AN EXPERIMENTAL INQUIRY INTO SOME ASPECTS OF THE MOTOR BEHAVIOUR AND PERSONALITY OF TIQUEURS.

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I. Introduction.

Tics are involuntary, repetitive or stereotyped movements which apparently lack purpose and which, with adults, tend to be permanent or long-term abnormal aspects of the individual's motor behaviour. The question arises whether certain basic psycho-motor and personality traits characterize persons who develop tics. No previous experimental work on this problem has been reported. In the present research, therefore, a preliminary attempt was made to describe precisely, by the use of psychological tests, certain aspects of the motor behaviour and some of the personality characteristics of tic patients and to compare the results with a similar examination carried out on matched, but non-tic, control patients.

II. Subjects.

Nine tiqueurs and 9 controls were examined, this being all the adult tiqueurs that entered this hospital during the year in which this study was carried out. The movement disorders from which the tic group suffered included facial tics, widespread involuntary movements, especially of the upper limbs, and Gilles de la Tourettes syndrome. Some of the tics were apparently of organic origin, e.g., those following chorea ; in others no organic basis could be discovered. The clinical condition of the patients in which these movement disorders occurred included schizophrenia, anxiety state, Sydenham's chorea, obsessive compulsive neurosis. Each of the tic patients was matched with a patient who could be used as a control. Sex, age, intelligence and clinical status were considered to be essential matching variables. With clinical matching, however, it is very difficult to match exactly, and so attention was paid particularly to matching for severity of illness. That this was achieved is supported by the scores of the two groups on an objective test of Eysenck's factor of " neuroticism " or emotional instability. On this test the Word Connection List (Crown, 1952), which is a controlled association test, the distribution of scores of the tiqueurs ($11 \cdot 8 \pm 4 \cdot 2$) and the controls ($11 \cdot 4 \pm 3 \cdot 0$) did not differ significantly. The matching for age and intelligence was also reasonably successful. The age distribution of the tiqueurs was $31 \cdot 2 \pm 5 \cdot 2$, for the controls $33 \cdot 7 \pm 5 \cdot 0$. The Progressive Matrices Test (Raven) was used whenever possible to match for intelligence using an I.Q. conversion table computed in this department. On four cases this was not possible, and the results on other tests, whose mean I.Q. is 100 and whose S.D. is approximately 16 points, were used. The mean I.Q. of the tiqueurs was $105 \cdot 3 \pm 7 \cdot 0$; of the controls $108 \cdot 4 \pm 6 \cdot 2$. Statistical tests showed that for neither age nor intelligence did the groups differ significantly.

III. Tests and Results.

The tests used may be considered in three categories : tests of skilled movements, tests of " expressive " movement, and a miscellaneous group of movement and personality tests. By " expressive " movements are meant individual peculiarities in the manner of performing adaptive acts (Allport, 1937). Short descriptions of all tests and of methods of administration and scoring will be given in this paper. Details of these, or similar, procedures may be obtained from the references quoted or directly from me.

The statistical analysis of each test consisted simply in computing the probability that the two samples came from the same population, taking into account the fact that the two groups were matched. This is allowed for in each of the significance tests by comparing the score of each person in the tic group with the score of his

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matched control and making up a difference (D) column. The hypothesis to be tested is that the mean of the D-column is significantly different from zero. It is usual to do this using the *t*-test. In the present research Lord's (1947) modified *t*-test was used,* in which the test of significance is based on the use of the sample range rather than on the sample standard deviation. Using the D-column just referred to, the formula used is as follows :

$$\frac{\Sigma \text{ D}}{\text{R} \times \text{N}},$$

Where

Σ D = sum of differences.
R = Range (highest—lowest D score).
N = Number of differences.

The ensuing number is then checked for significance using the Table 9 given by Lord. This significance test is slightly less efficient than the more usual *t*-test. It is, however, considerably easier to compute and, where the number of tests in an investigation is large, and the number of persons tested is small, is a useful significance test.

A. *Tests of Skilled Movement.*

(1) *Triple Tester* (Eysenck, 1947).

