

The Journal of Social Psychology, 1958, **47**, 327-337.

SPEED AND ACCURACY OF PERFORMANCE OF AN AFRICAN
NATIVE POPULATION AND OF BELGIAN CHILDREN
ON A PAPER-AND-PENCIL PERCEPTUAL TASK*¹

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A. PROBLEM

Students of inter-cultural psychological differences have long since been struck by a lack of responsiveness to instructions to work fast among non-European groups. This fact has been discussed mostly in relation to the applicability of testing procedures, especially intelligence tests, involving speed performance, to these populations (Klineberg, 2). The phenomenon by itself has received rather little attention, although it is of both theoretical and practical interest.

In the Belgian Congo, the slowness of the Bantu population is mentioned by the majority of casual observers. It is, in work situations, the source of many complaints from European supervisors who have a tendency to attribute it to deliberate ill will.

One can ask the question whether the matter is one of constitutional slowness of mental functions or rather of culturally determined attitude towards speed performance. The study of activities characteristic of tribal life suggests many reasons why Africans should have some difficulty in sharing our interest in speed. On the other hand, it shows that they can go fast when motivated, as for instance while hunting.

An approach to this problem that has been suggested by Lambeth and Lanier (3), consists of varying task complexity and observing effect on speed differences. If the relative slowness of the Negro is determined by slower mental processes, it should increase with the complexity of the operations to be performed.

The extensive study on primitive populations of southern Kasai which the senior author has been conducting for several years provided many data

*Received in the Editorial Office on March 26, 1958, and published immediately in accordance with our policy of special consideration for cross-cultural research.

¹Read before the XVth International Congress of Psychology in Brussels.

²The work in Africa has been generously subsidized by the Belgian "Fonds du Bien-Etre Indigène" (Fund for Native Welfare). The "Fonds National Belge de la Recherche Scientifique" (National Fund of Scientific Research) has provided aid for the gathering of comparative data on European populations.

that can be analyzed in that direction. The present report deals with a first application of the method.

B. TASK

The task used is a modification of a paper and pencil perceptual analysis test devised by Rey (8). It consists of 34 items each of which is constituted by a set of dots arranged mostly at random (Figure 1). By drawing

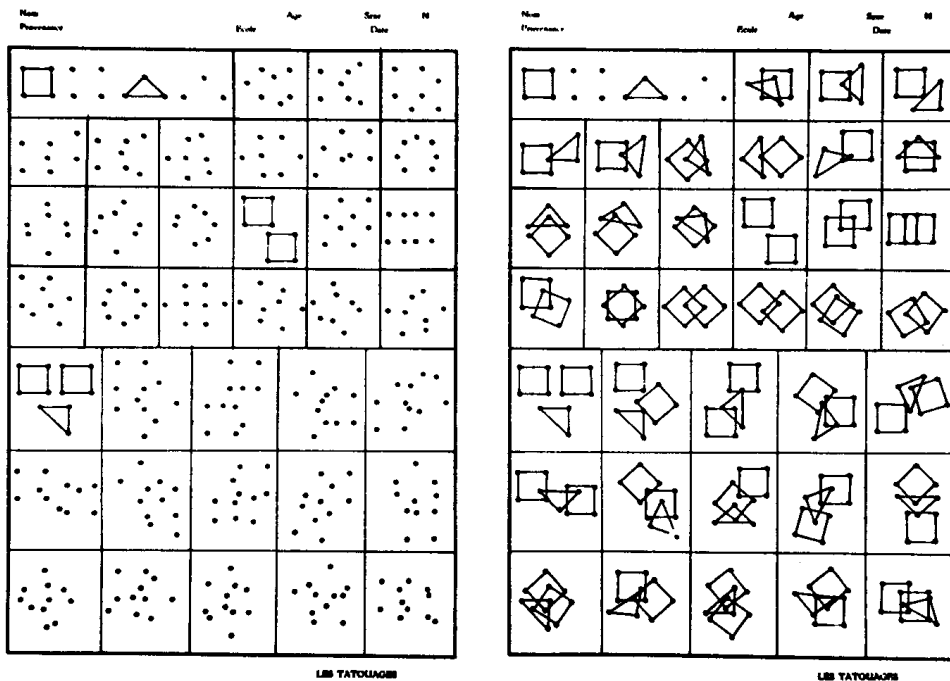


FIGURE 1
THE TEST (BLACK PAGE)
(Left, blank; right, completed)

