Affective Dog Behavior S

Level 1

Certification Course

Study Book

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Thank you for continuing your education through Affective Dog Behavior. While our workshop is designed to introduce you to a new way of looking at canine behavior, this study book will take you deeper and leave you with the necessary knowledge to prepare for the next step – your personal (virtual if international) coaching sessions with Scott Stauffer and/or Diana Kastner - of your journey to becoming a Level 1 ADB-certified K9 Life Coach.

Disclaimer: The authors of this study book are not scientists. The information we are passing on to you is solid, yet basic and in layman's terms. As science evolves, so will the contents of Affective Dog Behavior.

Foreword

How is the world perceived? What influences and ultimately drives behavior? Most of the answers to these questions meet at one common, crucial point: the brain. In order to better understand ourselves, as well as the animals we spend time with, it is important to take a deeper look at the neurological aspect and its role in how the environment is perceived and navigated through. Although the topic of emotions can certainly be difficult to approach and has been deemed "unquantifiable," it is worth noting that the internal processes taking place in the brain hold great importance in relation to how the immediate environment is experienced and the associations built upon it; the cognitive abilities, the neuroanatomy, neurophysiology and the neurochemistry are essential components of the organism – mammals, and as is the focus of this course, dogs.

The majority of what we will cover in this book study is about two fields of science that, until recently, haven't really been considered much for our dogs. Of course, we are aware that initially Affective Dog Behavior will raise a good amount of skepticism:

1. There is a good chance that many canine professionals who are not familiar yet with these sciences will initially assume that ADB was put in place to exclude or replace already existing methods and protocols. However, this couldn't be further from the truth. Affective Dog Behavior is about inclusion, not exclusion ... the inclusion of Affective and Social Neurosciences as well as the various theories of learning. Neither should be a stand-alone option but rather be combined in ways that allow for smooth transitions between them. Emotional systems, distinct as they are, overlap and fluctuate, and so do the sciences involved. They are nothing but an outward extension of the mind - distinct yet reliant on one another.

   The primary goal of ADB is to educate so that each one of us can help our dogs feel safe; safe with us, safe in their environments, safe and secure enough to express themselves,

to explore their world without looming repercussions, and to just be in the moment. It is not our goal to replace any existing programs, methods or protocols, but rather to provide the knowledge necessary for canine professionals and dog owners to truly connect with their canine friends, and maybe even shed light on why some techniques work better than others. A good relationship is the foundation upon which we can build all other skills. But if we don't have that emotional, social connection, then we do not have a solid foundation, and skills are just skills. As it is, we tend to rush into training in hopes that the positive aspects of learning will trickle down into the areas of the brain that promote bonding. While that may be possible in some cases, more often than not, the relationship aspect is only secondary and gets lost. Learning and bonding occur on two different levels in the brain. Bonding is a direct result of meeting **emotional** needs not of teaching skills.

2. Another reason for possible skepticism towards Affective Dog Behavior has to do with the inaccessibility of the mind. Of course, the use of Affective and Social Neurosciences in dogs is dependent mostly on guesses (guesses that are, however, strongly supported by research of other mammalian brains and the fact that basic brain functions are eerily similar across the board). Ordinary people like us cannot possibly look into the dog's brain to know without a doubt what's transpiring within, or what emotional system is actually most active at any given moment. Luckily, though, a whole new generation of scientists takes care of that for us. And these scientists are all too eager to share their discoveries. And thus, the brain is less of a mystery now than it has ever been, but if we want to gain access into the mind of a dog, we need to open our own to education; learn about the emotional systems, how they overlap and interact, how the arousal of positive raw affect can promote resiliency, and how some of the major neurochemistries affect everything our dogs do and feel. Then we can take this knowledge and combine it with what we already know about body language, with environmental cues and with our already acquired teaching skills. In all honesty, no canine professional should be without an understanding of the brain and without the ability to navigate in their own minds how the brain is organized.

However, the industry is slowly shifting, and rhetoric is changing to be more inclusive of emotions. More and more professionals become very excited about emotions, though, many are merely cherry-picking bits and pieces of information on the surface. Unaware of the three levels of control in the brain, the vast majority of professionals do not distinguish between the various levels of "emotions", causing the nature and origin of two very distinct types of "emotions" to be convoluted, which not only leads to confusion but may also directly affect the dogs in our care in negative ways, as their emotional needs may not be sufficiently met. When that happens, dogs may respond poorly to conventional training techniques, which may then lead to medicating behavior issues that could oftentimes be resolved simply by utilizing the dog's natural Primary Process abilities to cope with life's challenges. The two levels of emotions we are referring to are

those of: (1) the emotions/raw affects as they are aroused in the 7 Primary Emotional Systems of the Primary Process level; these are emotions in their most instinctual form and almost begging for us to understand them better so we can see that our dogs' emotional needs are met, then convey the same knowledge to our human clients as well. And (2) the emotional feelings of the higher-order Tertiary Process level; the type of feelings that have undergone complex cognitive processing in the higher regions of the brain. These feelings, such as love, jealousy, envy, learned fear and structured play, to name just a few, are cortical, and as you will learn, practically everything in the cortex is learned. While we know without a doubt that dogs and humans share the same primary emotional systems, to what extent they also share the cognitive capacity to create these more complex emotional feelings, remains subject to ongoing research, and as research uncovers new insights in the future, Affective Dog Behavior will adjust with that science.

Undoubtedly, some of what we just mentioned is foreign language to you. But as you journey through this course, brain processes and terminology will become more familiar and application of this new knowledge will become second nature to you.

We wish you good luck on this journey and want to reassure you that we are here to support you with live Zoom classes and Q&A opportunities throughout. And please check out the list of suggested reading below. If you find any good resources that we should add to this list, feel free to let us know.

Your ADB Team

Recommended reading:

www.nichd.nih.gov/health/topics/neuro/conditioninfo/parts
www.Khanacademy.org
www.qbi.uq.edu.au
www.visiblebody.com
www.emedicinehealth.com/anatomy_of_the_central_nervous_system/article_em.htm
www.verywellhealth.com/vagus-nerve-anatomy-1746123
Book: Jaak Panksepp and Lucy Biven – The Archeology of Mind
Book: Jaak Panksepp Affective Neuroscience – The Foundation of Human and Animal Emotions
Book: Dan Siegel and Tina Payne Bryson – No Drama Discipline
Book: Why Zebras don't get Ulcers
https://youtu.be/RcGyVTAoXEU - Kelly McGonigal about stress
https://youtu.be/LNHBMFCznE - Dr. Lara Boyd, TedTalk on Neuroplasticity, Vanouver 2015

Module 1 – The concept of Affective Dog Behavior

L.A.M.B. – Look At Me Buddy

By Scott Stauffer

"L.A.M.B. is a philosophy of CARE and PANIC/GRIEF. It is a philosophy which allows you to be more of a friend and mentor. It lets you SEEK help as a person and lets us be the human to look out for and be looked out for, because we do it naturally; and so do dogs."

What it means

The philosophy of L.A.M.B. is based on personal observations of thousands of dogs I have had the pleasure of working with throughout my career as a canine professional. As long as I can remember, my career goal has been to build trusting relationships with my canine pals and clients. That is the reason I have opted to become a K9 Life Coach rather than a trainer. Building relationships has always come quite naturally to me, but not without a conscious awareness of what actually happens during the bonding process. Do you ever wonder how "bonding" works? What behaviors happen naturally during bonding?

The bonding process

Think of bonding between two humans: looking, feeling, touching or reaching for the person you feel safe with. It is the same between dogs, or humans and their dogs. We bond more with our partners when we touch ... but with consent! - and we bond even more when we show active interest in our partners' interests; not only because we bring them pleasure, but because we help them feel safe. When we follow these few simple bonding behaviors with our dogs, we will get the same results in that our dogs, too, will look for us when they need something. In an in-home situation, they may look at us for food, for water or for exercise; or they need or want comfort or play. Thanks to the bonding process, they will seek us out for physical contact, lean into us and touch us somehow.

These are just some of the small behaviors I have noticed and reward for in my own and my client dogs. The dogs **looking for me** and **seeking me out**. And since we train for eye contact ("look at me" or the name game), we help them want to look at us even more. The beauty of L.A.M.B. is that dogs are quite assertive in initiating bonding behaviors. Unfortunately, though,

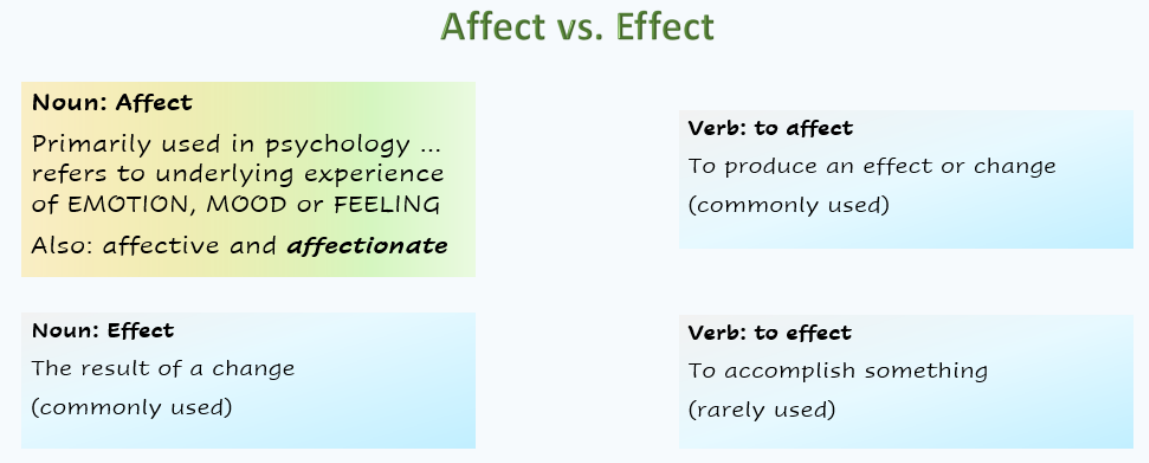
we rarely notice, since we are typically too busy looking for stressed body language, which we then try to change to “pleasure”.

With L.A.M.B., I am hoping to bring back the natural relationship building blocks of helping each other (human included) to feel safe, improve communication skills, increase conversation and help each other want to L.A.M.B. – Look At Me Buddy.

Thanks to Affective Neuroscience, we now have a better understanding of emotions; why we have them and how they work. Currently, we look at behaviors and draw our conclusions; all we need now is to learn about the emotional process behind the behaviors, so that we can better understand our dogs’ needs and improve communication. Basic body and mind functions. In other words, once we look deeper, look beyond those obvious behaviors, give and accept what we both, dog and human, have to offer, that’s when we can truly L.A.M.B. – Look At Me Buddy! *-Scott Stauffer, 2019*

Grammar Lesson

At times, we get challenged over the use of “affective” in Affective Dog Behavior. Typically, those who are not familiar with the definition of “affective” assume that this is spelled incorrectly. Undoubtedly, at some point, you will be challenged as well. And thus, let’s have a little grammar lesson.



To make your life a bit easier, here are some examples:

Noun **affect** – Primary Emotional Systems are also known as raw **affect**
Verb **to affect** – emotions affect behavior
Noun **effect** – emotions have an effect on behavior
Verb **to effect** – you effected coming here by driving in your car (most times when you see “effect” used as a verb, it is used incorrectly)

What is Affective Dog Behavior?

AFFECTIVE DOG BEHAVIOR (ADB) is a concept of inclusion, in which the core principles of affective neuroscience, social neuroscience, neuroscience and Behaviorism as well as the philosophy of L.A.M.B. are blended to better explain human-dog relationships, promote social & emotional connection and help our dogs feel safe in THEIR ways.

In the following are the descriptions of how each component contributes to Affective Dog Behavior:

- **Affective Neuroscience** teaches us about the biological and evolutionary origins of the 7 primary emotional systems and how they drive behaviors and facilitate learning and the building of memories through neurochemistries and neurological pathways.
- **Social Neuroscience** explains why we need relationships and how they work.
- **Neuroscience** helps us understand the neurobiology as a whole.
- **Behaviorism** is the science of associative learning as it was researched and developed in lab environments; but we will also introduce learning as it happens without human influence. For that reason, we may, at times, refer to all learning as the **science of learning**.
- **L.A.M.B. – Look At Me Buddy** is the philosophy of CARE and PANIC/GRIEF.

However, in a less formal way, Affective Dog Behavior is defined as an educational and coaching concept that combines what we already know about dogs with newer scientific discoveries in that:

- ***Affective*** represents Affective and Social Neurosciences and other scientific discoveries
- ***Dog*** represents the emotional wellbeing of the dog and our social connection with them
- ***Behavior*** represents the various theories of learning

Why should we look at the brain?

For decades, Behaviorism has been the only option for us to "speak dog". It is rooted in the theory that animal behavior can be conditioned and modified based on observable behaviors only and without consideration of the animal's thoughts and feelings. Throughout the history of behaviorism, the science community broke down the mysteries of observed behaviors and gave us ways to modify and shape behaviors through associative learning – particularly through Classical and Operant Conditioning.

But science is like the ocean; it never stops moving. It comes in waves and persistently washes new discoveries ashore. And some of the latest discoveries, especially those that deal with the brain, open doors into the most secretive places of the mind: the places that hold the answers to the urges and motivations behind the things all social animals do.

While observing behaviors remains a vital part we need to be skilled at, it is only a portion of what should to be considered when we deal with dogs. Since Emotions Affect Behaviors, these behaviors are best put into environmental and emotional context. How to help a dog feel safe WITH you but in THEIR ways. It is basically what Affective Dog Behavior is designed to do.

Positive communication + Connection = Relationship, Confidence and Trust

To give you an example, let's look at this short story:

Knock, knock. The door opens. Little Timmy runs up, flings himself into the visitor's arms and yells: "You're here!!!!" The visitor throws Timmy high up in the air, catches him and hugs him close, before Timmy gently slides back down onto the floor. They immediately start wrestling. Punching each other, tickling, running. The house just came alive in childish laughter. For weeks, Timmy has been anxiously awaiting his favorite relative's visit. His anticipation just about drove him insane, not to mention you (his parent). And in the mix of all this happy craziness is a wildly barking and bouncing dog named Buster, trying to get his fill of attention. Finally, you offer ice tea for the two and water for the pup, because by now, you can tell that your visitor is ready for a break. But young Timmy and Buster are not even close to settling down just yet. Both are still too wound up. Time for you to intervene, though, and time for Timmy and Buster to rest. After a couple of minutes, Timmy happily gulps down his refreshing tea while Buster dives into the water bowl.

What just happened here? Most likely, we can all agree that this encounter was quite emotional. Most behaviors throughout this story were prompted by some of the primary emotional systems that we will start discussing shortly. Starting with Timmy's anticipation of his

relative's visit ... that anticipation is a product of the SEEKING System. The happy little wrestling match was 100% rough-and-tumble Free PLAY, which already began when the visitor threw Timmy in the air. And their PLAY was interlaced with CARE, when the visitor embraced Timmy in a hug. And did you notice how Timmy was too wound up to accept the tea his parent offered? The emotional system of PLAY is so strong and stimulating that we can quickly ignore other needs, like the need for drink, food or rest. But the parent knew better; they knew what Timmy **needed**, and thanks to a positive connection between the two, Timmy was finally ready to simmer down and drink his glass of tea. All these behaviors were prompted by the flow of brain chemistries that are explained through Affective Neuroscience and rationalized through Social Neuroscience.

More experienced canine professionals in general can tell when a dog is stressed or over-aroused, but the signs can be subtle and easily missed. Hopefully, as you learn more and more about the basic (raw) emotions we share with our dogs, you will understand how a dog's mind functions, and how behaviors are shaped when mind and body connect.

Emotions and Affective Neuroscience

Dr. Jaak Panksepp, creator of Affective Neuroscience, would define emotions as: *"…the way we feel. It is not a sensory feeling like pain when you step on a stone… or a bodily feeling; emotional feelings are very large bodily and brain responses to the world. They tell animals what is important for survival inside the brain. They are very deep value systems in the brain, and when they become imbalanced, they cause emotional problems… too much fear, too much anger, etc.; the emotional systems want to do something: they want to hit, they want to run away, they want to caress, they want to cry, they want to laugh…"* And thus, in an attempt to bring cohesiveness between fields, such as biology, psychology, behaviorism and others, as well as to provide a foundation from which to continue building upon, growing and developing, affective neuroscience was born. Seven Emotional Systems were identified based on brain region activation and its internal processes; they interact with both subcortical and higher brain areas. They are written in capital letters to differentiate them from the common words. These emotional systems are: SEEKING, RAGE, FEAR, LUST, CARE, PANIC/GRIEF, PLAY. The reason why they are classified as emotional systems is that their arousal generates visceral, affective and behavioral reactions – however, putting into words what these emotions feel like is near impossible, unless the use of analogies is involved.

