Factors affecting the acquisition of new behaviour after administration of an amphetamine-barbiturate mixture.

T. H. BÖSSER, DAPHNÉ JOYCE* and ARTHUR SUMMERFIELD, *Department of Psychology, Birkbeck College, University of London.*

The demonstration by Rushton & Steinberg (1963) that certain mixtures of amphetamines and amylobarbitone sodium produce striking increases in spontaneous activity of rats in a Y-maze gave experimental support to the clinical impression that some combinations of these two drugs have psychoactive properties which may be of therapeutic value (Hare, McCance & McCormick, 1964). Rushton and Steinberg's extensive dose-response studies indicated which mixtures could be most suitably used for further investigations of their behavioural mode of action (Kumar, 1968; Cooper, Joyce & Summerfield, 1969; Porsolt, Joyce & Summerfield, 1969).

An effect of interest in relation to therapeutic usage is whether a psychoactive drug is able to facilitate the acquisition of new behaviour (Wolpe, 1952). To investigate this aspect of drug action a mixture of amphetamine sulphate (0·75 mg/kg) and amylobarbitone sodium (15·0 mg/kg), selected on the basis of Rushton & Steinberg's experiments, was given to rats 20 min before daily acquisition sessions on a bar-pressing task where each bar-press was rewarded (continuous reinforcement). Comparisons of mean times required to reach the learning criterion were made in both sexes, between four groups of twelve rats each, injected with the mixture or with saline. After saline injection, males reached the learning criterion faster (38·6 min) ($P<0·05$) than females (53·7 min); mixture injections did not modify acquisition time in males (42·3 min) but speeded ($P<0·02$) acquisition in females (30·2 min).

When each bar-press by the rat delivers a reward, it might be expected that drugs which increase spontaneous activity would also increase the probability that bar-pressing occurs. Therefore, while the mixture facilitated acquisition of behaviour under continuous reinforcement in female rats, it was important to investigate its effect on acquisition of behaviour where, in order to obtain the reward, rapid responding must *not* take place. This can be done by requiring an animal to learn to insert a delay between successive bar-presses in order that each bar-press be rewarded. Under these conditions of differential reinforcement of low rates of response, female rats given the mixture took much longer than others given saline ($P<0·003$) to learn to space their bar presses by 15 s intervals.

These results show that, in rats, sex and the nature of the task influence the effect of the mixture on the acquisition of new behaviour. Without extrapolating too much from one species to another it can be suggested that consideration of the form of behavioural change which is sought and the sex of the patient may help to select those cases which might most benefit from amphetamine-barbiturate mixtures.

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REFERENCES

COOPER, S. J., JOYCE, D. & SUMMERFIELD, A. (1969). Self-stimulation of the brain after administration of an amphetamine-barbiturate mixture. *Br. J. Pharmac.*, **36**, 192*P*.

HARE, E. H., MCCANCE, C. & MCCORMICK, C. (1964). Imipramine and 'Drinamyl' in depressive illness: a comparative trial. *Br. med. J.*, **1**, 818–820.

KUMAR, R. (1968). Psychoactive drugs, exploratory activity and fear. *Nature, Lond.*, **218**, 665–667.

PORSOLT, R. D., JOYCE, D. & SUMMERFIELD, A. (1969). Lack of tolerance to an amphetamine-barbiturate mixture. *Nature, Lond.*, **223**, 1277–1278.
RUSHTON, R. & STEINBERG, H. (1963). Mutual potentiation of amphetamine and amylobarbitone measured by activity in rats. *Br. J. Pharmac. Chemother.*, **21**, 295–305.
WOLPE, J. (1952). Experimental neuroses as learned behaviour. *Br. J. Psychol.*, **43**, 243–268.

A potential screening test for minor tranquillizing drug action.

CATHLEEN F. MORRISON, *Tobacco Research Council Laboratories, Harrogate.*

Rats can be prevented from escaping from a maze by having the runways of the maze enclosed by walls or by using elevated runways with no side walls. Rats tend to explore enclosed runways more readily than elevated ones. In a Y-maze in which two arms have walls and the third is open-sided the rats avoid the open-sided arm (Montgomery, 1955).

Drugs were tested at three dose levels using thirty-two rats, eight at each dose level and eight controls. Twenty minutes after injection each rat was observed for 3 min in the maze. Entries to each arm and time spent in each arm were recorded. Exploration of the open-sided arm could be increased by minor tranquillizers (for example, chlordiazepoxide, 30 mg/kg subcutaneously) and sedatives (for example, amylobarbitone, 15 mg/kg subcutaneously). This test does not, however, detect other centrally active drugs such as chlorpromazine (2 mg/kg), imipramine (20 mg/kg), or atropine (2 mg/kg). Amphetamine (1·6 mg/kg) could increase, decrease or have no effect on time in the open arm, depending on control performance level. When measures other than time in the open arm were considered, however, amphetamine could always be distinguished from the tranquillizing drugs.

The compounds which are effective in this test are similar to those which increase bar-pressing behaviour which is simultaneously rewarded and punished (punished responding) (Geller & Seifter, 1960; Geller, Kulak & Seifter, 1962). The Y-maze has advantages over punished behaviour as a screening test for drugs similar in action to chlordiazepoxide, as it requires no complex equipment and results can be obtained quickly using untrained animals.

REFERENCES

GELLER, I. & SEIFTER, J. (1960). Effects of meprobamate, barbiturates, *d*-amphetamine and promazine on experimentally induced conflict in the rat. *Psychopharmacologia*, **1**, 482–492.
GELLER, I., KULAK, J. T. & SEIFTER, J. (1962). The effects of chlordiazepoxide and chlorpromazine on a punishment discrimination. *Psychopharmacologia*, **3**, 374–385.
MONTGOMERY, K. C. (1955). The relation between fear induced by novel stimulation and exploratory behavior. *J. comp. Physiol. Psychol.*, **48**, 254–260.

Methods for detecting anti-anxiety drugs using baboons (*Papio cynocephalus*).

I. A. BEATTIE, P. A. BERRY* and R. E. LISTER, *Arthur D. Little Research Institute, Musselburgh, Midlothian, Scotland.*

Brody & Rosvold (1952), Maslow (1936) and Warden Fjeld & Koch (1940) showed that spontaneous social behaviour in monkey colonies was relatively simple and could be recorded and analysed; the patterns of behaviour that emerged in such studies could be modified by the administration of drugs. Delgado (1962) described a method for