lines between appropriate dots, geometrical figures can be isolated: one triangle and one square (Part A), two squares (Part B), one triangle and two squares (Part C). We introduced a preliminary practice task, consisting of the same dot patterns, printed in color, so that the dots belonging to each figure can easily be discriminated from the others by their color. The purpose of this modification was: (a) to make sure that all subjects had understood what sort of response was expected of them; (b) to get some measure of their graphic speed, which was considered of special importance when administering the test to populations little familiar with the use of paper or pencil.

C. SUBJECTS

1. *Africans*

Although the test has been extensively used during the various expeditions the senior author has led in the Belgian Congo, the present study is based only on the data obtained from 159 male adults employed as vehicle drivers in the diamond mines of Bakwanga (Kasai), or applying for such a job. This population, which was chosen for the present analysis because of the homogeneity of environmental factors, has been described in other publications by Ombredane, Robaye, and Plumail (6), and by Ombredane (5). Ages range from 17 to 45 years and number of years of previous schooling from 0 to 5.

2. *Europeans*

For comparative purposes, the data obtained from 190 Belgian male schoolchildren, tested in two schools in Brussels, aged 6-15 years, will be used. It was necessary to use children to get a European population for which the test, administered without time-limit, is still discriminative.

D. ADMINISTRATIVE PROCEDURE

All African *Ss* were tested in groups of 2-3, by an African assistant. Instructions were given in the local language (tshiluba) as follows:

Colored page: *E* shows the example at the beginning of Part *A*. "Here is a tattooing made up of 4 black dots. You have to draw lines between them and make a figure like the one on the left: it is a square" (If any *S* does not know what a square is, *E* explains: "it is like the shape of a house") *S* draws the square. "Now here is a tattooing made up of 3 red dots. Draw lines between them and make a figure like the one on the left: it is a triangle (X "like the roof of a house")" *S* draws the triangle. "Now you will go on drawing lines between all red dots to make triangles. Further on, you will draw lines between all black dots to make a square, and between all green dots to make another square, like this . . ." etc.

Great care was taken to insure that every *S* had understood the instructions. These were repeated whenever a *S* gave sign of not understanding.

E takes note of time taken to complete the page.

Black page: "Here, you see the same dots as previously, but they are all black. Here again, you will draw lines to make squares, like this or triangles, like this. Have you understood?"

Time to complete the page was taken previously. One great advantage resulting from giving the colored sheet first was that it made it far easier to explain what was to be done with the black sheet.

For the Belgian children, the procedure was the same, except that the instructions were shorter, references to tattooings and to native houses being of course left out.

Three scores only will be considered in the present report: x , number of correct items on the black page (0-34. An item is scored as correct only when all two or all three figures are correctly drawn); T_1 time taken to complete the colored page; T_2 time taken to complete the black page.

Errors on the colored patterns rarely occurred.

E. ANALYSIS OF RESULTS

As can be seen from Table 1, time taken to complete the black page is much longer for the African adults than for Belgian children, even under 10 years of age. Only 17 per cent of the Belgian children of that age group take as long as the median African.

TABLE 1
TIME AND NUMBER OF CORRECT RESPONSES ON THE BLACK PAGE

| | Africans | Belgian children 6-9 years | Belgian children 10-14 years |
|---|----------|-------------------------------|---------------------------------|
| N | 159 | 79 | 111 |
| Median number of correct items | 24 | 14 | 29 |
| Median time | 29' 30" | 19' 50" | 11' 06" |
| % of <i>Ss</i> slower than median African | 50% | 17% | 3% |

However, this is a very crude comparison. It is clear that speed by itself has no meaning as long as it is not related to achievement. Table 1 shows in fact that the groups differ also as to number of good responses, the Belgian children under 10 years being inferior, those aged 10-14, superior, to the African group. Before making any comparisons as to speed, the relationship between this factor and number of correct answers should first be investigated and if any correlation exists, comparisons should only be made between groups of comparable accuracy. It will be remembered that Belgian children were chosen as a comparison population for our group of African adults because European adults score too highly when the test is given without time limit.

