CONSTRUCTION OF AN INTELLIGENCE TEST FOR THE BLIND

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(Ohwaki-Kohs Tactile-Block Intelligence Test)

by

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I

Introduction

An attempt to construct an intelligence test for the blind.

For the education and vocational guidance of the blind, it is, no doubt, necessary to measure their intelligence accurately. Untill now, several intelligence tests have been used for the blind[1]. As individual test, such as Binet Test has been used, in which questions depend upon visual task are excluded. Examples are; Irwin (1910), Haines (1916)[2] and Hayes (1910)[3], or verbal section of Wechsler-Bervue Intelligance Test or verbal section of WISC intelligence test[4]. Group tests are; Pressy's general Ability Test (1921)[5], Kuhlmann-Anderson Test (1938), Pintner Intelligence Test (1944), Intelligence test in Braille by Niigata Prefectual School for the Blind[6]. However, since those tests translated in Braille are dependent upon the learning level of Braille letters, to these test score influence not only intelligence factor but learning factor. Accordingly these Braille tests are not reliable enough as an intelligence test. For the blind especially, it is desirable to use non-verbal test or performance test rather than verbal test. On the other hand, such test as the verbal part of the WISC intelligence test, which is given orally, is incomplete as an intelligence test. Because as it is only one part of the whole test it may result biased data to use the verbal part of the test only.

We have no reliable intelligence test for the full blind today, at least in Japan. Accordingly we intended to make out a reliable, non-verbal test for the blind. After several trials, we have found that the block-design test of S.C.Kohs[ ] is an excellent performance test. This test uses analysis and configuration of the color sensations in the designs as well as in the blocks. We have come to the idea that if we can transpose color into tactual surface, it would be able to use for the blind. However, such surfaces must be as easily and clearly discriminable by the blind, as colors, such as red, blue, green, yellow or white are discriminated by the normal sighted. As such easily discriminable tactile surfaces we have used, at first, sand papers with

different grades of roughness, suggested by the work of Ohi, Koyanagi and Maehigashi[8]. Then we have made blocks and designs with these sand paper surfaces, in which different grades of its roughness corresponded to the different colors of Kohs Blocks Design Test. This tactual surface test was given to several blind school children. We found the adequacy of the test in some measure, but found that the subjects were not so comfortable to rub around the sand paper with their delicate finger tips. It was about the end of 1955. Then we have searched other surface than sand paper which was not liked by the blind to rub around. We have tested many kinds of cloth which are easily and clearly discriminable each other in tactual sensation. At last we selected the following four sorts of cloth as surface and pasted them on the block as well as on the design, corresponding to the four colors of Kohs Block Design Test.

(1) Cotton flannel. It is soft warm, and white.
(2) Flax of hard fibre, rugged rough texture with yellowish brown color, originally used as interfacing for tailored suits.
(3) Very thin fine silk texture with smooth surface of red color.
(4) Cotton texture with many projections uneven, and easily recognizable with two kinds of stripes of redish brown and dark brown.

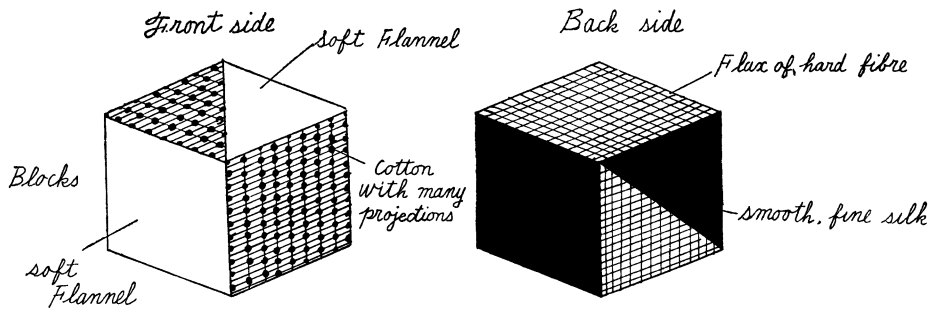
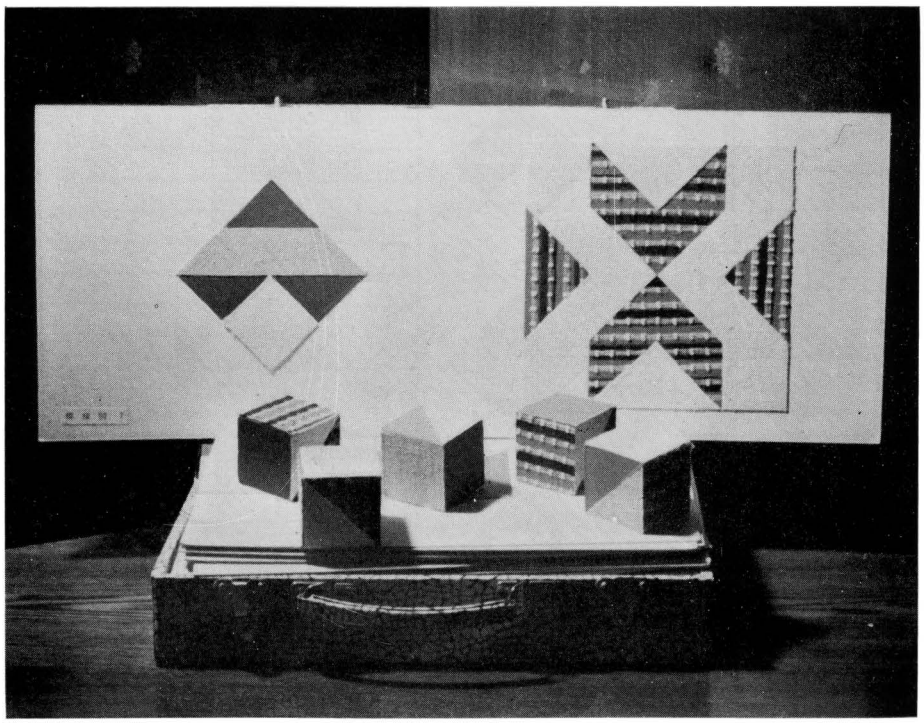
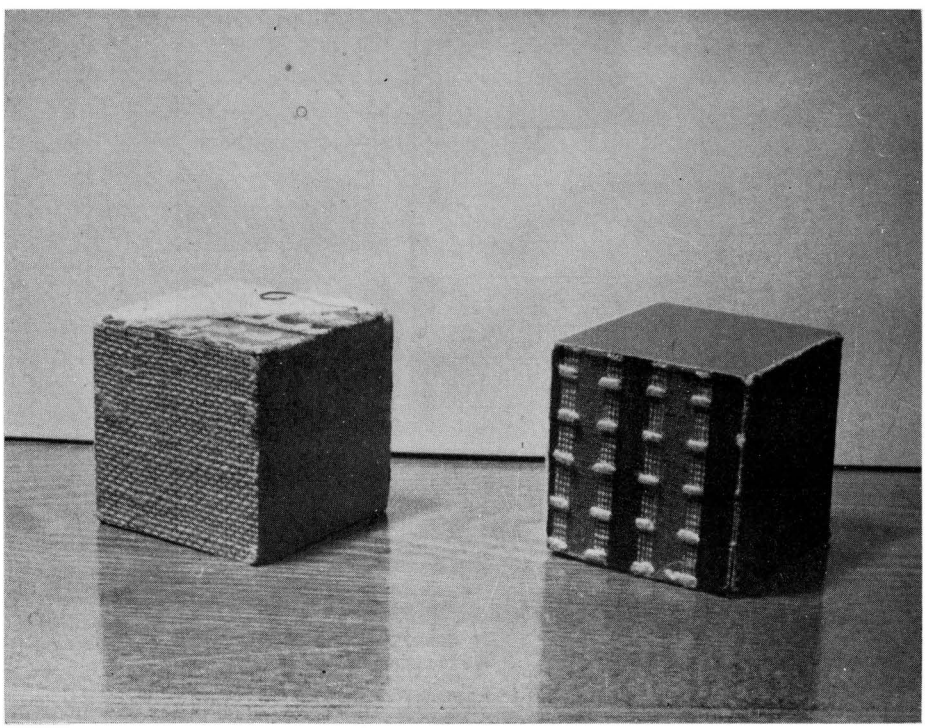