One of the things that makes these emotional systems important is their influence on processes related to physiology and behavior, thus affecting learning (Panksepp, 1998). This can be observed between people and their dogs, even during simple, day to day interactions. For instance, and for the sake of simplicity, there is a dog who tends to be gently playful; this dog could potentially develop a more rewarding relationship with a member of the family who appropriately reciprocates play, allowing for two-way communication interactions, than he would with another member of the family who may at times reciprocate play, but consistently ignores the dog's cues on, say, decreasing play intensity. Another possible scenario that could describe the influence of emotional states on learning, without diving into the intricacies involved, would be the case of a dog who has resource guarding tendencies towards toys. Now, this dog would likely exhibit calmer behaviors—or may even, eventually, attempt to initiate play while having the toy—in the presence of someone who has appropriately interacted with them while they have had a toy, than they would in the presence of someone who constantly tries to take the object away. Day to day interactions between a person and their dog starts building a history, where these interactions are collected, eventually defining the general quality (whether rewarding or aversive) of the relationship. Additionally, given that emotional systems also influence autonomic functions (Panksepp, 1998), in determining the quality of a relationship, physiological changes are involved—either pleasant or unpleasant, depending on context.

Therefore, when observing a behavior, it is important to consider an organism's aspects together, as they influence how an animal learns, behaves, and unfolds throughout its life.

Assignment

1. In your own words (up to 300), what is the ultimate L.A.M.B. experience with your dog?

2. In your own words, how would you define emotions?

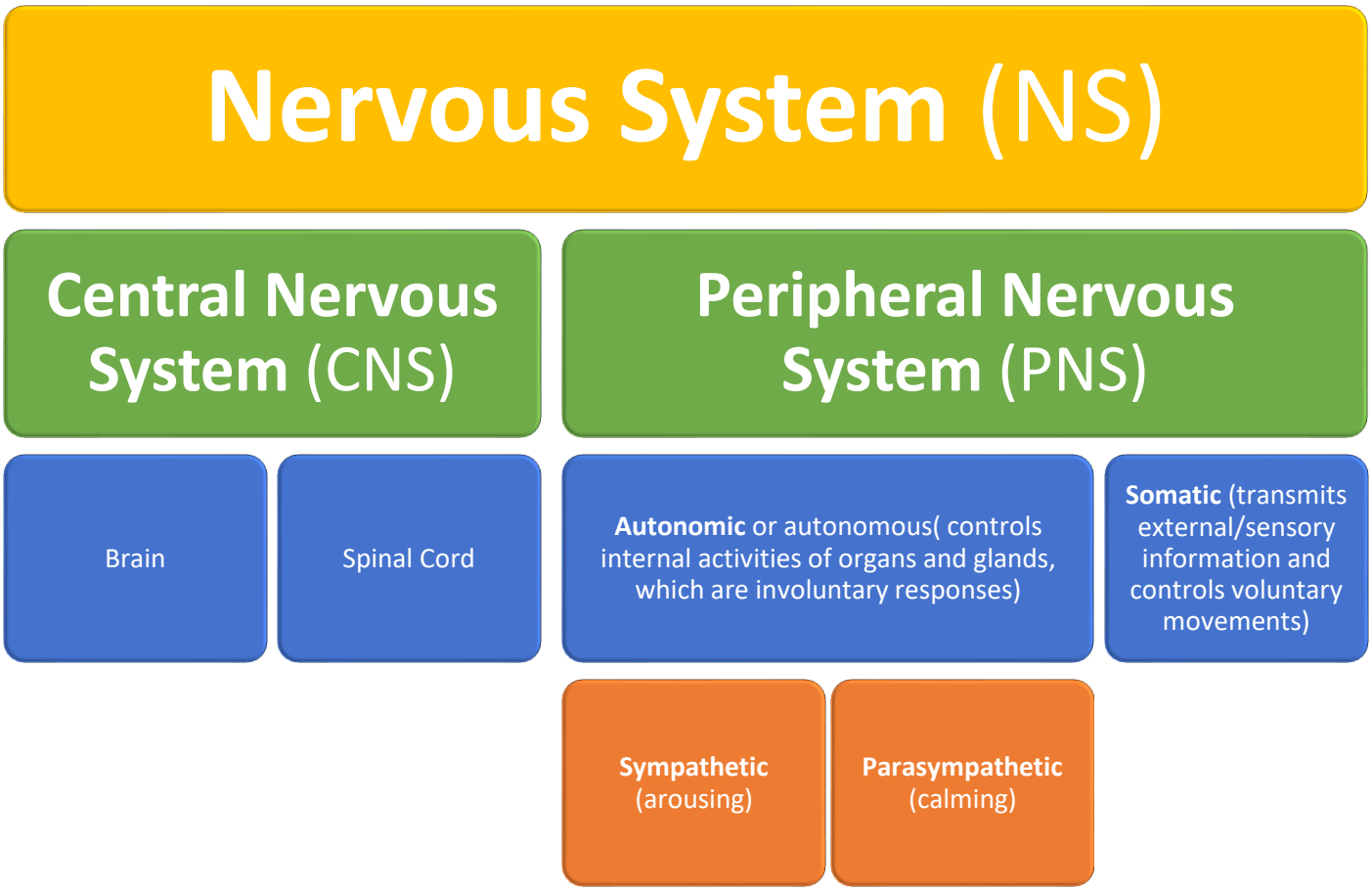
Module 2 – The Nervous System & the Brain

The Nervous System (NS)

The nervous system is a highly complex part of an animal that is very much like a computer in that the brain is the software that makes decisions and the nerves are the hardware that helps the rest of the body carry out those decisions. Its basic functions are sensory input, information processing and motor output; in other words the nervous system coordinates actions and sensory information, including the ability to move, breath, see, think (you get the idea), and it does so by transmitting signals between the brain and the rest of the body.

The NS consists of the

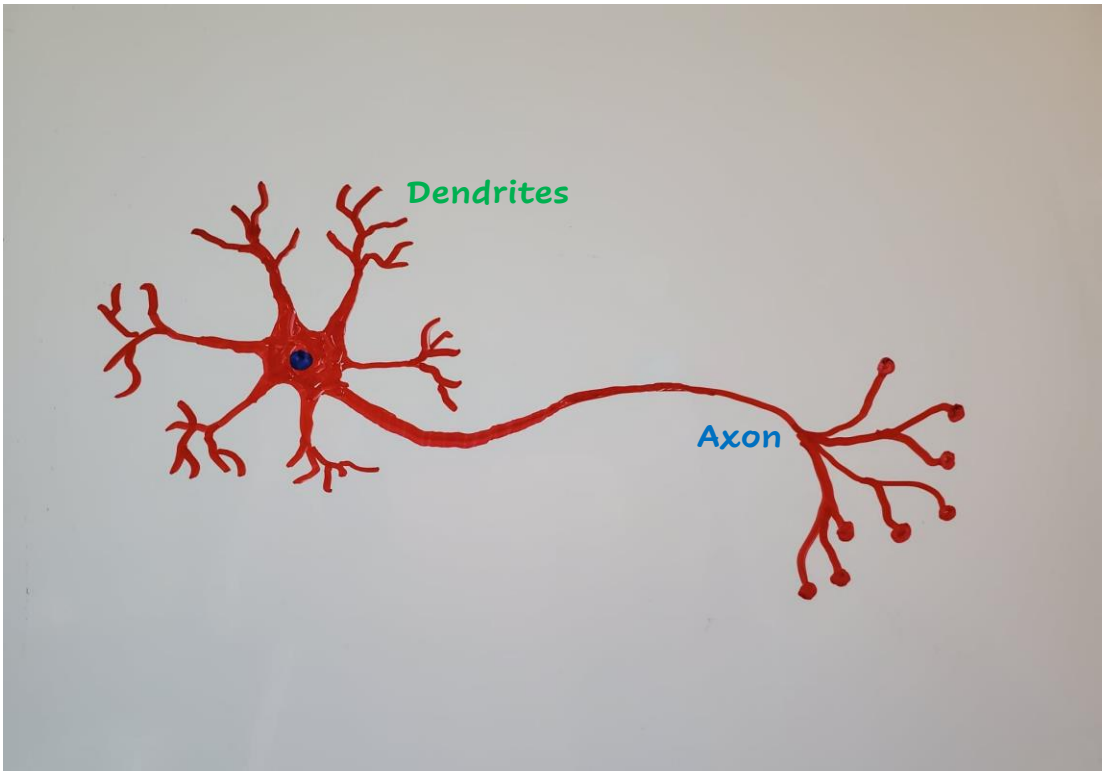
- **central nervous system** (CNS), which is made up by the brain and the spinal cord, and the
- **peripheral nervous system** (PNS), which includes sensory organs and the nerves that branch off from the spinal cord to all other parts of the body. The peripheral nervous system is divided into the
  - **somatic nervous system** to help carry motor and sensory information to and from the CNS via sensory (afferent) neurons and motor (efferent) neurons and the
  - **autonomic nervous system**, which regulates the body processes that happen without a conscious effort, such as heartrate, blood flow, breathing and digestion. And if that is not confusing enough, the autonomic nervous system branches out into the
    - **sympathetic nervous system**, to help our body prepare for fight/flight, and the
    - **parasympathetic nervous system**, to return our body to “calm” (homeostasis)



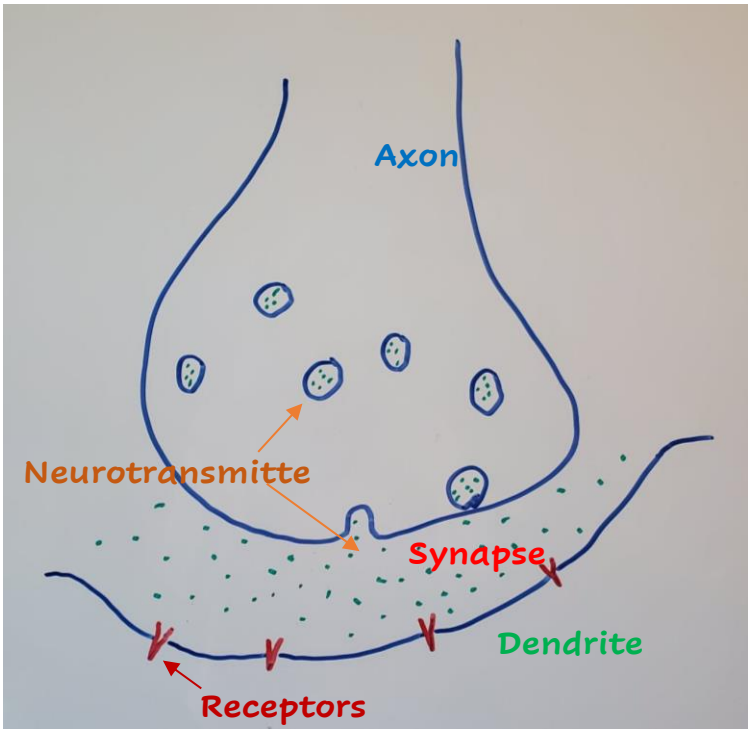
Communication throughout the nervous system is by electrical signals when charged neurons pass information throughout the body.

Nerve cells or **neurons** *(fig. 1)* are made up of the **nucleus** in the center, the **cell body**, **axons (to send signals)** and **dendrites (to receive signals)**. Nerves, which are distributed throughout the body, and especially the peripheral nervous system, are formed by a bundle of axons. It is with the help of these axons as well as dendrites that neurons can communicate even over longer distances. It is easiest to think of the axons as the sending units and the dendrites as receivers. When neurons communicate, neuron A sends an electrical signal down the length of its axon to be received by the dendrites of neuron B. However, before the signal is released at the end of the axon, it is turned from electrical into a chemical signal. The chemical messengers (neurotransmitters) are then released into the space between the end of the axon and the tip of the dendrite. This space is known as the **synapse** or the synaptic cleft *(fig. 2)*. As the neighboring dendrite receives the neurotransmitter via neuro**receptors** (in short **receptors**), it converts the chemical signal back into an electrical signal, which then moves through the neuron only to repeat the same conversion processes to communicate with other neurons.

Note: While the synapses we just described are **chemical** in nature, they can also be **electrical** when ions flow directly between the neurons.



(fig. 1 – neuron)



(fig. 2 – synapse)

The Central Nervous System (CNS)

As mentioned above, the CNS consists of the brain and the spinal cord, and both connect via the brain stem. While we may think that, being the central part of our being, the brain controls all bodily functions, there are CNS pathways that lie entirely within the spinal cord and allow for involuntary reflex movements to be carried out without the participation of brain structures. This allows for quick reflex actions by activating spinal motor neurons without delaying the process by sending signals through the brain.

Basically, the spinal cord is an extension of the brain, and as such, its primary function is to carry messages back and forth between the brain and the peripheral nerves.

The Peripheral Nervous System (PNS)

The peripheral nervous system is the division of the nervous system that lies outside of the central nervous system. The nerves of the PNS connect organs, limbs and skin with the CNS, allowing the brain and spinal cord to exchange information with other areas of the body and allowing the animal to respond to environmental stimuli.

- *Somatic Nervous System*

  The nerves of the somatic nervous system connect to the skin, to sensory organs and to all skeletal muscles. The sensory (afferent) neurons help us collect sensory information (i.e. sight, sound, touch) that is sent to the brain and spinal cord for further processing. In turn, the motor (efferent) neurons carry information from the CNS to muscle fibers throughout the body, which allows us to respond to environmental stimuli through physical action. These physical actions are voluntairy movements.

- *Autonomic Nervous System*

  The autonomic nervous system is a very special kind with very special functions. Unlike the somatic nervous system, which allows for voluntary actions, the autonomic nervous system has a mind of its own in that its respons to stimuli is of involuntary and internal nature. Thus, the autonomic nervous system regulates bodily functions such as blood flow, heartbeat, breathing and digestion, which the animal has no conscious control over. This branch of the nervous system is divide into:

Sympathetic Nervous System	Parasympathetic Nervous System
It would be detrimental to an animal's health to always be ready for flight or fight action, or always in an excited state. Thus, in case of a threat or other excitement, it is the ***sympathetic*** nervous system's job to prepare the animal for a flight or fight response or other exitatory activity by boosting blood flow to the muscles and elevating heart rate and respiration, which provides the additional oxygen necessary for the animal to take swift action. It also dilates the pupils to allow for more watchfulness.	Prior to a threat, this branch of the autonomous nervous system helps the animal maintain normal body functions as well as conserve physical resources. During a threat, the sympathetic nervous system is activated. And once the treat passes, the parasympathetic nervous system returns the body to a normal resting state by slowing heart rate and breathing, reducing blood flow to the muscles and constricting the pupils.

Perhaps now is a good time to introduce the parasympathetic's special nerve: the Vagus Nerve. The vagus nerve supplies parasympathetic fibers to all major organs of the head, neck, chest and abdomen. Do you have a strong reflex? Do you cough when your ear canals are stimulated? While the vagus nerve is to blame for that, it deserves credit for slowing the heart rate, controlling sweating, regulating blood pressure, controlling vascular tone and stimulating the gastrointestinal tract. And sudden stimulation of this nerve, as during sudden fright or sudden stress causes a sudden drop in blood pressure and a slowing of the heart rate, which is in direct contrast of the role the sympathetic nervous system plays during fear and stress. This is why, aside from this short anatomical introduction, we will also talk about a theory that stems from the vagus nerve in the chapter titled **Polyvagal Theory**.

The Brain

The brain is, without a doubt, the most complex part of the body, and studying the brain was – and still is – an inherently complex issue. Thanks to various imaging systems, we have a better picture of the brain structure now than we ever had before, which makes it easier for scientists to share their work and find common terminology to use. Naturally our understanding of how the brain works lies in the hands of various branches of Neuroscience. However, Affective Dog Behavior is greatly influenced by Dr. Jaak Panksepp's research in Affective Neuroscience and his many theories, which are in part included in this chapter and throughout the whole course.

