A NEW PICTURE COMPLETION TEST

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In organizing the series of tests which bears their names, Binet and Simon recognized as a fundamental principle that the degree of a person's intelligence is exhibited in the extent of his ability to find solutions for the various situations with which he is confronted. The nearer the situations devised for testing purposes come to those of real life, the more accurate will the results of the measurement be.

The following quotations will show the opinions of Binet and Simon, in their own words:

"... These intellectual acts consist in understanding, judging, explaining, defining, developing, inventing, imagining, deducing, demonstrating and in accomplishing a host of other operations which have for their object directly or indirectly the solving of problems." (p. 97)

"... Every thought is like a key which must fit exactly in the hole of some lock." (p. 141)

"When it is a question of new action, the adaptation does not take place immediately at the first attempt but by gropings, that is to say by successive trials; one is like a locksmith called to open a locked door; he searches in his bunch of keys and tries many but he does not try them all indiscriminately, for he sees at a glance those that will not fit; his attempts are not blind, they are directed, selected, according to a complex mechanism." (p. 142)

It is possible, by means of construction and performance tests, to duplicate many of the situations which are the basis of the verbal methods of testing employed in the Binet-Simon, Truax, and other similar series of tests. These tests not only lessen the emphasis placed on linguistic abilities (which is a recognized fault of the Binet-Simon method), but they are a necessity in the testing of the deaf, dumb, the foreign-born, and the children whose grasp of the English language is limited by the influence of their environment.

1 From the Laboratory of Educational Psychology, Harvard University. Communicated by W. F. Dearborn.

2 Binet and Simon, "The Intelligence of the Feebleminded" (translated by Elizabeth S. Kite), Publications of the Training School at Vineland, New Jersey, Department of Research, Number 12, June, 1916.
Further, it is often possible to make the situations in construction and performance tests approach more nearly to the actual situations which the child encounters in his daily life, thus greatly increasing the interest of the child in the test. In certain schools where the Binet test has made but an indifferent appeal to pupils and teachers, the performance tests have been received with open arms, and in some cases it has been necessary to choose the subjects by lot, so great is the desire on the part of the pupils to try the tests.

Many of the ninety tests included in the present Stanford Revision of the Binet-Simon Series find their counterparts in performance tests. Notable among these are the tests involving the pictures, the tests involving memory for shape and form, and the tests calling for discrimination of color and form. The "comprehension" tests are answered by the action instead of by mere words. The "similarities" and "differences" appear in the performance tests in several ways, each calling for a "motor" answer. The "absurdities" find their prototypes in the ridiculous "insets" in the Picture Completion Tests, and in the latter the question is always apparent to the child, and his answer is either correct or incorrect. There is no chance for a misunderstanding due to the incoherent utterance of the examiner or the lack of ability to read on the part of the pupil.

The "problems of fact" are much more naturally given with the "Picture Completion" Test, as in the latter real problems which touch every child's life are presented, and the pupil is working with familiar material.

"Mutilated pictures" and "aesthetic comparison" tests, "familiar objects" and "definitions" may find definite vehicles for expression in performance tests.

The abilities measured by the "sentences" in the Binet and the supplying of the missing words in the Trabue Scale are easily and accurately measured by the performance tests. "The three R's" have no influence on the result, the scoring is on an objective basis, and the child will almost invariably give his best answer, as he can readily understand the problem and he is cognizant of the fact that his answer depends on the quality of his action alone.

In the last analysis, the chief office of all mental testing is to furnish a means by which the examiner may get "under the skin," through the "veneer of civilization," of the child, and in the performance test we find an easy mode of approach. The child loses his embarrassment in the presence of a strange examiner; he sees the goal, with no linguistic obstacle inter-
vening, and as piece by piece he builds his result, he gains confidence.

While certain children fail to receive the credit which they deserve because they "must learn by doing," on the other hand certain individuals find it possible to reach the Freshman class in college on the strength of their skill in handling words, although they are unable to meet and solve successfully common situations in their daily lives. In one case which came under my observation, a man doing fair work in his first year at college failed utterly with the Picture Completion Test described below. There are doubtless other factors which need to be taken into consideration in explaining the result, but investigation showed that while he possessed a remarkable memory, he translated little of his "knowledge about" into "knowledge of" the world in which he lived. He seldom "suited the action to the word."

Children in the first grade sometimes make splendid records in performance tests, in which some college students have been known to fail.

The results of performance tests raise anew the long-standing criticism of our system of education in that it places altogether too much emphasis on the linguistic side without sufficient recognition of the child's "motor" needs. Some individuals may think and reason without any very definite verbal concepts. They seem to be "motor-minded," and with them action comes before words. An illustration of this "motor-mindedness" is found in the case of the Canadian of French-Indian blood, one of the twelve stalwart sons of a full-blooded Indian. Although not one of the sons can "read, write or figure," they are all successful business men or farmers. The first mentioned employs thirty or forty masons on large construction jobs. His estimates are always accurate, and he clears good profits without an account book of any kind. Such a man would make a bad failure with the Binet or a similar test, but with the performance test he is likely to do well.

