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Effect of Electric Convulsive Therapy on Memory.

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Electric shock therapy is one of the therapies that is being used currently in the treatment of mental disease. The technic utilized at the New York State Psychiatric Institute has been described[1] and the exact procedure together with the clinically observed sequelae were carefully noted. One of the most striking psychological concomitants of this treatment is the characteristic impairment of the patient's memory.

In order to obtain objective evidence of the degree of memory impairment, it was determined to teach 10 patients a series of tasks before treatment and note the influence of the treatment on the retention of this material.

The materials used in this experiment were paired word associates composed of common household commodities like sugar or coffee paired with pseudo-brand names consisting of two-syllabled nonsense material.

A week before treatment was begun the patient was given a control series consisting of a learning session in the morning followed by a retention test in the afternoon. The criterion of success was 2 consecutive correct repetitions. During the shock week the same procedure was followed on the shock days (Monday, Wednesday and Friday) as well as on the alternate non-shock days. At the end of the course of treatment, several of the patients were given a post-treatment series of tests.

Results. The effect of shock on memory was analyzed in accordance with the 3 methods available for testing retention: relearning, recall and recognition. The data for each patient were analyzed separately and after the consistency of the individual results was established they were combined. When no shock intervenes between learning and relearning, the number of trials saved is significant when compared to its standard error. However, when a shock is interpolated between learning and relearning, there is no significant saving, and indeed there is a slight, but non-significant

[1] Kalinowsky, L., and Barrera, S. Eugene, *Psychiat. Quart.*, 1940, **14**, 719.

loss. It should be noted, however, that learning ability is no poorer after shock than before shock.

The first trial in each relearning series was regarded as the recall trial, and the number of correctly recalled items in that trial constituted the recall score. The recall after shock was significantly less than the recall after the control and non-shock periods. It is interesting to note that the highest recall is shown in the post-treatment testing.

In addition to the evidence of memory impairment given by the saving and recall methods, the recognition method also yielded an index of memory loss. The afternoon before each shock day a series of paired associates was taught and in the morning immediately before shock, another series of paired associates was taught in which the commodities were identical with those taught the previous night. There were thus, two associates to each commodity, a "remote" one, learned the night before and a "recent" one, learned immediately before shock. After shock, when the patient had regained his composure, a recognition test was given to the patient. This test consisted of the commodity name followed by 4 choices, 2 of which were the learned brand names.

Under control conditions, the patients were able to recognize correctly both paired associates ("recent" and "remote") nearly 94% of the time. Under shock conditions, this percent dropped to 81.5. This represents a drop of 12.5 points which is found to be statistically significant. It should be noted, however, that shock interferes only slightly with recognition, for the post-shock recognition is 87% as strong as the post-control recognition. The recognition under non-shock conditions is very similar to the performance under shock conditions. It should be noted that even under shock conditions the performance is significantly greater than chance. This holds true not only of the group results, but also of the results for each individual.

It is interesting to note that under control conditions "recent" learning is stronger than "remote" learning for, in 5.8% of the items the recent associate was recognized while the remote associate failed to be recognized. Under shock conditions, the differential between "recent" and "remote" learning disappears, as shown by the fact that the proportions in the "recent only" and "remote only" categories are about the same. Apparently the shock affects the learning acquired immediately before shock more than the learning acquired less recently before shock.