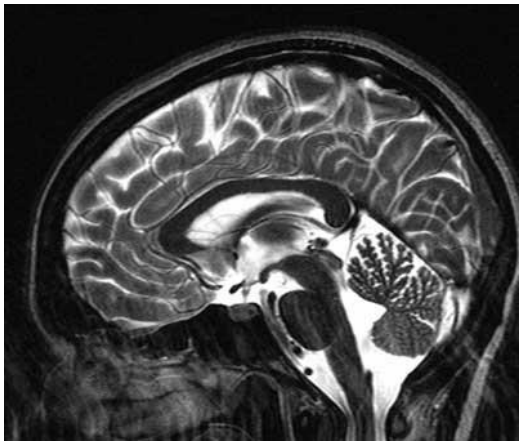
Basically, the brain is a mass of **neurons** (nerve cells) and **neurotransmitters** (neurochemicals). The human brain consists of an average of 86 billion neurons (some sources go as high as 100 billion), while the dog brain consists of only 500 million. There are a number of neurotransmitters (more than 40 in humans) and their corresponding **receptors** that help the nervous system ready body and mind for life. The site at which neurons communicate with one another by means of one neuron sending a message to a target neuron is called **synapse**. This process is the same as described above in *The Nervous System.*

Dr. Jaak Panksepp, whose research has laid the foundation for Affective Dog Behavior, had a vision: it was his dream to help people with mental illness, not by learning about fear and despair, but by finding the root of "happiness" in the brain. This vision led him on a journey of many discoveries and theories. One of these theories is that of a specific evolutionary development of the brain. It is not a theory that can be easily proven or disproven, but it is a theory that, upon open-minded consideration, simply makes sense, which is why we have decided to adopt Dr. Panksepp's brain model into our program.

When we look at the following images of the brain, it is easy to see how the brain is organized in layers, with the more ancient parts extending from the brainstem and the later developed neocortex "draped" around them.

In his research, Dr. Panksepp has identified 3 layers with distinct functions. Understanding the basic concept of these will help you better understand the primary emotional systems, and it will make it easier for you to learn about learning.

As you can tell by the following images, structurally, the canine brain and the human brain are very similar. With everything below the neocortex largely the same, the most apparent difference between the two brains lies in the complexity of the neocortex.



In Affective Neuroscience, these layers are referred to as the "3 Levels of Control", as each layer participates in the control of body and mind in vastly different ways. Jaak Panksepp's model of the evolution of the brain and how this works will be covered in Module 3, which is a chapter pulled from our upcoming book *Affective Dog Behavior* (the release date is not yet known).

Assignment

1. What are the functions of the following?

   axons
   dendrites
   receptors and
   synapse

2. When a body prepares for fight or flight, what specific nervous system is active, and how does it help the body prepare?

3. What is the difference between the central nervous system and the peripheral nervous system?

4. In less than 300 words, how does learning about the nervous system help you in your work with dogs? Please include any aha-moments you may have had.

Module 3 – The levels of control

Have you ever tried to reason with a 2-year old? How did that go? Not too well, did it? What about reasoning with a 15-year old? A 30-year old? Well, now we are getting somewhere. When we are born, part of our brain is nearly fully developed, the other part is pretty much a blank slate. The part that's in working order is evolutionarily the oldest. It is called the limbic system, and the deepest area of the limbic system regulates things like hunger and thirst, sensory feelings and also **raw emotions**. They are called raw (or primary) emotions for a reason; at the beginning of life, these emotions, though fully functional, have not yet been influenced by the environment and are therefore in their most natural state: raw. They are "objectless", so to speak. It is these raw emotions that tell an animal where they are on the path of survival. They are aroused within their distinct (yet overlapping) primary emotional systems on the **Primary Process Level**, where they create urges that make us want to do something.

As we move upwards in the brain, closer to the top of the limbic system, we are approaching areas that are affected by (raw) emotional input from below as well as external/environmental stimuli. This upper limbic system is evolutionarily younger than the Primary Process Level and thus called the **Secondary Process Level**. It is the part of the brain that gives an animal the ability to learn and store memories.

Up until this point, we have been moving about in brain areas that are eerily similar in all mammals, even some birds, crocodiles, and some fish. What sets all of these animals apart is not their limbic system, but the complexity and the genetic potential of the upper part of the brain; the thinking brain, which is also known as the neocortex. This neocortex is empty at birth, and incredibly susceptible to environmental programming/imprinting. It is the part of the brain where cognition, reasoning, decision making, 'free will' and some other cognitive functions happen. Even silly little things called feelings. These feelings are of a higher-order than the raw, primary process emotions in that they are created when "affect neutral" environmental events are paired with "objectless" raw affects. Now, consider this: In humans, the neocortex is not done developing until we are almost 30 years old, and even then, it remains subject to constant reshaping and change. Being the third in the evolutionary order, this cognitive layer of control in the brain has earned recognition as the **Tertiary Process Level**.

And it so happens that arguing with a 2-year old is less than satisfying, since, at such a young age, the thinking brain is barely beginning to take on shape in a process that takes decades. On the contrary, arguing with a young brain like that could be shaping the brain in ways that could spell trouble later on in life. Dogs undergo similar developmental stages, albeit a bit faster. And even when fully matured, their cognitive abilities aren't quite as complex as our own, which can

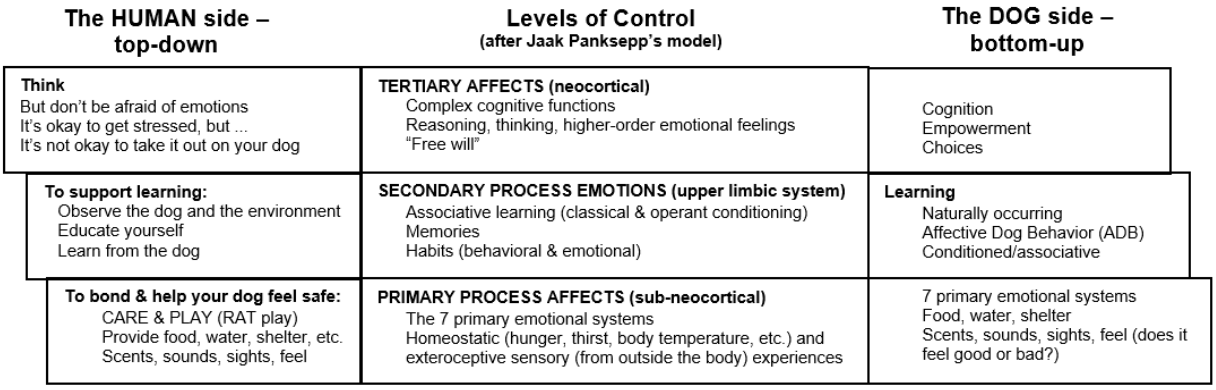
make for some very interesting interactions. Thus, understanding our dogs is easiest if we can somehow level the playing field between the human mind and the canine mind.

See, dogs don't sit around all day forging plans to make our lives harder, thinking up ways to train us or get even with us. And they don't waste time wondering what they did wrong two days ago. Such thought processes are highly complex and seem to be rather unique to our species. And since we are the ones capable of reasoning, it's up to us to adjust our own thinking so that we can tap into our dogs' minds on their level. So, while children and dogs follow an emotions-driven bottom-up process, healthy adult humans typically approach life itself in a cognitive top-down fashion. We will explain in a little bit what exactly that means, and what we can do to bridge the difference in mindsets.

But first, why is it even important for us to know this? Let's look at it this way: the top-down approach assumes that all behaviors are cognitively learned and driven by environmental events. (Of course, it is hard for an adult human to imagine otherwise, as we are so used to thinking before we act.) Therefore, the logical step to changing behaviors would be to change the environment while also creating positive associations with the environment, which ultimately sets a dog up for success and teaches new things. But what if it is not the environment that drives behaviors, rather it is emotional perception of the environment? In other words, what if affect drives behaviors? What if emotional systems are innate and not learned? What if, even though many behaviors are learned through experience and memory, others are instinctual? And what if the actual **urge** to respond in certain ways to any given stimuli is given at birth; not the behavioral response itself, but the urge that drives the response? An urge that can be overwritten but not eliminated through mature and complex cognitive thinking.

In fact, whether we realize it or not, nearly all behaviors can be traced back to the limbic system in one way or another. But nothing is black and white when it comes to the brain. Even within the human species we have to consider developmental stages. As we have just learned but cannot emphasize enough, children have a vastly unfinished cortex and follow much the same bottom-up flow as dogs do, which makes them relatively emotional and less reasonable. Adult humans can think and reason their ways through life, with or without much emotional input. Now let's add a dog or two to your already complicated lives. Apparently you have an interest in dogs, or else you wouldn't be participating in this program. And since you are reading this, is it fair to assume that you are looking for answers that would shed some light onto the mysteries of the human-dog relationship? Aside from language barriers (verbal vs. non-verbal) how we prioritize the different layers in the brain is probably the biggest challenge when we interact with animals. Luckily, evolution has brought dogs much closer to humans than any other species, and finding common ground is a lot easier than it may seem. All it takes is an open mind and a fresh perspective. Now, let's picture the brain again:

- In the lower limbic system, we have the **Primary-Process**, where instinctual emotional responses generate innate feelings (raw affect, primary emotional systems).
- In the upper limbic system, the **Secondary-Process** accommodates a variety of learning and the building of memories. What happens on this level is actually believed to evade consciousness.
- And last but not least, there is a third layer, hence **Tertiary Process**. That's the upper (cortical) area of the brain, which enables cognitive thinking, reasoning, higher-order feelings and other complex mental activities.



The HUMAN side – top-down	Levels of Control (after Jaak Panksepp's model)	The DOG side – bottom-up
Think But don't be afraid of emotions It's okay to get stressed, but ... It's not okay to take it out on your dog	**TERTIARY AFFECTS (neocortical)** Complex cognitive functions Reasoning, thinking, higher-order emotional feelings "Free will"	Cognition Empowerment Choices
To support learning: Observe the dog and the environment Educate yourself Learn from the dog	**SECONDARY PROCESS EMOTIONS (upper limbic system)** Associative learning (classical & operant conditioning) Memories Habits (behavioral & emotional)	**Learning** Naturally occurring Affective Dog Behavior (ADB) Conditioned/associative
To bond & help your dog feel safe: CARE & PLAY (RAT play) Provide food, water, shelter, etc. Scents, sounds, sights, feel	**PRIMARY PROCESS AFFECTS (sub-neocortical)** The 7 primary emotional systems Homeostatic (hunger, thirst, body temperature, etc.) and exteroceptive sensory (from outside the body) experiences	7 primary emotional systems Food, water, shelter Scents, sounds, sights, feel (does it feel good or bad?)

The ADB project © 2020

Now that we know that the neocortex is "blank" at birth, we can't possibly ignore the developmental stages of human and dog brain in our social interactions. Naturally, it is okay to expect sensible thought processes and decision making when we interact with other mature humans, but reasoning becomes a bit harder when we deal with children or with dogs. That's when top-down and bottom-up can quickly get in each other's way. But, as you can see in the following image, it doesn't have to be that way. Though we cannot undo evolution and just ignore our thinking brain, we can actually use it and consciously tap into our own emotional systems to meet our dogs on their emotional levels, just as we would do with small children.

And what would "tapping into our own emotional systems" look like? Generally, well socialized dogs have a relatively good understanding of each other. In addition to using their enormous sense of smell (to identify moods), and their hearing, they can also read each other's body language in a nano-second. And in cases of physical interactions (whether serious or playful), touch prompts additional sensory information that is sent to the brain. Typically, a dog does not "think" about sensory input on a cognitive level but responds quickly on the instinctual level of the 7 primary emotional systems. We humans perceive social interactions slightly different; more complicated. Our senses aren't quite as developed as those of our canine partners. And even though we consider ourselves as having superior brain powers, we do not

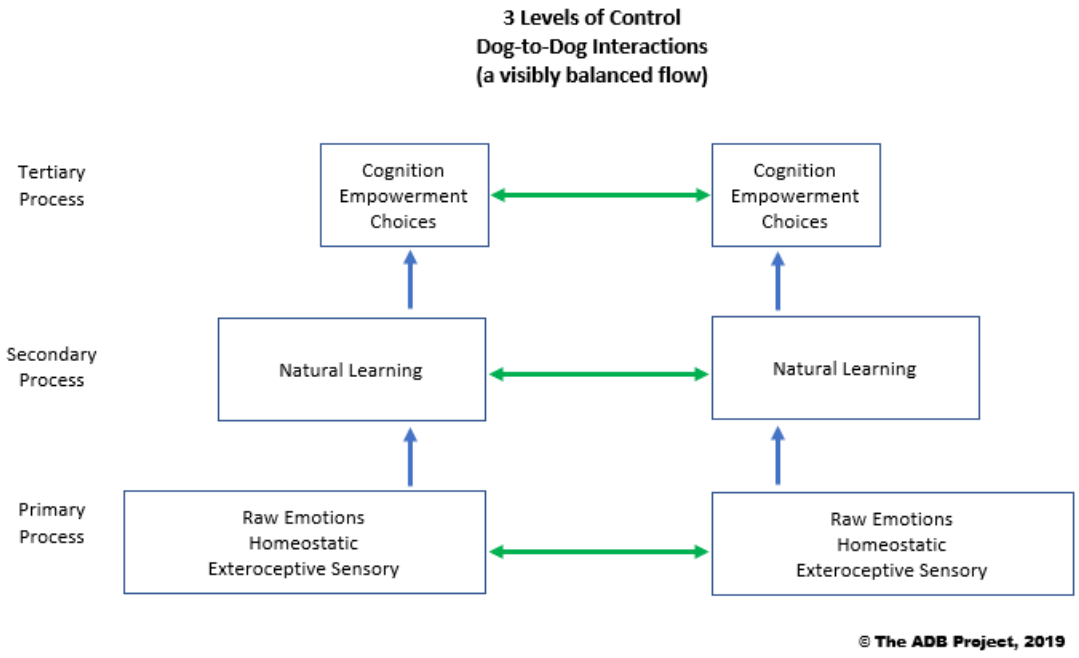
always know when it is time to relax. In other words, we tend to over-think and over-complicate especially social matters. But we can bridge many inter-species differences simply by becoming more aware of three of our own primary emotional systems (CARE, PLAY and SEEKING) while using empathy when a dog finds themselves influenced by one of the remaining four (RAGE, FEAR, LUST, PANIC/GRIEF).

"We will never understand emotions in human (and canine) *brains and minds, unless we take an evolutionary approach. ... we have to envision the brain as an evolved organ with many layers of development. And if we don't bring these layers of development into the conversation, we will be talking past each other ..." -Jaak Panksepp*

"Talking past each other" seems to be what happens a lot in our interactions with another species. Undoubtedly, in your work as a canine professional you have been or will be exposed to a variety of different opinions and techniques to help bridge the cross-species communications gab. Maybe looking at various interactions from the perspective of the human and the dog brain will help you develop your own understanding.

(1) Dog-to-Dog Interactions

In this next image, we will show dog-to-dog interactions are almost linear. Any time your dog meets another, regardless of what they have experienced in the past, they will meet on an emotional basis at the Primary-Process Level. But past experiences are important, too, since they determine what emotional state the dogs will be in at the time. Throughout their encounter, brain activity will also seep upwards into the Secondary-Process Level, as the dogs will learn from each other and either reshape existing memories or build new ones. From here on, the sky is the limit. All of what has happened so far contributes to how dogs cognitively pursue future interactions and life itself (Tertiary Process). All dogs conform to this process instinctually, which results in a visibly balanced flow of expectations and communication one might expect to see in members of the same species.

