DRUGS AND PERSONALITY

XII. A COMPARISON OF SEVERAL DRUGS BY THE FLICKER-FUSION METHOD

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1. Introduction

The phenomenon of flicker fusion requires no elaboration to the modern reader. Its psychological, physiological, physical determinants have been outlined by an immense literature (1). Even the limited field of the effects of chemical agents on flicker and fusion is great. In a recent review Landis (2) went so far as to suggest that CFF might be employed as a method of standardizing the depressant effects of somnifacient drugs (Landis (2)). Despite contradictions, which may occur due to the biphasic characters of certain drug effects, the barbiturates and similar depressant compounds tend to depress CFF whereas the stimulants tend to raise it. The effects of alcohol and caffeine are still unclear (Simonson and Brozeck (3)). Whether the drugs affect the organism towards greater or lesser total sensitivity or whether the changes are due to some complex function of, say, the light/dark ratio is also unclear.

The present report is one of a drug study in which flicker changes have been used, rather than investigated. For this reason the conditions have been held constant from day to day and the changes assumed to represent the action of the agent taken. It would, perhaps, be more accurate to designate the experimental conditions as a "flickering situation". Data are available from two studies. The first of these has been reported elsewhere (Eysenck, 1960) (4), and will be combined with the second (the present) because of their relevance to each other. The physical conditions and the experimental method are identical for both investigations.

2. Subjects and Apparatus

The first group consisted of 24 subjects who were tested on each of three consecutive days. They received three treatments: (*a*) meprobamate (2-methyl-2-n-propyl-1, propandiol dicarbamate) 400 mg., (*b*) doriden (glutethimide-3-phenyl-3-ethyl-2, 6-dioxopiperidine), 250 mg. and (*c*) no drug, in a balanced design. The second study was smaller and 6 subjects were again tested on three occasions, with a one-day interval between each session, this time receiving: (*a*) sodium amylobarbitone 3 grains, (*b*) d-amphetamine sulphate 10 mg., and (*c*) placebo. The experimental design ensured randomization of treatments. Both drugs and the placebo were administered in identically appearing capsules. The groups were tested approximately 1½ hours after administration of the drugs.

The first group comprised both sexes with a mean age of 30 S.D., 8 years. The second group was female with a mean age of 20·33 and a range between 19–24 years.

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The instrument used to investigate peripheral flicker thresholds was a modified Lister moving arm perimeter (Type 315/466). The perimeter has its own illumination source and was modified to carry, instead of fixed targets, a small neon bulb (Type CV 988) which at its highest point was 290 mm. away from the eye and subtended an angle of 1·8°. The neon was activated by a pulse generator and a make and break finger key placed between generator and bulb.

After adequate demonstration and practice, ascending and descending thresholds were determined at 14 positions in the left temporal visual field: along the horizontal and 135° meridian at 10, 30, 45, 60, 70, and 80 degrees, and along the 45° meridian at 10, 25, 50 and 60° positions. The method of limits was employed, and the successive "bursts" of light were about three seconds in length with a three-second interval between. Both periods were assessed subjectively and are, therefore, approximate. During the "off" periods the frequency was changed in one cycle steps. The right eye was occluded throughout testing by a black surgical patch.

3. Results

Results are presented here for the present investigation but both studies are summarized in Tables IV and V.

In the present study, analyses of variance have been conducted on the mean scores for the three individual meridians. These are outlined in Tables I, II, and III.

Table I

Outline of Analysis of Variance

(Left temporal field 45° meridian)

Source	d.f.	S.S.	M.S.V.	F	P
People	5	781·33	156·27	4·39>	5%
Drugs	2	517·33	258·67	7·27>	1%
Orders	2	37·33	18·67	—	—
Residual	8	284·51	35·56		
Total	17	1,620·50			

t A.B. = 3·791>1%
t A.C. = 2·792>5%
t B.C. = ·99 —

A — Amytal
B = Dexedrine
C = Placebo

Table II

Outline of Analysis of Variance

(Left temporal field 90° meridian)

Source	d.f.	S.S.	M.S.V.	F	P
People	5	415·70	83·14	2·268	N.S.
Drugs	2	284·10	142·05	3·876	5%
Orders	2	73·00	36·50	—	—
Residual	8	293·20	36·65		
Total	17	1,066·00			

t A.B. = 2·696 5%
t A.C. = 1·958 N.S.
t B.C. = — —

A = Amytal
B = Dexedrine
C = Placebo

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TABLE III

Outline of Analysis of Variance

(Left temporal field 135° meridian)

Source	d.f.	S.S.	M.S.V.	F	P
People	5	641·45	128·29	1·49	N.S.
Drugs	2	327·58	163·79	2·48	N.S.
Orders	2	32·25	16·33	—	—
Residual	8	527·84	65·98		
Total	17	1,529·12			

They indicate that with such a small sample as six subjects the drug variance is significant in two out of the three cases. In the third case it just falls short of the 5 per cent. level of confidence.

