



Spotlight on Dr. Barry Sterman: The Beginnings of Neurofeedback

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The field of neurofeedback today owes much of its preliminary research and findings to Dr. Barry Sterman for his work creating and establishing clinical applications for neurofeedback. After earning a Ph.D. in Psychology and Neuroscience from the University of California Los Angeles in 1963, Dr. Sterman began his research, which ultimately led to the discovery of an effective treatment for a variety of neurological conditions.

His breakthrough experimentation began as a Pavlov-like experiment training of the brains of cats. The initial experiment tested thirty cats that had been placed in cages without access to food. A cat was taken out one at a time and placed in a room with an empty bowl and a lever. When the cat pressed the lever, milk and chicken broth would be poured into the empty bowl. The cats began to learn right away what needed to be done to obtain food. Then the experiment was varied slightly by adding a tonal sound. Whenever the sound was occurring, the cats would not receive food when they pushed the lever. When the sound stopped, the cats could then press the lever and get the desired reward. It was in this very phase of the experiment that Dr. Sterman noticed the mental state of the cats as they waited for the tone to be over. The cats stayed very still, however their brains were very alert. The EEG interpreted this state as a rhythm frequency of 12Hz to 15Hz over a certain part of the brain called the sensorimotor frequency (SMR). Dr. Sterman began to wonder if he could effectively train the cats to produce this type of frequency on their own when they chose to do so. For the next experiment, the lever was eliminated and the cats were given food if they produced the desired frequency for half a second. Soon enough, the cats were able to produce these desired frequencies at will. This experiment was the first

time someone was able to prove that brain behavior could be changed and affected by EEG conditioning, a huge discovery in the field of neurofeedback. In 1967, these findings were published in *Brain Research*, a highly regarded medical journal.

A little after these experiments took place, Dr. Sterman was approached by NASA because astronauts were having trouble with the toxic rocket fuel that was being used. This fuel was already known to be capable of producing seizures. Dr. Sterman began to study this fuel and began testing the fuel on cats to see what their reactions would be. As expected, the fuel caused seizures in addition to other negative side effects in the cats. Strangely, about ten cats had a very high threshold for seizures. Dr. Sterman realized these were the cats that had participated in the EEG conditioning experiment. This observation proved that the changes that occurred for these cats that had a higher threshold for seizures were actual physiological changes. This discovery launched tremendous research on how seizures, their intensity, and their duration could be reduced with EEG training.

All of this research, although phenomenal, did not show how this type of brain training could be applied to other treatments and applications. The next step was to try to apply this to humans, so new experiments began. Dr. Sterman hooked up subjects to neurofeedback equipment, and when the subject produced SMR, a green light went on. When the patient was not producing SMR, a red light went on instead. The subject was given instructions to keep the green light on and the red light off. The results over time showed a 65% reduction in grand mal seizures, a huge improvement and massive discovery for the future of treatment for seizure disorders like epilepsy.

Today, Dr. Sterman is Professor Emeritus in the departments of Neurobiology and Behavioral Psychiatry at UCLA. He has written 6 books about operant conditioning in humans and animals, over 30 chapters in other books, over 100 articles, and is a frequent and sought-after lecturer on neuromodulation, the physiological process where a single neuron uses neurotransmitters to regulate various groups of neurons.

The clinical practices of neurofeedback could never have progressed into what they are today without the work of Dr. Sterman. Now neurofeedback can be used to treat a large variety of brain-based conditions and disorders. Dr. Sterman's findings made all of this possible and his research will continue to be the solid basis for the future of neurofeedback discoveries and applications.

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