Fig. 1.

The difference in color of the cloth is convenient for the experimenter to handle the blocks.

We have found that the blind subjects are very much interested in these blocks with different tactual surfaces of cloth. As soon as they get the block in their hands, almost all of them rub around it again and again. We have found the necessity to enlarge the size of blocks as well as the designs of Kohs Test, because the blocks and designs in Kohs test are too small for tactual search and discrimination by finger tips. Therefore, we have made blocks of each side 4 cm instead of one inch in kohs'. The designs were also enlarged corresponding to the block size.





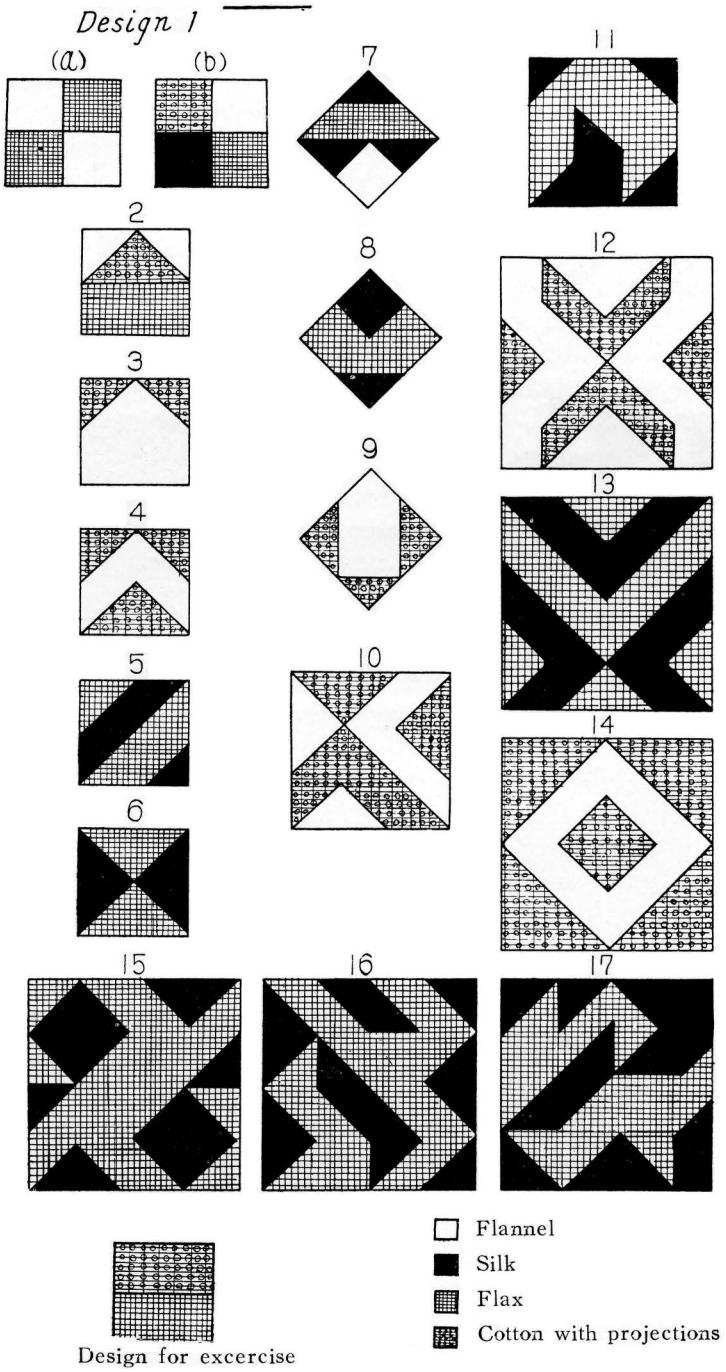

Design 1
(a)
(b)
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
Flannel
Silk
Flax
Cotton with projections
Design for excercise

Fig. 2.

