tests.

<sup>2</sup>For the testing of these children, I am indebted to Sister Katherine Sexton, School Psychologist.

<sup>3</sup>For the testing of these children, I am indebted to Dr. William J. Gnagey and Dr. Richard C. Youngs.

Make Something Out of It: Given simple forms, such as an ellipse, name alternative objects that could be made out of them (DFU--visual-figural units).

Different Letter Groups: Given eight large, capital letters, form alternative classes of three letters each (DFC).

Making Objects: Given five simple line forms, combine them to make different specified objects (DFS).

Hidden Letters: Given two somewhat complex line patterns, find and mark within them many capital letters (DFT).

Adding Decorations: Given scenes including common objects, add decorative lines (DFI).

The score in each of the DP tests is the total number of acceptable responses.

### The Lorge-Thorndike Tests

Examination of the components of the two composites of the L-T scale shows that the parts of the Verbal composite measure semantic-cognition abilities. The tests and their probable SI abilities are:

Sentence Completion: Select the word among four alternatives that correctly fills a blank in a sentence (CMI--cognition of semantic implications).

Verbal Classification: Find the word that belongs in the same class as three given words (CMC).

Arithmetic Reasoning: Solve verbally stated problems (CMS).

Vocabulary: A multiple-choice form (CMU).

The nonverbal tests are not all in the visual-figural category, as the following descriptions show:

Figure Classification: Find the alternative figure that belongs in the class with three given figures (CFC).

Number Series: Find the given alternative number that correctly completes each given series (CSS--cognition of symbolic systems).

Figure Analogies: This test has two kinds of items and measures two different abilities. One kind of item presents verbal concepts in the form of pictured objects, hence it is a semantic test, for ability CMR. The other kind of items satisfies the test title, and should measure CFR. Thus, unfortunately for the purpose of this study, the nonverbal IQ is not a variable confined to visual-figural abilities. There is a con-

founding with semantic and symbolic content. Another desirable condition is not fulfilled, namely completely parallel semantic and visual-figural tests so far as SI products are concerned. It should be said that the SI designation of these tests can be made with considerable confidence, since similar tests have been analyzed a number of times. The same may be said with regard to the divergent-production tests.

### Procedures

Two treatments of the data were employed. One is the common step of intercorrelating each of the DP tests with each of the two IQ variables. Where there are definitely triangular-shaped scatter plots, the accuracy of Pearson  $r$ 's is in some question, of course, for lack of homoscedacity. Dispersions of DP scores are greater at high-IQ levels than at low IQ levels, in the triangular plots. Coefficients were computed within the four groups separately, then averaged, using Fisher's  $z$  transformation. The average  $r$  for each test had 182 degrees of freedom, which is the sum of the  $dfs$  from the four groups in each case.

The second procedure was to determine which scatter plots were triangular. Owing to the smallness of the samples, and the low correlations which meant widely scattered cases within the bivariate plots, it was not possible to reach confident decisions, by simple inspection, as to whether each distribution was elliptical (as is conventional) or triangular. A new technique was introduced, which also made the operation more objective. For each of the 88 plots coming from the computer, a straight line was located at the lower margin of the distribution, so as to provide a boundary. This was done without knowledge of which test variables were involved. If the plot were triangular, this line was horizontal, or nearly so. Another line was fitted along the upper-left of the plot. This line slanted upward, if there were any positive correlation at all. If the two bounding lines were nearly parallel, the decision was for an elliptical scatter; if the lines definitely diverged to the right, the decision was for a triangular spread.

Two other, even more objective techniques, were tried out, but, owing to the relatively small samples, and the scarcity of points around the edges of the plots, too much chance was apparently involved. The results from these methods were therefore discarded.

## Results

The results from the two utilized procedures are summarized in Table 1. The correlations of semantic-DP tests tend to be higher with the verbal IQ than with the nonverbal IQ, but the difference is not great (.36 versus .28). The semantic content in the nonverbal IQ may have reduced the difference. The visual-figural DP tests correlate only slightly higher with the nonverbal IQ, very likely insignificantly. Tests of significance of differences here are precluded because of the fact of various intercorrelations of the DP tests.

The incidence of triangular plots is highest for semantic-DP tests as functions of verbal IQ. There were some triangular plots for visual-figural tests in relation to verbal IQ and apparently equally frequent triangular plots for both kinds of DP tests in relation to nonverbal IQ. Again, the semantic content in the nonverbal IQ seems to confound the picture.

