Perseveration: Its Correlation with the Intelligence Quotient

Jeanne Collins

Loyola University Chicago

Recommended Citation
http://ecommons.luc.edu/luc_theses/480

This Thesis is brought to you for free and open access by the Theses and Dissertations at Loyola eCommons. It has been accepted for inclusion in Master's Theses by an authorized administrator of Loyola eCommons. For more information, please contact ecommons@luc.edu.

This work is licensed under a Creative Commons Attribution-Noncommercial-No Derivative Works 3.0 License.
Copyright © 1946 Jeanne Collins
PERSEVERATION: ITS CORRELATION
WITH THE INTELLIGENCE
QUOTIENT

BY

JEANNE COLLINS

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF MASTER
OF ARTS IN LOYOLA UNIVERSITY

JUNE
1946
Jeanne Collins was born in Chicago, Illinois, May 20, 1915. She was graduated from Chicago Teachers College in 1935. The Bachelor of Philosophy degree was conferred by Loyola University in June, 1940. She has been engaged in teaching in Chicago elementary schools from 1937 to date.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>CHAPTER</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>The problem</td>
<td></td>
</tr>
<tr>
<td>II. REVIEW OF RELATED LITERATURE</td>
<td>6</td>
</tr>
<tr>
<td>Meaning of perseveration in psychiatry - Perseverating tendencies - perseveration and will - Perseveration of sensations, movements, ideas - Some tests - Inertia - Perseveration and 'g'</td>
<td></td>
</tr>
<tr>
<td>III. THE EXPERIMENT</td>
<td>20</td>
</tr>
<tr>
<td>Apparatus - The tests - procedure - Subjects - Scoring</td>
<td></td>
</tr>
<tr>
<td>IV. THE RESULTS</td>
<td>45</td>
</tr>
<tr>
<td>Quantitative data - Test behavior</td>
<td></td>
</tr>
<tr>
<td>V. CONCLUSIONS</td>
<td>53</td>
</tr>
<tr>
<td>BIBLIOGRAPHY</td>
<td>56</td>
</tr>
</tbody>
</table>
## LIST OF TABLES

<table>
<thead>
<tr>
<th>TABLE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. DISTRIBUTION OF SUBJECTS</td>
<td>60</td>
</tr>
<tr>
<td>II. CLASSIFICATION OF SUBJECTS INTO SUB-GROUPS</td>
<td>63</td>
</tr>
<tr>
<td>III. SCORES ON THE PERSEVERATION TEST GROUP A</td>
<td>64</td>
</tr>
<tr>
<td>IV. SCORES ON THE PERSEVERATION TEST GROUP B</td>
<td>65</td>
</tr>
<tr>
<td>V. SCORES ON THE PERSEVERATION TEST GROUP C</td>
<td>66</td>
</tr>
</tbody>
</table>
## LIST OF FIGURES

<table>
<thead>
<tr>
<th>FIGURE</th>
<th>FIGURE DESCRIPTION</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>SAMPLE CARDS - TEST 1</td>
<td>67</td>
</tr>
<tr>
<td>2.</td>
<td>SAMPLE CARDS - TEST 2</td>
<td>68</td>
</tr>
<tr>
<td>3.</td>
<td>SAMPLE CARDS - TEST 3</td>
<td>69</td>
</tr>
<tr>
<td>4.</td>
<td>COLOR CHART - TEST 4</td>
<td>70</td>
</tr>
<tr>
<td>5.</td>
<td>SAMPLE WORK-SHEET</td>
<td>71</td>
</tr>
</tbody>
</table>
No one interested in education is unaware of the influence of the wide-spread use of intelligence tests in our schools. The results of testing programs have furnished the basis for revising curricula. They have promoted the establishment of special classes for slow-learning and for especially gifted students. They have made teachers increasingly aware of the need to provide for individual variations in rate of learning.

As with every innovation, there have been some undesirable practices based upon the misinterpretation of test results. An almost superstitious belief in the predictive value of the intelligence quotient as an index of rate of mental growth was probably responsible for many of the attempts to establish homogeneous groups of students. A lack of understanding of the significance of test results still causes some teachers to believe that the child whose intelligence quotient is below or above the limits set for the average group is necessarily
doomed to failure or destined for a brilliant academic career.

In spite of this, probably none would deny that such testing programs have had a beneficial effect, insofar as they have given impetus to a trend toward revising standards and placing the emphasis in education upon meeting the needs of individual students rather than upon imparting traditional units of information and skill.

Though our concept of intelligence may be altered with the passing of time, it seems highly probable that schools will go on using test data in providing for the needs and capacities of students.

It seems fortunate that in our local school system, as in many other places, we are beginning to take cognizance of the fact that many other elements - in addition to intelligence - are significant in determining success in academic life and in various vocations. Increasing awareness of the vital role which non-intellective traits play in successful adjustments to various life situations has led to the incorporation of techniques for discovering (and, where necessary and possible, augmenting) such traits into our psychological research programs. It is not inconceivable that such research may ultimately alter the
nature of the psychological service offered to our schools and the task of the industrial psychologist in the future.

The work presented here is an attempt to discover whether any correlation exists between intelligence, as measured by psychological examinations and expressed in terms of the intelligence quotient, and perseveration, as measured in certain sensory-motor tests. Such an investigation seems to be particularly interesting at this time, when we are vitally concerned with the integration of character education programs into our school curricula. Though the use of perseveration tests has not been widespread, it has been conceded by some psychologists that they are among the best instruments yet devised for the objective measurement of character integration. It is true that in the most inclusive experiments in testing perseveration many adult patients in mental hospitals and large groups of institutionalized dependent or delinquent children were among the subjects tested. Perhaps this fact accounts, in part, for the limited use of the perseveration test. In most cases, investigators have agreed that extremely high or extremely low perseveration scores are frequently associated with character abnormality. The
constitution of the experimental groups, however, has suggested that the perseveration test would be most valuable in dealing with extreme instances of personality disintegration.

Nonetheless, many studies have demonstrated that juvenile delinquents exhibit a high incidence of abnormal mental traits which are non-intellectual in nature: notable among these are abnormal suggestibility, impulsiveness, and emotional instability. It is not inconceivable that the perseveration test, or some similar measure of character integration, may at some time in the not-too-distant future prove useful in helping this unfortunate group and in correcting other minor maladjustments which so often constitute an impediment to academic progress and social efficiency.

Such practical applications must wait, however, upon further experimentation and the selection of a battery of tests which will yield a score truly indicative of a permanent element and not unduly influenced by such factors as intelligence and speed. In this experiment, this particular four-test battery was chosen and the experimental procedure was designed with a view toward minimizing any advantage the older and more capable students might have (because of their
longer school experience and more favorable adjustment) over those less mature, and toward facilitating the maintenance of maximum speed throughout the testing period.
CHAPTER II

REVIEW OF RELATED LITERATURE

A review of current psychological literature discloses two rather important facts about studies of perseveration. Very few of the published investigations of perseveration testing have been conducted by American psychologists. A great deal of the work has been done with patients in mental hospitals.

It is rather surprising that there has been relatively little interest in a field of study which holds so much promise for education as well as for psychology. When we consider the widespread interest fostered by newspapers and popular magazines in the quiz, questionnaire, and any similar device which offers the individual an opportunity to know himself (and his fellows) better, it is truly amazing that the perseveration test has no become better known in this country. On the other hand, reputable scientists could scarcely afford to apply the findings of the investigations thus far conducted to the general public, in view of the fact that the subjects in these experiments have - in many instances - not been representative.
Interest in the concept of perseveration has been greater among British than among American psychologists. Though it is nowise typical, the attitude of Charles Spearman is worthy of note.

we have been considering
the greatest of all the faculties, if by this may be signified the one which has been most lavish of promises for individual psychology. .... When once the pack of modern investigators can be called off the many false scents of illusory faculties to this genuine trail; when the perseveration, already measurable even by groups, has been evaluated for persons of diverse age, sex, character, and social status; when the connection has been traced out which it bears to success in different branches of education and varieties of vocation - then perhaps psychological science will have made a second advance not much less in magnitude than that which is being achieved with respect to "intelligence".

(25 : 306)

Whereas the more recent studies have been concerned primarily with the relationship of perseveration to character, the term 'perseveration' has not always had the same meaning which is ascribed to it at present. We find references in the literature to three partial-
ly distinct conceptions of perseveration.