In Kohs test, the size of designs is reduced to 1/3 scale of blocks. On the contrary, we constructed designs exactly equal to block size. This is also due to the difficulty to discriminate very small surfaces each other by tactual sensation. This is the third point of differences between Kohs' and our tests.

Designs are made of four sorts of clothes, as described above corrsponding to colors in Kohs' design. The size of designs is different according to the number of blocks used. The size of designs, from No.1 to No.9, is 8 cm × 8 cm square, blocks are used in these designs. The designs of Number 10 and 11 are 12 cm × 12 cm square, as nine blocks are used in these subtests. Theas four designs of Number 12 to 17 are 16 cm × 16 cm square, as sixteen blocks are used in them.

Every design is mounted on a piece of card board, 27 cm × 19.7 cm in size. Besides, there is one design for practice to comprehend the instruction and the task.

The order of 17 subtests is of the difficulty of the task. The test No. one is the easiest and No. 17 is the most difficult.

The test is scored based on the number of succeeded test. But each test must be done within a time limit. If this time limit is over, the subject is regarded as unable to solve the task. For each subtest we have set up a particular time limit.

Table 1.

Subtest	Number of blocks required	Time limits (minutes)
Excercise	4	
Test 1 (a)	4	4.00
Test 1 (b)	4	4.00
〃 2	4	5.00
〃 3	4	5.00
〃 4	4	7.00
〃 5	4	7.00
〃 6	4	6.00
〃 7	4	6.00
〃 8	4	6.00
〃 9	4	6.00
〃 10	9	10.30
〃 11	9	10.30
〃 12	16	13.00
〃 13	16	12.00
〃 14	16	10.00
〃 15	16	12.00
〃 16	16	12.00
〃 17	16	11.00

From June 1956, to April, 1958, we have tested 217 total blind subjects. Then counted the mean and SD of the time spent for each subtest and added 2σ to the mean. This duration we have adopted as the time limit. Thus 95 % of the subjects succeeded to solve the subtests with the time limit. Subjects who were unable to solve the task in this time limit, may be regarded as unable to solve the problem. Consequently we adopted this duration as the time limit of each subtest.

II

The test procedure

(a) Procedure for excercise.

(1) When the blind subject sits down at the table, the experimenter presents one of the blocks to him and lets him rub around the six surfaces of the block fully and freely with the fingers of his both hands. Through this manipulation, the experimenter let the blind to comprehend sufficiently that the six surfaces of the block are different each other and to familiarize with the tactual sensation of each surfaces. If the subject does not actively touch and turn over the block, the experimenter takes the subject's hand and lets him touch around all of six surfaces.

After the blind subject rubed enough around the block, the subject is asked by the *E*, "Are you sure that the six surfaces of the block is all different each other?" If the subject answers "I have understood them sufficiently", then the experimenter proceeds to the next explanation. If the blind subject is not so severly feebleminded as idiot, he should be able to discriminate the surfaces. Then the experimenter gives the other three blocks one by one and explains to him that these blocks are all the same.

Then the experimenter presents the design for exercise to the subject. The four blocks are put to the right of him.

(2) Next the experimenter takes the back of subject's hands and lets his finger touch and rub the design on the board, and gives him instruction as follows ; "This is the model. It is made of the same sorts of cloth as those on the surfaces of the block. Toutch and rub thoroughly."

In such manner, the experimenter lets the subject comprehend that the design on the board is composed of the same sorts of cloth as those of the surface of the block.

(3) Then the experimenter gives the following instruction, "Now, with four blocks would you try to arrange the blocks in such a way that they make the same design as the model on the board.

The experimenter takes himself the back of subject's hand and lets the subject rub over the four blocks' surface and model's surface on board one by one. The experimenter let the subject arrange the four blocks to construct the design exactly the same as the model. Or, the experimenter makes himself the arrangement of four blocks' surfaces. And let the subject rub over it and then over the model on board one by one. In such manner, he makes the subject comprehend the task thoroughly. If the subject talks that he has comprehended the task well enough, the experimenter dissolves the arrangement

of four blocks and turn the blocks around randomly so as to come out the other surfaces. Then he lets subject combine the blocks surfaces again so that the constructed surface composes the design just the same as the model'. If he has succeeded in making the design with the blocks' surfaces, we can regard that the subject has comprehended the task thoroughly. Then we can proceed to the Test I.

If the subject does not suceed, we let him try once more. If he does not succeed yet, then, we regard him that he is untestable by this test and omit him.※

The task is easily comprehended through only one excercise, if the subject is in upper grades of primary school. But when the subject is younger in the first or second grades of primary school, the excercise must be repeated and be instructed especially thoroughly and carefully.

(b) Test Procedure

The procedure for each test (subtest) is almost the same as that for the exercise. With the stopwatch, the experimenter keeps time from the first toutch to the block untill the completion of the design arrangement. If the subject himself is unaware of his error in arranging the blocks and yet he reports that he has succeeded, the experimenter tells him, "Here it seems seems to be somewhat not good", while he takes subject's hand on his back and lets the subject rub over combined blocks and model design on the desk over again and compare them.

Nothing else is suggested by the experimenter.

If the subject manipulated the blocks beyond the time limit, the experimenter took design and blocks away from the subject.

Before the experimenter proceeds to the next test, he dissolves the arrangement and turns each block over.

If the subject does not succeed two tests one after another, the experimenter regards that the subject is unable to solve the following tests and ends up the test on him. However, if the subject succeeds, for example, in Test 5, but he has not succeeded in Test 6, then the experimenter lets him try the Test 7.

III

Scoring Method

The score is counted according to the Table 2. For example, in the Test I, if the subject has succeeded in the arrangement in 1'33", we give him 3 points,

※ To test such subjects who are untestable either by our Block Design test, so that we are now making a block design test which is useful for feebleminded subjects.

but if he spent more than 1′ 34″ but within the time limit, i. e. 4′00″, then we give him 2 points. If he does not succeed within the time limit, we do not give him point.

In the Test 2, if he has succeeded in 1′ 49 , we give him 5 points, if he succeeded after 1′50″ but within the time limits, we give him 4 points, if he does not succeed within the time limit, we give him no point.