The performance test encourages the child to believe in himself, and it seems to cause the adult to examine his own abilities and more carefully adjust himself to his niche in this world. Properly used, the performance tests will throw a new light upon some of the "hard cases" in the schools, and it behooves every wide-awake school man to study this question, to ascertain what there is in it for him and for his school.

There are a number of respects in which the performance tests now in use may be improved in order to approximate more closely the general methodology which has established itself in the more successful of the tests which depend upon
language ability. These considerations demand attention to a number of details which sometimes seem to be, in themselves, of insignificant or minor importance, but which are necessary to the development of a successful test.

The problems involved in the construction and use of a new picture completion test, which it is the chief purpose of this article to describe, will illustrate the considerations above mentioned. In the development of this test it seemed desirable to find a picture which should have a unity such as does not characterize other tests of like nature. A large number of pictures showing complicated situations were analyzed and discussed, and finally a drug store was chosen as the basis of the picture to be used. Nearly every town or city has its drug store with which children and adults are more or less familiar. The drug stores, also, are tending to take on much the same type of appearance with the development of the chain store idea. An endeavor was made to gain a sort of conception of

![Fig. 1](image-url)
A NEW PICTURE COMPLETION TEST

what "drug store" means to the average individual. Attitudes and motions of clerk and customer were as far as possible noted, and a sketch of the picture shown in Figure 2 was made. After further study and analysis of the various situations, the final arrangement of the picture, as shown in outline in Figure 1, was made.

Much care was exercised in choosing an artist since the picture must not be found open to the criticism of poor draughtsmanship, since older children almost invariably are led to hold a test lightly which is based on a picture poorly drawn, and it has been noticed that adults have been particularly interested in this picture because of the good workmanship involved. The insets were made circular in shape and of a standard diameter, in order to obviate the misconception involved when children try simply to fit in the blocks instead of completing the situations.

For each of the ten situations selected, every one of which involves action and is peculiar to the drug store, a second inset was devised which should have some of the elements of the correct situation but which should not fit as well as did the Number 1 inset. Then ten other insets were chosen which should have no connection with the drug store. These insets were changed again and again, until every ambiguity noticed
was removed. The blocks were made a bit thicker than the depth of the holes in the backing of the picture, so that the blocks might be readily removed. Each hole was left a little higher in the center, so that the blocks might be tilted and thus removed more easily. Choosing then a tentative set of directions, the picture test was given to some eighty children between the ages of eight and twelve, and the results carefully studied. Then it was found that some of the insets were not yet adequate and that a few of the figures on the picture could be changed and thus greatly improve the clearness of the picture. In making the necessary changes, it was also thought desirable to have the new picture reproduced in color, and then to the thirty insets already used, ten blanks colored to match the foundation color of the picture, were added, making forty insets in all.

Figure 2 shows the picture with the correct insets in place, numbering the insets from one to ten beginning at the lower right hand corner. The first inset contains a cone of ice-cream; the second one, a glass, being filled with orangeade; the third, a lighted match; the fourth, ball and dolls; the fifth, part of a scale and a scoop; the sixth, a bottle, tilted, containing a liquid; the seventh, a dish of ice-cream; the eighth, a book; the ninth, a hand with a coin; the tenth, a telephone.
receiver. Figure 3 shows the picture with the second set of insets in place again beginning at the lower right hand corner. The first inset is a piece of soap; the second, a plate to receive the soda; the third, a glass of water to light the cigar with; the fourth, some pipes; the fifth, a bottle containing liquid and a part of the scale; the sixth, an upright bottle containing solid matter; the seventh, a cup of steaming chocolate; the eighth, a box of candy; the ninth, a hand with a dollar bill; the tenth, an ear trumpet. It will be noted that each one of this set fits the situation less perfectly than does the corresponding piece in the first set. Figure 4 shows the ten blank insets, and also the ten insets which contain no suggestion of “drug store.”

With these developments, it is believed that most of the difficulties in the construction of picture completion tests have been satisfactorily met, as the children no longer attempt to fit blocks, an opportunity to grade the performance in each situation has been provided, and each block can be removed from any hole without putting the fingers through the back. Fifty adults who tried the test did not seem to find it silly or
childish at first sight, and most important of all, the unity of the picture, in which each situation was a constituent part, was apparent.