The term seems to have been first used by Neisser, a German psychiatrist, to describe a symptom observed in some of his patients. It indicated the frequent speaking or writing of a word or words at unsuitable places or times, or other instances of the abnormally persistent repetition of an activity after it should have been completed. The term has a similar connotation for psychiatry today.

The concept of perseveration seems to have been introduced to psychology by G.E. Muller and A. Pilzecker in their study of memory in 1900. They said that every idea has a tendency to remount spontaneously into consciousness. This tendency, they stated, is strongest when attention has been intensely directed upon the idea; it increases if the idea - or series of ideas - is soon repeated. Thus, the term seems to have been originally used in psychology to describe such "perseverating" tendencies.

In 1902 the psychiatrist Otto Gross placed a new interpretation upon the term. He spoke of the "primary and secondary functions" of the nervous system. He said that every element presented in consciousness persists for a time in a state of after-function and may be influential in regulating the direction of further
Four years later Gross' notion of secondary function was incorporated into the individual psychology formulated by the Dutch psychologist G. Heymans and the psychiatrist E. Wiersma. These workers devised the first definite and serviceable tests of perseveration.

One of Wiersma's tests was for light adaptation. The subject was kept in a dark room for a period of fifteen seconds; then the threshold for a weak light was determined. Next, the subject remained in a room lighted by an electric lamp so placed that the light rays did not fall directly upon him for a two minute period. When he returned to the dark room, the length of time which elapsed before he was able to see the weak light previously determined as his threshold was measured.

In another test, Wiersma placed red and green segments on a color wheel. He noted the number of revolutions of the wheel per minute when various subjects reported that the flicker had fused into gray. This fusion was supposed to indicate that one color sensation persists on the retina long enough for the next to be super-imposed upon it; hence the slower the rate of revolution, the higher the perseveration.
A third test measured the time required for various subjects to regain normal sensitivity to electric current after being subjected to the sudden shock of a relatively strong current.

These tests were administered to patients in a mental hospital suffering from mania and melancholia, and to a group of normal subjects. The time required for light adaptation was greatest for melancholics and least for manics. In the color test, melancholics saw gray sooner - at a slower rate - than did manics. Wiersma's results led to the inference that perseveration, or secondary function, is increased by melancholia and diminished by mania.

A six-test battery prepared by Heymans and another collaborator in 1913 took into consideration the motor as well as the sensory aspect of perseveration. In addition to the fusion of colors and light adaptation, there were tests to determine the threshold for flicker and for sound (after a loud noise). A fifth test was based upon the pronunciation of difficult words. The last test in the battery was a hand-writing test, in which the letter s was to be written normally and in reverse.

These early perseveration tests have been used by many investigators. They have been modified, and new
tests have been added from time to time.

L.W. Jones made several studies of perseveration; the first was published in 1915. Jones used tests of light adaptation and of color fusion which were similar in principle to those of Wiersma. However, he varied the procedure; his results did not corroborate those of Wiersma. He also developed several new tests.

Two of these were motor tests, which involved a change in handwriting. In the first, the subject was asked to copy a short passage as quickly as possible. The time allotted to this portion of the test was one minute and twenty seconds. In the latter half of the test the passage was to be copied again as quickly as possible, but this time without dotting i's or crossing t's. Four minutes was allowed for this activity. In scoring the test, the number of words written in each part of the test as well as the number of i's and t's written were taken into consideration.

In the second of the motor tests the subject wrote four figures repeatedly as quickly as possible for thirty seconds. In the second part of the test the same figures were written, but the direction of movement in writing each of them was reversed. The time allotted to this portion of the test was two minutes. The perseveration score was determined by dividing the
number of figures written in part two, when the direction was reversed, by four times the number written in the normal way.

Much of Jones' work was done with patients in mental hospitals. He became interested in the relationship of perseveration to fluency of ideas in certain types of psychoses. Flight of ideas is characteristic of mania, whereas in melancholia the individual often seems to brood on a single thought. Jones devised three ideational tests of perseveration to study this problem (14).

In the first test the task was to name as many nouns as possible beginning with each of two given letters; two one-minute periods were allowed for this test. In the second test the subject was asked to name all the animals he had heard of; this was a one minute test. In the third test of the series, for which a one minute time limit was set, Whipple's blots (numbers 1 and 4) were presented. The subject was asked to tell what he could see in each of the blots.

These tests were given to a group of about fifty subjects, including normal individuals as well as manics and melancholics. The results bore out the generally accepted view that fluency of associations is characteristic of mania, and that melancholia is characterized by a lack of associations.
On the basis of his own and other investigations, Jones considered the motor tests the best measures of perseveration. He says (14: 656) "When an adequate number of such tests is used, not only do the tests intercorrelate to some extent, but it will also be found that their pool shows appreciable correlation with independent estimates of perseveration made by competent judges".

For the manic group, however, he concluded that not even the motor tests really measure perseveration. Large variations in type probably existed between the individuals in the small group he studied. Though there was no significant correlation between the motor and ideational tests for this group, he held that the results of his investigation "seem to weaken the validity of the view that manic patients are non-persistors in sensory or motor tests" (14: 659).

W. Lankes (16) used eight tests and a questionnaire in an investigation of perseveration at about the time of Jones' earlier study, made in 1915. He found that various mental activities representing perseveration were positively inter-correlated. On the basis of his findings he posited the existence of a group factor of perseveration, which in normal subjects was very small.

Lankes also correlated the perseveration scores of forty-seven college students with their ratings in
what were considered the "persistent qualities" in character. These qualities were

a) perseverance, as opposed to changeability
b) kindness on principle
c) perseverance in the face of difficulties
d) trustworthiness
e) conscientiousness

Contrary to the belief that the strong perseverator was emotionally stable and steadfast in purpose, Lankes found a very small and negative correlation.

Lankes' establishment of a broad group factor of perseveration was challenged by Jasper (13) in a study planned to evaluate the functional unity of the perseverative tendency in various behavior processes. Jasper prepared a questionnaire which he hoped would measure perseveration alone. He concluded that his results failed to support the hypothesis of a broad group factor of perseveration, but there was some evidence of a narrow group factor of motor perseveration participating in a number of processes which require a rapid shift from one pattern of response to another. He stressed the need for measures of perseveration specific enough to eliminate the masking of the perseverative tendency by other factors, and held that no definite conclusions regarding the nature of a perseveration
factor in all behavioral processes could be arrived at until such measures were available.

The fact that Lankes expected to find a high degree of perseveration associated with emotional stability and persistence of motive leads us to conclude that he, like Webb (31), thought of perseveration as a manifestation of will. Cattell (5), in listing the most important positive characteristics of 'w' - the will factor - includes both these qualities. Cattell speaks of the will factor as an index of goodness of character; the perseveration factor, he says, refers to the type and soundness of character integration. He states that moderate perseverance is associated with a high degree of 'w'. Lankes' interpretation of his results to indicate a sharp distinction between will and perseverance is in agreement with Cattell's views.

The concept of perseverance upon which more recent investigations are based is more inclusive than the two previously given. The theory of mental inertia proposed by Spearman (25) seems to provide the best explanation thus far proposed for the fact that a perseverative tendency is manifested in the realms of sensations, movements, and ideas.

Spearman names five principles which govern cognition, "not in respect of quality, but only in that of
quantity" (26 : 131). One of these is the principle of retentivity, according to which every cognitive event has a tendency to re-occur. This principle, he states, manifests itself in two ways: facilitation and inertia. Inertia refers to the fact that, "Cognitive events always both begin and cease more gradually than their (apparent) causes" (26 : 133). Perseveration is one example of inertia.

According to the theory of inertia, the well-known 'g'-factor and the factor of perseveration are both concerned with mental energy. Stephenson (27) interprets this theory to signify that the 'g'-factor may be regarded as an individual's available mental energy and the 'p'-factor as the amount of inertia of that energy. Thus, the 'p'-factor is regarded as characteristic of an individual, just as is his 'g'. Stephenson says

We may picture general mental energy "switching" with extreme sluggishness from a group of neurons subserving a particular mental activity to another subserving a different activity, as when a mental activity begins or ends in an individual who is sleepy or narcotically drugged; antithetically, the energy may "switch" with great facility, instantaneously, from one operation to another, as,
perhaps, occurs in the maniacal patient. Degrees of this sluggishness—instinctivity antithesis, it seems, is what is measured by p-factor. The sluggishness is high 'p', high inertia; the instantaneous is low 'p'.