This is a type of pursuit-meter in which a " vehicle," in the form of a bronze ball, is steered along a line of holes in a brass drum which is rotating towards the S. The aim is to hit as many holes as possible. The apparatus is designed so that the response of the vehicle to the steering wheel is delayed and the S has, therefore, to anticipate the necessary moves. After a 30-sec. practice period the S does the task 4 times and the score is the average number of hits over the 4 trials :

$$\text{N} = 6 \quad \text{M}_\text{T} = 96{\cdot}0 \quad \text{M}_\text{C} = 71{\cdot}5 \quad \text{s} = 28{\cdot}0 \quad \text{P} = 0{\cdot}10,$$

where

N = Number of pairs.†
M_T = Mean of tiqueurs.
M_C = Mean of controls.
s = an estimate of the standard deviation of the D-column. Both this estimate and the tests of significance are based on the sample range instead of the sample standard deviation (cf. Lord, 1947).
P = Level of significance.

(2) *Mirror Drawing* (Eysenck, 1952).

The S is shown the apparatus, and it is demonstrated that when the apparatus is in position in front of him and his hand is in position on the base he cannot see his hand directly, but only in the mirror. A star shape is shown to the S in position on the base of the apparatus. His pencil is placed on the starting-point and he is told to trace round the star between the lines as quickly as possible. Six trials. Two scores : average time, 5 trials (first trial excluded) ; number of relapses :

Time .	N = 7	M_T = 43·3	M_C = 73·7	s = 27·4	P = 0·05.
Relapses .	N = 7	M_T = 0·9	M_C = 0·4	s = 1·1	P = Not significant (N.S.).

(3) *Dotting* (Culpin, 1931).

The apparatus, based on the McDougall-Schuster dotting apparatus, consists of an oblong box at the top of which is a small aperture beneath which passes a paper tape upon which small circles are irregularly spaced. The size of the aperture and the speed of the tape can be regulated. In the present experiment the size of the aperture was kept constant. With the speed at its slowest the task was explained to the S ; he was told that he was to try to tap as many dots as he could, and he

* I am indebted to Mr. A. S. C. Ehrenberg of this Institute for bringing the method to my attention.

† For practical reasons it was not always possible to test or to score all the subjects on every test.

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was given a ½-min. practice period. Then he was given five ½-min. trials at increasing speeds and scored for the average number of hits over 5 trials:

$$N = 3 \quad M_T = 35 \cdot 0 \quad M_C = 15 \cdot 7 \quad s = 3 \cdot 5 \quad P = 0 \cdot 01.$$

(4) *R/V Manual Dexterity.*

This dexterity test of the National Institute of Industrial Psychology, consists of putting ball-bearings into holes, on the first trial with tweezers, the second trial with a scoop, and lastly between finger and thumb. Score is the total of the three attempts:

$$N = 2 \quad M_T = 50 \cdot 0 \quad M_C = 43 \cdot 0 \quad s = 19 \cdot 5 \quad P = \text{N.S.}$$

B. *Tests of Expressive Movement* (Eysenck, 1952).

(5) *Three Circles.*

The S was handed a clean piece of paper and asked to draw three circles. Scoring as below.

(6) *Three Squares.*

The paper with the circles on was reversed and the S asked to draw three squares on the other side. Scoring as below:—time in seconds, measures in mm.:

Circles:

Time .	. $N = 9$	$M_T = 4 \cdot 6$	$M_C = 9 \cdot 7$	$s = 9 \cdot 8$	$P =$ N.S.
Largest diam.	. $N = 9$	$M_T = 19 \cdot 4$	$M_C = 30 \cdot 4$	$s = 38 \cdot 4$	$P =$ N.S.
Smallest diam.	. $N = 9$	$M_T = 14 \cdot 4$	$M_C = 20 \cdot 7$	$s = 24 \cdot 6$	$P =$ N.S.
Average diam.	. $N = 9$	$M_T = 17 \cdot 1$	$M_C = 25 \cdot 8$	$s = 31 \cdot 6$	$P =$ N.S.

Squares:

Time .	. $N = 9$	$M_T = 8 \cdot 7$	$M_C = 14 \cdot 4$	$s = 12 \cdot 1$	$P =$ N.S.
Largest diag.	. $N = 9$	$M_T = 28 \cdot 6$	$M_C = 38 \cdot 8$	$s = 49 \cdot 8$	$P =$ N.S.
Smallest diag.	. $N = 9$	$M_T = 22 \cdot 9$	$M_C = 32 \cdot 2$	$s = 36 \cdot 0$	$P =$ N.S.
Average diag.	. $N = 9$	$M_T = 26 \cdot 0$	$M_C = 35 \cdot 3$	$s = 42 \cdot 4$	$P =$ N.S.