In the same way we count the point for each subtest. And at last, summarizing the point of each test, we obtain the total score for him.

Table 2.

Test	Time limit	Score	Time limit	Score	Time limit	Score
	m. s.		m. s. m. s.		m. s. m. s.	
1 (a) } 1 (b) }	1 33	3	1 34~4 00	2	——	
2	1 49	5	1 50~5 00	4	——	
3	1 57	6	1 58~3 29	5	3 30~ 5 00	4
4	2 33	6	2 34~4 30	5	4 31~ 7 00	4
5	3 16	7	3 17~5 09	6	5 10~ 7 00	5
6	2 15	7	2 16~4 03	6	4 04~ 6 00	5
7	2 01	7	2 02~3 53	6	3 54~ 6 00	5
8	2 11	8	2 12~3 39	7	3 40~ 6 00	6
9	1 40	9	1 41~2 34	8	2 35~ 5 00	7
10	5 20	9	5 21~7 50	8	7 51~10 30	7
11	4 42	8	4 43~7 05	7	7 06~10 30	6
12	6 52	9	6 53~9 46	8	9 46~13 00	7
13	6 32	9	6 33~9 07	8	9 08~12 00	7
14	5 11	9	5 12~7 35	8	7 37~10 00	7
15	6 19	9	6 20~8 33	8	8 34~12 00	7
16	6 25	10	6 26~9 01	9	9 02~12 00	8
17	7 18	10	7 19~8 44	9	8 45~11 00	8

IV

Subject

Subjects are 345 blinds in total, who are totally blind pupils of the following eight blind schools.

	N.	
Miyagi Prefectural School for the Blind in Sendai	45	June to Aug., 1956.
Aomori Prefectural Hachinohe School for the Blind in Hachinohe	8	Aug. to Sept., 1956.

Iwate Prefectural School for the Blind in Morioka	52	Oct., 1956.
Tokyo Bunkyō School for the Blind	69	Apr., 1958.
Yamagata Prefuctural School for the Blind	43	Apr., 1958.
Ōsaka Prefectural School for the Blind	52	May, 1958.
Kyōto Prefectural School for the Blind	38	May, 1958.
Fukushima Prefectural School for the Blind	38	June, 1958.
Total.....	345	

The number of subjects according to the age from eight to twenty years old is as follows:

Age	8	9	10	11	12	13	14	15	16	17	18	19	20	Total
Number of S.	19	9	29	14	17	16	22	28	19	21	21	18	20	253

We have excluded the subjects under seven and over twenty one years old, because there were only few subjects belonging to such ages. The subjects of Fukushima are not included in this table.

V

Result of the Test

Table 3

(n=216)

Subtest	N of Ss succeeded	percentage passed %
1 (a)	197	91
2	174	81
3	172	80
4	156	72
5	107	50
6	130	60
7	91	41
8	92	43
9	84	39
10	61	28
11	65	30
12	49	23
13	44	20
14	43	19
15	37	17
16	36	17
17	34	16

(1) Percentage of succeeded subjects in task

The number and percentage of the successed subjects are shown in Table 3.

In this table are not included the subjects in Ōsaka, Kyōto and Fukushima, because the experiment has been already finished by April, 1958 and the subjects in above three Prefectures were added afterwards.

The Table 3 is graphically presented in Fig. 3.

As is clear on the Table 3 and Fig. 3, the number and percentage of the succeeded subjects are the largest for Test 1 and smallest for Test 17. The number and percentage are almost regularly decreasing from Test 1 to Test 17. The only exceptions are in