(27 : 724)

In concluding that, "For the present we have to employ the theory of mental inertia as that best-fitted to explain the p-scores" (28 : 330), Stephenson seems to be in accord with the viewpoint of many other investigators.

The pertinency of Professor Spearman's theories to the present investigation is rather doubtful. We do not presume with Earle (10 : 416) that, "'g' is taken to be roughly equivalent to the "general intelligence". Neither can we assume from Stephenson's apparent use of 'g' and "intelligence" interchangeably that 'g' is synonymous with intelligence as measured in the Stanford-Binet examination. Since, however, there are no available data pertaining to the relationship between perseveration score and intelligence quotient it seems well to mention here the meager facts which are given regarding the relationship of the 'p'-factor to 'g'. These are somewhat contradictory.
The results of one of Cattell's earlier investigations (6) indicated that high perseveration tended to be associated with low 'g', especially with feeble-minded persons. Stephenson also found a negative, though small, correlation between perseveration tests and 'g' in one of his studies (28). He administered a five-part battery of perseveration tests to 129 psychotic patients; the tests had an average correlation of -.26 with 'g'. However, the character of the experimental groups in these cases was such that their results have very little significance for the work presented here.

In a later publication, Cattell says that

Perseveration, as measured in tests, is a short time effect. It is a kind of inertia in nervous processes as they are made to respond to the will. It is the persistence of old, habitual responses in face of new ones which the will seeks to set up. 'P' factor has no relation to intelligence, or fluency, or introversion. (4 : 288)

The latter statement of Cattell agrees with Spearman's view that, "'P' and 'g' vary independently of each other. Both seem to deal with mental energy: 'g' measures quantity, 'p' may express degree of inertia."

(25 : 306) It is also in substantial agreement with
Stephenson's statement that, "... normally, 'p' and 'g' have no correlation". (27:740)
CHAPTER III

THE EXPERIMENT

The data for this study were derived from two sources: fifteen pupils in the ungraded division (a special class for mentally retarded children) at the William Penn school, and thirty-one pupils in grades three to eight at the same school were the subjects.

Five other children served as subjects in the preliminary work of simplifying and standardizing the procedure to be used in the actual experiment. The scores of these children - three boys and two girls - are not included in the findings given here. Observation of the responses and the test-behavior of these children furnished the basis for the necessary simplification of instructions, and for changing the technique used in test number four. These initial tests were also very helpful in determining the suitability of the particular tests chosen for use with the subjects who were to be included in the experimental group.

The work of six other subjects was excluded from this study for other reasons. The perseveration tests were administered to the children individually at the
close of the regular school day. After a number of children had been tested, a comparison of performances and of test scores indicated that those subjects who were tested on Fridays seemed to have a definite 'weekend' feeling, which adversely affected their efficiency in such a school-like task. As a result of this observation, the work of four subjects was excluded from the study. Also, the Friday afternoon testing periods were discontinued. The scores of two other subjects were also excluded. Their scores on the perseveration tests, especially the third test in the group of four (writing w's), indicated that these individuals were given an undue advantage over the other subjects because of their left-handedness.

The experimental group consisted of twenty-three girls and twenty-three boys.

The children's chronological ages ranged from eight years six months to fourteen years six months. The range of mental ages was from six years two months to sixteen years seven months. The intelligence quotients of the subjects ranged from fifty to one hundred forty.

Table I presents the distribution of the subjects by school grade, sex, chronological age, mental age, and intelligence quotient.
For the purpose of this study, the subjects were chosen to represent three levels of ability: below average, average, and above average. This classification was based on the results of individual psychological examinations administered by qualified psychologists. The Stanford revision, Form L, of the Binet scale was the intelligence test used.

An attempt was made to equate the subjects in the three groups on the bases of sex and chronological age, since the topic of special interest in this study was the inter-relationship between the intelligence quotient and the score on a battery of perseveration tests.

Table II presents the classification of the three groups of subjects on the bases named above.

Work-sheets for the four perseveration tests were prepared by the experimenter. Sheets of (8 1/2 x 11) paper were ruled to provide eight rows of spaces (1.3 x 1.3 cm.), nineteen spaces to the row. There were intervals of 1.3 cm. between the rows.

Sample cards to accompany the work-sheets for tests one, two, and three were also prepared. These cards were rectangles fourteen inches long and four inches wide. On each of the cards was reproduced a row of eight spaces or 'boxes', similar to those which appeared on the work-sheets. The size of the squares
on these sample cards, however, was increased to one and a half by one and a half inches.

On Card 1, the letters a b c a b c a were written in manuscript in the first seven spaces. On Card 2, the capital letters A B C A B C A appeared in the first seven spaces. On Card 3 was written a A b B c C a. Card 4 had four triangles with apex pointing upward. Card 5 showed four triangles with apex downward. On Card 6 there were five triangles: the first, third, and fifth pointed up, the second and fourth down. Card 7 had a row of four w's. Each letter had a red dot to indicate the starting point and an arrow to suggest the left-to-right direction to be followed in writing it. On Card 8 there were four w's with dots and arrows to indicate the reversal of direction to be used in this part of the test.

Small sheets of paper, on which the subjects wrote w's and drew triangles in a preliminary practice period, were also provided by the experimenter. In each case four letters or figures were made by the subject in the practice period to demonstrate that the verbal directions had been understood.

In the first three tests the subjects wrote their responses on the work-sheets. For the fourth test, the subjects were not required to write. The correct responses for this test were inserted on the work-sheet by the
experimenter before the test was begun.

A large color chart was also prepared for this fourth test. This was a rectangular sheet of manila document paper twenty inches long and fourteen inches wide. On it appeared six rows of colored circles, each one inch in diameter. There were ten circles in each row. A wooden stylus, six inches in length and three-eighths of an inch in diameter at its center, was used by the subjects in pointing out the red and blue circles on the chart.

A stop watch was used in timing all tests.

The four perseveration tests used in this experiment were those suggested by Cattell (5) for use with children.

Test 1. Writing a b c's
Test 2. Drawing triangles
Test 3. Writing w's
Test 4. Naming colors

Tests of perseveration may be constructed on either of two principles. In those which are constructed on the creative principle, perseveration is shown by a relative inability to re-assemble the elements of an old habit in a new way. In those which are constructed on the principle of alternation, perseveration is indi-
cated by slowing down when habits which have been well established are made to alternate rapidly.

In this four-test battery both principles of construction are represented.

At the beginning of the testing session the subject was given a work-sheet on which his name and the date had previously been written by the examiner. Several sharpened pencils - without erasers - were placed beside him on the table.

There were no preliminary instructions given, except E. I should like to have you do something for me.
Test 1 was begun immediately.

Test 1
Section A

E. When I say "go", I want you to write the letters a b c a b c in these boxes (pointing to line 1) as quickly as you can. Write them like this. (Card 1 was placed before S.). If you fill this line, go on to the next one. Go on writing until I say "stop". Then put down your pencil. Write as quickly as you can, but write carefully so that your paper looks like this (pointing to sample card). If you make a mis-
take, cross it out and go on writing as quickly as you can. Do you understand? Ready? Go.

(after fifteen seconds)

Stop. Put your pencil down.

Card 1 was then removed from the table. E. would examine the work and make some favorable comment about the speed or quality of the writing, to allow S. a rest period of seven or eight seconds.

Section B

E. Now I want you to write capital A, capital B, capital C, here (pointing to the row on the worksheet in which the writing was to be done). Write them like this (placing Card 2 before S.). When I say "go", begin to write. Go as quickly as you can, but write carefully so that your letters will look like these (pointing to sample card). If you make a mistake, cross it out and go right ahead quickly. If you fill this line, go on to the next one. When I say "stop", put your pencil down. Do you understand? Ready? Go.

(at the end of fifteen seconds)

Stop. Put your pencil down.

Card 2 was removed. A rest period of several seconds followed.
Section C

E. Now I want you to write a b c's like this (showing Card 1) again. When I say "go", start here (pointing to the line to be used). Write as quickly as you can, but write carefully. Keep on writing as quickly as you can until I say "stop". If you finish this line, go right on to the next. If you make a mistake, cross it out and go on quickly. Do you understand? Ready? Go.

(at the end of fifteen seconds)

Stop. Put your pencil down.

Card 1 was removed. Several seconds' rest followed.