(7) *Estimating Distances.*

The S is asked to indicate what he considered 2-foot distance was by placing two matches two feet apart on the table. Then one foot; then 8 inches, so that there are four matches on the table. These distances are measured and recorded. Scoring, in quarter-inch units, as below:

Overestimation, 3 tests	. $N = 7$	$M_T = 14 \cdot 7$	$M_C = 9 \cdot 1$	$s = 13 \cdot 3$	$P =$ N.S.
Underestimation, 3 tests	. $N = 7$	$M_T = 4 \cdot 6$	$M_C = 5 \cdot 1$	$s = 8 \cdot 5$	$P =$ N.S.
Error, 8-in. estimate	. $N = 7$	$M_T = 4 \cdot 0$	$M_C = 3 \cdot 0$	$s = 3 \cdot 0$	$P =$ N.S.
,, 1-ft estimate	. $N = 7$	$M_T = 5 \cdot 3$	$M_C = 4 \cdot 4$	$s = 5 \cdot 9$	$P =$ N.S.
,, 2-ft. estimate	. $N = 7$	$M_T = 10 \cdot 0$	$M_C = 7 \cdot 0$	$s = 9 \cdot 2$	$P =$ N.S.
Total error . .	. $N = 7$	$M_T = 19 \cdot 3$	$M_C = 14 \cdot 4$	$s = 16 \cdot 6$	$P =$ N.S.

(8) *Waves.*

A sheet of foolscap size, squared paper with 4 V's marked at precise places, is given to the S. In each of four trials the S is required, first, with the eyes open, to trace over a V; then with eyes closed, to make six more V's along the same line and, as far as possible, the same size. The arm is kept up all the while, only the pencil touching the paper. Two scores were derived: for amplitude (average of 1st and last amplitude of 4 sets of waves, i.e., of 8 measures altogether); and for wave-length (average wave-lengths of all 4 sets, measured parallel to edge of paper). Measures in mm.:

Amplitude	. $N = 9$	$M_T = 23 \cdot 3$	$M_C = 23 \cdot 1$	$s = 3 \cdot 7$	$P =$ N.S.
Wave-length	. $N = 9$	$M_T = 91 \cdot 7$	$M_C = 87 \cdot 1$	$s = 20 \cdot 5$	$P =$ N.S.

(9) *Reading Prose.*

The subject was asked to read aloud a piece of prose. Score:—time in secs.

$$\text{Time} \; . \; N = 8 \quad M_T = 28 \cdot 2 \quad M_C = 26 \cdot 2 \quad s = 6 \cdot 0 \quad P = \text{N.S.}$$

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(10) *Tapping.*

Tapping with a pencil on a sheet of paper for two trials of 15 sec. each. Score: Average number of taps made. Instruction is *not* to tap as fast as possible; score therefore, represents natural tempo rather than maximum rate:

$$N = 9 \quad M_T = 54\cdot8 \quad M_C = 53\cdot4 \quad s = 34\cdot0 \quad P = \text{N.S.}$$

C. *Miscellaneous Tests.*

(11) *Body Sway* (Eysenck, 1947).

A simple apparatus of the string and pulley type is arranged to record the S's forward and backward sway. Two scores are obtained: static ataxia, when the maximum forward sway during a 30-sec. period is added to the maximum backward sway, the S being told simply to stand quite still with his eyes closed; and suggestibility, in which the score is maximum backward or maximum forward sway during 1 minute, whichever is the greater, the S being continuously told by the E during this period that he is falling forward:

Static ataxia .	$N = 5$	$M_T = 2\cdot1$	$M_C = 0\cdot8$	$s = 1\cdot7$	$P =$ N.S.
Suggestibility .	$N = 5$	$M_T = +1\cdot9$	$M_C = +1\cdot0$	$s = 2\cdot1$	$P =$ N.S.

(12)

In this test* an attempt is made to obtain a measure of ideo-motor tendency, the aim of the test being partly disguised. The testees are asked to tell the examiner what certain words mean, the words being chosen because they are suggestive of movement, e.g., rattle, kick, punch, juggle, flinch, throw, etc. There are 21 words, and score consists in the number of words in which any form of gesture, accompanies the definition:

$$N = 5 \quad M_T = 5\cdot8 \quad M_C = 3\cdot6 \quad s = 7\cdot3 \quad P = \text{N.S.}$$

(13) *Perseveration* (Eysenck, 1952).

