Neurophysiology: Brain Science, Neural Pathways and Associations

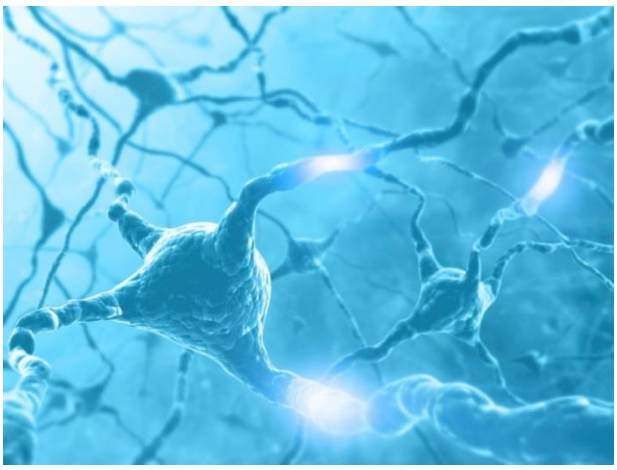
Neurons that Fire Together… Wire Together

In your brain, you have *hundreds of billions* of nerve cells (neurons) that are arranged in pathways, or networks (neural nets), much like the major interstates, freeways, and highways of a country.

Inside each of these neurons there is electrical activity, and between each neuron there is a small gap – in which chemicals, called neurotransmitters, are released.

You may have heard of some of the common neurochemicals in the synaptic gap: dopamine, serotonin, norepinephrine, GABA, and endorphins, among many others.

When your neurons fire together repeatedly, then they wire together, too.



That is, when an event, such as talking to an authority figure, causes you to feel anxious, then the brain puts two and two together and realizes that every time you talk to an authority figure you feel anxious and scared. If the neurons fire together – (i.e., talking to an authority figure leads to fear) – then the brain circuits wire together.

If they fire together repeatedly, then the association in the brain becomes stronger. Thus, every time you think of talking to an authority figure, it causes anxiety.

Let's say you have anxiety about standing in front of people and making a presentation.

Your emotions about making a presentation (fear, anxiety, and worry) set off a flurry of activity in the brain: all of these neurons fire together at the thought of making a presentation.

The more that there is a flurry of firing together, the tighter and stronger the neurons wire together.

When you get anxious, your brain says,

"Danger! Help! I don't like this!"

So, this event – making a presentation – becomes associated with feelings of fear. When you know a presentation is coming up, boom! Almost instantaneously, you feel anxious and fearful.

The neurons in your neural pathways *fire* and *wire* together.

These two things become closely associated in the brain, so that thinking of making a presentation immediately brings up the feeling of anxiety.

Thankfully, the brain is very malleable, or "plastic," and can be changed.

You have an important part to play in this situation, because you are ultimately in control of changing your brain's neural pathways.

To get better, you must "interfere" and "interrupt" this firing and wiring of the brain's neural pathways.

What does this mean?

When we interfere with this association long enough, our neurons literally begin to form new pathways through our brains. Interfering means that you respond differently to presentations, so that the thought of giving a presentation no longer automatically brings up anxiety and fear. When you interfere with this association enough times, the neurons no longer fire and wire together.

When you begin responding differently to making presentations, then your brain gradually "re-organizes" the layout of your neural networks.

You have learned a new strategy or method to help you feel less anxious in this situation, and, as a result, you begin interfering with that old fire-and-wire connection.

Gradually, you no longer respond to the thought of making a presentation with high amounts of anxiety. You have permanently interfered with this association and your brain's neural

pathway system changes as a result.

Social anxiety is a brain issue, and can be changed by using appropriate therapy that is specific to social anxiety disorder. That is exactly what you're doing in this series.

Note that you are interfering with anxiety's fire-and-wire connections every time you use a cognitive strategy against anxiety.

For example, using slow talk gradually calms you down and reduces anxiety. So when you think of mingling with other people, you remember you can use slow talk, instead of having immediate feelings of anticipatory anxiety. You are interfering and interrupting the old fire-wire connections.

Interfere and interrupt with the old wire-and-fire connections in any way possible. We've already learned several ways to do this – and we'll continue to learn more.