

## AN EXPERIMENTAL ANALYSIS OF THE MOSAIC PROJECTION TEST

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In clinical psychology attention has been focused increasingly on the possibilities of assessing personality by means of projective tests. In all these tests, e.g. the Rorschach or the Mosaic test, the subject is confronted with a comparatively unstructured situation, an inkblot or pieces of wood. He is asked to organize this material in his own way, and since there is no conventional pattern to guide him, he will draw upon the most readily available forces within himself. 'These tests create conditions for the unselfconscious revelation from the hidden regions of personality' (1). The interpretation of these imaginative productions offers great scientific difficulties. No hard and fast criteria of scoring can be employed—differences between two productions are qualitative rather than quantitative. Experimental validation of these more 'intuitive' techniques is, therefore, important in order to ascribe to them their proper place in clinical psychology.

### PART I

Part I of the present paper deals with the validation of the 'Mosaic' test. The mosaic test was invented by Dr Lowenfeld about 15 years ago. It consists of a box of wooden pieces, standardized so that each shape is available in every one of the six colours, red, blue, green, yellow, black and white. The pieces are of five different shapes: squares, diamonds, right-angled triangles, equilateral and scalene triangles. The subject is presented with the box of mosaics and asked to construct a pattern on a board. He is encouraged to construct any pattern he likes, no time limit being imposed. The principle upon which this test is based is common to all projective tech-

niques, as outlined above. The subject is ignorant of the aim of the experiment. Dr Lowenfeld found that the type of pattern made with regard to content, form of pattern, as well as choice of colour was indicative of the personality of the subject and enabled her to make an assessment of his personality structure. She also found certain patterns or elements in the designs characteristic of different clinical syndromes.

Comparatively little literature is available on the test, and only one attempt of its experimental validation has been reported. Wertham & Golden (2) and Diamond & Schmale (3) carried out investigations on a large number of normal, neurotic and psychotic subjects. Both papers deal with classification of patterns according to the different psychiatric groups rather than with validation. Wertham & Holden, using a somewhat larger set of mosaics, found that by taking twenty-three criteria of evaluation, they were able to obtain characteristic patterns for schizophrenics, manic depressives, mental defectives, and for those suffering from organic brain lesions. Diamond & Schmale used one main criterion instead of Wertham & Holden's twenty-three. Their criteria was the completeness of the Gestalt of the pattern. They divided their patterns into mildly defective, moderately defective and severely defective patterns, and correlated these with the degree of personality disintegration manifested in the patients. Those conditions in which personality structure was least disordered showed the smallest degree of abnormality in the design.

M. Kerr (4) classified the frequency with which certain types of designs occurred in a sample of over 1000 subjects, including adults

and children, both normal and neurotic. She too emphasized the need of a Gestalt or global method of interpreting the designs and of relating them to personality structure. She reported three experiments of validation by means of the matching method. The experiments were carried out by M. Kerr and Miss Traill, who are both experts in the interpretation of mosaics.

*Exp. 1.* Ten character sketches of adult subjects and ten mosaics were sent to the author who matched them. Six out of ten were correctly matched.

Coefficient of contingency:  $0.86 \pm 0.025$ .\*

*Exp. 2.* M. Kerr sent ten character sketches and ten mosaics including those of children and adults, stable and neurotic, to Miss Traill. Ten out of ten were correctly matched.

Coefficient of contingency:  $0.96 \pm 0.02$ .

*Exp. 3.* M. Kerr matched ten mosaics and character sketches of normal adults. Seven out of ten were correctly matched.

Coefficient of contingency:  $0.89 \pm 0.014$ .

These experiments are reported in such detail because the matching technique is also employed in the present investigation as one of the methods of validation. The above-mentioned coefficients of contingency are very high indeed, but on closer examination of the experimental set-up it will be found that these results are spuriously high.

(1) The character sketches were written by the experimenter giving the test, who was herself an expert in its interpretation. It is therefore possible that, consciously or unconsciously, the experimenter was influenced by traits that are characteristic of certain patterns and that these might have been given undue prominence in the character sketch of the subject.