## Discussion

There are other possible reasons why semantic and figural DP tests do not behave more differently in relation to the verbal and nonverbal IQs than they do. One possibility is that the examinees can, and probably do, engage in some translations between the two code systems--semantic and figural. This might be true, especially, in a test like Make Something Out of It. In that test, objects are to be named. Objects are retained in memory storage in both codes, and their retrieval could be in either or both languages.

Another reason is that there is much more in common between the two LT IQs than the one common factor of CMR, as indicated by an inter-correlation between them. For the four groups of this study, that correlation ranged from .68 to .73, with a mean of .69, which appears to be the normal result. Since no other SI abilities seem to be in common, we may look to possible higher-order factors. All tests in both categories involve the SI operation of cognition. There may be a higher-order cognition factor. In the two lists given earlier, there are in common some tests involving the products of classes, relations, and systems. We can therefore question whether higher-order factors for these three products, respectively, made any contributions to the inter-IQ correlation.

The same higher-order factors could apply to some of the DP tests, where those products are involved.

If this kind of study is to be done in the future, it would be wise to plan the compositions of the verbal and nonverbal composites of cognition tests in a better manner for experimental purposes. Ideally, all cognition abilities involved should be completely parallel with the DP abilities. This would make it possible to do a more refined investigation, in which every cognition test can be related to every DP test, with parallel and also nonparallel tests. The deficiencies of the study reported here indicate again the unwisdom of using composite scores of uncontrolled factorial content; too often of unknown content.

For a more comprehensive investigation, there are a third and a fourth set of DP abilities--symbolic and behavioral--to be considered in relation to different kinds of cognition abilities. It is also urged that in correlational studies we more often give attention to the scatter plots as well as the correlation coefficients, a step that has been much less likely since the coming of the electronic computer.

#### References

- Guilford, J. P. and Christensen. The One-way relation between creative potential and IQ. Journal of Creative Behavior, 1973, 8, (In press).
- Guilford, J. P. and Hoepfner, R. Creative potential as related to measures of IQ and verbal comprehension, Indiana Journal of Psychology, 1966, 41, 7-16.
- Guilford, J. P. et al., Creativity tests for children: Manual of interpretations, Orange, Ca.: Sheridan Psychological Services, 1971.

# INDEX

VOLUME ONE      FALL, 1973      NUMBER ONE

- 3    A Check on the 28-Factor Clinical Analysis Questionnaire  
     R. B. Cattell
- 13   A 28-Day Case-Study with the M.A.T.  
     Paul Kline and Jennifer Grindley
- 23   Theory and Measurement of Self-Esteem  
     Ellen Dickstein
- 31   Computer Assisted Personality  
     George Pierson

VOLUME ONE      FALL, 1974      NUMBER TWO

- 38   The Stability of Interest Variables and Items During  
     Adolescence  
     Andrew R. Baggaley
- 46   Personality Factors as Predictors of General and Differential  
     Performance in High School  
     Martin Cooper, Marvin Boss, and Virginia Keith
- 58   Human Motives as Dynamic States: A dR Analysis of Objective  
     Motivation Measures  
     Raymond B. Cattell, Gerrit E. DeYoung, and John L. Horn
- 79   A Large Sample Cross-Check on 16 P.F. Primary Structure  
     By Parcelled Factoring  
     Raymond B. Cattell
- 96   A Factor Analytic Study of Teacher Trainees and Business  
     Majors' Responses to the EPPS and the GZTS  
     James A. Beckner

- 108 Personality Factors in the Organizational Role Preferences of Middle Managers

Arthur B. Sweney and Leslie A. Fiechtner

VOLUME 1 WINTER, 1975 NUMBER THREE

- 118 Third Order Personality Structure in Q-Data: Evidence from Eleven Experiments

Raymond B. Cattell

- 150 A Factor Analytic Study Manifest Anxiety and Abstract-Concrete Word Recall

Stephen L. Reynolds and Charles Burdsal

VOLUME ONE SPRING, 1975 NUMBER FOUR

- 194 Proceedings of the Society of Multivariate Experimental Psychology, European Branch

Viktor Sarris

- 214 A multidimensional scaling approach to interpersonal similarity and attraction.

Brenda G. Heltne, L. A. Stone, and M. J. Gatton

- 232 A paraprofessional perspective on the concept of post-treatment functioning in a drug abuse program.

J. L. Sloan and Wendell R. Lipscomb

- 244 Relationships between cognitive and temperament traits and the concept of style.

Douglas Wardell and J. R. Royce

- 268 An investigation of the common factor space of some well-known questionnaire scales: the Eysenck EPI, the Comrey scales and the IPAT Trait-State kit (CST).

Keith Barton and R. B. Cattell

- 278 Relation of Divergent-Production Abilities to Verbal and Non-Verbal IQS

J. P. Guilford