Section D

E. Now I want you to write capital letters like these (pointing to Card 2) again. When I say "go", start here (pointing out the line where writing is to be done) and write as quickly as you can. Write carefully, so your letters look like these. If you finish this line, go on to the next one. If you make a mistake, cross it out and go right on. Write as quickly as you can until I say "stop". Do you understand? Ready? Go.
Section E

E. Now you are going to do something different. This time I want you to write small a, capital A, small b, capital B, small c, capital C, like this (showing Card 3). When I say "go", start here (pointing to the line to be used) and write as quickly as you can. Write carefully, though, so your letters look like these (pointing to sample card). If you make a mistake, cross it out and go on quickly. If you finish this line, go on to the next one. Write as quickly as you can until I say "stop". Then put your pencil down. Do you understand? Ready? Go.

Card 2 was removed, and a rest period followed.

Section F

E. Now you are going to write small a, capital A, small b, capital B, small c, capital C, again. When I say "go", start here (pointing to the line

(after fifteen seconds)

Stop. Put your pencil down.

Card 3 was removed. A rest period followed.
to be used) and write as quickly as you can. Write carefully, though, so your letters look like these (pointing to sample card). If you make a mistake, cross it out and go on quickly. If you finish this line, go on to the next one. Write as quickly as you can until I say "stop". Then put your pencil down. Do you understand? Ready? Go.

(after fifteen seconds)

Stop. Put your pencil down.

Card 3 and the work-sheet for Test 1 were removed.

Test 2

Section A

E. (Showing Card 4) Do you know what these are called? (If S. did not know it, the name 'triangle' was supplied by E.) You make four just like these on this paper (giving S. a small sheet of lined paper). Make them one space high. Now I want you to make a whole row of triangles in these boxes (pointing to first line on the work-sheet for Test 2). When I say "go", start here, and make a triangle in each box as quickly as you can. Make yours look just like these (pointing to sample card). If you finish this line, go
right on to the next. If you make a mistake, cross it out and go ahead as quickly as you can. Do you understand? Ready? Go.

(after fifteen seconds)

Stop. Put your pencil down.

Card 4 was removed, and a rest period followed.

Section B

E. (Showing Card 5) Here are some triangles which point downward. You make four just like these on this paper (presenting a small sheet of lined paper). Make them one space high. Now make a whole row of triangles like these (indicating Card 5). When I say "go", begin here (pointing to first space of the appropriate line) and make one triangle in each box as quickly as you can. Make your triangles look just like these on the card. If you finish one line, go right on to the next. If you make a mistake, cross it out and go ahead as quickly as you can. Do you understand? Ready? Go.

(after fifteen seconds)

Stop. Put your pencil down.

Card 5 was removed, and a rest period of several seconds followed.
Section C

E. Now you are going to make some more triangles like these (showing Card 4). When I say "go", start here (indicating first space in the line to be used) and make a triangle in each box as quickly as you can. Make them just like the ones on the card. If you finish this line, go on to the next one. If you make a mistake, cross it out and go right ahead as quickly as you can. When I say "stop", put your pencil down. Do you understand? Ready? Go.

(after fifteen seconds)

Stop. Put your pencil down.

Card 4 was removed. A rest period followed.

Section D

E. This time you are going to make triangles like these (showing Card 5) again. They point downward. When I say "go", start here (indicating first space in the appropriate line) and make a triangle in each box. Make them just like the ones on the card. If you finish this line, go right on to the next one. If you make a mistake, cross it out and go on as quickly as you can. When I say "stop", put your pencil
down. Do you understand? Ready? Go.

(after fifteen seconds)

Stop. Put your pencil down.

Card 5 was removed. Several seconds' rest followed.

Section E

E. Now you are going to do something different. Here (showing Card 6) are some more triangles. The first one points upward, the second one down, and so on: one up, and one down. I want you to make a whole row of triangles like these, pointing up and down. Make four on this paper (presenting a small sheet of lined paper) one up, one down, up, down. When I say "go", I want you to start here (indicating first space of the line to be used) and make one triangle in each box. Make them just like these (pointing to sample card), one up, then one down. If you finish this line, go right on to the next one. If you make a mistake, cross it out and go ahead as quickly as you can. When I say "stop", put your pencil down. Do you understand? Ready? Go.

(after fifteen seconds)

Stop. Put your pencil down.

Card 6 was then removed, and a rest period followed.
Section F

E. This time you are going to make triangles again just like these (showing Card 6). When I say "go", begin here (indicating the first space in the line to be used) and make a triangle in each box as quickly as you can. The first one should point up, the next down, up, down, all the way across the line. If you finish this line, go right on to the next. If you make a mistake, cross it out and go right on as quickly as you can. Do you understand? Ready? Go.

(after fifteen seconds)

Stop. Put your pencil down.

Card 6 and the work-sheet for Test 2 were removed. A rest period during which S. was sent to the opposite end of the room for pencils and paper followed.

Test 3

Section A

E. Do you see these letters? (showing Card 7) This red dot shows where to begin in writing the w. Make four w's just like these on this paper (presenting small sheet of lined paper). Make your letters one space high. Now make a whole row of w's on this sheet (presenting work-sheet
for Test 3). When I say "go", begin here (indicating first space in the row to be used) and write a w in each box. Write as quickly as you can. Make your letters just like these (indicating sample card). If you finish this line, go right on to the next one. If you make a mistake, cross it out and go ahead as quickly as you can. Write until I say "stop". Then put your pencil down.

Do you understand? Ready? Go.

(after fifteen seconds)

Stop. Put your pencil down.

Card 7 was then removed. A rest period followed.

Section B

E. Now you are going to write w's like these (again presenting Card 7) on this line (indicating the line to be used). When I say "go", start here (pointing to the first space in the line) and write a w in each box. Write as quickly as you can. Make your letters just like these on the card. If you finish this line, go on to the next one. If you make a mistake, cross it out and go right ahead as quickly as you can. Write until I say "stop". Do you understand? Ready? Go.
(after fifteen seconds)

Stop. Put your pencil down.

Card 7 was removed, and a rest period followed.

Section C

E. Here are some more w's (showing Card 8). They have been written backwards. The red dot shows you where the letter was begun. I want you to make four w's like these on this paper (presenting small sheet of lined paper). Make the w's backwards like these. Make them one space high. Now I want you to make a whole row of w's just like these. When I say "go", start here (pointing to first space in the line where writing is to be done) and write a w backwards in each box. Write as quickly as you can, and be sure to make all your letters this way. If you finish this line, go right on to the next one. If you make a mistake, cross it out and go ahead as quickly as you can. Keep on writing until I say "stop". Then put your pencil down. Do you understand? Ready? Go.

(at the end of fifteen seconds)

Stop. Put your pencil down.

Card 8 was then removed. A rest period followed.
Section D

E. This time you are going to make w's like this (showing Card 7 and tracing over the first letter) again. When I say "go", start here (indicating first space of the line to be used) and write a w in each box. Write as quickly as you can. Make your letters like these. If you finish this line, go on to the next one. If you make a mistake, cross it out and go ahead as quickly as you can. Go on writing until I say "stop". Do you understand?

Ready? Go.

(after fifteen seconds)

Stop. Put your pencil down.

Card 7 was removed. A rest period followed.

Section E

E. Now I want you to make some more w's backwards, like these (presenting Card 8 and tracing over each letter from the red dot). When I say "go", start here (indicating the first space to be used) and write a w backwards in each box. Write as quickly as you can. Be sure to make your letters this way (tracing over a letter on the card). If you finish this line, go right on to the next. If you make a mistake, cross it out and go ahead
as quickly as you can. Go on writing until I say "stop". Do you understand? Ready? Go.

(after fifteen seconds)

Stop. Put your pencil down.

Card 8 and the work-sheet for Test 3 were then removed. The subject's pencils were also removed from the table. A rest period followed.

Test 4

Section A

E. (Presenting color chart) There are red, blue, green, and yellow circles on this chart. I want you to point to some of them with this stick (presenting stylus to S.) and say their names. Point only to the red and blue circles, and say their names as quickly as you can, like this. (E. then demonstrated by pointing out and naming all the red and blue circles on the chart quickly.) When I say "go", start here (indicating first red circle at upper left-hand corner) and point to all the reds and blues in this line as quickly as you can. When you finish this line, go right down to the next. If you get to the end of the last line, go back to the beginning and name the reds and blues again. Keep on
pointing out all the reds and blues until I say "stop". If you make a mistake, correct it by saying "No". Then give the right name and go right on as quickly as you can. When I say "stop", put the stick down. Do you understand? Ready?

Go.

