

The effects of alcohol on serial verbal learning in chronic alcoholics¹

THOMAS STORM, UNIVERSITY OF BRITISH COLUMBIA
W. K. CAIRD, DALHOUSIE UNIVERSITY

Forty male chronic alcoholics, 40-50 years old, learned a list of 12 two-syllable common nouns under alcohol and no-alcohol conditions. Forty-eight h later, they relearned the same or different alcohol conditions in a 2 by 2 factorial design. Alcohol significantly retarded original learning. A significant interaction of alcohol condition during original learning with alcohol condition during relearning provided some support for a "dissociation" hypothesis of the effects of alcohol on long-term memory. These results replicated the results of an earlier study with non-alcoholic Ss.

Storm, Caird, & Korbin (1965) reported a preliminary study of the effects of alcohol on serial verbal learning and retention with normal Ss, 21-30 years old. Alcohol, in a dosage of 1/60 oz/lb of body weight significantly interfered with learning of a list of 12 nonsense syllables. During relearning only the interaction of alcohol condition during original learning and alcohol condition during relearning itself significantly affected trials to relearning criterion. Those Ss relearning under the same drug condition did better than those who relearned under drug conditions different from those which obtained in the original learning session. This result was consistent with a dissociation hypothesis proposed by Storm & Smart (1965), suggested by studies with other depressant drugs (Overton, 1964; Otis, 1964), to explain some features of chronic alcoholism.

The present study was an attempt to repeat as closely as possible with chronic alcoholics the experiment summarized above, to explore the effects of alcohol on learning and retention in these Ss, and to test the dissociation hypothesis again with this new population. The dissociation hypothesis suggests that alcohol might interfere less with original learning in alcoholics than in normals, but that the dissociation effect of change in alcohol condition from learning to relearning might be more marked.

Procedure

Ss were 40 males (aged 40-50 years), patients in the alcoholic ward of Riverview Psychiatric Hospital. All had long histories of excessive drinking, and all were volunteers for the study, which they knew would involve alcohol. Only those patients who had not had a drink for three weeks prior to the experiment were asked to volunteer. Only those who would be in the hospital for three weeks following the experiment, and who had no physical complications due to alcohol were accepted. Patients with suspected or known brain damage were also excluded.

Ss were randomly assigned to one of four groups.

One group received alcohol during learning and relearning (A-A); one, alcohol during learning but not relearning (A-N); one, no alcohol during learning but alcohol during relearning (N-A); and one, no alcohol at either session (N-N). Learning and relearning sessions were 48 h apart.

The material to be learned was a list of 12 two-syllable common nouns² presented on a memory drum by the serial presentation method at a rate of 3 sec/word with an intertrial interval of 9 sec. Ss learned the list to a criterion of one perfect repetition. Ss were asked to return 48 h later for a second session, when their "motor skills would be tested." The latter instruction was intended to minimize the possibility of rehearsal between sessions. The procedure in the second session was the same as the first, and Ss relearned the list to the same criterion.

The procedure described is identical to that employed with normal Ss by Storm, Caird, & Korbin (1965) with one important exception. The earlier study employed a list of 12 nonsense syllables rather than words, with a mean association value of 40 on the Archer Scale (1960). This deviation from an exact replication with the new population was made necessary by the fact that of 15 alcoholic Ss run prior to the study proper, not one was able to reach the criterion with the nonsense material, and most refused to continue for more than 20 trials, frustrated by the fact that only two or three items at most had been learned in that time. This experience seems to be worthy of further investigation in its own right. For present purposes, it is one additional reason that direct comparisons of learning and retention in the two studies are not possible.

Results

The 20 Ss who received alcohol before original learning required more trials to reach criterion ($M=24.8$, $SD=5.86$) than those who learned under no alcohol ($M=20.7$, $SD=5.34$). This difference was significant ($t=2.34$, $p < .05$).

The results of the relearning session for the four groups, in terms of trials to criterion, were as follows: alcohol during both sessions, $M=8.5$, $SD=2.22$; alcohol during the first session only, $M=11.2$, $SD=3.82$; alcohol during the second session only, $M=7.5$, $SD=2.22$; no alcohol at either session, $M=5.8$, $SD=2.20$. An analysis of variance based on these results showed a significant effect of alcohol during original learning ($F=14.5$, $df=1/36$, $p < .01$). There was no significant effect of alcohol during relearning ($F <$

1.0, $df=1/36$). The interaction of alcohol condition during learning with alcohol condition during relearning was significant ($F=6.86$, $df=1/36$, $p < .05$). Groups relearning under the same alcohol condition as original learning required fewer relearning trials to reach criterion. When alcohol condition was present during original learning, the detrimental effect of the change approached significance (A-A vs A-N, $t=1.93$, $df=18$, $.05 < p < .10$). The comparison of the N-N with the N-A group was not significant ($t=1.72$, $p > .10$).

Discussion

These results confirm the Storm, Caird, and Korbin results with normal Ss showing that alcohol in the dosage employed interferes with original learning of verbal material by the serial anticipation method. The interaction of drug condition during original learning with drug condition during relearning 48 h later was also replicated with this quite different population and with different material to be learned. In both studies, Ss required fewer trials to criterion if they relearned under the same drug condition than if drug conditions were altered from those present during original learning, regardless of the effect of drug condition during learning and relearning per se. Thus, both studies confirm to this extent the prediction from the dissociation hypothesis.

Further investigation is required with a wider range of alcohol dosages, with systematic variation in meaningfulness of the learning materials, and with

other paradigms than serial learning. Retro- or proactive interference with materials learned under the same or different alcohol conditions might provide a more sensitive test of the dissociation effect. The preliminary experience suggesting that the verbal learning of hospitalized alcoholics may be considerably deficient compared to nonalcoholics should be verified with such variables as age, education, general intelligence and physical health controlled.

References

- ARCHER, E. J. Re-evaluation of the meaningfulness of all possible CVC trigrams. *Psychol. Monogr.*, 1960, 74 No. 10 (Whole No. 497), 23.
- OTIS, L. S. Dissociation and recovery of a response learned under the influence of chlorpromazine or saline. *Science*, 1964, 143, 1347-1348.
- OVERTON, D. A. State-dependent or "dissociated" learning produced with pentobarbital. *J. comp. physiol. Psychol.*, 1964, 57, 3-12.
- STORM, T., CAIRD, W. K., & KORBIN, E. The effects of alcohol on rote verbal learning and retention. Paper presented at 1965 meetings of the Canadian Psychological Association, Vancouver, B. C.³
- STORM, T., & SMART, R. G. Dissociation: a possible explanation of some features of alcoholism, and implications for treatment. *Quart. J. Stud. Alcohol*, 1965, 26, 111-115.

Notes

1. This research was partially supported by a grant from the Scientific Advisory Council, Licensed Beverage Industries, and by the Alcoholism Foundation of British Columbia, where the senior author is research consultant.
2. The words, in order of presentation, were: ivy, pepper, flower, channel, table, ruler, zebra, mirror, laundry, apple, member, building.
3. This paper has been submitted for publication to the *Quarterly Journal of Studies on Alcohol*. Copies are available on request from the senior author.