A quarto-sized sheet of plain paper is placed horizontally in front of the S. He is required to write a series of S's, as many as he can, for 15 seconds (period A), then a series of S's reversed for 15 seconds (period B), followed by a 30-second period (period C) in which he writes alternately one S followed by an S reversed, as many as he can. Score:—$\frac{A + B}{C}$:

$$N = 8 \quad M_T = 1\cdot7 \quad M_C = 1\cdot7 \quad s = 0\cdot7 \quad P = \text{N.S.}$$

(14) *Luria Test.*

The S sits in front of the Luria apparatus and is told that, when a word appears in the aperture in front of him he must respond with the first word that comes into his mind. At the same time he should jab downwards a plate on which his right hand rests. His left hand he is told just to keep resting on the appropriate plate. A 30-word list is used. Continuous records are obtainable: from the right hand (a series of V's, i.e., whenever the S jabs downward, which may be scored for various indices of motor disturbance); from the left hand; and of the time of presentation of the stimulus, and of the time of the verbal response. Scores† as follows:

Right hand:

Average width . .	$N = 6$	$M_T = 1\cdot6$	$M_C = 1\cdot0$	$s = 0\cdot6$	$P = 0\cdot05$
$\frac{\text{Range}}{6}$ . . .	$N = 6$	$M_T = 0\cdot2$	$M_C = 0\cdot0$	$s = 0\cdot1$	$P = 0\cdot02$
Average amplitude .	$N = 5$	$M_T = 21\cdot0$	$M_C = 17\cdot7$	$s = 5\cdot7$	$P =$ N.S.
$\frac{\text{Range}}{6}$ . . .	$N = 5$	$M_T = 0\cdot8$	$M_C = 0\cdot8$	$s = 0\cdot6$	$P =$ N.S.
Number of disturbances‡ . .	$N = 4$	$M_T = 6\cdot7$	$M_C = 1\cdot8$	$s = 8\cdot3$	$P =$ N.S.

* Devised by Dr. P. Sainsbury of this Institute.

† The scoring is based on a method devised by Messrs. J. Standen and G. Thorpe of this Institute.

‡ Number of motor disturbances between presentation of stimulus and motor response or during response but not after response.

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Number of changes of base line .	. $N = 2$	$M_T = 5{\cdot}5$	$M_C = 4{\cdot}0$	$s = 13{\cdot}3$	$P = $ N.S.
Number of motor failures . .	. $N = 4$	$M_T = 0{\cdot}5$	$M_C = 0{\cdot}0$	$s = 1{\cdot}0$	$P = $ N.S.

Left hand :

Number of disturbances† .	. $N = 5$	$M_T = 8{\cdot}2$	$M_C = 8{\cdot}2$	$s = 15{\cdot}5$	$P = $ N.S.
Average verbal reaction time (mm.) .	. $N = 6$	$M_T = 6{\cdot}2$	$M_C = 5{\cdot}2$	$s = 2{\cdot}7$	$P = $ N.S.
$\frac{\text{Range}}{6}$ . .	. $N = 6$	$M_T = 2{\cdot}3$	$M_C = 2{\cdot}0$	$s = 1{\cdot}3$	$P = $ N.S.
Average discrepancy between motor and verbal R.T. (mm.)	. $N = 6$	$M_T = 3{\cdot}2$	$M_C = 3{\cdot}8$	$s = 2{\cdot}9$	$P = $ N.S.
$\frac{\text{Range}}{6}$ . .	. $N = 6$	$M_T = 0{\cdot}7$	$M_C = 0{\cdot}8$	$s = 1{\cdot}1$	$P = $ N.S.

(15) *Level of Aspiration* (Himmelweit, 1947).

The mirror drawing test (Test 2) was also used to get a measure of level of aspiration. The time for the first trial was recorded and the S was asked to guess how long he took (judgment). Also, how long he thought he would take the next time (aspiration). This procedure was repeated for all the trials. Discarding the first trial, three scores were used : average goal discrepancy score (average discrepancy between performance and aspiration) ; average judgment discrepancy score (average discrepancy between performance and judgment) : index of flexibility (number of times the aspiration level was changed).