(2) The exceptionally heterogeneous nature of the group tested (*Exp. 2*) makes it impossible to accept the resulting coefficient of contin-

\* The formulae for calculating this coefficient and its P.E. are given by P. E. Vernon<sup>(5)</sup>. The coefficient is analogous to a correlation coefficient, and roughly identical with it, except towards the upper limits.

gency as giving an indication of the value of the test in ordinary clinical practice.

(3) There are certain dangers inherent in the matching technique itself which lower its value as a validation method considerably. This can best be brought out by an example: amongst a set of five sketches and five mosaics to be matched only one pattern represents a railway bridge. On reading the sketches, the experimenter finds that one of the subjects is an engineer. This enables him to match the pattern and the sketch correctly on an external criterion alone and thus, of course, facilitates the task of matching the remaining sketches. Additional methods of validation must, therefore, be used to assess to what extent matching by relatively external criteria has played a part in obtaining the final coefficient of contingency.

The present experiment constitutes an attempt to test the validity of the mosaic test by various methods previously used by one of us<sup>(6)</sup> in a validation study of graphological analysis of personality. The experimental design avoids the three criticisms we had to make of M. Kerr's experiment. This was done in the following way:

(1) Character sketches of the patients were obtained from psychiatrists and not from the person who administered the mosaic test.

(2) A group of male neurotic army patients was used which was not unduly heterogeneous.

(3) The matching method was amplified by three further methods of validation.

In addition, the fact that the set-up of the experiment was identical with that in which the graphological method of interpretation was tested, makes it possible for us to compare the effectiveness of these two techniques.

#### *Experiment 'A'*

The subjects of this investigation were fifty male neurotic patients at the Mill Hill Emergency Hospital. The information available about each patient consisted of the psychiatrists' diagnosis and the case paper of the patient, containing a description of his neurotic

history and temperamental make up, and of the patient's intelligence score on the Progressive Matrices.

The patients were asked to construct a mosaic, making up any pattern they liked. As they constructed the mosaic, the experimenter filled in the record sheet (Appendix A). On this were noted the order in which colours were introduced, the method of construction, such as from centre outwards or from base upwards, and the patient's behaviour, whether he was quick or hesitant, made frequent changes, etc. When he had completed the mosaic he was asked whether he had planned the construction beforehand or in the course of it, what it suggested to him, and whether he was satisfied with it. Dr Lowenfeld, in her instructions, emphasizes that the subject must be satisfied with his design. In practice it was not found possible to adhere to this, as the very nature of the patient's difficulties in some instances made it impossible for him to feel satisfied with his performance. It was also thought that a dislike of a pattern and the rationalization given for this dislike would prove revealing.

The subject was then given a test of approximately half an hour's duration in connexion with another investigation that was being carried on at the same time. The test is fatiguing and somewhat irritating by its monotony. As soon as the subject had completed the test, he was asked to construct a second mosaic. This enabled us to investigate the reliability of the test.

In addition, the subjects filled up a questionnaire based on the main personality traits isolated by Guilford<sup>(7)</sup> (Appendix B). The experimenter was present and discussed any difficult points with the subject. From the type of questions asked and the behaviour of the subject in general, it was evident that they tried to answer the questionnaire correctly.

For the validation experiment we have been very fortunate in enlisting the co-operation and skilled help of Miss Traill. Miss Traill is a psychologist who has specialized in the interpretation of the mosaics. She took part in

the earlier validation experiments reported by M. Kerr.

Four methods of validation were used which act as a check on one another. At this point, the results only will be given and a discussion of the implication of the results reserved for a later part.

*Validation of Method 1.* Miss Traill was given fifty sets of two mosaics (the two mosaics produced by each subject will subsequently be referred to as set of mosaics). No information other than the notes of the experimenter on the construction of the mosaic and on the behaviour of the patient during the test situation was given. Miss Traill then wrote a character sketch on each of the patients (a sample is shown in Appendix C) and also filled up the personality questionnaire as she envisaged the patient would have answered it.