Before the beginning of the testing period, E. had inserted the correct responses for each section of this test on a work-sheet. This made it possible to watch the performance of each subject closely. Omissions were recorded on these sheets by placing parentheses around the responses omitted. Substitutions were written in at the appropriate places. Errors were indicated by drawing a diagonal line through the expected response. If a correction of an error was made, this was indicated by writing in the corrected response above the space where the line had been drawn. A check was made after the last response given within the time allowed.

After fifteen seconds, the stop signal was given and the answer sheet was removed from the table. A rest period of several seconds followed.

Section B

E. I want you to point out all the red and blue
circles on the chart again. When I say "go", start here (at first red circle in top row) and name all the reds and blues as quickly as you can. When you finish one line, go right on to the next. If you make a mistake, correct it by saying "No"; then give the right name and go on as quickly as you can. When I say "stop", put the stick down. Do you understand? Ready? Go.

(at the end of fifteen seconds)
Stop.

A rest period of several seconds followed.

Section C

E. This time you are going to do something different. I want you to point out the red and blue circles again, but call them by the wrong names. When you point to a red circle, say "blue". When you point to a blue circle, say "red". Go as quickly as you can, like this. (E. then demonstrated by pointing out and naming - in reverse - all the red and blue circles on the chart very quickly.) When I say "go", start here (pointing to first red circle at upper left-hand corner). Call all the reds blue. Call all the blues red. Go as quickly as you can. If you make a mistake,
correct it by saying "No". Then give the right name and go right on as quickly as you can. If you get to the end of the last row, go back to the beginning. When I say "stop", put the stick down. Do you understand? Ready? Go.

(after fifteen seconds, during which time the experimenter checked the subject's responses against those previously entered on the work-sheet)

Stop.

Several seconds' rest was allowed.

Section D

E. Now I want you to point out the red and blue circles again. This time you are to call them by their right names, like this. (E. demonstrated by pointing out and naming correctly the red and blue circles in the first line of the color chart.) When I say "go", begin here (indicating first red circle) and name all the reds and blues as quickly as you can. If you make a mistake, correct it by saying "No". Then give the right name and go right on as quickly as you can. If you get to the end of the last line, go back to the beginning. When I say "stop", put the stick down. Do you understand? Ready? Go.
(at the end of fifteen seconds, during which the responses given were compared with those on the sheet which had been prepared)

Stop.

A rest period followed.

Section E

E. This time you are going to call all the reds blue and the blue circles red again. When I say "go", start here (at first red circle) and name the red and blue circles like this. (E. demonstrated by naming - in reverse - the red and blue circles in the first row on the chart quickly.)

Go as quickly as you can. If you make a mistake, correct it by saying "No". Then give the right name and go on as quickly as you can. If you get to the end of the last row, go back to the beginning. When I say "stop", put the stick down.

Do you understand? Ready? Go.

(after fifteen seconds, during which the responses were compared with the answer sheet)

Stop.

The actual working time for the four tests was five and one half minutes, but the length of the
testing period for different subjects varied from fifteen to twenty minutes. At the conclusion of this period, some favorable comment was made upon the subject's performance, his cooperation, or his industry. At this time, many children expressed a desire to compare their performances on various sections of a test. They were allowed to inspect the work-sheets if they cared to do so. Some subjects had asked questions about the purpose of the test and the method of scoring. These were answered at the end of the testing period. Among the older children there were many comments about the practical value of being able to change from one activity to another with the expenditure of a minimum of time and energy; the departmental program in the upper grades had made them acutely aware of that need.

The scoring of the perseveration tests was done in the following manner:

Test 1

The score for each section was the number of letters written in fifteen seconds, minus any errors. The scores for sections A, B, C, and D were added together to obtain the 'x' score. The scores on sections E and F were added together; twice this sum was taken as the 'y' score. The total score for Test 1 was obtained by
dividing 'x' by 'y'.

Test 2

The score for each section was the number of triangles completed in fifteen seconds, minus any errors. The scores for sections A, B, C, and D were added to obtain the 'x' score. The scores for sections E and F were added together; twice their sum was the 'y' score. The score for Test 2 was obtained by dividing 'x' by 'y'.

Test 3

The score for each section was the number of w's written in fifteen seconds, minus any errors. The score for section A did not figure in the final score for this test. The scores for sections B and D were added to obtain the 'x' score. The scores for sections C and E were added to obtain the 'y' score. The total score for Test 3 was obtained by dividing 'x' by 'y'.

Test 4

The score for each section was the number of red and blue circles named (normally or in reverse) within fifteen seconds, minus any errors, insertions, or omissions. The score for section A was not used in
the scoring. The sum of the scores for sections B and D was the 'x' score. The sum of the scores for sections C and E was the 'y' score. The total score for Test 4 was obtained by dividing 'x' by 'y'.

This method of dividing the sum of the scores on the unimpeded parts of the tests by the sum of the scores for those activities which were slowed down by reversal or alternation was chosen because its use eliminates or greatly minimizes the speed factor.

The sum of each individual's scores on the four tests was taken as his total perseveration score. This total was the figure used in investigating the correlation between the intelligence quotient and the perseveration test score.
CHAPTER IV
RESULTS

The subjects were divided into three sub-groups on the basis of their intelligence quotients, as shown in Table II. Their scores on the perseveration tests are given in Tables III, IV, and V.

An examination of the scores shows that the highest total score (6.8705) was made by a member of Group A, the group having intelligence quotients below the range of the average. The lowest score (4.5293) was made by a member of Group C, comprised of subjects having intelligence quotients above the average range. Though these scores represent the extremes of the experimental group, it is well to point out that they do not represent extraordinarily high or low degrees of perseveration. For this particular battery of tests, with the method of scoring used in this experiment, a total score of 4.0 would indicate no hindrance effect or perseveration at all. We should scarcely expect to find extremes of perseveration or non-perseveration in this experimental group. Even though various levels of intellectual ability are represented, it is to be
presumed that subjects chosen from an elementary school population would be normal or nearly so, with respect to perseveration.

The averages for the three groups are as follows:

For Group A

<table>
<thead>
<tr>
<th>Mean Chronological Age</th>
<th>11 years 3 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Intelligence Quotient</td>
<td>67.1</td>
</tr>
<tr>
<td>Mean Perseveration Score</td>
<td>6.1334</td>
</tr>
</tbody>
</table>

For Group B

<table>
<thead>
<tr>
<th>Mean Chronological Age</th>
<th>11 years 4 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Intelligence Quotient</td>
<td>100.7</td>
</tr>
<tr>
<td>Mean Perseveration Score</td>
<td>5.5235</td>
</tr>
</tbody>
</table>

For Group C

<table>
<thead>
<tr>
<th>Mean Chronological Age</th>
<th>11 years 3 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Intelligence Quotient</td>
<td>119.7</td>
</tr>
<tr>
<td>Mean Perseveration Score</td>
<td>5.1042</td>
</tr>
</tbody>
</table>

When the average intelligence quotients and perseveration scores of the three groups are compared, we discover that the highest average perseveration score, as well as the highest individual score, is earned by the group having the lowest average intelligence quotient. The lowest average score is that of the group having the highest average intelligence quotient.
The differences between the average scores of the groups follows the same trend as the differences between their average intelligence quotients. That is, the difference between the average scores of Groups A and B (like the difference between their average intelligence quotients) is greater than the difference between the average scores of Groups B and C.

The correlations between intelligence quotients and perseveration scores, translated into product-moment coefficients, are:

- For Group A: \( r = +0.10 \)
- For Group B: \( r = -0.26 \)
- For Group C: \( r = +0.10 \)
- For Groups B and C: \( r = -0.40 \)
- For All Groups: \( r = -0.693 \pm 0.05 \)

The group averages, as well as the coefficients of correlation between intelligence quotients and perseveration scores for the entire experimental group, and for Groups B and C taken as a unit, indicate that the perseveration score correlates negatively with the intelligence quotient.

However, when each group is considered separately the differences both in degree and direction of relationship between intelligence quotient and persevera-
tion score are such that no reliable correlation is found between the two measures for the individual groups.

There was another great distinction between Group A and Groups B and C which is not revealed by these figures. This was the difference in the subjects' test behavior.

If the subjects were rated on cooperation, there would be very little difference between individuals or groups. Each child seemed to give careful attention to the instructions. Each made a sincere effort to comply with every detail of the procedure. Nevertheless, it was frequently necessary to remind a number of the subjects in Group A of the need for maintaining maximum speed; these children were apt to strive for accuracy of letter formation at the expense of quickness.