As the physical conditions of the experiment are identical with the one previously mentioned comparisons are available for six treatment conditions. These are presented in Tables IV and V.

TABLE IV

Flicker Scores for the Three Meridians Examined. Values are Representative of the Six, Four, and Four Positions Measured

	Horizontal Meridian	45° Meridian	135° Meridian	Total
1. Doriden (250 mg.) ..	33·48	28·96	32·02	94·46
2. Meprobamate (400 mg.)..	35·18	30·78	33·98	99·94
3. Amytal (195 mg.) ..	36·26	31·16	34·58	102·00
4. No drug	35·58	32·86	35·44	103·88
5. Placebo	38·30	35·84	37·76	111·90
6. Dexedrine (10 mg.) ..	39·16	37·50	38·50	115·16
Means	36·326	32·850	35·380	104·557

TABLE V

Table of Threshold Scores at Different Positions in the Left Temporal Field for the Several Drugs Used

Horizontal Meridian

	10	30	45	60	70	80
1. Doriden	40·92	36·62	34·20	31·38	30·38	27·38
2. Meprobamate ..	41·94	38·66	35·88	33·80	31·88	28·92
3. Amytal	42·51	39·66	36·00	34·66	33·50	30·16
4. No drug	42·44	39·10	36·32	34·02	32·24	29·62
5. Placebo	44·94	42·34	40·16	36·66	34·16	31·66
6. Dexedrine	45·00	43·66	40·00	37·32	36·32	32·66

135° Meridian

	10	30	45	60	70	80
1. Doriden	37·80	32·46	29·62	28·16		
2. Meprobamate ..	38·30	35·46	32·20	29·96		
3. Amytal	38·66	36·00	32·50	31·16	30·00	28·82
4. No drug	40·12	36·80	33·96	30·88		
5. Placebo	41·50	38·00	37·00	34·16	31·16	30·16
6. Dexedrine	41·16	39·50	37·66	35·66	33·16	30·82

45° Meridian

	10	25	50	60
1. Doriden	36·38	31·04	25·38	23·08
2. Meprobamate ..	37·54	33·00	28·04	24·54
3. Amytal	37·34	32·66	28·34	26·34
4. No drug	39·08	34·40	29·76	27·80
5. Placebo	39·34	37·50	33·34	33·16
6. Dexedrine	40·66	40·50	36·16	32·66

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4. Discussion

An examination of these tables reveals several interesting features. The first of these is that the accepted depressant drugs—the hypnotic doriden, the tranquillizer meprobamate, and the barbiturate sodium amytal—have the three lowest thresholds followed by the "no drug" and placebo conditions. The highest threshold is given by the stimulant d-amphetamine sulphate. From the obtained results it would also appear that 250 mg. of doriden and 400 mg. of meprobamate depress thresholds more than the barbiturate (3 grains). This is probably a dosage effect and to assess it adequately is required some kind of baseline or intensity level . . . not an impossible task.

The final feature of interest is the fact that the placebo has raised the threshold from the "no drug" level. It would appear that placebo, in this small group, is acting something like a mild stimulant. One reason why such pill-taking effects may appear similar to mild stimulation lies in the tendency observed in subjects, after taking a pill of any kind, to be a little more introspective and possibly introverted. On Eysenck's (5) theory of personality it might be expected that this increased alertness and attention (in its widest sense) would lead to the slight increase observed.

The test results have, on the whole, supported Landis' belief that the flicker-fusion method, which is highly reliable with little diurnal variation, might be used as a standardization procedure for the operational definition of drug effects. Even in its less rigorous application, epitomized by this report, the flicker method may permit useful comparisons.

5. Summary

An experiment is reported in which the effects of depressant and stimulant drugs are studied on critical flicker fusion frequency. Thresholds are lowered by the three depressant drugs used—doriden, meprobamate, and sodium amytal, and raised by the stimulant drugs—dexedrine. The placebo was also found to raise the threshold level above that of the "no drug" condition.

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