The character sketches were divided into groups of five, and, together with the names of the patients concerned, given to the doctors in charge. The sketches were then matched by the psychiatrists against the personality of the patients. Owing to the absence of one doctor, it was not possible to use all fifty sketches. The results of nine sets of matchings of five sketches each are given in Table 1.

Table 1

No. of correct matchings	Coefficient of contingency
1	0.00
2	0.45
1	0.00
0	-0.45
3	0.71
1	0.00
0	-0.45
2	0.45
5	0.90
—	—
Av. 1.7	0.18

From this table it will be seen that the average number of correct matchings is 1.7 or 33 %—by chance the average would have been 1.0 or 20 %. This difference is statistically significant. The correspondence between the

matchings is spuriously low owing to the distribution of patients in the hospital. Similar types of patients tend to be placed under the charge of the same doctor; therefore, the difference between the patients in each group is less pronounced than one would expect in a random sample such as is used in the subsequent validation experiment. This homogeneity would tend to lower the correlation considerably.

*Validation Method 2.* The clinical notes of each subject, including a personality sketch, an account of his illness and past history written by the psychiatrist and his intelligence score were sent to Miss Traill. The above data we shall subsequently refer to as the 'write up' of the patient. All signs of identification were removed and they were divided at random into groups of five. Miss Traill was asked to match the write-ups against the corresponding mosaics. It was not possible to obtain write-ups on all fifty patients so that the matching had to be confined to seven sets of five matchings each. The results are given in Table 2. Twenty-one out of thirty-five

Table 2

No. of correct matchings per group	Coefficient of contingency
5	0.90
3	0.71
2	0.45
3	0.71
5	0.90
3	0.71
0	-0.45*
Av. 3.0	0.56

matchings are correct, by chance one would expect seven correct matchings, namely, one per group. The results are thus well above

\* The theory of contingency coefficient as worked out by Vernon does not include negative values. At his suggestion, we have put the value for no correct matchings as being as much below zero as the value for two correct matchings is above zero.

chance. In five out of seven matchings *C* is more than three times as large as the standard error and more than five times as large as the probable error.

*Validation Method 3.* The self-assessments of the patients by means of the questionnaire were compared with the assessment given by Miss Traill on the same questionnaire. There were thirty-two questions, i.e. in all 1600 judgements. +1 is given for each correct judgement, -1 for each incorrect judgement, and 0 for judgements that were omitted by either patient or by Miss Traill, usually because they felt unable to decide upon one of the alternatives.

Table 3

	No. of correct judgements	Expressed as % of total number of judgements
+1	623	39
0	327	20
-1	650	41
	1600	100

If we omit the ambiguous cases, we find that 49 % of judgements are correct, i.e. the results are no better than chance. If, however, one divides the subjects into two groups, according to whether the patients' write-up and mosaic have been correctly or incorrectly matched by Miss Traill, one obtains the following picture: The number of correct judgements minus incorrect ones is +44 in the group of correctly matched patients and -65 in the group of incorrectly matched patients. This shows that some people's designs reveal their temperament more clearly than those of others.

Analysing the results of each individual patient, the scores of the two extreme cases are +21 and -16 respectively, the former patient's write-up was correctly matched and that of the latter incorrectly.

An analysis of the number of points scored on each of the thirty-two questions shows that the highest number of points scored is +13, the lowest -13. ('When you are out with friends, do you enter into the fun whole-

heartedly?’ and ‘Do you feel like “kicking up hell” when you don’t get a square deal, or when you are being taken advantage of?’ are the respective questions.)

Fig. 1 shows the distribution of scores for the thirty-two traits and for fifty subjects respectively, both curves resembling a normal distribution curve. It is, therefore, reasonable

psychiatrists and psychologists with no experience of the mosaic test, to be matched against the mosaics of the patients. Thus we have ten times two five by five matching results (Table 4). The number of correct matchings given by psychiatrists and psychologists without previous experience of the test was not significantly above chance.

