DRUGS AND PERSONALITY

XI. THE EFFECTS OF STIMULANT AND DEPRESSANT DRUGS UPON AUDITORY FLUTTER FUSION*

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1. INTRODUCTION

SEVERAL workers have demonstrated a relationship between anxiety and critical flicker frequency (CFF); among these are Krugman (1947), Goldstone (1955) and Friedl (1954). Unfortunately the trait of *anxiety* is not unidimensional, being a compound of neuroticism and introversion, so that these data might indicate a lower threshold of CFF for neurotics, or for introverts, or for both. The second of these interpretations has been tentatively adopted (Eysenck, 1957), in spite of some questionnaire evidence to the effect that thresholds are lower for extraverts (Washburn *et al.*, 1930; Madlung, 1935; Simonson and Brozek, 1952). The main reason for not considering this additional evidence too convincing lies in the curious nature of the measures used to determine extraversion-introversion; these seem to compound introversion and neuroticism, as pointed out elsewhere (Eysenck, 1960). However, when we take into account the rather strong evidence regarding drug effects (Simonson and Brozek, 1952; Landis, 1954), which tends to show that stimulant drugs raise the threshold, while depressant drugs lower it, as well as the fact that brain injury tends to lower the threshold (Enzer *et al.*, 1944; Halstead, 1947; Landis, 1949; Werner and Thuma, 1942), then the case against this tentative hypothesis becomes rather strong. It may be that the attempt to relate CFF to only one dimension of personality was mistaken, and that CFF is related to both neuroticism and extraversion, in the sense that low thresholds characterize the more neurotic and the more extraverted person. This hypothesis would certainly account for all the available facts better than the original hypothesis.

A great deal of work has been done in this Department by Granger on drug effects on CFF thresholds (see also Holland's paper. which is number XII in this series), and the present study deals rather with auditory flutter, which has been suggested by several writers (Davis, 1955; Ogilvie, 1956) to be an auditory analogue of CFF. The hypothesis to be investigated is that *depressant drugs lower flutter fusion threshold, while stimulant drugs raise it.* There has become available some evidence that extraverts have lower thresholds than introverts (Eysenck, 1960), thus supporting our revised hypothesis, but the data are lacking in significance, and cannot be accepted as proving such a relationship.

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2. The Experiment

Details of drugs, experimental design and subjects have been given in a previous paper (Eysenck and Easterbrook, 1960). Eight subjects in all were tested under four drug conditions (d-amphetamine sulphate, sodium amylobarbitone, meprobamate and a placebo), under an experimental design which ensured that each drug would be given once after each other drug and in each serial position. The experimental design, a balanced incomplete block, was completed twice, once for the subjects seen in the morning and once for those seen in the afternoon. The test under discussion was only one of several applied to the same group of subjects.

The test used was the University of Chicago Sound Discrimination Test, which has been designed and developed in the Section of Medical Psychology under the direction of W. C. Halstead. Detailed information on the test may be obtained from the manual, but the following brief description may be useful. The test is administered by tape recorder. The signal consists of interrupted "white" noise with square wave characteristics at an intensity of 70 db. Repetition rates vary between 10 and 150 i.p.s., in steps of 10, and the sound-time fraction is 0·90. There are four random presentations of the fifteen frequencies by the method of constant stimuli. Instructions, examples, and practice items are all contained in the first part of the recording, and they are reported as being adequate for normal subjects of average intelligence. The test presents the subject with short bursts of white noise in pairs, and the subject is instructed to report whether the two sounds were the same or different. Three scores were taken from each record: the frequency of interruption at which the second judgment of "same" was made; the threshold in the same terms by standard methods, and the interval of uncertainty, defined as the range in c.p.s. between the points at which 25 per cent. and 75 per cent. of the pairs were judged "same".

3. Results

Table I shows the mean results from this test. Although the two threshold estimates are consistent with one another in showing improved discrimination under all drugs, this result is devoid of statistical significance, and cannot even be regarded as suggestive (F= ·06 and ·02). The interval of uncertainty, which is the difference in c.p.s. between the flutter frequency and the fusion frequency (each measured at the relevant quartile) is a slightly more reliable measure, and gives higher values, showing greater uncertainty, for all drug conditions. The F ratio for treatments, using the variance between replications as an estimate of error, is again insignificant (F=2·4, with 3/13 degrees of freedom).

Table I

Auditory Flutter Fusion Test Results

	Treatments			
	Placebo	Amphetamine	Amytal	Meprobamate
Fusion frequency in c.p.s.:				
(*a*) Second "same"	50·0	53·75	51·25	53·75
(*b*) Point of subjective equality	75·18	77·87	76·06	77·06
Interval of uncertainty	52·75	67·00	63·96	62·07

4. Discussion

In view of the regularity with which drug effects have been found in relation to CFF thresholds, it is a little surprising to note the complete failure of the

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present experiment. It is possible that flutter fusion is more unreliable as a test, particularly when measurement is not carried out in a sound-proof room. Alternatively, it is possible that flutter fusion is not a true analogue physiologically of flicker fusion; in particular the lateral inhibition so characteristic of CFF phenomena may not be at all apparent in the present test. In view of the strong opinion of experts that the two phenomena are similar it might be wise to await duplication of the present findings before coming to any definite decision.

5. Summary

The effects of d-amphetamine sulphate, sodium amylobarbitone and meprobamate were compared with those of a placebo in respect to their power to affect the threshold of auditory flutter fusion. No significant effects were observed.

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