On the other hand, the availability of a time score for the easy colored patterns makes it possible to get some idea about the influence of the graphic difficulty on the speed with which the black patterns are completed. This will be done by combining the two time scores.

Our analysis will proceed like this: first, using the data of the African group, we shall combine the two raw time scores in such a way as to give

two independent speed components of test performance; then the relationship between components and accuracy will be investigated; if any relationship between time components and number of correct responses is revealed, the Africans will be compared with Belgians at the same accuracy level.

1. *Combination of Time Scores*

A simple logarithmic transformation ($t = \log T$, $T =$ number of seconds) succeeded in making the distributions of the two time scores symmetrical and approximately normal. The two transformed scores t_1 and t_2 are significantly correlated (product-moment $r = .52$). A simple way of expressing the information given by two correlated variables consists of combining them by Hotelling's method of principal components. A simplified procedure for obtaining the components in the case of two variables has been given by Faverge (1). The principle of Hotelling's method, it will be remembered, is to rotate the coordinate axes until they coincide with the principal axes of the concentration ellipse. The position of each point can now be expressed by two independent values.

In the present case, the principal components are practically equivalent, except for the constant term in each, to the two simple expressions

$$A = t_2 + t_1 = \log T_2 + \log T_1$$

$$B = t_2 - t_1 = \log T_2 - \log T_1$$

$$(r_{AB} = .027)$$

A measures general tendency to be slow in the two tests considered. It will be noted that: $A = 2 \log$ (geometric mean T_1 & T_2)

B measures the tendency to be slower on the black than on the colored page. It represents the relative delay caused by the perceptual difficulty of the black page.

(Note that $B = \log T_2/T_1$).

Although the interpretation of the obtained components is here straightforward, it should be kept in mind that the main reason for the transformation is that it gives independent variables. Another transformation which we considered (T_1 and $T_2 - T_1$) has the disadvantage that it yields correlated components, which thus transmit partly redundant information.

2. *Relationships between Time Components and Accuracy (African group)*

A is negatively correlated (see Figure 2) with x . Variance analysis shows that a linear regression explains all existing correlation. The regression equation is:

$$A = 6.46 - .01065 x \quad (r_{Ax} = -.42)$$

This means that *the subjects who have the greater tendency to be slow on both tasks also give the fewer correct answers on the black page.*