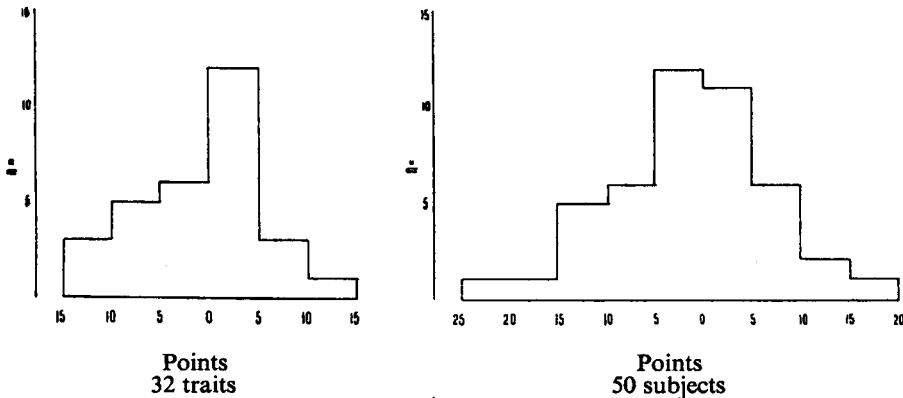


Figure 1

to say that people differ as to the ease with which their mosaics can be interpreted, and that traits differ with regard to the ease with which they can be detected from the mosaics.

*Validation Method 4.* Ten personality sketches were prepared by psychiatrists in charge of the patients in question and divided into two sets of five each. The sketches in the two groups, A and B, were given to ten

*Discussion*

It seems pertinent at this point to compare the results of the mosaic experiment with those obtained on the validity of the graphological assessment of personality.

The technique employed in both experiments is the same and the results are comparable, since the fifty patients in each experiment were a random sample of the same hospital population.

Table 4

	No. of correct judgments per set	
	Set A	Set B
Ros.	2	0
Hal.	0	3
Mck.	1	0
Sto.	3	3
Mac.	0	2
Eys.	0	0
Rus.	3	3
Ree.	2	1
Lew.	0	1
Jol.	2	2
	1.3	1.5

*Psychiatrist's matchings*

	No. of correct matchings
Mosaics	1.7
Handwriting	1.1

The difference between the number of correct matchings in either case is not statistically significant. (Owing to technical reasons, *t*:*t* matchings were not possible in the graphological experiment, but four sketches had to be matched against five patients. This increases considerably the difficulty of matching and might in part explain the graphologist's lower

number of correct matchings as compared to the number of correct matchings made by the mosaic expert.)

*The questionnaire*

	Percentage of correct judgements
Mosaics	49
Handwriting	62

While the judgements of the mosaic expert are about chance, those of the graphologist are significantly better than chance. It appears from this data that ways of feeling and acting and attitudes generally express themselves more in handwriting, or rather can be more readily interpreted from handwriting than from mosaics.

*Matchings by the graphologists and by the mosaic expert*

	Percentage of correct matchings
Mosaics	60
Handwriting	48

This difference is not statistically significant. These comparisons suggest the following conclusions: The mosaic test enables the expert (1) to match mosaics with personality sketches and (2) to write character sketches of the patient based entirely on his mosaic which is matched better than chance by the psychiatrist, with greater success than is possible for the graphologist working on the basis of the patient's handwriting.

That this superiority may be largely spurious is shown by the fact that when the possibility of judgement based on external factors is removed as (3) in the case of the questionnaire, the graphologist's judgements are significantly more correct than those of the mosaic expert.

This distinction may justify a more detailed discussion. An analysis of the projective material used in the two experiments will explain the discrepancy and at the same time throw light on some of the difficulties of the matching technique when employed as a

validation method. The graphologist's test material consisted of the handwritings of a number of subjects. The contents were standardized words. Her material therefore differed in form only from one subject to another. In the case of the mosaics, we find individual differences of form as well as of content. The content of the design, although intimately bound up with the interests and personality of the subject and as such a true projection, can still be considered as an 'external' factor. (External in the sense that it enables the matcher to find the direct correlate to the subject-matter in the write-up of the patient, e.g. the example quoted with reference to M. Kerr's experiment.) In a number of cases, particularly in those where the subjects constructed designs of concrete objects, the matchings were determined by the content of the mosaic rather than by its form and use of colour. In order to evaluate what the mosaic expert can do in cases where no helpful indication as to the interests and occupation of the subject are given by the subject-matter, the results of the questionnaire experiment and of the matchings by the graphologist and mosaic expert respectively ought to be considered together.