In Groups B and C, after the first few sections of the initial test had been completed the subject was likely to compare the number of letters or figures he had written with his performance in the previous sections of the test and to make some comment upon his own performance. This auto-critical attitude was notably (and, it seems, characteristically) lacking in Group A.

There was also a significant difference in the interest shown by the various subjects after the comple-
tion of the test. The large majority of the subjects in Group A were satisfied to be dismissed with a favorable comment after the final section of Test 4 had been completed. A few of these children, however, said they had found the tasks so enjoyable that they wished to repeat the experience. One or two even expressed the belief that they could do better on a re-test.

In Group B, and even more frequently in Group C, there were questions regarding the purpose of the test. Many subjects requested permission to examine the worksheets to discover in which portion of the test their best work had been done. Several children in these groups were interested in knowing how their performances compared with those of other subjects. One eighth grade boy wanted to know "whether boys or girls make a better showing on a test like this".

As a matter of fact, the results of this study indicate that there is very little difference between the perseveration scores of the boys and girls. This similarity is in accord with the findings of Pinard (18).

The average scores for the sub-groups and for the entire experimental group were as follows:
The average inter-correlations between the sub-tests in the battery also reveal a striking difference between Group A and Groups B and C. Whereas the inter-correlations for Group B and - with a single exception - for Group C are consistently positive, for Group A these inter-correlations are such that we would not be justified in drawing any definite conclusions concerning the relationship between perseveration test scores and intelligence quotients for this group of subjects. For Groups B and C (those subjects having intelligence quotients in the average and superior ranges) there is a positive correlation between each sub-test and the total score. For Group A this part-whole correlation in one instance is negative.

The average inter-correlations between the scores on the sub-tests in the battery were:

<table>
<thead>
<tr>
<th></th>
<th>Girls</th>
<th>Boys</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>5.9697</td>
<td>6.3205</td>
</tr>
<tr>
<td>Group B</td>
<td>5.4817</td>
<td>5.5602</td>
</tr>
<tr>
<td>Group C</td>
<td>5.1827</td>
<td>5.0258</td>
</tr>
<tr>
<td>All Groups</td>
<td>5.5474</td>
<td>5.6057</td>
</tr>
</tbody>
</table>
The average correlations of the sub-test scores with the total scores were:

<table>
<thead>
<tr>
<th>Group</th>
<th>Group A</th>
<th>Group B</th>
<th>Group C</th>
</tr>
</thead>
<tbody>
<tr>
<td>abc - △</td>
<td>.49</td>
<td>.44</td>
<td>.82</td>
</tr>
<tr>
<td>abc - colors</td>
<td>.05</td>
<td>.58</td>
<td>-.12</td>
</tr>
<tr>
<td>abc - w</td>
<td>-.42</td>
<td>.36</td>
<td>.32</td>
</tr>
<tr>
<td>△ - w</td>
<td>.00</td>
<td>.21</td>
<td>.49</td>
</tr>
<tr>
<td>△ - colors</td>
<td>-.14</td>
<td>.42</td>
<td>.20</td>
</tr>
<tr>
<td>w - colors</td>
<td>-.24</td>
<td>.46</td>
<td>.54</td>
</tr>
</tbody>
</table>

An examination of these figures reveals that the perseveration test used, though it was chosen because it seemed suitable for the range of abilities in the experimental group, is a less reliable instrument for Group A than for Groups B and C.

While the number of subjects was small, and the distribution was carefully planned to include three well-defined levels of ability rather than to approximate a normal (unselected) population, the results of
this experiment do indicate clearly that there is a negative correlation between intelligence quotients and perseveration scores when a reliable test is used.
Several conclusions may be drawn from the results of this experiment.

1. When the entire experimental group (including subjects whose intelligence quotients are below average, average, and above average) is considered, there is a negative correlation between perseveration test scores and intelligence quotients. This is demonstrated by the computation of the coefficient of correlation between the perseveration test scores and intelligence quotients of the group, as well as by a comparison of the averages for the three sub-groups separately considered.

2. When each of the sub-groups (of below-average, average, and above average intelligence quotients) is considered separately, no reliable correlation of perseveration test scores and intelligence quotients is found.

3. There is a positive correlation between the scores on the individual perseveration tests and the total scores on the four-test battery, for the groups
having average and superior intelligence quotients. The average inter-correlations between the sub-tests for these two groups are also positive, with one exception. These facts indicate that the perseveration test used in this experiment is a reliable instrument for measuring perseveration when used with subjects having average or superior intelligence.

4. When the average and superior groups together are taken as a unit, perseveration test scores correlate negatively with intelligence quotients.

5. It is impossible to derive from the findings of this experiment any conclusion regarding the correlation of perseveration test scores with intelligence quotients in the case of the group of subjects classified in this study as Group A (having intelligence quotients below the average range). The test used is less reliable for this group than for the other subjects in the experimental group. This lack of self-consistency is indicated by the average inter-correlations between the individual tests in the battery for this group, as well as by the average correlations of the sub-test scores with the total scores.

On the basis of these facts, we may conclude that perseveration correlates negatively with the
intelligence quotient when a test of perseveration which is known to be internally consistent is administered.
BIBLIOGRAPHY

1. Bernstein, E. : "Quickness And Intelligence"
   British Journal of Psychology Monograph Supplements vol. 3, no. 7 1924

2. Boring, E.G., Langfeld, H.S., Weld, H.P. :
   Psychology A Factual Textbook
   Wiley and Sons New York 1935

3. Brown, W.M. : "Character Traits As Factors In Intelligence Test Performance"
   Archives of Psychology no. 65 New York 1923

4. Cattell, R.B. : General Psychology
   Sci-Art Publishers Cambridge, Mass. 1941

5.  : A Guide To Mental Testing
   University of London Press, Ltd. London 1936

6.  : "On The Measurement Of Perseveration"
   British Journal of Educational Psychology v.5 p. 76 1935

7.  : "Temperament Tests I"
   British Journal of Psychology v. 23 p. 308 1933

8.  : "Temperament Tests II"
   British Journal of Psychology v. 24 p. 20 1933

9.  : "An Objective Test Of Character-Temperament"
   Journal of Social Psychology v. 19 p. 99 1944
10. Earle, F.F.: "Vocational Testing In Relation To Professor Spearman's Theories"
   Journal of the National Institute of Industrial Psychology v. 3 p. 416 1927

11. Foster, W.S.: "On The Perseverative Tendency"
   American Journal of Psychology v. 25 p. 393 1914

12. Gray, J.: "Perseveration As A Test Of The Quality Of Intelligence"

   Journal of Social Psychology 2 p. 28 1931

   Journal of Mental Science v. 74 p. 653 1928

15. Jung, C.J.: Psychological Types
   Harcourt Brace New York 1923

16. Lankes, W.: "Perseveration"
   British Journal of Psychology v. 7 p. 387 1915

17. Lentz, T.F.: An Experimental Method For The Discovery And Development Of Tests Of Character
   Teachers College Contributions To Education No. 180 Teachers College, Columbia U. New York 1925

18. Pinard, J.W.: "Tests Of Perseveration I. Their Relation To Character"
   British Journal of Psychology v. 23 p. 5 1932
British Journal of Psychology v. 23 p. 114 1932

20. Rangachar, C.: "Differences In Perseveration Among Jewish And English Boys"
British Journal of Educational Psychology v. 2 1932

Harcourt Brace New York 1927

Wiley and Sons New York 1938

23. Sadler, W.S.: Theory And Practice Of Psychiatry
C.V. Mosby Co. St. Louis 1936

Macmillan Co. London 1914

Macmillan Co. New York 1927

26. ________: The Nature Of Intelligence And The Principles Of Cognition
Macmillan Co. London 1927

27. Stephenson, W.: "Studies In Experimental Psychiatry I. A Case Of General Inertia"
Journal of Mental Science v. 77 p. 723 1931

28. ________: "Studies In Experimental Psychiatry II. Some Contact Of p-Factor With Psychiatry"
Journal of Mental Science v. 78 p. 315 1932

29. ________: "Studies In Experimental Psychiatry III. p-Score And Inhibition For High p-Praecox Cases"
29. Journal of Mental Science v. 78 p. 908 1932