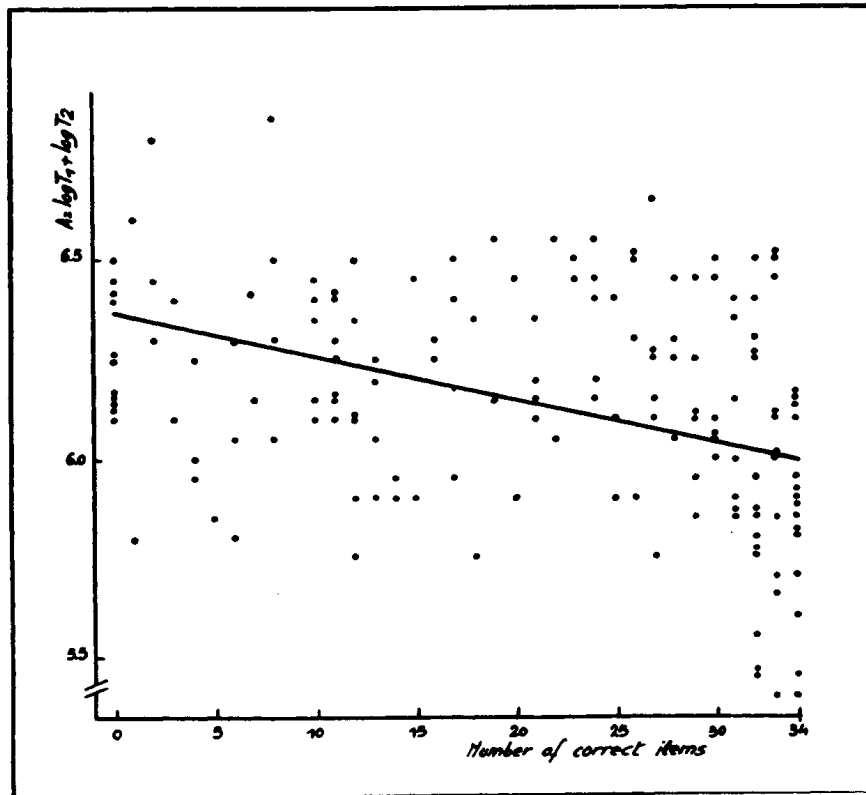


FIGURE 2
TIME COMPONENT *A* AND NUMBER OF CORRECT ITEMS (*X*) FOR 159 AFRICAN ADULTS,
WITH REGRESSION LINE OF *A* ON *X*

B has a parabolic relation to *x* as can be seen in Figure 3. Variance analysis shows that the adjustment of a parabola explains all existing correlation. The equation of the parabola is:

$$B = -.0995 + .04165 x - .00099 x^2$$

$$\eta_{Bx} = .63$$

Inspection of Figure 3 shows that the less accurate *Ss* spend as a group relatively less time on the black patterns. It seems they are delayed less than better *Ss* by the perceptual difficulty. It is as if they did not see that

there is a difficulty. As score increases, Ss are more and more delayed, until a maximum is reached in the vicinity of score 21. Above this score relative delay decreases. Very good Ss, near the maximum score of 34, are delayed to a lesser extent than medium ones.

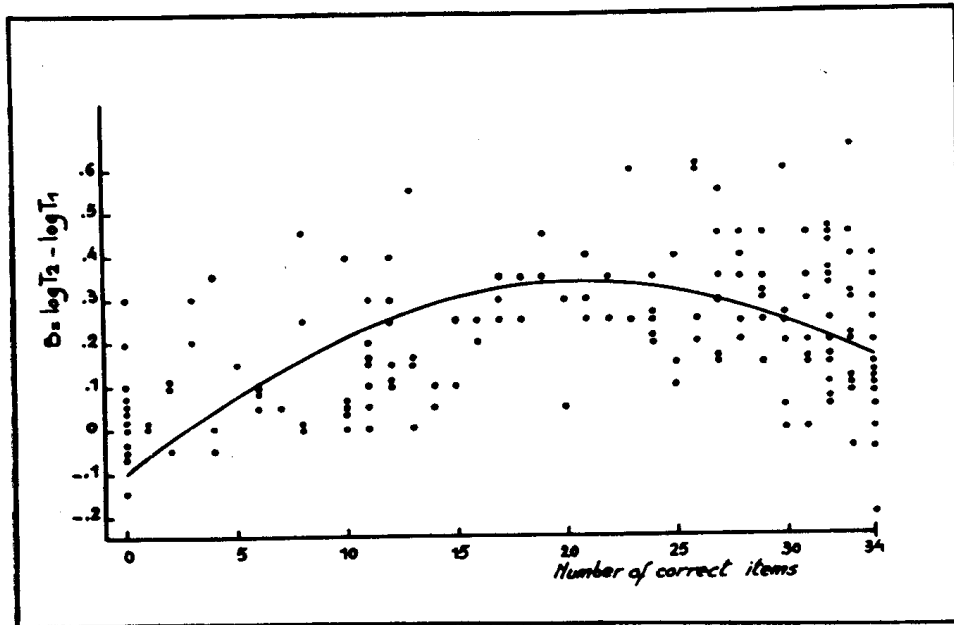


FIGURE 3
TIME COMPONENT B AND NUMBER OF CORRECT ITEMS (X) FOR 159 AFRICAN ADULTS,
WITH REGRESSION PARABOLA OF B ON X

3. Comparison with the Belgian Children

For the group of Belgian children, the relationships between time components and accuracy score have exactly the same shapes as for the African children.

$$A = 6.04 - .02096 x \quad (r_{AX} = -.52)$$

$$B = -.11402 + .04761 x + .00111x^2 \quad (\eta_{BX} = .60)$$

Here again, general tendency to work fast is correlated with accuracy, and, on the other hand, relative delay caused by the perceptual problem first increases and then decreases with accuracy.