Similar spuriously good results might be obtained with the matching technique for projective tests such as the Rorschach and the Thematic Apperception Test, both tests in which the content of the subject's responses shows great individual variations. Sufficient can be learned from the content of the performance to enable correct matchings to be made on the basis of the subject's hobbies and occupation rather than on the basis of a detailed personality assessment.

It is therefore important to place the findings into the right perspective by such additional technique as counter matchings by the psychiatrists or the questionnaire method used in these experiments.

PART II

Two mosaics were obtained from 100 male neurotic patients under the conditions de-

scribed in Part I. The patients fall into these three clinical groups: thirty hysterics, thirty-one dysthymics, thirty-nine effort syndrome patients. This classification demands a certain amount of justification. Dysthymia is a term which was coined originally to cover patients suffering from anxiety, depression, and/or obsessional symptoms. This syndrome was shown to have functional unity, and to be opposed to a hysterical syndrome in a factorial study carried out on 700 patients at Mill Hill Emergency Hospital. This factorial study was based on thirty-nine trait ratings made by the psychiatrists in charge of the patients<sup>(8)</sup>. We fully realize that effort syndrome is not a clinical entity, similar in kind to the other two syndromes, but merely a

In Tables 1-7 the two mosaics per subject have been considered as two separate designs—there are therefore 200 designs. Hysterics constructed a significantly smaller number of concrete designs than the other clinical groups.

A second criterion of classification is the outlay of the design on the board. This can be either compact, scattered or intermediate. A compact design is one where all the elements are fitted closely together; a scattered design is one in which the pieces stand apart from one another; an intermediate design occupying a position between these two extremes. 60 % of the dysthymics made up designs of the compact type. The difference between the outlay of their designs and those of the hysterics is statistically significant.

Table 1

	No. of concrete designs	No. expressed as percentage	No. of abstract designs	No. expressed as percentage
Hysterics	12	20	48	80
Dysthymics	23	37	39	63
Effort syndrome patients	33	42	45	58

Table 2

	Compact		Scattered		Intermediate	
	No. of designs	%	No. of designs	%	No. of designs	%
Hysterics	16	27	7	12	37	61
Dysthymics	37	60	10	16	15	24
Effort syndrome patients	30	38	14	18	34	44

symptomatic classification of heuristic value allied to the dysthymic syndrome.

The designs were analysed in accordance with the criteria given by Dr Lowenfeld. The use of colour was investigated and comparisons made between the first and second design of each subject. Finally, six judges ranked the patterns for their aesthetic quality and correlations were run between aesthetic ability and intelligence.

According to Dr Lowenfeld, patterns can be divided into concrete and abstract ones. 'Concrete is the name given to a type of pattern which represents a person, animal, object or scene. Under this heading are also included the patterns which are symbols of abstract ideas.'

Hysterics' designs were predominantly of the intermediate type. There was no significant difference in the number of scattered designs in the various clinical groups.

Preference for certain colours was investigated. Dr Lowenfeld reports that in children and young people the use of many black pieces is associated with depression, and that designs edged with projecting red pieces tend to be made by excitable and impulsive people. In the present analysis the percentage of pieces used in each of the six colours is given.

No significant difference was found between the groups in the percentages of each colour used. These findings therefore do not support the theory that bright colours are predominantly used by hysterics while dys-

thymics tend to prefer blue and black. In order to analyse this problem of preference of red versus blue and black further, each subject was given an 'index of red preference'. This was worked out in the following way. The percentage of red used was doubled and divided by the combined percentage of blue and black colours used. While all groups

The record sheet (Appendix A) indicates whether the subject planned the design before starting on it, whether the plan was developed in the course of construction, or whether the design was made haphazardly, without any definite plan.