British Journal of Educational Psychology v. 4 p. 2 1934

31. Webb, E.: "Character And Intelligence"

British Journal of Psychology Monograph Supplements 3 1915

32. Wiersma, E.: "Psychology Of Dementia"

Journal of Mental Science v. 76 p. 1 1930

33. Wolf, T.H.: "The Effect Of Praise And Competition On The Persisting Behavior Of Kindergarten Children"

American Journal of Psychology v. 53 p. 166 1940

34. Woodworth, R.S.: Experimental Psychology

Henry Holt and Co. New York 1938
TABLE I

DISTRIBUTION OF SUBJECTS

<table>
<thead>
<tr>
<th>Subject No.</th>
<th>Sex</th>
<th>School Grade</th>
<th>Chronological Age</th>
<th>Mental Age</th>
<th>Intelligence Quotient</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>yr.</td>
<td>mo.</td>
<td>yr.</td>
</tr>
<tr>
<td>1.</td>
<td>M</td>
<td>UD</td>
<td>12</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>2.</td>
<td>M</td>
<td>UD</td>
<td>14</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>3.</td>
<td>M</td>
<td>UD</td>
<td>13</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>4.</td>
<td>F</td>
<td>UD</td>
<td>11</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>5.</td>
<td>F</td>
<td>UD</td>
<td>10</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>6.</td>
<td>M</td>
<td>UD</td>
<td>12</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>7.</td>
<td>F</td>
<td>UD</td>
<td>13</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>8.</td>
<td>F</td>
<td>UD</td>
<td>13</td>
<td>11</td>
<td>9</td>
</tr>
<tr>
<td>9.</td>
<td>M</td>
<td>UD</td>
<td>8</td>
<td>11</td>
<td>6</td>
</tr>
<tr>
<td>10.</td>
<td>F</td>
<td>UD</td>
<td>11</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>11.</td>
<td>M</td>
<td>UD</td>
<td>9</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>12.</td>
<td>F</td>
<td>UD</td>
<td>9</td>
<td>10</td>
<td>7</td>
</tr>
<tr>
<td>13.</td>
<td>M</td>
<td>UD</td>
<td>10</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>14.</td>
<td>F</td>
<td>UD</td>
<td>8</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>15.</td>
<td>F</td>
<td>UD</td>
<td>9</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>16.</td>
<td>F</td>
<td>4A</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>17.</td>
<td>M</td>
<td>8B</td>
<td>13</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>18.</td>
<td>F</td>
<td>3A</td>
<td>8</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>19.</td>
<td>M</td>
<td>7B</td>
<td>12</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>20.</td>
<td>F</td>
<td>6B</td>
<td>11</td>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td>Subject No.</td>
<td>Sex</td>
<td>School Grade</td>
<td>Chronological Age</td>
<td>Mental Age</td>
<td>Intelligence Quotient</td>
</tr>
<tr>
<td>------------</td>
<td>-----</td>
<td>--------------</td>
<td>-------------------</td>
<td>------------</td>
<td>----------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>yr. mo.</td>
<td>yr. mo.</td>
<td></td>
</tr>
<tr>
<td>21.</td>
<td>M</td>
<td>7A</td>
<td>13 5</td>
<td>13 3</td>
<td>99</td>
</tr>
<tr>
<td>22.</td>
<td>F</td>
<td>4B</td>
<td>9 2</td>
<td>9 2</td>
<td>100</td>
</tr>
<tr>
<td>23.</td>
<td>M</td>
<td>5A</td>
<td>10 11</td>
<td>11 0</td>
<td>101</td>
</tr>
<tr>
<td>24.</td>
<td>M</td>
<td>7B</td>
<td>12 4</td>
<td>12 7</td>
<td>102</td>
</tr>
<tr>
<td>25.</td>
<td>M</td>
<td>4B</td>
<td>8 11</td>
<td>9 1</td>
<td>102</td>
</tr>
<tr>
<td>26.</td>
<td>M</td>
<td>8A</td>
<td>14 6</td>
<td>15 1</td>
<td>104</td>
</tr>
<tr>
<td>27.</td>
<td>M</td>
<td>4A</td>
<td>9 5</td>
<td>9 11</td>
<td>105</td>
</tr>
<tr>
<td>28.</td>
<td>F</td>
<td>6B</td>
<td>11 2</td>
<td>11 10</td>
<td>106</td>
</tr>
<tr>
<td>29.</td>
<td>F</td>
<td>7A</td>
<td>14 0</td>
<td>14 11</td>
<td>107</td>
</tr>
<tr>
<td>30.</td>
<td>F</td>
<td>5A</td>
<td>10 5</td>
<td>11 4</td>
<td>109</td>
</tr>
<tr>
<td>31.</td>
<td>M</td>
<td>8A</td>
<td>14 5</td>
<td>15 5</td>
<td>111</td>
</tr>
<tr>
<td>32.</td>
<td>F</td>
<td>3A</td>
<td>8 6</td>
<td>9 6</td>
<td>112</td>
</tr>
<tr>
<td>33.</td>
<td>F</td>
<td>5B</td>
<td>9 10</td>
<td>11 0</td>
<td>112</td>
</tr>
<tr>
<td>34.</td>
<td>M</td>
<td>7B</td>
<td>12 3</td>
<td>14 1</td>
<td>115</td>
</tr>
<tr>
<td>35.</td>
<td>F</td>
<td>4B</td>
<td>9 3</td>
<td>10 9</td>
<td>116</td>
</tr>
<tr>
<td>36.</td>
<td>M</td>
<td>8B</td>
<td>13 5</td>
<td>15 4</td>
<td>116</td>
</tr>
<tr>
<td>37.</td>
<td>F</td>
<td>8A</td>
<td>13 10</td>
<td>15 10</td>
<td>117</td>
</tr>
<tr>
<td>38.</td>
<td>F</td>
<td>6B</td>
<td>11 4</td>
<td>13 4</td>
<td>118</td>
</tr>
<tr>
<td>39.</td>
<td>F</td>
<td>7A</td>
<td>13 2</td>
<td>15 7</td>
<td>119</td>
</tr>
<tr>
<td>40.</td>
<td>M</td>
<td>7A</td>
<td>12 7</td>
<td>15 3</td>
<td>121</td>
</tr>
<tr>
<td>Subject No.</td>
<td>Sex</td>
<td>School Grade</td>
<td>Chronological Age</td>
<td>Mental Age</td>
<td>Intelligence Quotient</td>
</tr>
<tr>
<td>------------</td>
<td>-----</td>
<td>--------------</td>
<td>-------------------</td>
<td>------------</td>
<td>----------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>yr.   mo.</td>
<td>yr.   mo.</td>
<td></td>
</tr>
<tr>
<td>41.</td>
<td>M</td>
<td>6B</td>
<td>10    10</td>
<td>13    2</td>
<td>122</td>
</tr>
<tr>
<td>42.</td>
<td>F</td>
<td>6A</td>
<td>11    4</td>
<td>13    10</td>
<td>122</td>
</tr>
<tr>
<td>43.</td>
<td>M</td>
<td>8A</td>
<td>13    8</td>
<td>16    7</td>
<td>124</td>
</tr>
<tr>
<td>44.</td>
<td>M</td>
<td>4B</td>
<td>9     4</td>
<td>11    7</td>
<td>124</td>
</tr>
<tr>
<td>45.</td>
<td>F</td>
<td>5B</td>
<td>10    4</td>
<td>13    0</td>
<td>126</td>
</tr>
<tr>
<td>46.</td>
<td>M</td>
<td>4B</td>
<td>9     0</td>
<td>12    7</td>
<td>140</td>
</tr>
</tbody>
</table>