By plotting regression lines for both groups, it is now possible to compare on each component Africans with Belgian children of the same accuracy level. This has been done in Figures 4 and 5. It can be seen:

(a) That at the same accuracy level, Belgian children have a far greater speed than the Africans. Bearing in mind that $A = 2 \log$ (geom. mean T_1 & T_2), one can estimate that the Africans take on the whole twice as much as the Belgian children—1.6 as much at the 0 score level, and 2.5 as much at the maximum score level.

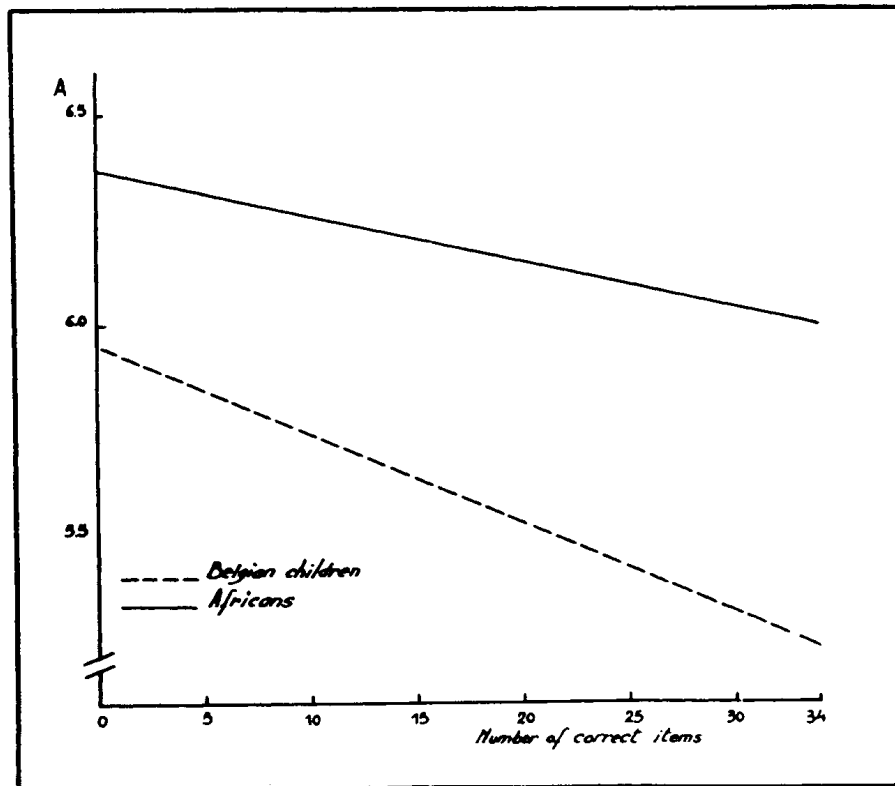


FIGURE 4
REGRESSION LINES OF A ON X FOR AFRICANS AND BELGIAN CHILDREN

(b) That at the same accuracy level, relative delay is practically the same for Africans and for Belgian children.

F. DISCUSSION

Our analysis made possible a comparison with regard to our two time components of our African adults with Belgian children at the same accuracy level. The result is very striking. The difference lies completely in the general slowness component. Africans are definitely slower than Belgians

at each level of accuracy. But this greater slowness is by no means related to complexity of task. There is no perceptible tendency for the Africans to be delayed more than the Belgians by the perceptual difficulty involved in solving the black patterns.