A significantly higher percentage of subjects in the effort syndrome group constructed

Table 3

Percentage of each colour used in making the design

	White	Yellow	Black	Red	Green	Blue
Hysterics	12	16	19	19	16	18
Dysthymics	12	19	15	20	13	20
Effort syndrome patients	11	15	20	20	17	17

Table 4

	No. of cases where no red was used	No. of cases where no black or blue used	Average index of red preference
Hysterics	10	3	1.34
Dysthymics	13	2	1.38
Effort syndrome patients	10	7	1.18

Table 5

Percentage in each group who used 40% or more of the pieces in one colour

Hysterics	27
Dysthymics	26
Effort syndrome patients	41

Table 6

Percentage of subjects per group

	Planned beforehand	Planned in course	Not planned
Hysterics	25	32	43
Dysthymics	21	27	52
Effort syndrome patients	18	12	71

showed a preponderance of red over blue and black there was no significant difference between the groups as to the degree of 'red preference'.

The designs were further divided into those where 40% or more of the pieces used were of one colour and those where there was no such colour dominance. While effort syndrome patients showed a higher percentage of one-colour dominant designs, none of the differences were statistically significant.

a design without any fixed plan than did the hysterics.

Comparisons between the first and second design of each subject were made. Dr Lowenfeld claims that 'current changes of mood are reflected in the design by change of colour and alteration of detail, but these are superimposed upon a basic design which remains constant'.

Two criteria of reliability were selected: (1) that of the number of pieces used per



design, and (2) that of the number of colours used. Both correlations are very significantly positive,  $+0.646 \pm 0.04$  P.E. and  $+0.490 \pm 0.05$  P.E. respectively.

Table 7 gives the percentage of subjects per group who constructed the same pattern and

Table 7

	% with same pattern	% with different pattern
Hysterics	57	43
Dysthymics	61	39
Effort syndrome patients	59	41

those who constructed a different pattern. Similarity of pattern was assessed on the basis of the design being concrete or abstract. There was a tendency for the same pattern to recur. The differences between the groups were not significant.

Using outlay of design on the board as criterion of similarity we find that in a large number of subjects the same outlay tended to be selected for both designs (Table 8).

Table 8

	% of subjects with same position in both designs	% of subjects with different positions in the two designs
Hysterics	57	43
Dysthymics	48	52
Effort syndrome patients	64	36

The relationship between intelligence scores and aesthetic quality of the mosaics was examined. For this purpose, six judges ranked the mosaics for their aesthetic quality (the first design of each subject was used). The average intercorrelation coefficient between the rankings of the six judges was  $+0.454$ . We can calculate from this value the correlation of the average order of ranking given by the six judges with the 'true order', i.e. the ranking given by an infinite number of judges, by means of a formula given by one of us<sup>(9)</sup>. This correlation was  $+0.91$ ; we may therefore conclude that the empirical average ranking

has considerable validity. Each subject was then assigned a score on the basis of the average rank obtained. The correlation between this score and the intelligence score turned out not to be significant ( $r = -0.181 \pm 0.07$  P.E.). Correlation between intelligence score and number of pieces used in the design was also not significant ( $r = +0.061 \pm 0.07$  P.E.).

### Discussion

The above analysis of the designs shows that the reliability of the test is moderately high as measured by the kind of pattern produced, its outlay on the board, choice of colours and number of places used. This constancy lends some support to the theory that in projective tests there is a tendency for subjects to organize the material in a certain way corresponding, if one uses White's terminology, to the 'most readily available forces within himself'.

Contrary to expectation, we have found no significant correlation between aesthetic ability in the construction of mosaics and intelligence.

We have been able to show that certain significant differences in the designs of hysterics, dysthymics and effort syndrome patients can be brought out on the basis of objective criteria only. These differences were found to be significant both with regard to the content of the pattern, and to its outlay on the board. This type of objective analysis seems to offer a useful approach to projective tests.

### SUMMARY AND CONCLUSIONS

An experimental analysis was undertaken of the 'mosaic' projection test, in which the subject is required to make up patterns from coloured pieces of wood, available in various shapes. The type of pattern produced is claimed to be related in various ways to the personality-structure of the subject. The analysis falls into two main parts: (1) a validation study of the claim that it is possible to relate patterns created in the manner described above to personality structure, and (2) an experimental study of various aspects of the

pattern (use of colour, method of construction, etc.) as related to neurotic syndromes.