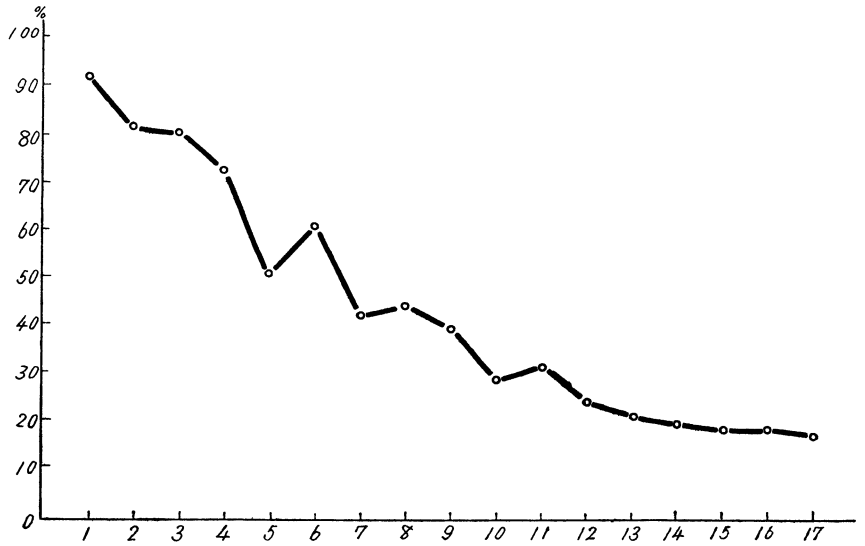


Fig . 3. Percentage of number of succeeded subiects for each subtest

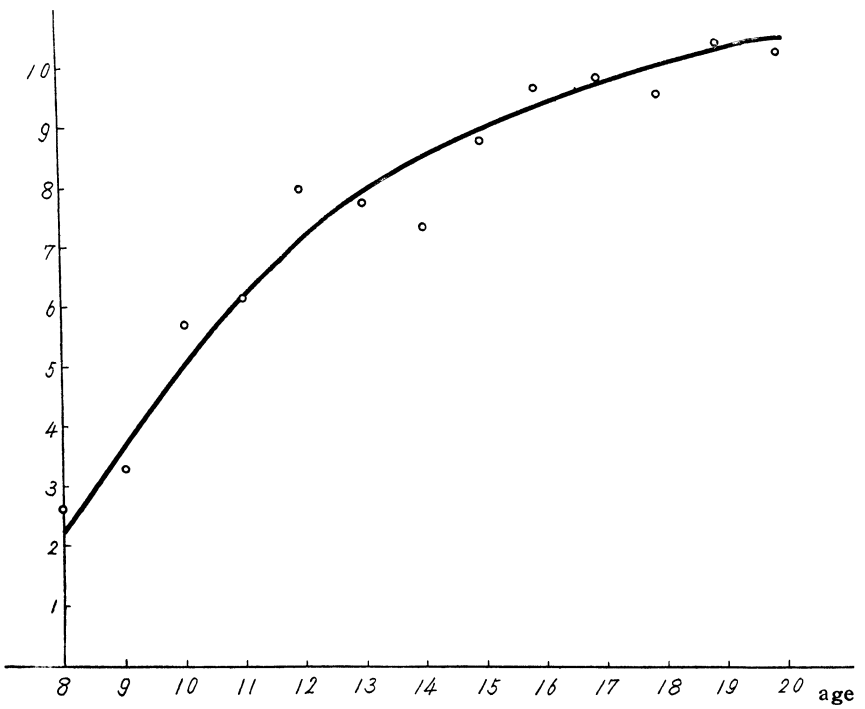


Fig. 4

three places: between Tests 5 and 6, between Tests 7 and 8, and between Tests 10 and 11. Therefore we may say that this Test of tactual sensation for the blind is in general well arranged from the easiest to the most difficult subtest. Also it is almost a good parallel with the Kohs' Block Design Test in this point.

(2) The number of subtest successed at different age. (The number of block design constructed.)

Next, let us see the difference in number of design successfully constructed in different age levels.

In Table 4 we find that the subject of age 8 has succeeded about two subtests only, but the older the subject was, the more he succeeded, and at last the subject of twenty years old has succeeded about 10 subtests in average. From this result we can also see that in this test for the blind subtests are reasonably arranged according to the difficulty of task.

(3) Test Score

As we have shown our scoring method in the section III, we have taken account not only of the number of design succeeded but also of the amount of time spent solving it, as is clear from the Table 2. Then we get the following result shown in Fig. 5 which was arranged according to subjects' age.

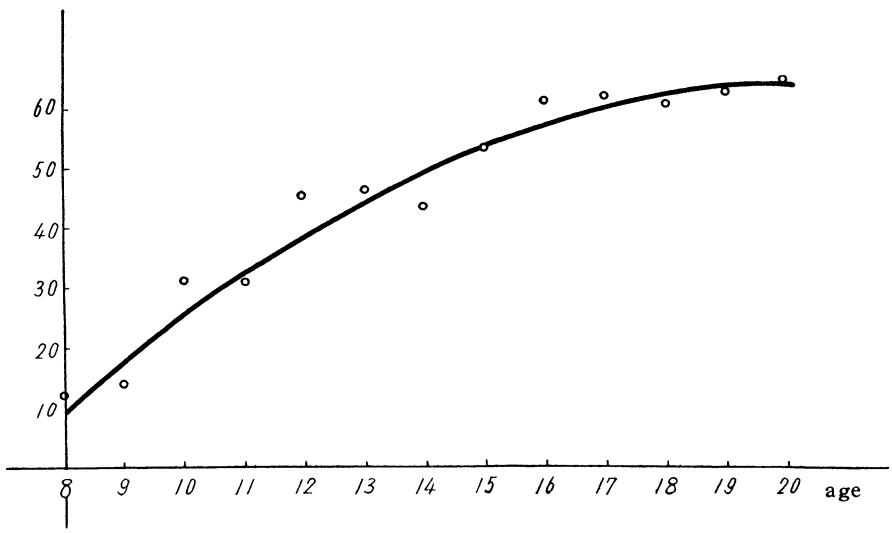


Fig. 5.

The score has increased with increasing chronological age from eight to twenty years very regularly and gradually. However from eight to thirteen years old the increment of the score is large. From sixteen to twenty years old, on the contrary, the increment of the score is small. Oléron who has

tested 246 deaf-muets with Raven's Progressive Matric Test found that their intellectual capacity was about 2 years 4 months lower in average than the normals[9]. Besides he found that the retardation becomes greater yearly from 10 years 6 months to 13 years 6 months. It is interesting to note that there is almost the same amount of retardation in different ages of the blind as in the deaf-muets. From this result we may regard that our tactual block design test is suitable to measure intelligence of the blind.

VI

Distribution of Intelligence

Now if we compute blinds' I.Q. from this test score based on the Kohs' table of mental age equivalents of score values,※ we get the I.Q. distribution

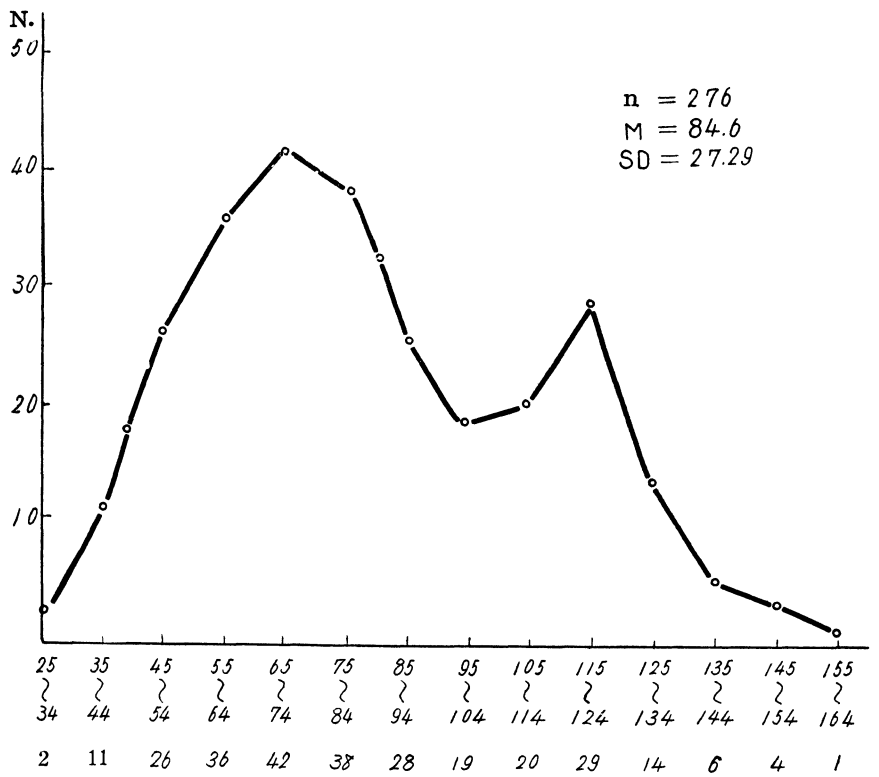


Fig. 6. Distribution of I. Q. in Full Blind S.