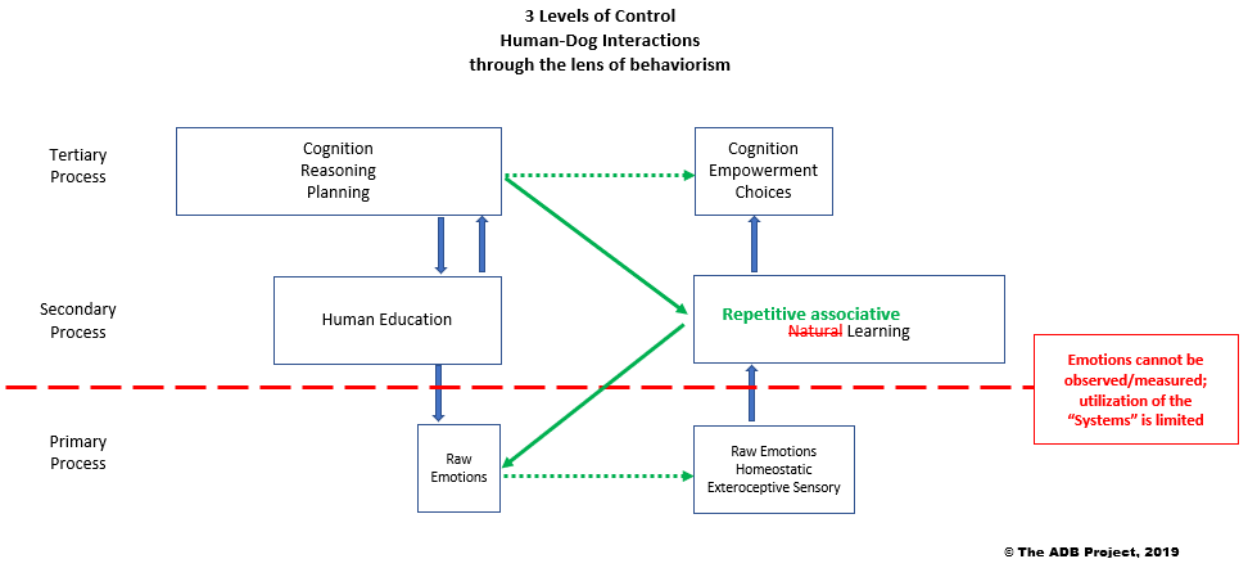


(2) Cognition-based human-dog interactions

Behaviorism is basically the science of associative learning, which was created during laboratory research. This approach works under the presumption that all behaviors are acquired through conditioning by interacting with the environment. In other words, it is environmental stimuli which shape a dog's actions. It is commonly understood that this process follows a top-down pathway. But let's look how it actually fits into the flow of brain activities. Keeping in mind that brain processes of two different species are involved, this process isn't as linear as the one between dogs.

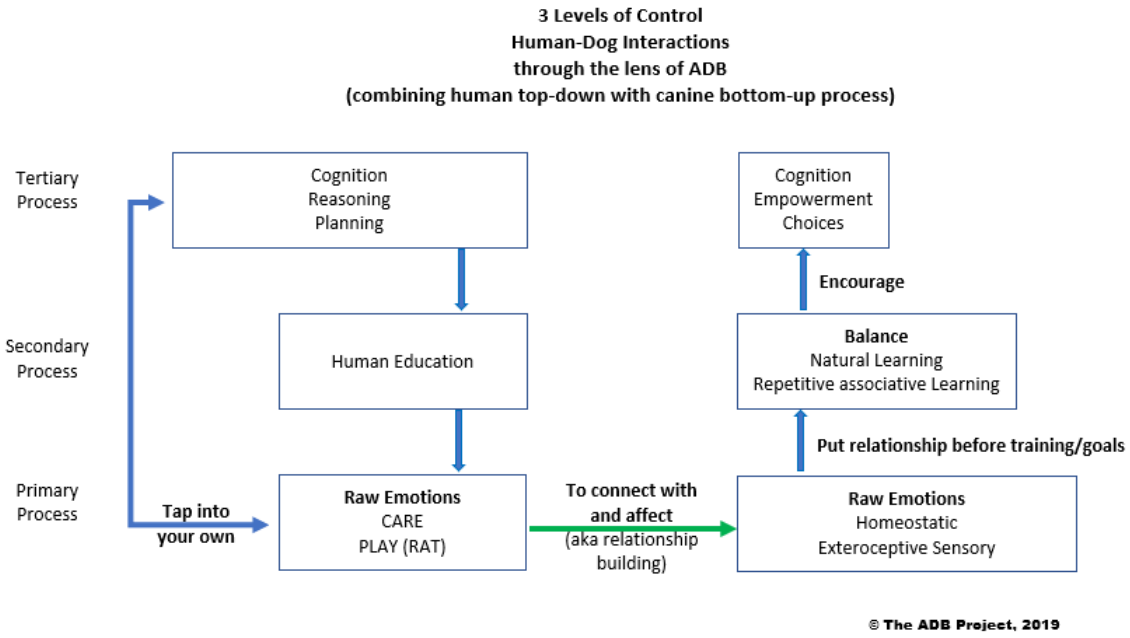
Let's say you set up a training session. You developed a plan of what you want to accomplish and how to go about it. For you, this is very much a cognitive process (Tertiary Process). You decided to use treats and teach a new "cue". Learning, as we know by now, takes place in the Secondary-Process Level. And so, in your interaction with the dog, you tap straight into their Secondary-Process, where learning and memories happen. And if you pair enthusiastic praise and cuddles with your treat rewards, you actually do follow a top-down approach reaching all the way down into the Primary-Process Level.

But for your dog, brain activity flows in the exact opposite direction. From your dog's perspective, interactions always start with emotional perception at the Primary-Process. That's the brain activity that tells the dog whether something should be avoided or embraced, whether to worry about training or enjoy it. If the dog is receptive to learning, their brain activity freely progresses to the Secondary-Process Level, and further up into the Tertiary Level, if choices are allowed and cognition is encouraged. So, clearly, we humans work from the top down, while dogs continue to operate from the bottom up.



(3) Human-Dog Interactions through ADB

Last but not least, what do human-dog interactions look like when we coordinate the natural top-down flow of an adult human with the natural bottom-up process of the canine mind through the principles of Affective Dog Behavior? In this model, we encourage all of you to tap into your own emotional systems (primarily the CARE and PLAY Systems) in order to connect with your dogs on THEIR level. Only when you take care of your dogs' emotional needs first, can you truly bond. Once your dog feels safe, you become socially and emotionally connected. A trusted source in their relationship with their environment. This makes training much easier for both of you. In short: **Put the relationship before training and goals.**



In his research, Dr. Jaak Panksepp took the side of evolution, promoting the mottos that ***"what came first always rules"*** and that the brain would never throw away a mechanism that was valuable for living before. This is why it is important for us to understand the levels of control in the brain. And we will be so much better off when we understand the instinctual affective systems (Innate Primary Emotional Systems) and how they affect and drive behaviors and control learning and memories. Can we teach dogs without knowing any of this? Yes, of course we can. We have done so for many decades, and we have done relatively well, considering that we really didn't know much about the brain, which restricted us considerably. Luckily, times are changing, and prevention of or dealing with reactivity, anxieties, phobias and other behavioral issues is becoming increasingly easier.

But first, did you know that there is even an evolutionary purpose for learning and memories? The brain learns and memorizes from past events to help anticipate and predict the outcome of future events. So, in case of your dog, the primary emotions and their subsequent learning and memories help them navigate their world safely, and when raw affect is paired with environmental events, they generate additional emotions, which are more cognitive and oftentimes referred to as (higher-order) feelings. Thus, only do we share the same raw emotions with our dogs, we also share some (not all) of these higher-order feelings. And the combination of both, raw affect and more complex feelings, tell the brain immediately whether a dog is on the path of survival (positive feelings) or destruction (negative feelings), which helps them anticipate the future ... through learning and memories. Can you see how no area of the brain is isolated and how the whole brain works together, as one mechanism that is comprised of many intricate neural components. Yes, some circuits are addressed individually, but always keep in mind that these circuits overlap, just as the subcortical brain - the part of the brain that regulates raw emotions and learning, amongst other things - continually “talks” to the neocortex (the thinking brain), and both areas in the brain exchange information about affects. To simplify it, when raw affects (deeply subcortical) meet up with environmental stimuli, the brain stores these experiences and the associated feelings as memories, from which the neocortex can draw in the future, and even create more complex, higher-order social emotions.

Assignment

1. What are the 3 Levels of Control, and what are their basic functions?

2. In your opinion, why is it even important that we understand these Levels of Control?

3. What questions do **you** have that will help you clarify this topic?

Module 4 – The 7 Primary Emotional Systems

Basic intro to the 7 Primary Emotional Systems

This basic introduction to the 7 Primary Emotional Systems (7 PES) will put you in the right mindset for the later Modules. Much of the basics will be repeated throughout this book study – as you know, repetitions are a necessity for most learning. Now let's get started:

When we think emotions, we tend to romanticize, and it shows in our language: love and jealousy, envy, guilt and shame, to name just a few, are some powerful feelings, and each is designed to define relationships or the intensity and vulnerability of one's mind and soul. But these are not the type of emotions we have in mind when we discuss Affective Neuroscience. Feelings such as the ones just listed are **not** innate, rather they are the products of more complex emotional learning that involve:

- raw affect (the ones we will discuss)
- environmental events
- memories and
- processing in the higher (cortical) regions of the brain

The thinking brain (the neocortex) varies greatly in different species, therefore, many species may not even be able to feel certain higher-order social feelings. Though not much is known yet about the more complex social feelings in our dogs, interest in the science community to get to the bottom of our dogs' abilities to experience them is higher than ever before, which will undoubtedly result in many future books to be written about canine emotions and feelings.

But for now, we will focus on the raw emotions; the ones that are seated so deeply in the subcortical brain that they can easily escape regular use in mature humans, but are unavoidable in young children as well as our dogs, which is the reason why all canine professionals should be familiar with the processes of the subcortical brain. Sometimes you will hear us refer to these raw emotions as primary or primal emotions or as core emotional affects or raw affects. They are affective experiences that originate in more ancient brain networks and are not necessarily known for their "intelligence". In fact, even though they are functional from birth, the primary emotional systems are born more or less "objectless", and they require learning and experiences before they can form connections to the world. However, as Dr. Jaak Panksepp has determined, these primary emotions (he identified seven but acknowledged that there may be more) are something possibly all mammals share, which means that we have a lot more in common with our dogs than previously thought. And the more we learn about the similarities as well as the peculiarities, the easier it is for us to bond.

These seven primary emotional systems are:

SEEKING

RAGE

FEAR

LUST

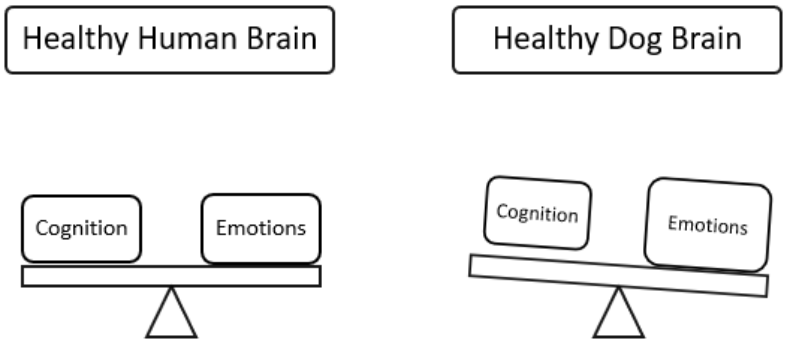
CARE

PANIC/GRIEF

PLAY

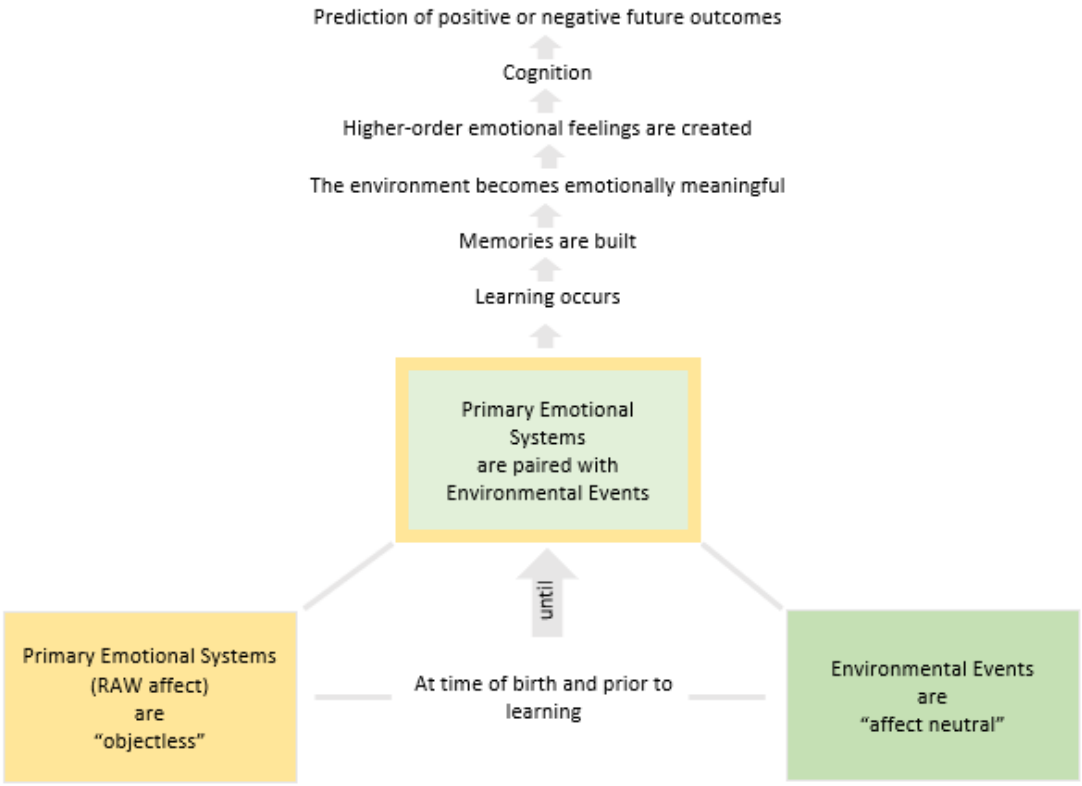
Again, they are innate and thus instinctual. They are hidden way below the cortical brain in the lower part of an area that is commonly known as the limbic system. And because the limbic system is "subcortical" (below the cortex), the **primary emotions don't rely or depend on the neocortex** (the "thinking" brain). Also, the **cortex is mostly influenced by the environment and not by stringent genetics**. But the lower and the upper parts of the brain are in no way isolated from each other. They "talk" via neural pathways and develop a reciprocal relationship, sending messages back and forth. And so, the possibilities of learning, building memories and creating thought processes are almost endless and only restricted by the capacities of the cortical brain.

Ideally, a healthy adult human would utilize the subcortical and the cortical brain somewhat equally and balanced. But dogs are not humans, and even in cases of the most mature and cognitive canine minds, it is questionable that they use their minds to the same extent that we use ours.



Yet, one thing we have always admired in our dogs is their amazing ability to learn. That's what makes dog training so much fun, isn't it? And it's so easy to see how environmental events can affect a dog's emotional state; but that is after learning has occurred, and even then, **all behaviors we observe in our dogs are in one way or another affected by emotions**. See, at birth, emotions and environment haven't really had a chance yet to "meet". As mentioned earlier, prior to learning, the emotional systems are in place and capable of raw arousal without much

stimulation from the environment. The same is true for the environment, only reverse; the environment, too, is already in place, but does not yet evoke any emotions. Both, brain and environment remain in their independent state until they are paired with one another. In other words, when raw, "objectless" emotions are paired with "affect-neutral" (not linked to emotions) environmental experiences, raw affect and environment merge and give each other meaning; that's how learning occurs, memories are built and the thinking brain (cortex) is shaped in ways that help the dog deal with the environment utilizing all levels of the brain.



Even though we are about to discuss each of the primary emotional systems separately, please understand that despite their individualities, these systems overlap in order to enable the brain to rapidly shift gears. Internal needs and memories of past experiences help the dog maneuver through life in ways that make sense to THEM. And so it is not the environment, but internal needs and perceptions what dictates which system is most active to begin with and when it is time to shift to another mindset. For example, what may start as PLAY can quickly shift to FEAR, RAGE, even PANIC/GRIEF and vice versa. To make it a bit easier for you to "feel" the emotional systems, we will not only describe how they function in our dogs, but also how we may experience them in ourselves, since both are quite similar in nature.

Basic Emotions

SEEKING – THE ANTICIPATION OF LOOKING FOR STUFF

"The emotion of curiosity, exploring the world, finding things"

One of the most fascinating raw emotional system is the one that almost tirelessly propels an animal through life in pursuit of something positive, something rewarding and beneficial. Even though, the art of staying alive is made a lot more rewarding by this brain circuit, we rarely ponder over the intense, sometimes overly enthusiastic drive behind our own actions. Is it any wonder then that we have adopted a somewhat mechanistic approach to shaping the actions of our canine friends?