(1) The validation study was carried out mainly by means of the matching technique. An expert mosaic interpreter matched the mosaics of fifty neurotic patients against their case notes (five mosaics were matched against five 'write-ups'); she also filled in a questionnaire regarding various personality traits of the patients. This she did on the basis of her interpretation of the mosaics and it was then compared with the answers given by the patient to the same questionnaire. The expert wrote a personality sketch of each patient, based on his mosaic; the personality sketches were then matched by the doctor in charge of the patient (again matchings in groups of five). Lastly, psychiatrists and psychologists without previous knowledge of the technique of mosaic interpretation tried to match ten mosaics, in two groups of five, against personality sketches.

The results revealed that the expert could match mosaics and personality sketches with better than chance success; could write personality sketches from mosaics which were matched by the doctors with better than chance success; but failed in giving above chance correct judgements on the questionnaire. Non-experts failed in matching mosaics and personality sketches with greater success than one would expect by chance. The success of the expert was considered to be partly, but not wholly, due to the possibility of matching by *content*, a possibility which is an important factor in estimating the relative success of the mosaic expert as compared with a graphological expert similarly tested.

(2) Two designs were obtained from 100 male neurotic army patients who fell into three main clinical groups: (a) hysteria, (b) dysthymia, (c) effort syndrome. Certain statistically significant differences were found between patients suffering from hysteria, and patients suffering from dysthymia, both with regard to content of the design (concrete *v.* abstract) and to outlay of the design on the board. No such differences were found with regard to use of colour by the two groups.

A study of the reliability of the test was made by comparing the first and second designs produced by the subjects. Significant correlations were found with regard to number of pieces used, choice of colour, similarity of pattern, outlay of design on the board, and content of pattern. A study of the aesthetic quality of the patterns did not reveal any significant relation with intelligence. The objective methods used in this part of the experiment did not bear out to any considerable extent the theories on which the test was based, but do suggest that further studies along these lines may increase the facility with which patterns of this kind may be interpreted.

This investigation was carried out with the help of a Rockefeller grant. We are also indebted to the Superintendent of Mill Hill Emergency Hospital, Dr W. S. Maclay, for his permission to use the clinical material at the hospital. Lastly it is a pleasure to record our gratitude to those psychiatrists and psychologists whose kind assistance made the successful completion of this study possible.

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APPENDIX A

Record sheet

	Test 1	Test 2		Test 1	Test 2
<i>Order in which colours are introduced:</i> Note colours in order in which they are introduced, cross out any that are removed—if another colour is put in its place, note the new colour next to the one that has been removed.	1. Yellow	1. Red	<i>Plan of construction:</i> (a) Planned beforehand. (b) Planned in course. (c) No plan.	C	C
	2. Blue	2. Black		.....	.....
	3. Red	3. Blue	<i>Behaviour:</i> (a) Hesitant. (b) Quick. (c) Frequent changes. (d) Careful movements.	B	A and D
	4. White	4. White		.....	.....
	5. Green	5. Yellow	<i>What does it suggest to subject:</i> Hearthrug    Nothing		
	6.	6. Green		.....	.....
<i>Method of construction:</i> (a) From centre outwards. (b) From base upwards. (c) From top downwards. (d) Crosswise. (e) Frame first, filled in later. (f) Started design at edge of board.	A	A	<i>Describe:</i> <i>At finish:</i> (a) Satisfied. (b) Dissatisfied.	B	A
	.....	.....		Because	.....
				choice of	
				colours	
				too restricted.	

APPENDIX B. QUESTIONNAIRE

Personality Inventory

This sheet contains some questions concerning your usual behaviour and your customary attitudes in a variety of situations. Please answer them *carefully* and *truthfully*; do not try to make yourself appear either better or worse than you are. The questions are always concerned with your *present behaviour and attitudes*, unless otherwise stated. You are not required to write anything; just underline that one of the answers printed after each question (either Yes or No) which agrees most closely with your own estimate of yourself as you are at the moment. *Answer each question* to the best of your ability.