In giving this Picture Completion Test, the directions to the examiner were as follows: Place the board before the subject, taking your position at the opposite side of the table. Open the box containing the blocks, and place it at the subject's right hand. Then begin at once to give the following instructions: "This picture is not complete, as you see. You will find the missing parts there (pointing to the open box). Of course you can't use all the blocks in the box, but you may be sure that the proper block for each space is in the box. You may use one or both hands, and you may change the blocks around as much as you wish. Work as quickly as you can, and tell me when you have finished it. Do you understand?" Then start the stop watch. Note the manner in which the subject attacks the problem and record the number of each block used in the spaces provided on the record sheet (the holes being numbered from one to ten beginning at the bottom and at the right of the picture, the blocks taking the numbers of the holes in which they fit the situation for the first set of ten, the next set of ten taking the numbers of the holes with an "A" added, as "3 A," the blocks which have no drawing on them being recorded as "W," and the rest of the blocks taking the name of the objects drawn on them). When the individual indicates that he has finished, stop the watch and record the time elapsed. Filling all the holes does not, of course, constitute the completion of the task. It is finished when the individual can see no more changes that he cares to make and says that it is done. Then ask, unless he has mentioned the name of the picture during the performance, "What is this a picture of?" Record the answer. Then ask "Why do you say that?" Record the answer. Then say "What season of the year is it?" and "why?" If the subject hesitates, check the word "afterwards" on the record sheet. If he has mentioned the name before, check the word which will indicate that fact. Score by allowing ten for each hole correctly filled; five for each hole filled with the second choice (i.e., 3A merits 5); three for any one of the first or second choices misplaced (for instance, 2 or 2A in number 5 hole); score zero for a hole left vacant, minus two for a blank block in any hole; and minus three for any of the set of ten blocks which have no connection with the "drug store."

Record the results on blank similar to the following form:
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Whole idea, at first, mid-way, at end, afterwards.
What is it a picture of? Why?
What is the season? Why?

The Picture Completion Test, following the method indicated, has been given to about ninety children between the ages of eight and twelve years inclusive. The results to date of the standardization of the test are given in Table 1.

<table>
<thead>
<tr>
<th>Age</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>Adult</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median Score</td>
<td>32</td>
<td>64</td>
<td>64</td>
<td>75</td>
<td>75</td>
<td>80</td>
<td>85</td>
<td>75</td>
</tr>
<tr>
<td>Median Time</td>
<td>6-10</td>
<td>8-14</td>
<td>10-35</td>
<td>6-05</td>
<td>5-20</td>
<td>4-54</td>
<td>4-00</td>
<td>4-33</td>
</tr>
<tr>
<td>P.E.</td>
<td>(1-10)</td>
<td>(2-14)</td>
<td>(3-15)</td>
<td>(2-15)</td>
<td>(2-05)</td>
<td>(1-10)</td>
<td>(1-00)</td>
<td>(1-05)</td>
</tr>
</tbody>
</table>

Table 1 shows the median scores and median times in minutes and seconds for the performances of children of the various ages. It is to be noted that the adult score (fifty cases) does not indicate a better performance than that of the older children.

In Figure 5 the relationship existing between the score and the time, between the years eight and twelve, where we have a reasonable number of cases, is clearly shown. The score increases as the time decreases. The score line as a whole shows a decided improvement with age, and without doubt the younger side of the time line will show up as well when we have obtained a larger number of cases. We may expect a normal child of ten years to make a score of seventy-five in five minutes or less time.

The range of performance is made large by some exceptional cases, but the "norm" is probably sufficiently indicated by the number of cases thus far tabulated. Some of the exceptional cases may be mentioned.

The college Freshman above mentioned seemed unable to
see any unity to the picture, and in the majority of the depressions he placed insets chosen at random. He seemed unable to associate the different elements of the situation and secured a very low score (twenty-two) in a very long time (fifteen minutes). This disconcerting result led to other inquiries in regard to the student which are not pertinent to this discussion.

On the other hand, certain very young children made excellent scores in comparatively short times. The comments of one little girl may be added: "Now what do you s'pose the baby wants?" Again, "Now if I put that chocolate in there, it will be winter, but this ice cream will make it summer, and that's what I want it to be." "He wouldn't light his cigar with a glass of water." "He wouldn't be turning orangeade into a plate. Oh, I see, there's the glass." "I guess she'd rather eat a cone than eat soap." Monologues more or less like the above were heard on many occasions.

Even with some of the children who were considered by their teachers to be dull and unintelligent, we discovered a decided tendency to analyze the various situations first and
then deliberately set about to find the block which best answered the conditions. They were interested and eager to try the test, and the teachers seemed to be willing to give considerable credence to the findings obtained. The test is proposed as one of a series of performance tests to supplement tests now in common use; the partial standards already obtained seem to indicate that it may at least be depended upon to furnish valuable supplementary evidence.