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Classical Light Stimulus Conditioning with Positive Reinforcement: Can It Help Alzheimer’s Patients

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Abstract

In this experiment, we tested 40 Alzheimer’s patients to see if we could use Pavlovian classical conditioning to teach the patients to go to the nurses’ station to take their medicine. We used patients at a rest home specifically for Alzheimer’s patients. All the patients were in the early stages of dementia where their memory loss was not too severe. We used light changing stimulus to prompt them to go to the nurses’ station for their medicine. After one month of conditioning, 20 of them were then rewarded with their favorite snack every time they responded. After 2 more weeks, the same 20 were rewarded only every fourth time they correctly responded. The other 20 were never rewarded with anything. The purpose was to see if a positive reward, such as their favorite food, which causes a positive chemical reaction in the brain, could actually stimulate the learned behavior.
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Woodruff-Pak (2001) did an experiment using eyeblink classical conditioning to differentiate normal aging from Alzheimer’s Disease. She coupled a buzzing noise with a puff of air to the eye about half a second later. After about 70 to 90 times, she then just did the buzzing noise and watched for the conditioned eyeblink. While normal healthy participants learned faster than Alzheimer’s participants did, some Alzheimer’s participants did in deed learn.

Steinzmetz, Tracy and Green (2001) used eyeblink classical conditioning on participants with autism. Their results showed that people with autism learned quicker than those without and sometimes blinked without the stimuli. They hypothesized that the reason for this is because of above-normal levels of excitation in the deep nuclei. However, there is a reduced number of neurons in the cerebellar cortex and it is likely that the nucleus is in a state of hyperexcitation due to a lack of inhibition from the Purkinje cells in the cerebellar cortex. Since we know that as we get older, our cerebellar cortex changes, such as loss of Purkinje cells, and even more so in Alzheimer’s patients, we can assume that Alzheimer’s patients will learn slower or sometimes not at all due to this loss.

Graff, Muad, Vernooij-Cassen, Myrra, Thijsen, Marjolein, Dekker, Joost, Hoefnagels, Willibrord, Rikkert and Olde (2006) did a study to see if community based occupational therapy could help patients with dementia on a daily basis. They did 10 sessions over 5 weeks, including cognitive and behavioral interventions, to train the patients in the use of aids to compensate for cognitive decline. The results were positive. At 12 weeks, patients showed improved daily functioning despite the patients’ limited learning ability. Seeing as Alzheimer’s is one of the main causes of dementia, and that is where the patients’ memory becomes severely impaired, we
believe that it is possible to condition an Alzheimer’s patient to perform a simple task even when their memory has been compromised.

Pavlov’s famous salivating dog experiment taught us a lot about learned conditioning and how, with reward, one can learn to respond to a simple stimulus. The reward was first consistent with the stimulus then slowly weaned off to every nth time. Pavlov’s experiment showed that without occasional reward, the learned behavior would fail. For this experiment, we used reward for 20 of the 40 participants. Their reward was their favorite snack. This was to see if we could induce a positive reaction in the brain to aid in the learned response. The other 20 participants were not rewarded. This was to compare the times that the rewarded group responded and the group that was not rewarded, responded. We wanted to see if a positive reward would make a difference in the learned behavior.
Method

Participants

For this experiment, we tested 40 Alzheimer’s patients who were in the early stages of dementia where their memory loss was not severely impaired. Twenty of them were from one rest home and the other 20 were from another. Both rest homes were specifically for Alzheimer’s patients. Their vision was either normal or corrected and none of them were color-blind. There was the same number of men as women although sex was not thought of to be a factor. They were all mobile either on their own or with an aid other than a person.

Materials

Each participant’s room was equipped with a blinking green light in the center of the room on the ceiling. We also used 20 of the participants’ favorite snacks that were not readily available to them at that rest home.

Procedure

The green light on the ceiling would turn on and blink at one-second intervals for 2 minutes, after which a nurse would come in and escort the participant to the nurses’ station to take their medicine. Each participant was signaled individually at different times throughout the day but at the exact same time each day. This was done for one month. After that, the blinking light would turn on at its scheduled time at one-second intervals for no longer than 5 minutes or until the participant came out. The 20 participants at one rest home were given their medicine and their favorite treat if they came out in response to the signal. The other 20 at the other rest home were not rewarded with anything and only received their medicine for the entire time of the experiment. If after the five minutes a patient did not come out, the nurse would go and get that patient and he or she would not be rewarded. This lasted for 2 weeks, after which the treats
were only given every fourth time the participant came out on their own. This lasted for 2 more weeks and then the data needed for the experiment was complete.
References

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