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**Psychology Today: Does PTSD Cause Brain Damage In Dogs?
If So, Is It Reversible?**
Published on July 10, 2012 by Lee Charles Kelley in My Puppy, My Self

"PTSD, depression, and other psychiatric disorders cause what is called 'negative neuroplasticity,' including activation of abnormal circuitry in the brain, and strengthening of those circuits over time. They also cause shrinkage ... and decreased connectivity between parts of the brain." —David J. Hellerstein, M.D.

How Common Is PTSD in Pet Dogs?

Post traumatic stress disorder is probably much more common in dogs than most people realize. We tend to think that it's only found in military service personnel, including canine members of the armed services. But it turns out that deeply stressful events have a lasting negative effect on brain plasticity and learning even in pet dogs. This is often clear in dogs who've suffered physical abuse by their owners (or trainers), but can also be seen in some dogs who've suffered a serious illness during their fear or social developmental phases and had to be kept in a kennel at the vet's office for an extended period, or dogs who've been traumatized by attacks from other dogs, etc. Stress is the common denominator, not necessarily exposure to violence or to physical trauma.

Of course, just as in humans, not all dogs experience stress in the same way. Some are more sensitive than others. But those that *are* more sensitive are deeply affected by stressful events, and can develop some symptoms that are quite similar to those found in human beings who suffer from PTSD, including neurological damage and memory loss.

One of the hallmarks of PTSD is that the original trauma is continually re-experienced by the victim. And each time the stress response is triggered, or re-triggered, a cascade of hormones and neurochemicals are released into the bloodstream, causing oxidative stress resulting in brain damage. This damage to neural circuitry makes PTSD one of the most difficult psychological illnesses to treat.

Stress and Neuronal Toxicity

Neuroscientist J. Douglas Bremner writes: "Stress in animals is associated with damage to neurons in the CA3 region of the hippocampus ... and inhibition of neurogenesis [new cell growth]." Bremner also says that high levels of glucocorticoids that come with body's stress response are also associated with deficits in new learning. [1]

Glucocorticoids, which are released during stress-related experiences, in turn cause an increase in glutamate, an amino acid that plays a key role in facilitating long-term connections between neurons, connections that are vital to learning and memory. This suggests that the more stress a dog experiences during a traumatic experience, the stronger his memory of a stressful event becomes and the more difficult it is to restore normal working memory, not to mention normal emotional and behavioral function. This is why it's not only difficult to keep the dog who suffers from PTSD from over-reacting to certain triggers, it can also be difficult to teach him new behaviors as well.

Mind you, I'm paraphrasing and condensing some very complicated research into what I hope are easily understood bytes of information. But what essentially happens is that the fear circuits (connecting the amygdala, hypothalamus, and hippocampus), which are normally capable of being inhibited to some degree by the impulse control centers in the prefrontal cortex, create a kind of permanent or semi-permanent loop, blocking the higher parts of the brain from exerting impulse control while decreasing the ability of the hippocampus to provide normal working memory.

The dog's normal ability to control his behavior is reduced dramatically. He's classified as a "reactive" dog, or out-of-control, or hyper-vigilant.

Exposure Therapy or Play Therapy?

It may seem strange but some human victims of PTSD—specifically military personnel—have had their symptoms moderated a great deal, and in some cases apparently cured, by playing violent, virtual reality video war games like *Halo*.

Some in the field believe that violent video games act as a form of "exposure therapy," where the patient confronts a feared thought, image or memory associated with a past traumatic event. I'm not convinced that that's true. I think what's needed is research on whether these games can also facilitate healing in cases of PTSD that *don't* involve combat, such as victims of sexual abuse, or

witnesses of a major tragedy, etc. Another possible way of determining if it's the content of the game or the act of playing that has a moderating effect on PTSD symptoms would be to have military or ex-military personnel play violent virtual reality games set in a make-believe world of sword and sorcery, as in the *Warcraft* series.

It seems to me that play, of any kind, and in any species, always has an element of aggression built into it. This is as true of a game of chase at the dog run as it is of working the controls of a violent video game. What differentiates play from actual aggression is the lack of danger to the players: the moment fear enters the equation, the fun stops.

Another aspect of play is the mostly unconscious process of pattern recognition, a process that also tends to release dopamine, one of the brain's "feel-good" chemicals. The more complicated the game (up to a point), the more dopamine is released and the better it feels to play. Plus, generally speaking, the more playful a dog is the more resilient and adaptable he is as well.

When working with dogs who have PTSD I've found that play is an essential part of the healing process. In some cases it can be play with other dogs, but the most important type involves the owner or trainer playing games like fetch and tug-of-war, where the dog gets to bite a toy, preferably as hard as he can. The harder a dog can bite a toy in play, the more pleasurable, and the more therapeutic it is for him.

There are caveats, of course. The dog has to "know it's a game." If the dog takes things too seriously, it's only a matter of time before he flips over into real aggression. So if your dog doesn't know it's just a game, DON'T PLAY until you can get him to relax. The way to recognize the difference is in how tense or relaxed the dog's body seems during play.

How do you do get a tense dog to relax?

You have to work very slowly, never act in a threatening manner toward the dog (this includes things like scolding or correcting the dog physically). You also have to find ways to gently activate the dog's urge to play without reaching or even coming near his threshold. This means you work in small increments. *Very* small. It also means that you can't take things too seriously yourself. You have to relax as well. Long, protracted moments of just being with the dog, and massaging his muscles in a very gentle manner can be very therapeutic. So can Tellington Touch techniques.

It's also important to remember that in cases of PTSD, the dog's "fear circuits" are capable of overriding his "pleasure circuits" in a heartbeat. But if you can generate a feeling of trust, and a deep emotional bond with the dog, he'll slowly gravitate more and more toward wanting to feel pleasure than to re-live his old fears.

There's another important feature built into play; it requires high levels of impulse control. And finally, rough-and-tumble outdoor play tends to release tremendous amounts of BDNFs—brain-derived neurotrophic factors—associated with brain plasticity. Depending on how much trauma the dog has experienced, I believe it's possible that just by playing with a dog who has PTSD you can reverse some of the brain damage and cognitive deficits that might otherwise make the dog's recovery almost impossible.

Is that all there is to it? No, there are a few other tricks I find helpful.

Transitional Objects, Fighting the Fear, and Impulse Control

Always remember that the dog with PTSD doesn't have the same capacity for impulse control, or for learning new behaviors, as a dog who hasn't been traumatized. That doesn't mean he can't learn impulse control. It just means you have to take things more slowly.

When my dog Freddie was having panic attacks I found two strategies that helped him with his symptoms during the period where I was slowly working on getting him to play with me, and teaching him impulse control tasks. One was barking on command (fighting the fear), and the other was carrying a pacifier in his mouth on our walks.

Whenever Freddie went into his panic state—which could be triggered by any number of New York street noises—I would tell him to "Speak!" As soon as he barked he went from being a terrified pooch—trembling, ears and shoulders down, tail between his legs, trying to run off in any direction—to his usual, casual self. This works better in cases of fear than it does with dogs whose PTSD manifests as aggression. But it still works.

The other tactic I took was having him carry a toy of some sort in his mouth. I got the idea from seeing how some dogs I knew tended to seem less anxious when their owners let them carry a tennis ball or other object around in their mouths. It worked wonders for Freddie, and many other dogs as well.

I've found that by using these strategies—taking things slowly, earning the dog's trust, teaching the dog to play, using transitional objects, and teaching impulse control—I seem to have been able to reverse symptoms of PTSD in some dogs completely