

Meeting Your Potential

Purpose: To demonstrate the way an action potential arises in a post-synaptic cell after a depolarized pre-synaptic cell releases a neurotransmitter. The general concept of several action potentials spreading along the length of the axon to cause a motor response (propagation) will also be briefly explained. Secondly, the receptor blocking and antagonistic effects of drugs on neurotransmitters, in relation to the generation of action potentials, will be covered.

Materials: For this demonstration, we will need a regular-sized foursquare ball with “NT” written on it. At least eight grade school participants will be required for the task. Finally, a box of any kind with assorted candies in it.

Procedure: First, a brief overview of the general properties of an action potential and neurotransmitter release/binding will be introduced. TO begin the activity, two groups with equal quantities of children will be aligned and spaced approximately five feet apart. One group will be named “Pre-Synapse” and the other will be called “Post-Synapse.” Next, a single child will be centered in the space between the two groups (this child will act as the post-synaptic receptor). These children will all be facing the same direction. Another child will stand about six to eight feet directly across from the child whom is in the middle of the two groups and will face him or her. This child will start by holding the ball labeled “NT” and will act as the neurotransmitter releasing point for the pre-synaptic cell.

When my partner and I say the word “Go,” the group representing the pre-synapse will begin to do the wave (the wave made popular at sporting events) starting from left to right. As the wave approaches the center, the child initially holding the ball will bounce-pass the ball to the child in between the two groups, thus modeling the effect of neurotransmitter exchange. Then, the group acting as the post-synapse will do the wave, again starting from left to right, until the last child raises his or her hands. At this point, we will open a box labeled “Response,” which will be filled with assorted candies, if the action potential progressed appropriately. Next, to demonstrate that drugs hinder the binding and release of neurotransmitters, we will intercept the ball exchange. Therefore, the action potential will be disrupted and no candy will be received. We will then reemphasize the negative effects of drugs briefly. Finally, the children will be encouraged to perform the activity properly in the absence of drugs to receive candy again.

Issues: The main issue is that one single action potential does not result in a motor response. This will be explained. Also, the child throwing the ball should be associated

with the pre-synaptic team and the child in the center should be associated with the post-synaptic group. However, it will be easier for the children in the groups to observe the neurotransmitter exchange in our setup, so the action potential model will progress in sync. Finally, we are over simplifying the effects of drugs by simply taking the neurotransmitter (the ball) away. Drugs, of course, affect synapses in several ways, including reuptake, blocking, and inhibition on the post-synapse.