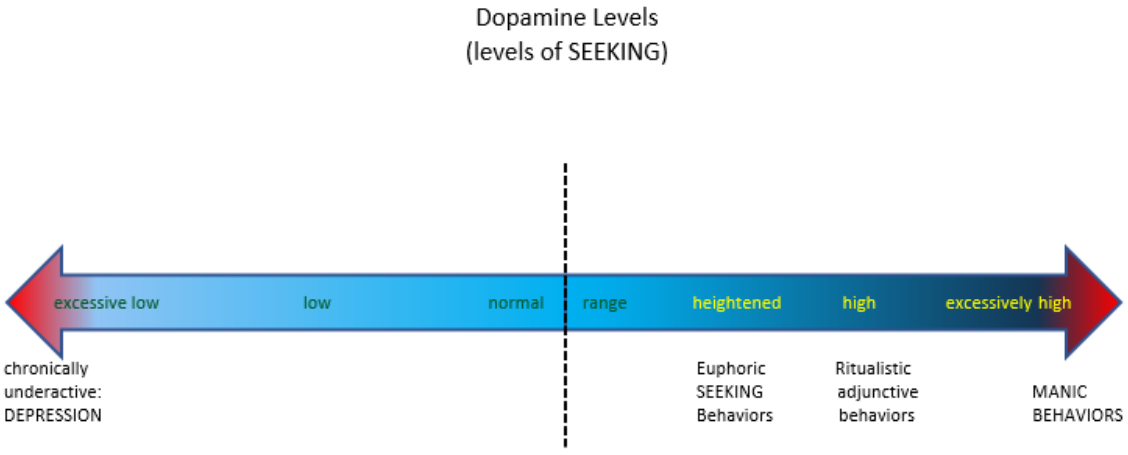
It is the SEEKING System that gets us out of bed in the morning, motivates us to look for the light at the end of the tunnel, and urges us to **enthusiastically** chase after daily pleasures we cannot help but anticipate, while it also sets us up for cinematic dream adventures when we sleep. Whether awake or asleep, this brain circuit rarely takes a break and when it does, it is usually so subtle and short in duration that we barely ever notice, for we are creatures of **anticipation**. The SEEKING System, as it is known today, has captivated the imagination of researchers for many decades. And before the full capacity of this circuit was understood the way it is today, it was simply referred to as our reward center(s).

If we would rank the emotional systems, the SEEKING System would take the seat at the head of the table due to its great influence over each of the other emotional systems. That influence is exercised as the SEEKING System makes itself available whenever anticipation and motivation are needed (which is pretty much all the time). And what exactly does the SEEKING System do? As the term SEEKING implies, it **motivates** us to move and to look for something ... look for special rewarding events. And when we give in to the urge generated by the SEEKING System, we set our bodies and/or minds into motion and go after whatever it is we are seeking. In other words, the **SEEKING System is synonymous to the motivation we feel that drives us to pursue something beneficial to us**. The motivation itself can be felt as excitement over something desirable to happen; it can be felt as anticipation, and a strong urge to pursue and explore the rewards of life. These rewards can present themselves in many different ways; food for example, or pleasurable experiences, interesting places, sights and sounds, objects, and even in form of solutions to a problem or avoidance of aversive events. When we are in dire straits, we seek safety, and if loneliness or sadness overtakes us, it is social and emotional connection that we find most comforting and rewarding.

Dopamine is the neurotransmitter that arouses the SEEKING System. Dopamine is potent; it is a drug so strong and desirable in its effects that humans go out of their ways to manufacture illegal synthetic equivalents (i.e. cocaine) and even risk addiction and legal ramifications only to prolong and further enhance the more or less pleasurable experiences evoked by dopamine. Because dopamine is so potent, we have a responsibility to utilize SEEKING in its most natural form and learn what this system really represents for the dog, rather than exploiting it for our own benefit and possibly creating a dopamine imbalance – that is, manic or stereotypical behaviors (repetitive) when dopamine is excessively high or a decrease in observable behaviors when dopamine is less available. We should never ignore dopamine's natural flow and how it operates in the moment and at any given time and place. Thus, anytime we think SEEKING, we need to think dopamine and vice versa.

SEEKING System = Dopamine
Dopamine = SEEKING System

Dopamine is the key brain chemical that enthusiastically triggers reward-motivated behaviors. Dopamine levels constantly fluctuate, with too little of it leading to depression, and excessively high dopamine levels resulting in manic behaviors. The circuitry that makes up the SEEKING System would lay dormant, if it were not for the synaptic energy that urges our dogs to follow their inquisitive nature. However, SEEKING never really stops. Even in that moment when all of a dog's various needs and wants seem satisfied, the SEEKING System continues to operate in the background; granted, at much lower levels, but always on standby ... even during sleep. Not surprising, a dog's energy level is directly affected by the abundance (or lack) of dopamine synapses. Thus an increase in endogenous dopamine means higher behavioral arousal.



However, aside from these excessive levels that can lead to mental and behavioral issues, the fluctuation also plays a role in creating somewhat of a SEEKING cycle.

The SEEKING Cycle

The SEEKING System includes in it two general types of motivational behaviors, namely **appetitive (increased dopamine)** and **consummatory (decreased dopamine)**. Simply put, the appetitive aspect controlled by the SEEKING System can be observed through behaviors such as foraging, searching and investigating (amongst others), whereas consummatory behaviors are generally related to reduction of arousal. The SEEKING System is described as being in constant change, that is, continually switching between appetitive and consummatory phases. To make this process more visual, we decided that it would be easier to think of it as a cycle that starts with the innate affective **appetitive urge** (appetitive phase), which prompts a variety of enthusiastic **seeking behaviors** (appetitive phase) in the anticipation of and with an expectation to attaining the **reinforcing reward** (consummatory phase). SEEKING is in control of all appetitive activation, and is triggered either by an outer-body (environmental) stimulus, or a homeostatic impulse (i.e. hunger, thirst, etc).

Prompted by the emotion of the appetitive urge, typical Seeking Behaviors exhibited by dogs are **hunt/chase behaviors**, **behaviors of exploration/investigation** (sniffing objects, ground and air, visually scanning the surroundings, listening to the environment, tasting and feeling, all while moving about or staying in place), **foraging, SEEKING safety, comfort and play**, as well as **the pursuit of a mate**, and **many others**. The more observant we are, the easier it is for us to notice even the subtlest of movements, be it a slight twitch of an ear or the tiny wiggle of a nose (amongst others) in an effort to take in information from the environment. Different as all these behaviors are, they have one thing in common: to SEEK experiences with positively reinforcing values, and experiences or outcomes that are beneficial for survival. Please keep in mind though, **what is of reinforcing value to one dog may be aversive to another**.

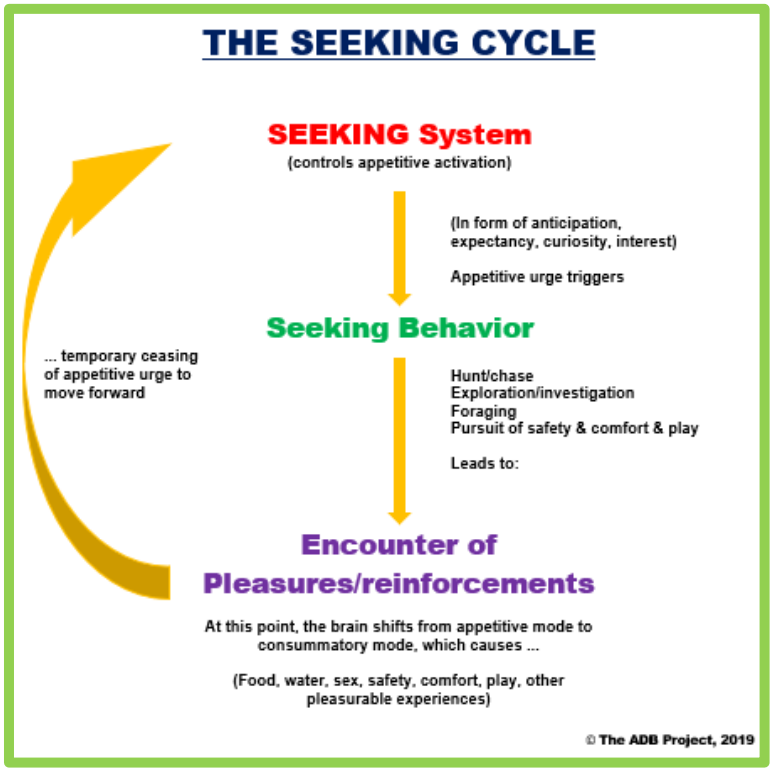
Once the dog encounters the rewarding object/experience, the brain will shift from **appetitive phase** (the urge to move forward) to the **consummatory phase**, at which point, at least in strictly controlled lab environments, the SEEKING System calms down (dopamine release ceases), but not for long. Once the satisfaction of consummation lets up, the brain rapidly shifts back to the appetitive phase and again increases the release of dopamine; the cycle starts anew.

In layman's terms, SEEKING always starts with an urge to go after something exciting or beneficial. Unless we suppress that urge, it will turn into an actual pursuit, which is always an observable behavior in dogs, i.e. when they sniff or when they chase after things, when they scan the horizon for information, when they go through your garbage and even when they run for shelter (to name just a few). The goal is to get the "reward" – to goal is to transition from the *appetitive phase* to the *consummatory phase* (achievement). During the appetitive phase,

dopamine release is highest urging the dog to anticipate and to keep SEEKING. During the consummatory phase, dopamine release slows down, but only for as long as the satisfaction doesn't weaken. Once that happens, dopamine release increases again shifting the mind back into an appetitive state. But that's not to say that the new appetitive phase is motivated to seek the same "reward" it targeted before. In other words, **motivation can shift**.

Imagine feeding time for Buster. Buster is on a feeding schedule and is now eagerly anticipating his meal (emotional SEEKING urge). Timmy has taught him well, and Buster sits nicely, patiently waiting. Buster's nose is wiggling to catch the scent (observable seeking behavior) of the food while Timmy prepares the meal and finally sets down the food bowl. Buster approaches the bowl (seeking behavior). As he gulps down his food, he is in a consummatory state. The moment he swallows the last bite (and even between bites), his brain shifts back into an appetitive state with a renewed SEEKING urge. Is he necessarily seeking more food? Maybe, or maybe not. Chances are that after his meal, Buster may be more motivated by a need for water, or a need to go outside to relieve himself, then seek to take a nap.

As you can see, the SEEKING system is constantly switching between appetitive (high dopamine) and consummatory (low dopamine) states. The challenge for us is to figure out the motivation that drives the appetitive urge at any given time. **Most SEEKING urges are triggered by needs**, not just by wants. So, this is a really important thing to keep in mind when we deal with dogs.



Especially since, thanks to some far-reaching dopamine pathways, the SEEKING System is also involved in the appetitive phase of all other emotional systems:

SEEKING and RAGE: When dogs find themselves irritated enough to engage in a physical confrontation, it is most likely the SEEKING System that gives them the confidence of expecting a positive outcome.

SEEKING and FEAR: When dogs are scared, they will most likely seek safety. In pet dogs, FEAR is mostly an issue when an aroused

PANIC/GRIEF System goes ignored and adequate emotional support from their trusted human is lacking.

SEEKING and LUST: An intact dog will actively pursue a mate.

SEEKING and PANIC/GRIEF & CARE: A lonely young pup will exhibit many seeking behaviors to cope with separation distress (PANIC/GRIEF), while a parent dog will seek to comfort and care for their offspring (CARE). In human-dog interactions, physical isolation or emotional disconnect (PANIC/GRIEF) will cause a dog to seek connection, which the human will hopefully provide in form of CARE.

SEEKING and PLAY: Surely, the SEEKING System is involved in prompting the most enthusiastic play bow an energetic pup can muster to invite the most anticipated of all activities: rough-and-tumble Free PLAY and chase.

Caution: SEEKING

Needless to say, all animals have different "habits" and needs, which results in a variety of consummatory behaviors. However, there is one behavior they all share: moving out in exploration. That's what all the searching, sniffing and investigating is for, and objects that catch their curiosity in the environment are explored and manipulated.

Sadly, in the domestic animal world, we vehemently try to suppress many of these very primal, emotional behaviors, inadvertently and probably rather unconsciously contributing to many behavioral issues in our companion dogs. Homeostatic imbalances, social needs, even FEAR and looming dangers will arouse SEEKING. For example, when dogs experience unpleasant homeostatic imbalances, their SEEKING Systems naturally become more responsive to rewards, and even the cues that predict rewards, no matter how subtle these cues are. However SEEKING can also make a dog greedy beyond homeostatic needs, which is why treats can be an effective reward even after a meal. Or when dogs are left alone or ignored and their needs for social comfort are not met, dogs will seek companionship; and if their quest to find a friend is unsuccessful, they may try to pacify themselves by getting into things we rarely appreciate.

The most common misconceptions tied to the SEEKING System typically raise questions in regards to activating or heightening of the SEEKING System. Contrary to popular believe, the SEEKING system cannot be activated, as SEEKING never stops, which means that SEEKING is always active. As for the question of whether you can heighten the SEEKING System: Yes, you can, by intentionally creating over-arousal. And this is where we want to caution you. Over-arousal is caused when the brain releases an excessive amount of dopamine, and, as we mentioned earlier, excessive amounts of dopamine are linked to manic behaviors and other problem behaviors, some of which may mimic behaviors linked to fear arousal or even RAGE. The function of dopamine is to seek rewards; if the promised reward does not match the excessive levels of dopamine, frustration will set in, which can then lead to feelings of anger, and even

progress to FEAR. So, anytime you decide to create more excitement or calmness, do so with the awareness that dopamine is a highly potent neurotransmitter.

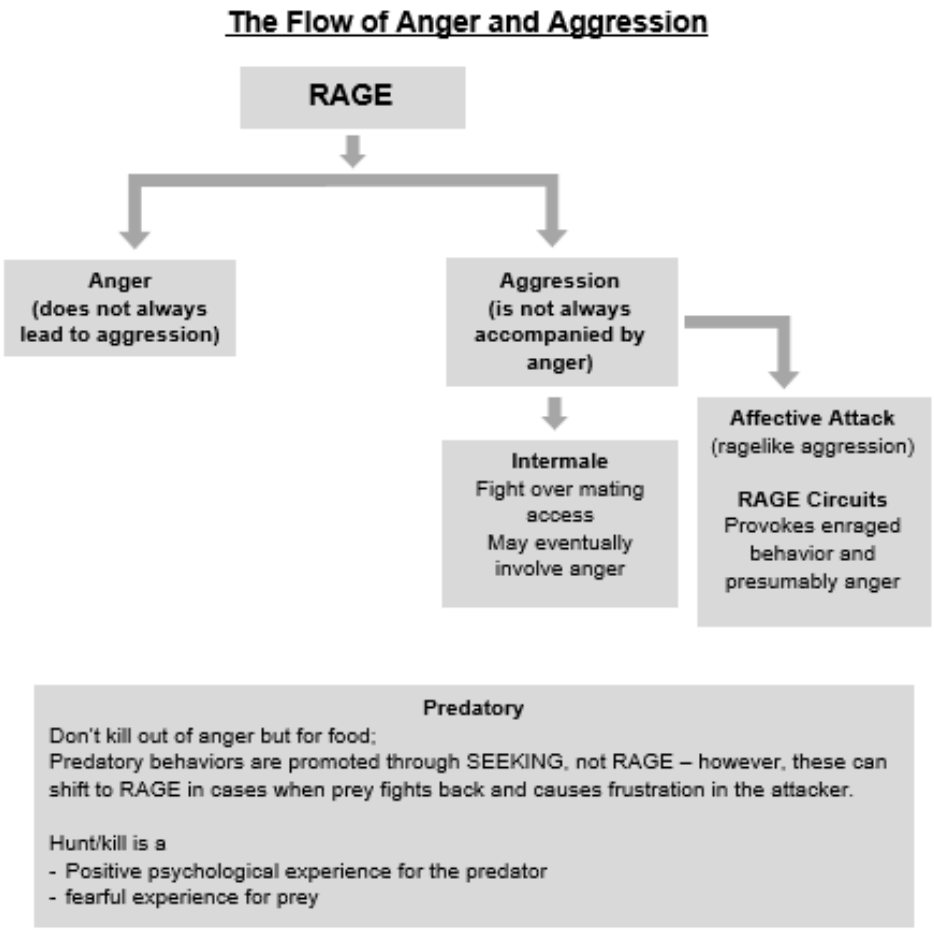
RAGE – COMPETING FOR STUFF

"The resource system"

> *"The aim of anger is to increase the probability of success in the pursuit of one's ongoing desires and competition for resources ... To be angry is to have a specific kind of internal pressure or force controlling one's actions and views of the world ... Anger must not necessarily be considered a wholly negative emotion, for if the energized behavior of rage produces the desired changes in the environment, then it is rapidly mixed or associated with positive emotional feelings." -Jaak Panksepp, AN*

We would certainly like to offer a good definition for RAGE, but it appears that while the human mind knows what rage and anger feel like, we have the hardest time defining either. Actually, the concept of anger is so vague that animal researchers and even psychologists were discouraged from using the terms of rage and anger. Despite the difficulties of defining these states of mind, online literature frequently establishes a correlation between anger, rage and aggression. Surely, the various states of RAGE are not foreign to us: sometimes we harbored them as the host, while at other times, we were on the receiving end? Like all emotional systems, RAGE creates urges. In this case, they are not noble urges, though, and they can be quite strong and intimidating and are definitely **anti-social**. When we feel them, we just want to deal with whatever we find offensive, deal with it in an annoyed confrontational, possibly aggressive manner. Luckily, anger and aggression do not necessarily go hand in hand; meaning that anger can be felt without triggering aggression, and aggression can happen even without feeling particularly angry, and so we don't always have to act out.