Speed of performance should be investigated on a larger sample of tasks before definite conclusions can be reached. Limiting oneself to the present

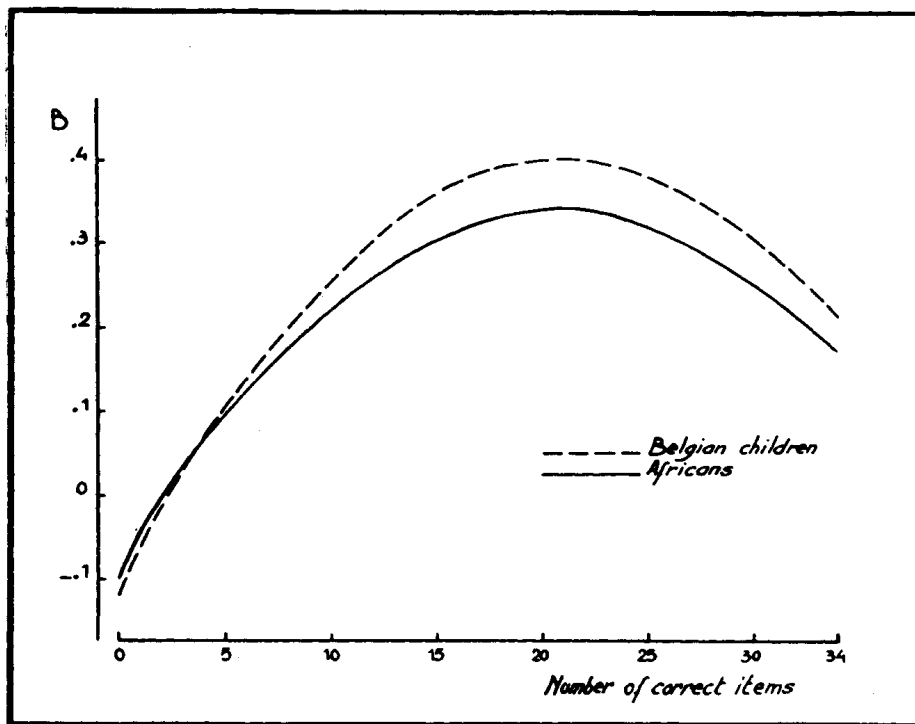


FIGURE 5
REGRESSION PARABOLAS OF B ON X FOR AFRICANS AND BELGIAN CHILDREN

data, one can observe that they are compatible with the hypothesis of a generalised slowness on the part of Africans, not with that of a specific slowness related to task difficulty. They do not enable us to say what this general slowness is due to. Probably, it is the resultant of a whole set of factors. One which is very striking when one watches African S s passing any test is a kind of careful attitude towards a task which has been given by an European. Very often S s stop after answering an item and look to the E as though waiting for some sort of approval. On several occasions, S s complained that it was somewhat unfair to ask them to provide a solution which

had not been shown to them before (see Ombredane and Robaye, 4). Similar observations have been reported by Porteus (7, p. 308).

If slowness is interpreted as a general attitude towards the unfamiliar testing situation, one could ask whether it must not be considered as a simple artifact of this situation, of little interest after all. In fact, many professional situations introduced by the Europeans have the same unfamiliar characteristics. Many observations suggest that very often the Negro worker does not understand the criteria that are used by the European supervisor to judge his achievements. Slowness could then well be a simple matter of wisdom.

G. SUMMARY

One hundred fifty-nine male African adults from the Belgian Congo were given a paper-and-pencil perceptual task devised by A. Rey and consisting of drawing lines between randomly arranged black dots so as to isolate simple geometrical figures. A practice task, where the perceptual difficulty was reduced by printing in different colors the dots corresponding to the different figures, was always given first. Both tasks were given without time-limit. Scores were number of correct patterns on the black test, and time taken to complete each of the two tasks.

Both time scores were combined by Hotelling's principal components method. Two independent variables were obtained, one of which (*A*) expresses the general tendency to be slow on both tasks and the other the tendency to be slower on the (difficult) black patterns than on the (easier) color ones. The relationship of these components to accuracy on the black patterns was determined.

Africans were compared on both time components with Belgian *Ss* at the same accuracy level. (It was necessary to use children because European adults are too accurate on this test.) It appears that, for the same degree of accuracy, Africans are always slower on *A*, but no difference is apparent on *B*. It is concluded that, as far as these tasks are considered, the slowness of the Africans—defined by comparison with Europeans of the same level of accuracy—is not related to task difficulty. This finding is more easily explained by a general lack of interest in speed performance than by a slower operation of mental functions.

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