※ Oléron, P., Etude sur les capacités intellectuelles des sourds-muets. L'Année psychol., 47-48, 1946-47, Tableau 5, 144.

※ Kohs, S. C. Intelligence Measurement. 1923. N. Y. p. 73, Table 26.

of the blind as in Fig. 6.
Average I.Q. of the blind is low. It is 84.6 and SD is 27.29.

The distribution of I.Q. extends to the lower part in general and the higher part is definitly distinct from the lower part. The children who are in the middle part or the normal zone of I.Q. are contrary to our expectation, relatively few. As the number of subjects tested are not large enough, we can not determine definitly whether this is due to the characteristics of the intelligence distribution in the blind or it is due to the small number of subjects. It must be investigated hereafter.

VII

Reliability of the Test

We have tested the reliability of our tactual block design test by test re-test method. The test was carried out on Fukushima and Miyagi Blind School pupils.

The test on the Fukushima pupils:

The first test : 25, 26 th May, 1956.

The second test: 8, 9 th Sept., 1956.

That is, we have re-tested the same subjects two months and one half after the first test. The number of subjects is 33, from 8 to 20 years old. The correlation between two tests is as follows.
The correlation coefficient is 0.846, and the confidence interval with level of

Table 4. Correlation table between two tests (Fukushima).

	ow bel-40	40～49	50～59	60～69	70～79	80～89	90～99	100～109	110～119	120～129	130～139	over 140	
over 140													0
130～139													0
120～129										1	2	1	4
110～119									1	1			3
100～109									2	1	1		3
90～ 99								2					2
80～ 89						1	1						2
70～ 79				1	1	1			1				4
60～ 69					2	3	1		1				7
50～ 59			1		1	1			1				4
40～ 49		1		1	1								3
below 40	1												1
total	1	1	1	2	5	6	2	2	6	3	3	1	33

95 % reliability is $0.71 \leqq \rho \leqq 0.93$.

The test on the Miyagi pupils:

The first test: 1-4 th Sept., 1956.

The second test: 5,6 th Nov., 1956.

That is, we have re-tested after about 2 months. The number of subject is 46 including eight to twenty years old.

Table 5. Correlation table between two tests (Miyagi)

	below 40	40～49	50～59	60～69	70～79	80～89	90～99	100～109	110～119	120～129	130～139	over 140	
over 140													0
130～139											1	1	2
120～129										1		1	2
110～119										1			1
100～109										2			2
90～ 99								3	1	1			5
80～ 89					1		2	3			1		7
70～ 79			1	1	1		2	2					7
60～ 69			2	5	1	5							13
50～ 59		1	1				1						3
40～ 49			1										1
below 40	2		1										3
total	2	1	6	6	3	5	5	8	1	5	2	2	46

The correlation coefficient between the I.Q. of the first and second test is

$r=0.80$.

The confidence interval with 95 % reliability is $0.66 \leqq \rho \leqq 0.89$. In respect to time interval between the first and second test, there is only few differences between Fukushima and Miyagi School. Therefore, we test the significance of difference between the $r=0.85$ (Fukushima correlation) and $r=0.80$ (Miyagi correlation). Then we get.

$Z=0.35$, $df=1$, nonsigificant.

In consequence we count the average of two correlation coefficient.

$r=0.82$

The confidence interval with 95 % reliability is $0.73 \leqq \rho \leqq 0.89$. The correlation coefficient 0.82 indicates the suitability of using the tactile block design test as an intelligence test for the blind.

However, the score of the second test is to some extent better than the first test, both in the Fukushima subjects and Miyagi subjects. The average I.Q. of the first test in Fukushmia School of the Blind is 80.12, while that of the second test is 97.09; the difference is 16.97. The average I.Q. of the first

test in Miyagi School of the Blind (Sendai) is 80.38, while that of the second test is 91.95; the difference is 11.57. In both school, the I.Q. increased in the second test. The average increase of I.Qis 12.75.

$CR=4.17$ significant on 1% level.

That is to say there is practice effect in this test.

VIII

Validity of the Test

Further we must examine the validlty of our tactile block design test.

(1) Range of the score

The range of individual score is considerably wide from 0 point to 131 points.

(2) The average score tends to increase corresponding to the increase of age in general (Fig.5).

Table 6. Correlation table between arithmetics and tactile block test I. Q. $r=0.552$

achievement I. Q.	superior	middle	inferior
25～ 34			7
35～ 44	1	3	11
45～ 54	5	12	9
55～ 64	5	14	10
65～ 74	11	18	9
75～ 84	11	11	10
85～ 94	14	10	5
95～104	12	5	3
105～114	11	5	2
115～124	8	10	3
125～134	9	2	
135～144	3	1	
145～154	3	1	
155～164	1		
165～174			
175～184	1		
185～194	2		
total	94	97	69

Table 7. Correlation table between drawing and handicraft and tactile block test I. Q. $r=0.518$.

achievement I. Q.	superior	middle	inferior
25～ 34			1
35～ 44		1	12
45～ 54	1	7	8
55～ 64		10	9
65～ 74	2	13	12
75～ 84	4	7	5
85～ 94	10	7	3
95～104	3	6	2
105～114	3	6	1
115～124	2	9	1
125～134	2	3	
135～144	2	3	
145～154		2	
155～164		2	
165～174			
175～184	1	1	
185～194		1	
195～			
total	30	78	54