With anger and aggression being controlled individually, and aggression consisting of two distinct circuits, the flow within the RAGE System can become a little confusing. For that reason, we have created the following basic visual:



Typically, behaviors that threaten, injure or kill another are referred to as aggression. Though all mammals are capable of experiencing and acting on the effects of rage, anger and aggression, different species show aggression differently. In dogs, the wrath of anger can range from an intimidating baring of the teeth to a dangerous, sometimes full-blown fatal attack.

The two distinct circuits that control aggression are referred to as **intermale** and **affective attack (rage-like aggression)**. However, there is another type of aggression that also causes great concern to dog handlers: Predatory aggression. Predatory aggression is different, though, in that it is primarily under the control of the SEEKING System, not the RAGE System; though RAGE can get involved, if let's say the prey animal fights back and thus causes frustration in the attacker. Intermale aggression cannot be reliably identify amongst domestic dogs, as it is oftentimes difficult to separate environmental triggers from true male-to-male aggression. This is only obscured even more by our strict management of canine reproduction, including altering the dog. As Dr. Panksepp points out in his work, there may even be more aggression circuits, but not enough evidence is available yet to discuss them separately, i.e. infanticide (injury and killing of

the young) and defensive aggression, as well as resource guarding in canines. Though all RAGE circuits operate on individual agendas, and dogs can exhibit many different forms of aggression, all have one important thing in common: the potential to cause bodily injury and even death, being the most serious.

RAGE in dogs works much like it does in us. Typically, when RAGE is aroused, we are in a negative state of mind, but in cases when it interacts with *"cognitive patterns"*, let's say victory over an opponent leaves us feeling larger than life, that's when RAGE can also adopt positive characteristics and become self-rewarding.

It is a good thing that dogs that know each other and live together in stable, safe homes develop an acceptance of each other, and conflict is often resolved in non-confrontational ways, either through a quick glance, a bit of vocalization or subtle body language. However, dogs that have never met may be more prone to become physical, especially if they have been poorly socialized in the past.

Though this may be a hot topic in lieu of widespread legal and social breed-specific prejudice, science does show that increased aggressiveness can be bred into both males and females through selectively breeding for aggression. In short, aggressive tendencies can be passed on genetically. But given how few dogs are really properly socialized and how nature and nurture intermingle, it is almost impossible to say with certainty whether a dog is genetically predisposed to increased aggression or higher levels of aggression are a side-effect of past environmental experiences; or maybe even a combination of both.

Fortunately, as Dr. Panksepp states repeatedly, **it is very likely that certain neurochemicals, including those that emerge from the Social Emotional Systems, promote peace in animals**; in this case in dog-to-dog and dog-to-human relations, **which is why Affective Dog Behavior focuses mostly on the social benefits of these emotional systems** - to help our dogs feel safe **with** us but in **their** ways, even in situations that seem worrisome.

Even though environmental stimuli can provoke feelings of anger, contrary to common belief, **environmental events do not actually create the emotion itself**. The emotion already exists in the brain, ready to be aroused when certain stimuli gain access to the RAGE System. Examples of these stimuli include restricting one's freedom, repeatedly irritating one's body surface or withholding an expected reward to the point of frustration, which looks like this in dogs:

- **restriction of freedom** includes hugging a dog without consent, restricting a dog with the leash, and can also be seen in perimeter aggression

- **irritating body surface** would include continuously pestering a dog by poking them or pulling ears or tail, and so on
- **withholding an expected reward to the point of frustration** can easily be observed in dogs and may lead to future aggression issues. Here, Dr. Panksepp (1998) used a really good prime example: Imagine your frustration (a major link between SEEKING and RAGE) and the bouts of anger when a vending machine cheats you out of your money without dispensing your much anticipated snack. With cognitive intervention you could shake off the feeling rather quickly, but it may take a bit longer your tummy is growling at you and you have no more money to spare. Yikes! People have been seen hitting the machine or shaking it while cussing. And it's all based on unfulfilled expectations, which are instigated by the SEEKING System and caused by a spike in dopamine. When expectations go unmet, RAGE is activated.

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The issue of unfulfilled expectancies, such as in the vending machine example, certainly meets the criteria of the SEEKING System at least indirectly influencing the RAGE System by causing frustration when expectations in the SEEKING System are not met. (see how it all works together?) In other words, if a reward does not live up to expectation, it may arouse the RAGE circuit and promote anger.

Anger has a profound impact on a dog's physical and mental states. The body tenses, and blood pressure, muscular blood flow, heart rate and even body temperature increase in preparation to carry out the orders of the brain, as the mental likelihood to strike intensifies. Depending on past experiences, a situation may escalate rather quickly. If, for example, similar confrontations happened in the past, they were stored as memories, and the RAGE System can rapidly retrieve them when the need arises, and lead to new episodes of anger.

And when positive expectations (SEEKING) are unfulfilled and reward is interrupted or terminated, that too, may quickly lead to frustration and even to a bite (such as may be the case in resource guarding). However, aside from frustration, there are other causes for aggression, i.e. hunger, pain, fear, possibly some neural effects of testosterone; it is important to remember that the various circuits that spark aggressive behaviors can be triggered into action by a great number of external stimuli, and aggression has many different faces.

As mentioned above, rage-like aggression, predatory aggression and intermale aggression are driven by three very distinct circuitries in the brain:

(1) **Predatory aggression**, though a type of aggression, has very strong ties to the SEEKING System, which is not really surprising considering the fundamental purpose for hunting and killing prey: food. It's best to remember that, from the dog's point of view, no apparent anger is involved in this food-seeking behavior. In fact, predatory aggression is accompanied by positive affect; yet

it does have the potential of rapidly shifting to RAGE, should the victim turn out to be a fierce fighter and cause frustration in the attacker.

(2) The brain region that promotes **rage-like aggression**, on the other hand, also yields escape behaviors (as might be needed during a fight). As mentioned earlier, frustration can be a major instigator of anger. Frustration is strongly associated with unfulfilled expectations in a process that involves frontal cortical areas where conditional stimuli predict rewards. Thus, if an anticipated reward does not register, a "request for activity" is sent to the RAGE System.

Fortunately, while frustration in dogs may lead to anger of varying degrees, it does not always lead to aggression or aggressive attacks, as dogs have found numerous ways to release frustration-elicited stress, such as destructiveness, physically acting out, vocalization, even escape, and avoidance etc.

(3) **Intermale aggression** appears to interact strongly with both the RAGE and the SEEKING Systems. In many mammalian species, males fight more than females. Not surprisingly, males possess more active circuits that promote aggression, which helps boost assertiveness and, in turn, ensures reproductive success. Therefore, male sexuality and aggressiveness tend to go together. This appears to be due to a high density of testosterone receptors in areas of the brain that promote RAGE. Testosterone has a powerful effect on a neuropeptide that is linked to territorial marking, intermale aggression, male sexuality and the formation of social memories. Interestingly, with two opponents ready for battle, the initial motivation for intermale aggression is positive, as both males enter battle with rather optimistic expectations. Only when one is about to lose the battle, frustration sets in and gives way to negative emotions. Chances are that in males the brain systems that regulate social play and intermale aggression collaborate rather closely.

Although intermale aggression and rage-like attacks are independent circuits, they are highly interactive, as intermale aggression certainly could evoke anger. However, as mentioned above, this form of aggression is less identifiable in a canine society whose reproduction is oftentimes strictly managed by humans - from alteration of the sexes to separation.

Aggression circuit	Exhibited "language" during attack pattern	Target "victim"
Quiet-biting attack (predatory)	Methodical stalking and well-directed pouncing	Specific
Affective/defensive attack (rage-like)	Piloerection (hair standing up) Autonomic arousal (involuntary bodily responses) Growling	May be specific but can be "any living target" close-by; may also be directed at more "submissive" animals
Intermale aggression	No reliable identification in companion dogs	Specific

From a learning point of view, as with any emotional system, aggressive behaviors can certainly be learned; in fact, dogs can be trained to be more aggressive or more passive. The hormones involved in aggression between males provide feedback and also reinforce the learning of aggression. Female hormones (estrogen and progesterone) on the other hand, as well as the pleasures of touch (and sexuality in breeding situations) have a more mellowing effect on certain types of aggression. And how important is learning in the mediation of rage-like affects and behaviors? Unfortunately, not much research has been done to come to any kind of valid conclusions. Yet, it is probably fair to assume that in the realm of classical conditioning, pairing of certain neutral stimuli with the unconditional response of anger would quickly lead to conditioned anger responses.

Now, what could be so bad for our pampered companion dogs that they feel like lashing out? Mostly, we have to concern ourselves with the following:

- **Frustration** is definitely a major trigger. Just remember the vending machine analogy from above. Dogs deal with their own types of "impenetrable vending machines", which may or may not involve us. Sometimes it's a delayed meal the SEEKING System helped them anticipate at a certain time, or a reward during training that wasn't delivered. Being restrained in any way, for example by a leash or a fence, can also prevent a dog from meeting their "expectations" and cause frustration (amongst many others).
- **FEAR**, the emotional system we will discuss next, can bleed into RAGE (fight), especially when running away is not an option and physical harm is imminent. It is often said that "fight and flight" go together as fear responses, but in the brain they really don't. In the brain they are regulated by two separate circuits, and the RAGE circuit only pitches in when all other measures were exhausted or previous experiences have taught the dog that sometimes offense is the best defense to begin with.

- **PLAY** is also an emotional system we will discuss shortly, and it, too, can bleed into RAGE (and even into FEAR); mostly when the innate desire to play was satisfied but another, more playful dog doesn't get the message of "game over", or when one of the play partners doesn't play fair.

As the RAGE System also interacts with the SEEKING System, and we have mentioned numerous times, unfulfilled positive expectations and interruptions during a time of reward typically lead to frustration, possibly even a bite; such as may be the case in resource guarding. But frustration is in no way the only cause for aggression; hunger and pain, for example, and possibly even some neural effects of testosterone can easily put a dog on edge. And so, it is best we remember that aggressive behaviors can be triggered by a multitude of external stimuli and aggression has many different faces.

Luckily, frustration in dogs – or other causes of anger – does not always lead to physical attacks. Dogs have developed various ways to release frustration-elicited stress, such as destructiveness, physically acting out, vocalization, even escape and avoidance, etc.

In the world of canine professionals, aggression is oftentimes divided into the following three strategy-driven categories. Though this is not directly related to Affective Neuroscience, we decided to include this information in an attempt to make this crucial chapter more complete.

1. Defensive aggression happens when a human or another animal approaches or touches the dog, and the dog perceives the action as a threat and reacts accordingly. In this case, RAGE and FEAR overlap.
2. Offensive aggression happens when a dog approaches an individual and initiates aggression regardless of what the individual was doing. This is a case of an active RAGE System.
3. Predatory aggression usually involves the sequence of visual/auditory stimulation, which triggers a silent and direct chase, followed by capture and kill. This form of aggression is not originated in the RAGE System, but the SEEKING System. However, the RAGE System can be involved, if at any time during the predatory chase or attack frustration sets in.

As issues of fear and aggression have long been a focal point for canine professionals, the industry has developed a variety of methods to categorize and deal with aggression. There are many subtypes of aggression we commonly refer to, such as resource guarding (possessive aggression), territorial aggression, fear aggression, redirected aggression, defensive aggression or dog-to-dog aggression, to name just a few. And as we will see in the next section, the circuits for aggression and fear overlap in many areas of the brain, which means that they are highly interactive emotional systems.

FEAR – PROTECTING YOURSELF

"Because of the RAGE System, evolution also created the FEAR System"

It is dark. You have always been afraid of the dark. Remember the monsters under your bed when you were little? Remember how they came alive, creeping up your bedroom walls as the moonlight barely penetrated through the window? Remember how you were peeking out from under the covers? You were alone. Mom and dad left you alone. Alone with your monsters and alone with your fear. Guess what ... you are alone again. In the dark. Not trapped in your bed this time, but out in the middle of nowhere, enveloped by silence and trapped by nothing other than fear. Goodness, ... did you just hear that? Ha, apparently you did; you almost jumped out of your skin; couldn't help it, could you? A reflexive response to a sudden little noise somewhere ... you certainly didn't mean to jump, but you did anyway. And now you hold still. Very still. Or better yet, you freeze. While you are standing there, your senses run wild. Because you can't see well in the dark, you listen intently. Hear the monsters? Frozen in time and space, you are trying to decide which way to turn, what to do next. Should you stay put, hiding within your motionless self, hoping to remain undetected? Should you make a run for it? All the while, you feel your heart pounding in your throat. That little startle a few seconds earlier was really unsettling. Imagination runs wild, and with it you finally make a dash ... but for what? Perceived safety? Where? Yeah, right, anywhere but here. You run as fast as your feet can carry you. You stumble, get up and carry on. You run until you can't run anymore, and if by then you were lucky enough to find that perceived place of safety, you hide. Heart throbbing like crazy, from the physical exertion and also from fear. You tremble. You remain on high alert. You feel cold. And you wonder ... what's out there, sharing the night with you in this strange, desolate environment? What else will hunt and haunt you before the night is over with?

We all have felt it, and we all know how debilitating it can be. Unless you are a thrill-seeker, fear is not a particularly pleasant emotion to experience. But it is an important one; it helps us anticipate danger. When the FEAR System is aroused, depending on the situation, we either feel a strong desire to escape (flight) or fear may render us immobile (freeze). While freeze is certainly a response elicited by the FEAR System, in the lab, it was observed primarily in milder cases of fear. Science never answers why-questions, but Affective Dog Behavior tries to. So, why would mild cases of fear result in a freeze? Freeze, or **pause** as we call it, serves several purposes:

(1) **Pause** gives us time to assess a situation longer and weigh our options more cognitively
(2) **Pause** helps the autonomous nervous system to balance between the sympathetic and parasympathetic output
(3) **Pause** helps us preserve our resources for the moment when they are absolutely needed
(4) **Pause** allows us to remain undetected longer

During a stressful event (including but not limited to FEAR) the body prepares itself for emergency action by releasing adrenaline (amongst others); adrenaline, as we know it, is released from the adrenal glands. But the brain also releases adrenaline, in which case adrenaline is referred to as norepinephrine. The release of both, adrenaline and norepinephrine can be triggered simultaneously, but a blood-brain barrier that doesn't allow adrenaline to advance to the brain assures that both can be released independently. This explains why our bodies can be in a high state of sympathetic alert while we are perfectly capable of keeping a cool head, which is most likely the case during FEAR-induced **pause** (aka freeze). As fear intensifies, the rapid release of norepinephrine then allows the brain to quickly collaborate with the already energized body and take swift action. Flight is typically the first choice, but if flight is not an option, the FEAR circuit may even seek support from the RAGE System and urge us to fight for our lives, in which case FEAR, though still aroused, takes a backseat to RAGE.