Goal discrepancy .	. $N = 6$	$M_T = +2{\cdot}2$	$M_C = +14{\cdot}5$	$s = 8{\cdot}3$	$P = 0{\cdot}02$
Judgment discrepancy	. $N = 6$	$M_T = -4{\cdot}2$	$M_C = +7{\cdot}3$	$s = 6{\cdot}7$	$P = 0{\cdot}01$
Flexibility . .	. $N = 6$	$M_T = 3{\cdot}2$	$M_C = 3{\cdot}5$	$s = 0{\cdot}8$	$P = $ N.S.

(16) *Rosenzweig P-F Study* (Rosenzweig *et al.*, 1947).

The picture-association study is a projective technique for assessing reactions to frustration. The test consists of a series of pictures of persons in frustrating situations, e.g., being splashed by a car, being woken by the telephone in the night, being stopped by a policeman for a motoring offence, etc. The testee is asked to supply what one person in each situation would say, the assumption being that the testee, consciously or unconsciously, identifies himself with the frustrated individual in each pictured situation and projects his own bias in the replies given. No elaborate scoring was carried out in the present study. Each response in the records of the tiqueurs and controls was simply scored for direction of aggression, using Rosenzweig's Revised Scoring manual in making decisions where possible. The responses were scored E = extrapunitiveness (aggression is turned onto the environment) ; I = intropunitiveness (aggression is turned by the S upon himself) ; and M = impunitiveness (aggression is evaded in an attempt to gloss over the frustration). Score consists in the total number of each type of response given by the S :

E .	$N = 3$	$M_T = 7{\cdot}3$	$M_C = 9{\cdot}3$	$s = 1{\cdot}8$	$P = $ N.S.
I .	$N = 3$	$M_T = 5{\cdot}7$	$M_C = 5{\cdot}0$	$s = 1{\cdot}8$	$P = $ N.S.
M .	$N = 3$	$M_T = 7{\cdot}0$	$M_C = 5{\cdot}7$	$s = 1{\cdot}2$	$P = $ N.S.

IV. Discussion.

Despite the small numbers, certain findings seem to the writer suggestive. This discussion is based, firstly, on differences which are significant at less than the 10 per cent. level of probability ; and secondly, on groups of differences which, although individually are not significant, are consistently in an expected direction.

The most clearly supported finding is that the tiqueurs are consistently better in their performance on the tests of skilled movement than the controls. On the

† Number of motor disturbances between presentation of stimulus and verbal response.

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Dotting and Mirror Drawing tests this difference reaches the usually accepted levels of significance, on the Triple Tester the difference was significant at the 10 per cent. level, and on the R-V Manual Dexterity test the difference, while not significant, was in the same direction. These findings will be discussed in connection with the results from the Luria test.

On the tests of expressive movement no significant differences are found on any measure. Nor are the direction of the changes consistent in any way suggestive of worth-while hypotheses. The battery includes a variety of objectively scorable tests of expressive movement, including tests indicative of expansiveness and speed in drawing simple shapes; tendency to over- or under-estimate distances; a test (Waves) which appears similar to those of Mira (1940); and, lastly, two tests of personal tempo, reading prose and tapping. The variety of tests included makes the more significant the lack of differences in results between the two groups. It seems doubtful whether tiqueurs show peculiarities of expressive movement which are worth investigating further.

Of the remaining tests, the most complex motor test was the Luria test. A variety of measures was taken from this test, but those which appear to be of the greatest interest are those showing disorganization of right-hand voluntary movement. There is no difference between the groups on the measure of left hand involuntary disturbance; and, of the measures making use of reaction times, no consistent findings emerge. Of the seven measures of disorganization of right-hand voluntary movement, two differentiated between the groups significantly, the tiqueurs tending both to make wider V's with the right hand and to be more variable on this measure. The direction of all except one of the remaining five right-hand indices also suggest that the tiqueurs show a greater degree of disorganization, with emotion, of voluntary motor performance than the controls. This finding is of interest when it is remembered that it was also found that the tiqueurs are consistently better in their performance on tests of skilled movement than the controls. Future research should be directed towards finding out what it is in the psycho-physical make-up of tiqueurs which makes both for skill in motor performance and for motor disorganization when under emotional stress. A number of investigators have demonstrated a relationship between muscular tension and motor learning (Hovland, 1951). This finding, together with those of the present study, suggests that the systematic investigation of the relation between muscular tension and tics should prove a fruitful line for future investigation. Both physiological (electromyographic) measures of tension and behavioural measures (psychological tests) should be used. A matched group design is probably the most efficient for exploratory purposes, and tics with a discoverable organic basis should be investigated separately from those resulting from psychological causes. It would also seem wise to use as many measures as possible of tension reactions: tension at rest, tension when under emotional stress and change from resting to stress conditions.* In light of the results from the present investigation, the last of these measures seems especially important.