Ages (Chronological and Mental) corrected as of March 1, 1945

UD - Ungraded Division
TABLE II
CLASSIFICATION OF SUBJECTS INTO SUB-GROUPS

<table>
<thead>
<tr>
<th>GROUP A</th>
<th>GROUP B</th>
<th>GROUP C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below Average Intelligence</td>
<td>Average Intelligence</td>
<td>Above Average Intelligence</td>
</tr>
<tr>
<td>1.</td>
<td>M</td>
<td>12-3</td>
</tr>
<tr>
<td>5.</td>
<td>F</td>
<td>10-5</td>
</tr>
<tr>
<td>10.</td>
<td>F</td>
<td>11-4</td>
</tr>
<tr>
<td>12.</td>
<td>F</td>
<td>9-10</td>
</tr>
<tr>
<td>14.</td>
<td>F</td>
<td>8-7</td>
</tr>
<tr>
<td>15.</td>
<td>F</td>
<td>9-2</td>
</tr>
<tr>
<td>17.</td>
<td>M</td>
<td>13-6</td>
</tr>
<tr>
<td>Subject No.</td>
<td>abc</td>
<td>A</td>
</tr>
<tr>
<td>------------</td>
<td>-------</td>
<td>-----</td>
</tr>
<tr>
<td>1.</td>
<td>1.2304</td>
<td>1.4733</td>
</tr>
<tr>
<td>2.</td>
<td>1.5958</td>
<td>1.4269</td>
</tr>
<tr>
<td>3.</td>
<td>1.7962</td>
<td>1.6834</td>
</tr>
<tr>
<td>4.</td>
<td>1.6427</td>
<td>1.1434</td>
</tr>
<tr>
<td>5.</td>
<td>1.0000</td>
<td>1.5000</td>
</tr>
<tr>
<td>6.</td>
<td>1.5000</td>
<td>1.2639</td>
</tr>
<tr>
<td>7.</td>
<td>1.2222</td>
<td>1.0500</td>
</tr>
<tr>
<td>8.</td>
<td>1.6346</td>
<td>1.3572</td>
</tr>
<tr>
<td>9.</td>
<td>1.8267</td>
<td>1.3652</td>
</tr>
<tr>
<td>10.</td>
<td>1.1538</td>
<td>1.0000</td>
</tr>
<tr>
<td>11.</td>
<td>1.6233</td>
<td>1.3691</td>
</tr>
<tr>
<td>12.</td>
<td>1.7130</td>
<td>1.5257</td>
</tr>
<tr>
<td>13.</td>
<td>1.8750</td>
<td>1.8667</td>
</tr>
<tr>
<td>14.</td>
<td>1.4792</td>
<td>1.7925</td>
</tr>
<tr>
<td>15.</td>
<td>1.1136</td>
<td>1.1667</td>
</tr>
</tbody>
</table>
TABLE IV

SCORES ON THE PERSEVERATION TEST

GROUP B

<table>
<thead>
<tr>
<th>Subject No.</th>
<th>abc</th>
<th>(\Delta)</th>
<th>w</th>
<th>colors</th>
<th>Total Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>16.</td>
<td>1.4723</td>
<td>1.5000</td>
<td>1.4333</td>
<td>1.7647</td>
<td>6.1703</td>
</tr>
<tr>
<td>17.</td>
<td>1.5455</td>
<td>1.3333</td>
<td>1.4333</td>
<td>1.3767</td>
<td>5.6888</td>
</tr>
<tr>
<td>18.</td>
<td>1.3849</td>
<td>1.3750</td>
<td>1.4225</td>
<td>1.4873</td>
<td>5.6697</td>
</tr>
<tr>
<td>19.</td>
<td>1.3143</td>
<td>.9889</td>
<td>1.4167</td>
<td>1.4639</td>
<td>5.1838</td>
</tr>
<tr>
<td>20.</td>
<td>1.2767</td>
<td>1.1967</td>
<td>1.3223</td>
<td>1.2433</td>
<td>5.0390</td>
</tr>
<tr>
<td>21.</td>
<td>1.6667</td>
<td>1.5983</td>
<td>1.4839</td>
<td>1.4866</td>
<td>6.2355</td>
</tr>
<tr>
<td>22.</td>
<td>1.3064</td>
<td>1.2639</td>
<td>1.2498</td>
<td>1.3462</td>
<td>5.1663</td>
</tr>
<tr>
<td>23.</td>
<td>1.2308</td>
<td>1.2500</td>
<td>1.7368</td>
<td>1.3171</td>
<td>5.5347</td>
</tr>
<tr>
<td>24.</td>
<td>1.2983</td>
<td>1.3491</td>
<td>1.3233</td>
<td>1.3618</td>
<td>5.3315</td>
</tr>
<tr>
<td>25.</td>
<td>1.4167</td>
<td>1.5000</td>
<td>1.4333</td>
<td>1.7647</td>
<td>6.1703</td>
</tr>
<tr>
<td>26.</td>
<td>1.2157</td>
<td>1.0750</td>
<td>1.3223</td>
<td>1.3736</td>
<td>4.9866</td>
</tr>
<tr>
<td>27.</td>
<td>1.3333</td>
<td>1.2667</td>
<td>1.3578</td>
<td>1.3926</td>
<td>5.3504</td>
</tr>
<tr>
<td>28.</td>
<td>1.5455</td>
<td>1.0333</td>
<td>1.5294</td>
<td>1.5000</td>
<td>5.6082</td>
</tr>
<tr>
<td>29.</td>
<td>1.2461</td>
<td>1.3134</td>
<td>1.3787</td>
<td>1.4264</td>
<td>5.3646</td>
</tr>
<tr>
<td>30.</td>
<td>1.2143</td>
<td>1.2727</td>
<td>1.4667</td>
<td>1.4000</td>
<td>5.3537</td>
</tr>
</tbody>
</table>
### TABLE V

**SCORES ON THE PERSEVERATION TEST**

**GROUP C**

<table>
<thead>
<tr>
<th>Subject No.</th>
<th>abc</th>
<th>$\Delta$</th>
<th>w</th>
<th>colors</th>
<th>Total Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>31.</td>
<td>.9545</td>
<td>.9672</td>
<td>1.2139</td>
<td>1.4875</td>
<td>4.6231</td>
</tr>
<tr>
<td>32.</td>
<td>1.4667</td>
<td>1.3774</td>
<td>1.4923</td>
<td>1.6234</td>
<td>5.9598</td>
</tr>
<tr>
<td>33.</td>
<td>1.2967</td>
<td>1.3626</td>
<td>1.4707</td>
<td>1.3943</td>
<td>5.5243</td>
</tr>
<tr>
<td>34.</td>
<td>1.0472</td>
<td>.9769</td>
<td>1.2498</td>
<td>1.4167</td>
<td>4.6906</td>
</tr>
<tr>
<td>35.</td>
<td>1.2729</td>
<td>1.3233</td>
<td>1.2923</td>
<td>1.3467</td>
<td>5.2352</td>
</tr>
<tr>
<td>36.</td>
<td>1.2062</td>
<td>1.1164</td>
<td>1.2493</td>
<td>1.2764</td>
<td>4.8483</td>
</tr>
<tr>
<td>37.</td>
<td>1.1337</td>
<td>.9937</td>
<td>1.1167</td>
<td>1.3048</td>
<td>4.5489</td>
</tr>
<tr>
<td>38.</td>
<td>.9894</td>
<td>1.2765</td>
<td>1.4143</td>
<td>1.6125</td>
<td>5.2927</td>
</tr>
<tr>
<td>39.</td>
<td>1.2223</td>
<td>.9919</td>
<td>1.2500</td>
<td>1.2250</td>
<td>4.6892</td>
</tr>
<tr>
<td>40.</td>
<td>1.1467</td>
<td>.9993</td>
<td>1.1333</td>
<td>1.2500</td>
<td>4.5293</td>
</tr>
<tr>
<td>41.</td>
<td>1.3823</td>
<td>1.3427</td>
<td>1.2738</td>
<td>1.4556</td>
<td>5.4544</td>
</tr>
<tr>
<td>42.</td>
<td>1.1334</td>
<td>1.2823</td>
<td>1.2656</td>
<td>1.5148</td>
<td>5.1961</td>
</tr>
<tr>
<td>43.</td>
<td>.9889</td>
<td>1.2286</td>
<td>1.4643</td>
<td>1.3250</td>
<td>5.0068</td>
</tr>
<tr>
<td>44.</td>
<td>1.2664</td>
<td>1.3043</td>
<td>1.3333</td>
<td>1.2936</td>
<td>5.1976</td>
</tr>
<tr>
<td>45.</td>
<td>.9750</td>
<td>.9423</td>
<td>1.5600</td>
<td>1.5384</td>
<td>5.0157</td>
</tr>
<tr>
<td>46.</td>
<td>1.4834</td>
<td>1.4333</td>
<td>1.4647</td>
<td>1.4748</td>
<td>5.8562</td>
</tr>
</tbody>
</table>
FIGURE 1
Sample Cards
Test 1

Card 1

abcabcabc

Card 2

ABCABCA

Card 3

aAbBcCcCa
FIGURE 2
Sample Cards
Test 2

Card 4

Card 5

Card 6
FIGURE 3
Sample Cards
Test 3

Card 7

Card 8
FIGURE 4
Color Chart Test 4

[Image of a color chart with dots of different colors arranged in a grid]

Top
APPROVAL SHEET

The thesis submitted by Miss Jeanne Collins 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.

June 12, 1946
Date

Signature of Adviser