But, as you will learn, the FEAR System is a lot more complex than just that. Remember how SEEKING anticipates and detects rewarding experiences? Well, FEAR anticipates and detects the exact opposite: aversive experiences. And both are very convincing teachers.

The primitive state of fearfulness has been described in many works of literature throughout recent history, but none has captured Jaak Panksepp's attention more than Jack London's depiction of the development of instinctual fear in White Fang, who had never *"encountered anything of which to be afraid. Yet fear was in him. It had come down to him from a remote ancestry through a thousand lives. It was a heritage he had received directly ... through all the generations of wolves that had gone before. Fear! – that legacy of the wild which no animal may escape"*.

FEAR in depth

We all know fear; have experienced fear in one way or another. Yet, the question is: can we describe what it feels like? To describe it, we would most likely use very simple language that identifies the autonomous effects of FEAR, rather than the feeling itself. Effects our bodies produce to put us into survival mode. So, we would probably say that our hearts pound a little harder and that we get the chills or start sweating profusely. But no matter how often we have experienced the emotionally and physically crippling effects of fear, we cannot really put in words the feeling itself, can we?

We are sure that most of you know what it's like to almost jump out of your skin when someone unexpectedly jumps at you from behind. Whatever your reaction, it is entirely involuntary, just like any other fear reaction, be it from a sudden bone-chilling scare, the

anticipation of something horrible or the long-lasting agony of anxiety that wears you down and messes with your sense of security. Whatever causes your fear and whatever type of fear you experience, the process in the brain is the same.

Though there is no way for us to address all aspects of FEAR, we will try to pass on to you the most pertinent information provided by Dr. Panksepp; information we can confidently say applies to the canine world.

The FEAR circuit courses between the central amygdala and the PAG of the midbrain. Dogs may have different triggers than humans, as they perceive the world differently, but the FEAR System works very much in the same way, and fear responses in dogs are no less severe and serious than in humans. What makes FEAR such a difficult and complex emotional system is primarily rooted in its function of warranting survival, whether danger is real or perceived. Though there are other areas in the brain that have the ability to generate alarm and dread (one such example is the later-discussed PANIC/GRIEF circuit), here we are discussing the distinct circuit that, when aroused, prompts the typical fear behaviors of pause (freeze) and flight. This most primal survival mechanism, the FEAR circuit, has a system in place we are rarely aware of. The ultimate function of FEAR is to anticipate bad things in the future. Naturally, it would not be all too wise if a dog would be fearful nonstop, and that's where experience comes into play to teach a dog what they should and shouldn't be afraid of. While some fears are innate, other fears are learned through classical conditioning (typically unintended by us) by pairing neutral conditional stimuli (i.e. objects, other animals & people, places, even specific situations) with aversive unconditional stimuli (pain, threat, intimidating tone of voice or gestures, etc.). This is often referred to as Fear Conditioning. When the pairing of stimuli happens, glutamate "unlocks the gates" to the FEAR System, and stimuli that were somewhat insignificant before now gain easy access, and before you know it, the dog is conditioned to aversive environmental situations. The neural path between environmental cues and the FEAR System is quite complex and while it involves areas of the upstairs (cognitive) brain, all emotional learning can occur without cognition.

What all this means is that our dogs can literally learn to be fearful ... quickly ... fearful even of us; and they acquire conditioned cues from the environment that predict threats. Though crucial for survival from the dog's point of view, such conditioned fear associations can make a dog handler's life beyond challenging, as we **will constantly have to maneuver between trying to prevent negative associations and trying to cope with associations already cemented into the dog's brain.**

A word about FEAR:

(1) The reason FEAR learning happens so rapidly is that glutamate, the very neurochemical that promotes learning, is one of the main neurochemicals released during a fear episode.

(2) Innate fears are primary, and the fear of pain, injury and death, the fear of sudden sounds and the fear of specific odors (i.e. smoke) are genetically programmed.

(3) Learned fears are typically secondary fears. We are not born with a fear of needles; dogs are not born with a fear of crates or cars. And when you really think about it, it is not the needle we fear but the pain that might be cause by the needle. And it is not the crate or a car the dog fears, but the prospect of what might happen when they are inside of either.

(4) Comfort touch through CARE helps suppress the amygdalae (there are two); the deeper the emotional connection (release of CARE-cocktail) in that moment, the more comfortable and confident the dog feels.

(5) Recovery is what helps the dog process a fear event properly.

Needless to say, fear is an aversive emotional state; a state that triggers **involuntary** autonomic responses such as increased heart rate, a rise in blood pressure, eliminative behaviors and adrenal stress responses (i.e. release of adrenaline and cortisol) and **involuntary** behaviors (freeze, flight). When a dog is intimidated and traumatized time after time, their FEAR System can become over-responsive. Scaring a dog badly enough or long enough (think flooding) will most likely hypersensitize the dog's FEAR System. And when fears are long-lasting, anxieties can lead to chronic stress, at which point, fear isn't triggered by actual events but is a direct result of an overactive FEAR System that communicates with upper parts of the brain. Since the effects of fear convey to a dog that their safety is at stake, it is only natural that **in chronic fear the dog lives in a constant state of feeling unsafe**. Fear learning is rather rapid and persistent, and through its process a dog gains experiences and builds memories that help them identify threats without having to learn about them time and again. Note: A dog's perception of danger or threat may differ considerably from your own.

In the following, we are listing a few interesting facts about fear:

- Tests have shown that flight and pause behaviors, as well as FEAR-related autonomic responses can be stimulated along the whole path of the FEAR System. While freeze episodes are typically short lived and linked to mild forms of fear, flight is more commonly triggered when fear is more intense. However, **dogs can also appear frozen in time when fear is severe but neither flight or fight are an option**.
- While pain can certainly trigger fear, fear does not evoke pain.
- During intense fear, the brain secretes analgesic brain chemicals (i.e. opioids) that can help inhibit the experience of pain, which helps an injured dog override the agony of pain and not focus on the injury.
- Aside from anxiety and pain, aversive internal feelings such as hunger and thirst (amongst others) may affect the intensity of fear.
- All emotional systems interact with other systems, and FEAR is no exceptions. Both FEAR and RAGE have a strong presence in the amygdala, and an occasional interaction between these two circuits, which leads to a fight response, is part of a dog's primal defense mechanism.
- The PANIC/GRIEF System also evokes feelings of alarm and dread. However, **PANIC/GRIEF and FEAR run on entirely distinct circuits**. While the FEAR System evokes feelings of fear and anxiety that may trigger a dog to **escape a situation** as it intensifies, the feelings associated with PANIC/GRIEF are separation distress/anxiety, loneliness, feelings of loss and grief; in severe cases, acute distress can lead to panic attacks, which are similar to panic attacks in humans. Dogs that suffer from separation distress seek the company of those they trust most.
- PANIC and FEAR also differ in their autonomic responses, with each being regulated by a different branch of the autonomic nervous system. (see comparison chart below)
- As pain is an effective stimulus that can create fear and help generate learned fear, it is widely believed that fear is nothing other than a conditioned response to a cue that predicts pain. Though FEAR is definitely susceptible to learning, building fearful memories wouldn't be possible if dogs weren't born with the capacity to do so in the first place. Indeed, even at the onset of life, before any learning occurs, fear responses can be triggered, but only by unconditional stimuli such as pain, sudden loud sounds or possibly a specific scent. Over the course of a dog's life, experience then becomes a powerful teacher and contributor to the memory bank, and events and objects that once were rather meaningless can now trigger fear. In this way, the FEAR System is brought under the control of life itself, and learning ranges from simple Secondary Process learning to more complex cognitive learning that happens on the Tertiary Process level.

- Most dogs show at least some fear response to startling loud noises, but if a dog is already in a fearful state, the startle reflex will be much stronger (even though the startle reflex is organized much lower in the brain than the FEAR System).
- Typically, dogs try to escape from fearful situations, and they try to avoid places where they have experienced fear in the past.
- Dogs can be genetically predisposed to anxiousness.

FEAR vs. PANIC/GRIEF

As mentioned above, the FEAR System is not the only region in the brain that accommodates feelings of dread. Another such system is the PANIC/GRIEF System, which we will discuss separately. We do feel, though, that you could benefit from a quick comparison between these two emotional circuits. Aside from anatomical and neurochemical differences between them, they also differ significantly in general characteristics.

FEAR	**PANIC/GRIEF**
Fear requires a dog to actively respond in some way, possibly even take flight. It would be detrimental to a dog's health to always be ready for such action. Thus, it is the *sympathetic* autonomic nervous system's job to prepare the dog by elevating heart rate and respiration, which provides the additional oxygen necessary for the dog to flee. It also dilates the dog's pupils to allow for more watchfulness	Separation distress puts the dog in a more passive state; therefore, it is the job of the *parasympathetic* autonomic nervous system to slow the heart rate, while breathing and pupils remain normal
Rapid heartbeat, excessive panting, gastrointestinal upset, increased muscle tension, apprehensive tension	Weakness, lethargy, whining
Triggers an urge to escape from situations that worsen anxiety	Intense desire to reconnect with their trusted humans

FEAR and other emotional systems

Although all emotional systems can function independently, more often than not the various systems interact almost continuously in that one emotional state can quickly shift to another, but also operate simultaneously. One such example is when a fearful dog is driven over threshold and bites, in which case three emotional systems are aroused: SEEKING, to seek safety, FEAR

itself and RAGE, which is responsible for the bite. These swift and close interactions of raw affects make it harder to diagnose the root cause of behavioral problems. Understanding the characteristics of each emotional system enables us to better understand the underlying causes of problem behaviors and the individual needs that typically arise when a dog is in a specific emotional state. And eventually, we can use what the brain provides to communicate with the dog in ways that help them feel safer in their environments. In the case of FEAR vs. PANIC/GRIEF, for example, we know that both cause feelings of dread. And now we also know that these two systems differ considerably in the needs they evoke. The dread experienced by a dog that is afraid of a strange person is very different from the panic stricken anxiety a dog feels when left without social contact. Needless to say, these two dogs have different needs to help them feel safe, and in the past, observing their behaviors was the only means we had to determine their needs: distance to the source of fear in the first, closeness to a trusted person in the latter. But where is a dog to run off to attached to a six foot leash? What happens if the environment cannot be changed to accommodate the dog's needs in that moment? And how are we to comfort a lonely dog when we are not home?

Thanks to the knowledge we gained (and continue to gain) through Affective Neuroscience, we know a lot more about what's happening inside of the brain. We do not have to have x-ray vision and see how the brain processes information, we just need to acquire basic knowledge from all sciences available, then use that knowledge to ready our dogs for their lives with us. Help them build resilience so that stressful situations, whether they arouse FEAR or PANIC/GRIEF, become less intense and easier to cope with.

Another emotional system that oftentimes works in tandem with FEAR is RAGE. Just as FEAR and PANIC/GRIEF, these two are anatomically and chemically distinct systems, yet intimately intertwined. How exactly they interact depends on the severity and type of environmental threat, as well as the coping options and skills available to the dog. Most dogs that are able to flee from a frightening episode will do so. If escape is not possible, however, FEAR will seek the help of RAGE.

Fear Conditioning

Fear conditioning experiments conducted in lab environments usually involve physical pain. An easy way to inflict pain on animals is by electrical shock. During such experiments, a previously neutral stimulus such as a light or a sound is paired with a painful shock. At some point, the animal will become afraid of the sound or the light even if there is no shock. What we learn from these experiments is that not only do once neutral stimuli gain access to the FEAR System, a variety of contextual stimuli do also. In short, a dog that is being beaten with a newspaper will not only become afraid of the newspaper, but also of the abuser and possibly a specific smell or sound that was present during the abuse, and maybe even the whole room in which the abuse took place, and so forth.

Before we move on, let's keep in mind that the basic principles that apply to fear-conditioning also apply to other forms of sensory-emotional conditioning. In this section, which is quite technical and only included for general information, we will learn that there are two primary paths in the brain that lead to learning, which Dr. Panksepp identifies as the "high-road" and the "low road". The first involves the cortex, the latter does not. Typically, FEAR-learning occurs simultaneously on both paths; generally they complement one another when the higher regions regulate the lower and in turn the lower regions arouse and sensitize the higher ones. And so it happens that the neocortex, in an adaptive response, can learn to suppress emotional arousal. Very simply put, a dog may jump (low-road) at the sudden noise of a backfiring riding lawnmower, but when a short moment later a relatively reasonable neocortex (high-road) makes sense of what happened, it will inhibit further arousal of the FEAR System, which helps the dog calm down rather quickly.

Research into fear-conditioning as well as FEARfulness is generally done in lab environments. As mentioned earlier, foot shock pain is typically paired with sound or light stimuli. Though it isn't quite clear yet, whether other predictive stimuli - such as touch or smell, etc. - can yield similar results and also enter the FEAR System via the low-road, it's best to remember that how the brain prioritizes the sensory systems to mediate rapid fear-conditioning is most likely species-specific.

In the brain, nearly all senses (all but smell that is) pass through the thalamus before they advance to the neocortex, while the pain of the foot shock is felt way below the thalamus, in the PAG (Panksepp, 2012). Again, in fear-conditioning experiments, sight and sound are the prevailing conditioned stimuli used. To put it rather simply, initially, sight or sound undergo general subcortical processing, after which they advance to the thalamus, where they are sorted, mixed and re-processed, before they are sent on to the cortex. At cortical level, this sensory information is then transformed into refined perceptions. Pain, on the other hand, is too urgent of a matter and requires quicker processing; therefore, it never makes it to the thalamus nor the cortex. And even more urgent than pain are cases that involve the startle reflex, which is produced very rapidly in the brain-stem. In cases of anxiety, the pathway of the startle reflex is extra sensitized, which explains why a dog who is in an already fearful state startles very quickly. Given that an aroused FEAR-circuitry most likely sensitizes the mechanism of fear-conditioning, the logical conclusion that follows is that the FEAR System serves as a conductor for fear-learning.

When pain happens, information about initially neutral objects and events - those that were of little to no importance before pain was experienced - will gain access to the FEAR System. Being closely associated with that pain, they now become predictive cues, which are put in charge of anticipating "danger" and eliciting "anticipatory-conditioned emotional behaviors". These are no different from the unconditional primary-process (innate) FEAR responses (including involuntary autonomic responses and fear behaviors). And as if the phenomenon of this straight-

forward fear-conditioning isn't complicated enough already, contextual fear-conditioning complicates matters even more. Though, during lab experiments, sound and light are the primary neutral stimuli paired with pain to create negative associations to the stimuli, thanks to hippocampal involvement, lab animals soon learned to fear not just sound and light, but also the sight of approaching researchers, the chambers in which they were tested, the smell of sawdust on the floor and many other objects, situations and events that could possibly be associated with the discomforts of testing; and such is the concept of contextual fear-conditioning.