Of the other motor tests in the battery, three may be mentioned which were included as measures of ideomotor action (i.e., the tendency of an idea, or image, of movement to produce the precise movement imagined or a modified form of it). The strength of this tendency may be expected to be greater in persons who have developed motor disorders, rather than disorders of the other bodily systems. The tests particularly concerned are test 12, where the definitions of words suggestive of movement are asked for, and the suggestibility score on the Body Sway test. The test of static ataxia may also be included here if, as Eysenck (1947) has suggested, this test includes an element of auto-suggestion. Although none of the differences between the groups on these tests are significant, they are all in the same direction, the tiqueurs tending to make more movements when defining words, and to sway more on the Body Sway test whether this is given in the suggestion or non-suggestion form. These measures are, however, crude in their present form. The results need following up using more delicate methods of recording a person's tendency to make movements. At a physiological level the electromyograph would appear suitable, and, at a behavioural level, cine photography. Both techniques have been used in a similar connection by Sainsbury (1952).

* A research, in part along these lines, is being carried out by my colleague, Dr. P. Sainsbury.

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Finally, of the motor tests, an interesting negative result is the failure, using the Ss-test, to corroborate Angyal's (1949) finding of a relationship between perseveration and psychomotor symptoms. On this test the performance of the tiqueurs is identical with that of the controls.

On the question of the personality correlates of tics, the clinical literature suggests that tiqueurs may tend to be, what in Eysenck's (1947) terminology is called, of dysthymic temperament. This term is used by him to characterize the syndrome of anxiety, reactive depression and obsessional tendencies, and is defined in terms of objective tests which differentiate groups of dysthymic patients from groups of hysterics. In the present investigation the level of aspiration of the two groups was studied using the Mirror Drawing Test. Dysthymics would be expected to aim high, judge that they had performed poorly and be relatively inflexible in varying their aspirations. In fact, comparing the performance of the tiqueurs with that of the controls, although the second and third of these hypotheses are confirmed (the second at a statistically highly significant level) the first is disproved, also at a statistically significant level. Thus, no clear interpretation of the results of this test is possible. However, there are further lines of evidence in support of the hypothesis that the tiqueurs tend to be of dysthymic temperament. On the Rosenzweig picture-association study, although none of the differences is significant, their direction is such that the tiqueurs tend, compared with the controls, to be intropunitive, or impunitive rather than extrapunitive, that is, they tend to turn their aggression upon themselves, or to evade the aggression in an attempt to gloss over the frustration rather than turn the aggression on to the environment. Although no direct experimental evidence is available, these traits would appear consistent with the dysthymic temperament. Additional evidence may be cited from two of the tests included primarily as tests of skill, but which are known to be related to temperament. The work of Culpin (1931) strongly suggests that good performance on the Dotting test picks out persons with obsessional tendencies. Petrie (quoted by Eysenck, 1947) has shown that on the O'Connor Tweezers test given in speeded form and similar in principle to the R-V Manual Dexterity test, a dysthymic group correctly placed more pins than a group of hysterics. It may be said, therefore, that the evidence both from the personality and from certain of the motor tests is confirmatory of the hypothesis that tiqueurs tend to be of dysthymic temperament. A follow-up investigation of this temperamental correlate of tics would involve further testing, with a fuller battery of tests known to measure this personality dimension.

V. Summary.

Tests of skilled movement, expressive movement and temperament were administered to a small number of tic patients and to individually matched, but non-tic, control patients. The aim was to see whether any basic psycho-motor or personality traits could be said to characterize the tiqueurs. The results were as follows:

(1) The tiqueurs were more efficient in their performance on tests of skill. At the same time, their voluntary movement was more easily disorganized under the influence of emotion These findings suggest that the relationship between muscular tension and tics should be systematically explored.

(2) On the tests of expressive movement no pattern of performance was found to be characteristic of the tiqueurs.

(3) The tiqueurs tended to have a greater ideomotor tendency. This finding should be followed up using sensitive physiological and behavioural measures.

(4) There was confirmation from the test results of the clinical suggestion that the dysthymic temperament is a personality correlate of tics.

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