# DRUGS AND PERSONALITY

## VI. THE EFFECTS OF STIMULANT AND DEPRESSANT DRUGS UPON BODY SWAY (STATIC ATAXIA)*

By

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### 1. Introduction

In a previous study H. Holland (3) had found an increase of static ataxia under a depressant drug, as compared with a "no drug" condition, and in view of the close relation between static ataxia and the body sway test of suggestibility (1), which in turn is a frequently used measure of personality, it appeared desirable to investigate the general problem of the relation between drugs and behaviour on the ataxia test.

### 2. The Experiment

(a) *Drugs*

D-amphetamine sulphate (5 mg.), sodium amylobarbitone (90 mg.), meprobamate (100 mg.), and a placebo (225 mg. lactose) were packed in identical capsules. Three capsules of the chosen variety were administered per day, two in the morning and the third with an extra placebo capsule four and a half hours later, an hour after lunch. The incubation period allowed for each drug ($\frac{1}{2}$ hour for all but amylobarbitone which was 1 hour) was occupied in the morning by the collection of biographical data and in the afternoon by casual conversation. Testing was completed in an hour and a half. The subjects were requested to restrict their intake of tea or coffee at breakfast and were denied either at lunch.

(b) *Experimental Design*

The experimental design, a balanced incomplete block, ensured that each drug would be given once after each other drug and in each serial position as shown in Table I. The block was completed twice, once for the subjects seen in the morning and once for those seen in the afternoon. The test under discussion here was only one of several applied to the same group of subjects under identical conditions; the other tests will be discussed in later papers. The body sway test was the fifth to be carried out.

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TABLE I

*Experimental Design: Treatment Given on Day Indicated to Indicated Subjects*

| Subjects | | Days | | | |
|---|---|---|---|---|---|
| Block I (a.m.) | Block II (p.m.) | 1 | 2 | 3 | 4 |
| 1 | 2 | A | B | C | D |
| 3 | 4 | C | A | D | B |
| 5 | 6 | B | D | A | C |
| 7 | 8 | D | C | B | A |

A=Placebo, B=Amphetamine, C=Amytal, D=Meprobamate.

(c) *Subjects*

The subjects were five men and three women members of a club that limits its membership to those who can make high scores on a paper-and-pencil test of the intelligence test type. Their behaviour seemed as alert and ego-involved as this fact suggests.

(d) *Method of Measurement*

Body sway in the forward-rearward direction was measured against the movement of a spring-loaded wheel from a neutral position as a result of the increase or relaxation of a slight tension on a string between the wheel rim and the subject. The string was clipped to a belt around the subject's chest, or to his collar if it were tight. The apparatus yields three readings: (*a*) the difference between the extreme positions reached in forward and rearward sway, (*b*) the total number of alternations of direction of sway, and (*c*) the total number of times a given point on the wheel rim moved through a (short) unit of distance, which is an index of the total amount of movement.

## 3. RESULTS

The mean scores for body sway are presented in Table II. Analysis of variance of the raw scores showed three of the matrices whose means are

TABLE II

*Body Sway Scores*

| | Treatments | | | |
|---|---|---|---|---|
| *Mean Scores in Arbitrary Units:* | Placebo | Amphe-tamine | Amytal | Mepro-bamate |
| 1. Difference between extremes: | | | | |
| Eyes open (EO) .. .. .. | 1·08 | 0·89 | 1·48 | 1·13 |
| Eyes closed (EC)* .. .. .. | 1·42 | 1·19 | 2·29 | 1·18 |
| 2. Number of alternations (EO)* .. | 6·25 | 6·37 | 13·12 | 10·00 |
| (EC) .. .. | 9·87 | 11·87 | 16·62 | 14·25 |
| 3. Total movement (EO)* .. .. | 4·75 | 4·37 | 9·75 | 5·62 |
| (EC) .. .. .. | 8·37 | 10·12 | 15·87 | 9·37 |
| *Means as Percentage of Individual Totals:* | | | | |
| 1. Difference between extremes (EO) .. | 19·4 | 17·9 | 39·8 | 23·0 |
| (EC) .. | 19·2 | 23·1 | 36·3 | 21·4 |
| 2. Number of alternations (EO) .. .. | 17·5 | 17·8 | 36·7 | 28·0 |
| (EC) .. .. | 18·3 | 22·1 | 30·9 | 28·9 |
| 3. Total movement (EO) .. .. .. | 23·6 | 19·5 | 32·3 | 24·7 |
| (EC) .. .. .. | 23·4 | 19·5 | 37·5 | 19·3 |
| Average of percentage scores* .. | 20·2 | 20·0 | 35·6 | 24·2 |

* Significant by analysis of variance.

shown in Table II to be significant. These were: the difference between extremes with eyes closed, alternations with eyes open, and total movement with eyes open. As shown, all other means indicate comparable effects. Thus the matrix of mean percentage scores shown in the table is highly significant ($F=36\cdot9$ with 3/20 d.f.). The standard error of the difference between any two column means in this matrix is $1\cdot7$, so that performances under both amylobarbitone and meprobamate treatments are significantly less accurate than those under the placebo or amphetamine treatments.

## 4. Discussion

The results leave little doubt that depressant drugs have three effects. They increase the amount of forward and backward sway; they increase the number of alternations (swings forward and backward); and they increase the total amount of movement of the subjects under the conditions of the test. The stimulant drug used showed a slight tendency in the opposite direction, but this was so minute that it is doubtful if the finding could be duplicated. For all practical purposes, amphetamine in the dose administered had the same effect as the placebo. Of the two depressant drugs used, amylobarbitone was more potent, in the dosage used, than was meprobamate.

Many hypotheses could be advanced to account for these results. It may be possible to link up the findings with the general theory of excitation-inhibition (2) along the following lines. The maintenance of body posture requires a constant adjustment of the relevant muscles in line with information supplied by the eyes (when open), by muscle spindles acting as interoceptors, etc. These perceptual and motor activities are subject to satiation (reactive inhibition), and as satiation is stronger in extraverts than in introverts, and is increased by the administration of depressant drugs, we would expect performance to be worse in extraverts than in introverts, and in subjects administered a depressant drug as compared with those administered a stimulant one, or a placebo. As regards personality, static ataxia has been shown to correlate with neuroticism (1), but nothing is known concerning its relationship with extraversion. As regards the drug effects, the results are in line with prediction, excepting that the favourable effects of stimulant drugs, which ought to decrease satiation, are not very apparent.

A possible test of the hypothesis here put forward would be this. Reactive inhibition requires time to accumulate, and consequently it would be expected that if the total period of static ataxia measurement were to be divided up into 10-second intervals, then placebo and drug conditions should become more unlike each other during successive intervals; in other words, there should be a drug-trial interaction. No repeated measures were taken in this experiment, and consequently no data are available to prove or infirm this hypothesis. It might also be postulated that reminiscence effects should be greater for extraverts and subjects administered depressant drugs; it is not known whether this prediction would be borne out in fact. In view of the general significance of static ataxia in medicine and in psychology, further work along these lines might be of some interest.

## 5. Summary and Conclusions

The effects of d-amphetamine sulphate, sodium amylobarbitone, and meprobamate were compared with those of a placebo in respect to their power to influence subjects' static ataxia. It was predicted, on the basis of Eysenck's

drug postulate, that depressant drugs should increase static ataxia, while stimulant drugs should decrease it. The first prediction was verified at an acceptable level of statistical significance; the second prediction was not verified, results supporting it too slightly to infirm the null hypothesis.

REFERENCES

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