Exploratory locomotor response habituation: dissociable effects of (+) – amphetamine and (–) – amphetamine

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Habituation, declining response to repeated or maintained stimulation, constitutes an elementary form of learning, which may be independent of conditioning processes in learning (Tighe & Leaton, 1976). Combinations of either (+) – or (±) – amphetamine with amylobarbitone appear to attenuate the rate of habituation for exploratory responses in the rat (Cooper, 1976; Rushton & Steinberg, 1963). Rushton & Steinberg (1963) showed that an amphetamine-barbiturate mixture produced a marked increase in locomotor exploratory activity when rats were placed in an unfamiliar Y-maze; the increase reflected a block of the normal habituation of the response. In the present work, (+) – amphetamine was first compared with (–) – amphetamine, under conditions closely similar to their study.

Adult female Lister rats were assigned to several groups injected as follows: (i) (+) – amphetamine sulphate (1.0 mg/kg), (ii) (–) – amphetamine (1.0 mg/kg), (iii) amylobarbitone sodium (7.5 mg/kg), (iv) (+) – amphetamine (1.0 mg/kg) + amylobarbitone (7.5 mg/kg), (v) (–) – amphetamine (1.0 mg/kg) + amylobarbitone (7.5 mg/kg), (vi) saline control ($n=6$ per group). All injections were given i.p., 20 min before Trial 1 in the Y-maze. Activity counts were made at 1 min intervals for 5 minutes. One week later, the same test was repeated (Trial 2), with rats in an undrugged state.

On Trial 1, the (+) – amphetamine-barbiturate mixture increased the total activity score ($P<0.005$); no other treatment affected Trial 1 locomotor activity. Whereas all other groups showed typical habituation curves, rats given the (+) – amphetamine-barbiturate were as active at the end of the test as at the beginning. On retest (Trial 2), animals typically show a decline in total activity, which reveals the retention and transfer of some Trial 1 experience. Animals in all groups conformed to this pattern, with the exception of those treated with (–) – amphetamine before Trial 1. In such cases, activity on Trial 2 was equivalent to activity on Trial 1, indicating a lack of transfer across trials. Hence, (–) – amphetamine evidently did affect Trial 1 experience, the effect only being expressed on Trial 2.

A further experiment determined if habituation experience on Trial 1 under (–) – amphetamine (1.0 mg/kg) was state-dependent (Overton, 1968). This would imply that the habituation experience gained on Trial 1 would fail to transfer to Trial 2 as a result of the change from drug to non-drug state. As before, rats injected with (–) – amphetamine before Trial 1 and saline before Trial 2, were as active on Trial 2 as on Trial 1. However, rats injected with (–) – amphetamine on both occasions, showed a normal decline in activity from Trial 1 to Trial 2 ($P<0.05$). This state-dependency effect was asymmetrical, in the sense that rats run on Trial 1 under saline, and Trial 2 under (–) – amphetamine did show a normal transfer effect ($P<0.01$).

At 1.0 mg/kg therefore, (+) – amphetamine, but not (–) – amphetamine, in combination with amylobarbitone, blocked the habituation of a locomotor exploratory response. By contrast, (–) – amphetamine, but not (+) – amphetamine, was associated with an asymmetrical state-dependency of the habituation experience.

Smith, Kline and French donated (+) – and (–) – amphetamine sulphate.

References

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