Table 8. Correlation table between Japanese and tactile block I. Q. $r=0.466$

achievement I. Q.	superior	middle	inferior
25～ 34			7
35～ 44		5	10
45～ 54	8	10	8
55～ 64	7	12	12
65～ 74	13	19	6
75～ 84	13	13	6
85～ 94	19	7	4
95～104	8	11	2
105～114	12	3	3
115～124	10	12	
125～134	7	7	
135～144	2	3	
145～154	3	1	
155～164		1	1
165～174			
175～184	2		
185～194	1		
195～			
total	105	104	59

Table 9. Correlation table between Science and tactile block I. Q. r=0.359.

achievement I. Q.	superior	middle	inferior
25～ 34			1
35～ 44		4	9
45～ 54	2	9	8
55～ 64	4	11	7
65～ 74	8	9	10
75～ 84	5	7	5
85～ 94	9	12	1
95～104	1	8	1
105～114	5	4	1
115～124	3	8	1
125～134	2	5	
135～144	1	4	
145～154	1	1	
155～164		1	1
165～174			
175～184	1	1	
185～194	1		
195～			
total	43	84	45

Table 10. Correlation table between Music and tactile bloc I. Q. $r=0.241$.

achievement I. Q.	superior	middle	inferior
25～ 34			1
35～ 44	2	5	6
45～ 54	7	9	4
55～ 64	9	14	1
65～ 74	7	15	5
75～ 84	8	4	5
85～ 94	11	12	3
95～104	5	4	1
105～114	4	6	2
115～124	5	4	1
125～134	2	4	
135～144	1	1	
145～154	1	2	
155～164			
165～174			
175～184	2		
185～194	1		
195～			
total	65	84	29

Table 11. Correlation table between Social science study achievement and I. Q. $r=0.237$.

achievement I. Q.	superior	middle	inferior
25～ 34			1
35～ 44	1	3	8
45～ 54	8	5	6
55～ 64	8	10	6
65～ 74	9	12	6
75～ 84	9	5	6
85～ 94	10	12	2
95～104	4	7	1
105～114	5	3	3
115～124	4	8	1
125～134	2	4	
135～144	1	4	
145～154	2		
155～164		1	1
165～174			
175～184		1	
185～194	1		
195～	1		
total	65	75	41

Table 12. Correlation table between tactual acuity and tactile block test I. Q. $r=0.325$.

achievement I. Q.	superior	middle	inferior
25～ 34		1	
35～ 44		4	3
45～ 54	2	8	2
55～ 64	2	12	3
65～ 74	4	11	2
75～ 84		7	1
85～ 94	4	12	1
95～104	1	6	
105～114	1	5	
115～124	1	7	
125～134	1	2	
135～144		4	
145～154	1	1	
155～164		1	
165～174			
175～184	2		
185～194	1		
195～			
total	20	81	12

Table 13.

achievement	n. of S.	correlation
Arithmetics	260	0.552
Drawing and handicraft	162	0.518
the Japanese	268	0.466
Science	172	0.359
Music	178	0.241
social science study	181	0.237
tactual acuity	113	0.352

(3) Correlation of the score with the school achievement.

We have counted the correlation between the test score and school subjects; Arithmetics, Japanese, Science, Music, Drawing and Handicrafts and Social Study. The pupils' school achievement was evaluated by the teacher as superior, middle and inferior. The correlation was obtained on the subjects in the blind schools in Hachinohe, Morioka, Yamagata, Tōkyo, Ōsaka, Kyōto and Sendai. We counted the triserial correlation coefficients of superior, middle and inferior achievement with the test score, and obtained the following correlations.

Summarizing the various correlation coefficients, we get the Table 13.

The correlation with arithmetics is the highest (0.552). The next to it is drawing and handicraft (0.518), then follows that of Japanese (0.466). Correlations with social study and music are the lowest. This order of coefficients is intelligible for us. That the test score correlates most highly with arithmetics, Japanese and science, suggests that this tactual intelligence test may be adequate as an intelligence test.

IX

Conclusion and Summary

At present, we are hardly able to find a satisfactory intelligence test for the blind. In order to construct such a test, we picked up the Kohs' Block Design Test. Then we have transposed the colors in the Kohs' block and design in tactual surfaces which were made of different sorts of cloths and

easily and clearly discriminated with finger each other. We have made blocks and designs utilizing cloths with different surfaces. The size of the block and design of our test were enlarged in some measure from the Kohs' block and design. The time limit of each subtest was also prolonged about three or four times longer than that of Kohs' visual test.

With this set of blocks and designs, we have tested 345 total blinds of eight to twenty years old in various cities in Japan. From the number of solved tasks (17 in total) and required time (within time limits), we have counted total score. From this score, we have found its mental age, refering the Kohs' table of mental age equivalents of the score value. The scores of subject counted in this way regularly increased with increasing chronological age. The number of successed tasks also increased with increasing subjects' age. The distribution of I.Q. of the total blind does not seem to be normally distributed but bimodally distributed. The number of subjects with middle intelligence level is relatively few. The inferior intelligence group, on the contrary, is the largest and then relatively higher group than normal intelligence is also large in frequency. It is not clear from this investigation whether this distribution is general tendency of total blind subjects or it is due to the small number of subjects tested.

By means of test re-test method, we have tested the reliability of the tactual test for the blind, and have gotten 0.82 correlation coefficient.

If we examine the validity of the test by means of the correlation of the score with school achievements, we have found correlations as relatvely high as 0.552 with arithmetic, 0.518 with drawing and handicraft and 0.466 with Japanese, but correlations as relatively low as 0.241 with music and 0.237 with social study. From such results, we may regard our tactile intelligence test have considerablly high validity. However, it is necessary to test greater number of total blind subjects in the future. On the other hand, it is necessary to test normal subjects who are blindfolded during this test as well as Kohs' visual Block Design Test and other intelligence test unblindfolded. Through such procedure we may be able to compare between the intelligence levels of normal and total blind subjects.