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|--|-----|----|--|
| 1. Are you more interested in sports than in intellectual things, such as books, politics, theatre, music, etc.?                   | Yes | No |  |
| 2. Do you have a particular dislike of being 'bossed' and ordered around generally?  | Yes | No |  |
| 3. Do you usually feel like 'kicking up hell' when you don't get a square deal, or when you feel you are being taken advantage of? | Yes | No |  |
| 4. Do you like and enjoy having responsibility (as a foreman or N.C.O., for instance)?   | Yes | No |  |
| 5. Are you inclined to worry over possible future misfortunes that may happen to you?  | Yes | No |  |
| 6. Do you often act on the impulse of the moment?  | Yes | No |  |
| 7. Are you inclined to ponder over your past?  | Yes | No |  |

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|---|-----|----|--|-----|----|
| 8. Do you tend to be very conscientious in your work?             | Yes | No | 22. Do you like meeting new people, and look forward to it?  | Yes | No |
| 9. Do you often try and watch your own mind at work?              | Yes | No | 23. When you and your friends are doing something, do you often take the lead?   | Yes | No |
| 10. Do you enjoy thinking about complex and complicated problems? | Yes | No | 24. Do you have frequent ups and downs in mood?  | Yes | No |
| 11. Do you adapt yourself easily to new conditions?               | Yes | No | 25. Are your feelings easily hurt?   | Yes | No |
| 12. In exciting situations, do you get rattled easily?            | Yes | No | 26. Do you express such emotions as delight, sorrow, etc. readily?   | Yes | No |
| 13. Do you often lack self-confidence and feel inferior?          | Yes | No | 27. When you are out with your friends, do you enter into the fun whole-heartedly?   | Yes | No |
| 14. Do you often feel self-conscious?                             | Yes | No | 28. Would you prefer going through thrilling experiences and adventures yourself to reading about them, or to seeing them at the pictures? | Yes | No |
| 15. Are you easily distracted from your work?                     | Yes | No | 29. Do you worry about your health whenever you feel off-colour?   | Yes | No |
| 16. When you are sitting or lying down, can you relax easily?     | Yes | No | 30. Are you easily put off by difficulties?  | Yes | No |
| 17. When something unexpected happens, are you easily startled?   | Yes | No | 31. Do you tend to be influenced by other people's opinions?   | Yes | No |
| 18. Do you often sleep badly?                                     | Yes | No | 32. Have you original or unconventional ideas on any subject?  | Yes | No |
| 19. Are you quick and agile, bodily?                              | Yes | No |  |     |    |
| 20. Do you often rush from one activity to another?               | Yes | No |  |     |    |
| 21. When out with your friends, do you usually talk a lot?        | Yes | No |  |     |    |

## APPENDIX C

'X.' Intelligence good. Strong obsessional tendency. Anxious in front of new situation, becomes driven by anxiety. Might be loquacious when anxious but can be concise and to the point. Good conventional routine mind, thorough, well able to carry through a complicated job. Can organize in a practical way but would be liable to be upset in an emergency and becomes over-fussy. Would try hard and be a reliable employee. Probably stable when not faced with change and responsibility.

'Y.' Intelligence probably grade 4. He is fundamentally stable, uncreative and very limited. A nice person and presents a good facade. He is, however, precariously balanced, easily put off by difficulties and gets depressed. A dependant personality who needs support and would feel inferior amongst superiors. Could not take responsibility and needs a job where the limits are exactly defined, which is not too complicated and

where the unexpected does not happen. The state of delicate balance in which he finds himself is probably due to circumstances and is not fundamental.

'Z.' Intelligence average. He likes change and variety up to a point. He himself is changeable and one would never know in what mood one would find him. He is unco-ordinated, so tends to contradict himself. He displays the correct feelings for the occasion. He is what one might call a conventional unconventional, there is nothing subtle about him. Likes display of a crude kind such as window-dressing or jazz. He is capable in a practical way and is tidy and efficient within his limits, but would be no good in a routine job or in a job of real responsibility. He might be a salesman as long as the job went well, as he wants a quick return for the effort he makes. He is easily crushed but soon revives.