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Conclusion et Résumé

A présent, nous ne pouvons guère trouver une test satisfaisant de capacité intellectuelle pour les aveugles. Afin de construire tel test, nous avons tenu le plus grand compte de Kohs Bloc Dessin Test. Alors, nous avons transposé les couleurs dans les blocs et dessins de Kohs Test avec les surfaces tactiles que nous avons fait de toiles de quatre sortes et ces surfaces sont ce que nous pouvons discriminer l'un de l'autre clairement et facilement avec doit de la main. Nous avons fait des blocs et dessins qui sont pourvu de telles surfaces différentes. La grandeur de bloc et dessin de nôtre a été agrandie dans quelque mesure que celle de Kohs Test. La limite de temps de chaque sous-test a été prolonguée aux environs trois ou quatre fois plus longue que celle-la.

Par ces blocs et dessins, nous avons examiné 345 aveugles totalement de naissance, âgés de huit à vignt ans, dans des villes diverses dans Japon. D'après le nombre de sous-test résolu (ce sont 17 au totale) et temps employé (dans la limite de temps), nous avons compté des points gagnés par chaque sujet. Alors, nous avons trouvé l'âge mental équivalent à ces points par la tableau de l'âge mental de Kohs. Des points ainsi comptés indiqent l'accroissement gradual selon le développement de l'âge chronologique. Le nombre de réusites (de sous-test résolu) est aussi en augmentation selon l'âge de sujet. Il paraît que la distribution de Q.I. des aveugles totalement n'est pas normale mais elle a deux cimes : il y a peu de personnes moyennes intelligentes. Au contraire, la groupe moin intellectuelle est le plus large et la groupe plus intellectuelle que normale est aussi plus large jusqu'à un certain point. Mais il n'est pas claire si cette distribution est une tendance générale de sujets aveugles ou elle est originaire de ce que le nombre de nos sujets n'est pas assez large. Au moyen de methode de re-test, nous avons examiné la sécurité du test tactile pour les aveugles et trouvé la valeur de 0.82 comme le coefficient de corrélation.

Si nous inspectons la validité du test suivant à la corrélation de ses points et l'évaluation d'accomplissement dans l'école, nous avons trouvé telles hautes corrélations comme 0.552 à l'arithmétique, comme 0.518 au travail manuel, comme 0.446 à la langue japonaise; mais telles basses corrélations comme 0.241 au music et comme 0.237 au cours civil. A cette résulté, nous pouvons regarder notre test tactile de capactié intellectuelle a montré une validité satisfaisante considérablement.

Mais, il faut que nous examinons plus large nombre de sujets aveugles totalement par ce test dans future. D'autre part, il faut aussi que nous examinons par ce test des sujets normals qui sont leur couverts les yeux avec bandeaux et aussi par Kohs Bloc Dessin Test et des autres tests de capacité intellectuelle sans bandeaux. Par telle procédé, nous voulons comparer l'intelligence de sujets normals à celle des aveugles totalement.

Zusammenfassung

Es ist heute noch kaum möglich, eine zuverlässige Intelligenzprüfung für die Blinden zu finden. Um eine solcher nicht-sprachlich Blinden-Intelligenzprüfungen herzustellen, haben wir lange nach-gedacht und den "Block Design Test" von S.C. Kohs ins Auge gefasst. Dann haben wir die verschiedenen Farben, welche an Körpern und Mustern von Kohs gebraucht wurden, an die Tastflächen von verschiedenen Tüchern umgesetzt. Die Tastflächen sind aus Tüchern von verschiedenen Arten gemacht, welche durch Fingerbetastung leicht und deutlich untereinander unterscheidbar sind. Weiter haben wir die Grösse der Körper und Muster etwas vergrössert, damit sie durch Betastung leichter erkannt werden können. Die erlaubte Zeit für jeden Untertest wurde um das Mehrfache als dieselben von Kohs verlängert. Mit diesen Körpern und Mustern haben wir Versuche bei 345 vollständigen Blinden von 8 bis 20 Jahren als *Vp* aus verschiedenen Städten in Japan gemacht. Aus der Zahl von gelösten Aufgaben (17 Unterteste im Ganzen) und aus der gebrauchten Zeitdauer (innerhalb der Zeitgrenzen) haben wir die ganzen Punktzahlen von *Vp* errechnet. Aus diesen Punktzahlen haben wir Intelligenzalter der *Vp* entschieden, mit Rücksicht auf die Zuordnungstabelle zwischen Punkten und Intelligenzalter nach Kohs. Nun ergibt sich, dass der Gesamtpunkt ein regelmässiges Wachstum je nach dem Lebensalter zeigt. Die Zahl der gelösten Unterteste (Aufgaben) gibt auch das Wachstum je nach dem Alter der *Vp* an. Die Verbreitung von IQ von dem Ganzblinden scheint nicht normal verteilt, sondern es gibt zwei Hubhöhen: die mittelgradrige Intelligenz ist verhältnismässig weniger. Die niedrige Intelligenzgruppe, im Gegenteil, ist am meisten. Die verhältnismässig höhere Intelli-

genzgruppe ist auch etwas mehr als die der normalen. Es ist nicht klar, ob diese zwei modalen Intelligenzverteilung eine allgemeine Tendenz des Ganzblinden zeigen, oder der kleineren Zahl unserer *Vp* verdanken.

Mittels des Wiederprüfungsverfahrens haben wir die Verlässlichkeit unseres Betastungstests für die Blinden geprüft. Dann haben wir als Korrelations-Koeffizient 0.82 bekommen. Wenn wir die Gültigkeit unseres Betastungstests an der Korrelation zwischen diesem ganzen Punkte und der Schulleistung untersuchen, so haben wir folgende höhe Korrelation gefunden: 0.552 für Arithmetik, 0.518 für Zeichnen und Handwerke, 0.446 für die Japanische Sprache, 0.359 für Naturwissenschaft; aber auch folgende niedrige Korrelation: 0.241 für Musik, 0.237 für soziale Kunde. Aus solchem Resultate vermögen wir unsren Betastungstest der Intelligenz eine relativ grössere Gültigkeit zu haben. Doch ist es nötig, dass wir durch unsere Prüfung noch mehr *Vp* untersuchen sollen.