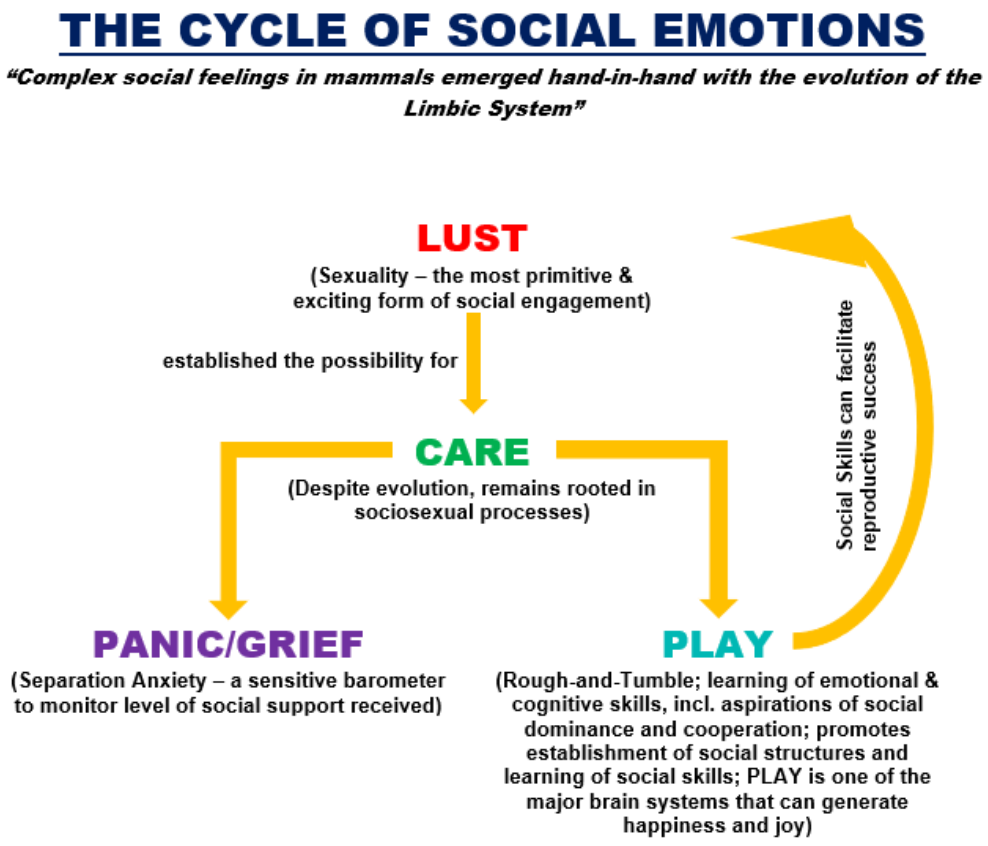
In order for us to understand the importance of these processes we need to realize that the neocortex is unable to initiate any emotional responses on its own unless it was persistently trained to do so (Jaak Panksepp, 1998). In fact, research has shown that during classical conditioning, the neocortex is the slowest area in the brain to respond to learning and only slowly develops the ability to communicate clear cognitive information to the amygdala in order to initiate learned emotional responses. This may explain why in human psychotherapy strictly cognitive approaches are less effective than methods that involve primary-process affects (Jaak Panksepp, 2012).

But why is all this so important for us to know? How can this knowledge possibly help us help our fearful dogs? After all, we cannot always control every neutral stimulus that could possibly become a predictive cue. In the world of behaviorism, trainers have two major options. One is to control the dog's environment and avoid triggers altogether. And another is to use a reward-based method to create positive associations; in other words, use primary and secondary reinforcers to change a dog's emotional perception. As we have just learned, this cognitive approach is lengthy. Furthermore, it may have to be repeated with every new event that could arise (i.e. a skateboard, a bicycle, riding in a vehicle, and so forth), a process that is very much a part of successful puppy socialization. But not all dogs come into our lives as well-rounded puppies. All too often we are facing major behavioral issues, and the more we understand about fear-conditioning (incl. conceptual fear-conditioning) - the more we understand about learning in general - the better we can help our dogs feel safe. When all is said and done, the goal cannot and should not be to eliminate fear altogether, as FEAR is an innate emotional system designed to keep an animal safe; rather we can use our knowledge of fear-conditioning and pair it with the positive effects of CARE to help our dogs cope through social-emotional connection.

Social Emotions

The beauty of the primary emotional systems is that they are designed to create a link between two or more individual minds, even across the lines of different species. When you think about it, social life is not unlike social media, which consists of millions of individual biological minds that connect via digital networking. Purely biological networks, on the other hand, connect through matters of the mind itself: neurons, neurochemistries and the social engagements that arouse them into action. One prime example of this natural type of networking is how we need each other and thrive especially through positive social interactions.

And so Affective Neuroscience has grouped the next four emotional systems into the category of *Social Emotions*, with each functioning individually, but also collaborating in the primal effort to create life and promote social connections. To continue the miracle of life from generation to generation (LUST), to commit to the future (CARE), to fight loneliness by building and maintaining relationships (PANIC/GRIEF) and to feel joyous and alive (PLAY), such are the promises of social emotions. On this premise, it is hard to separate the discipline of Affective Neuroscience from the studies of social behaviors that lay the foundation for Social Neuroscience.



LUST – SEXUAL REPRODUCTION

"What would the future hold, if it weren't for an urge to reproduce?"

The first of the social emotions we are covering is that of sexuality. Sexuality is a product of the LUST System facilitates courting and mating urges and rituals and is one of the most primal, yet the most pleasurable of all emotional circuits. Unfortunately, it is also the least understood in our dogs, and thanks to intense efforts to control canine reproduction, one of their most micro-managed and suppressed emotional systems. This is why we will only touch on the most basic facts that can reliably be applied to the canine species.

Though, the social aspects of the reproductive system can vary greatly between species, the basic functions and processes of the limbic system are similar in all mammals. What is quite interesting to know is that, contrary to some myths about "creation", all mammalian (amongst others) life starts with a female type brain, meaning that maleness in body and mind is not achieved until the prenatal neural process of masculinization is completed. This process causes sexuality to be organized differently in a male brain than in a female brain. If the biomechanical process goes as planned during this most critical time of gender development, testosterone converts to estrogen while still in utero, leading to masculinization of the once female brain. Also during this process the "male" will grow a larger anterior hypothalamus, while other areas, i.e. the corpus callosum – which connects the two cerebral hemispheres – remains smaller (Jaak Panksepp, 1998).

Male and female sexualities are every bit as different in the brain as they are in bodies, which ultimately leads to psychobiological differences as well. While testosterone and estrogen organize maleness and femaleness in the brain, oxytocin and vasopressin regulate some of the aspects of sexual and/or social behaviors, with oxytocin having more effect on females and vasopressin on males. It would be easy for us to claim that, in general, male dogs tend to be more aggressive and females more nurturing; however, no species is quite as diverse in breeds, genetics, lifestyle, environmental exposure and medical alterations as the dog. For that reason, generalizing would not offer a fair or clear assessment of psychobiological differences between canine genders and, in all honesty, would not contribute anything crucial to the questions of canine behavior management.

When thinking in terms of behavior management, the most important factor about LUST to keep in mind is the undisputed role of the SEEKING System. It drives unaltered dogs to seek out a mate, and may even motivate altered dogs to possibly seek out gender-specific companions.

As mentioned earlier, the SEEKING System is the most powerful emotional system. It ties all limbic functions together and connects the subcortical to the cortical brain, promoting communication between the two**. LUST helped establish the need for a CARE System, which greatly relies on the PANIC/GRIEF System and is strengthened by the PLAY System. All are also greatly affected by the SEEKING System. Are you beginning to see how the various emotional systems are intertwined, how they "talk" to each other to determine individual needs? And this is just the beginning!**

The Social Bond: CARE System & PANIC/GRIEF System

"And we had this theory that social attachment is an addictive process." ... Dogs, as well as humans *"are releasing opioids all the time during positive interactions* (like play and cuddling). ... *All social, positive things facilitate opioid activity*. ... *We have demonstrated that the* PANIC/GRIEF *system actually has opioids around it." -Jaak Panksepp*

Social Bonding is something we rarely think about but experience in one form or another every given moment of our lives. It involves complex neurobiological and neurochemical processes and two distinct emotional systems that are mediated by separate neural circuitries: the CARE System and the PANIC/GRIEF System. They are so tightly connected that we have decided to combine them in the same section. For example, some of the neurochemistries that contribute substantially to the creation of social attachments in one system (CARE) inhibit separation distress in the other (PANIC/GRIEF). No doubt, these major contributors to social bonding are on two opposite poles, reciprocating between two individual minds the release of addictive, confidence-boosting feel-good chemicals, and complementing each other in ways that help build bridges between family and friends, between total strangers and even between different species – in this case human and dog. At this point, we do want to add, though, that dogs also utilize olfactory (scent) cues in the establishment of social attachments.

CARE – MAKING SURE THE YOUNG CAN GROW UP NICELY

"Because of the LUST System, the animal also had to develop a CARE System"

Imagine a world without the pleasures of tender loving care. Imagine a mother-infant relationship without gentle touch. How cold and mechanical would relationships be, were they deprived of heartfelt nurturing, deprived of the bond that affectively holds them together? Would such a relationship even be possible, or would it closer resemble that of many species where the young fend for themselves without the care of a parent? Though we are a far cry from

being biologically maternal to our dogs, the CARE System plays a key role in every aspect of canine husbandry: relationship building, trust and confidence building, improved resiliency, behavior management and learning, to name just a few.

When we nurture our dogs, the release of feel-good chemicals in the brain instill a sense of "everything is alright" in the dog. Sadly, the exact opposite happens when the dog's need for connection is not met. The lack of these feel-good chemicals allows chemical patterns that do not promote confidence and social success to prevail in the brain. These chemical patterns are more in line with feelings of resentment and emotional distress, and if these feelings linger for too long, they will cause depression, possibly even changes in overall behaviors (personality).

The two neurochemical main-players in the bonding process are quite interesting, and learning about them will help you look at relationships from a slightly different angle: the angle of addiction.

- **Oxytocin** is a hormone that increases confidence, and also helps us feel drawn to those we already care about and to those in our inner circles. The downside of oxytocin is that it also makes us cautious and prejudice towards outsiders.
- The other neurochemical may come a bit as a surprise: **opioids**. Did you know your brain releases opioids? These opioids help ease emotional and physical pain and also modulate dopaminergic activity.

It is this potent CARE-cocktail of oxytocin and endogenous opioids, which makes hugs feel so darn good. Or petting a dog. Or for the dog to be petted in a certain way. The beauty about this CARE-cocktail is that it is released in all parties that participate in bonding – us, the dogs, the fleas on their back, you name it.

"Animals are sentient, intelligent, perceptive, funny and entertaining. We owe them a duty of care as we do to children." -Michael Morpurgo

And so we like to refer to ourselves as doggie parents, and we nurture and pamper our canine friends like we do our children. In general, this is a good thing in that it helps us connect emotionally, which makes for better overall relationships and helps build trust, confidence and resiliency. But we haven't always looked at dogs in that way, just as history has not always been kind to human children either. Harsh punishments and intimidation were not uncommon, causing emotional harm on young children that was passed down from generation to generation. But with each generation, the harshness decreased a little bit more. Still, even today, in a time when we, as a society, have become more and more in tune with the needs of children, we encounter hard-knocks who believe that raising a child to be a tough, responsible adult should still involve intimidation and physical punishment; a "because I said so" mindset that is also reflected in the tenacious notion that dogs have to be dominated.

And it almost seems that changing our attitudes towards children also carries over into the way we handle dogs, and more and more we look at them as one of our kids or even child replacements. We call them fur babies, soul puppies, grand puppies; we dress them in style, dye their hair, carry them like human infants, put them in strollers and humanize them in any way we possibly can, even use baby talk and expect childlike manners and communication. Good thing or not, there is absolutely no doubt that, at least in the western hemisphere, we care deeply about our dogs, and we do not hesitate to practice similar maternal care that is typically reserved for offspring of the same kind.

But CARE is only one half of a good relationship. **Without feeling pain when we part ways from a loved one, we would not recognize the need for reunion nor appreciate the joy of feeling connected.**

PANIC/GRIEF – SEPARATION DISTRESS & THE PAIN OF FEELING ALONE

"Little ones have to indicate to their parents when they are lost"

> *When no one cares about you and when you lose someone who did, when you feel isolated and disconnected – even in a crowd -, and when you miss someone so much it almost takes your breath away, loneliness overcomes you and robs you of rhyme and reason. That's when your confidence hits rock bottom and in its place moves pain; emotional pain, it seems at first, until suddenly you notice little body aches that weren't there before. Your overall wellbeing crumbles and you stop being your normal self. The pain of loneliness is real; but your brain is designed to survive and thrive anyway, and even though it is hard for you to get through the day, you find a way.*
>
> *- Diana Kastner, Fall 2019*

If CARE helps us and our dogs feel secure and good about ourselves and the world around us, what happens when we don't feel the CARE? Or when our most rewarding social bonds get interrupted or broken, whether through death, a break-up or any other kind of temporary or permanent separation? We often hear the loss of someone described as being a painful experience, and indeed that pain is real. See, the area of the brain that responds strongly to physical brain is situated in very close proximity to where the PANIC/GRIEF System is located.

Evolution intended for the PANIC/GRIEF System to guide parents back to their vulnerable young. Imagine this situation: The life of a bear cub is completely dependent on the care and protection it receives from its mother. Aside from being a sperm donor, the father plays no role in a bear cub's existence, forcing the mother to take on the role of both parents - caretaker, guardian and provider. Mother and cub stick closely together, but at times they may get separated. During separation, it is the cub's call, the cry for reunion that not only conveys distress and a plea for mom to return, but also provides an audible signal that will help mom locate her young. Without that separation call, the cub may be lost forever. If reunion doesn't happen, panic gradually gives way to a depression-like state during which the young will go quiet. The confidence that was instilled (through the timely release of endogenous opioids and oxytocin) when mom cares for her young when she is present is vital to help the young cope during her absence in a calm manner and only interrupted by an occasional separation call. While these depression-like quiet times during which the young is less noticeable to other predators help increase survival chances, the occasional separation call signals to mom that the young is still alive and needy, and helps her locate and reconnect.

This so-called *separation distress* is not much different in our canine companions, only that we typically refer to it as *separation anxiety* (*SA*). When dogs voice their opinion about sudden abandonment their *separation call* can range from insistent whining to even more insistent and neighborhood-displeasing barking. This process is innate and involuntary, and not meant to annoy, but to urge our return, since the feelings of loss and loneliness that can overcome the dog during separation can be disturbing. As painful as this sounds, to promote social bonding in the absence of social support, a dog needs to be able to experience separation distress, and to also be able to experience neurochemically mediated comfort after reunion. Depending on the level of confidence we are able to instill when we are **with** the dog determines how well a dog can cope with the inevitable effects of separation distress and its resulting depression-like state. When confidence is low, the struggles during separation are real and can be almost unbearable, which may result in:

- destructive behaviors that help the brain modulate increased dopamine release
- self-harm that helps the brain release much-needed endogenous opioids and/or
- indoor defecation and urination due to the increased release of stress hormones

Whichever is the case, when dogs are quiet and calm during separation, they are in a depression-like state - something we typically do not recognize; rather, we believe that the dog is getting used to being alone.

PANIC vs. FEAR: One might wonder about the difference between the PANIC/GRIEF and the FEAR System. How is it PANIC/GRIEF isn't considered to be related to FEAR? First and foremost,

we need to distinguish between the way we have historically defined "panic", namely as *"sudden uncontrollable fear or anxiety often causing wildly unthinking behavior"* (Dictionary.com). The PANIC/GRIEF System, however, is solely connected to issues of separation loss/distress. Brain stimulation studies have clearly identified that PANIC/GRIEF and FEAR systems have different neuroanatomies, which, by the way, tend to overlap and interact in some parts of the brain. However, while separation distress may also activate the FEAR System, behavioral research data indicates that the opposite is not the case. Furthermore, anticipatory anxiety and panic attacks originate in separate neural systems, with anticipatory **anxiety being a product of the FEAR circuit** and **panic attacks being linked to separation distress and the PANIC/GRIEF System** (Panksepp, 1998).

<table>
<tr><th colspan="3">CARE
The release of endogenous opioids and oxytocin (the CARE-cocktail) through comfort and nurturance</th></tr>
<tr><td>Timely
When we are in close proximity of our dog and provide comfort and an emotional connection/support the moment it is needed or asked for, the CARE-cocktail is released in a critical moment</td><td>Paired with "rejection"
When we are in close proximity of our dog but withhold emotional connection/support (through comfort and/or play) the moment it is needed or asked for, we become an unreliable source of the CARE-cocktail</td><td>Minimal social/emotional connection
The dog is living mostly isolated from humans</td></tr>
<tr><td>This helps shape a more confident dog by literally creating pathways in the brain that promote confidence (coping and resiliency)</td><td>This shapes the brain in ways that do not promote confidence (coping and resiliency)</td><td>"Non-existent" source of the much needed CARE-cocktail shapes the brain in ways that help the dog fulfill their needs without a human; confidence may be highly situational</td></tr>
<tr><td colspan="2">When the trusted source is absent, SEPARATION DISTRESS IS INEVITABLE AND WILL, after a period of time, LEAD TO A DEPRESSION-LIKE STATE</td><td>SEPARATION IS A CONSTANT</td></tr>
<tr><td rowspan="2">The dog remains confident throughout the period of depression-like state</td><td>The dog is unable to cope with the emotional demands (pain) of separation</td><td rowspan="2">Separation does not have the same significant emotional impact as the dog is in a constant state of loneliness</td></tr>
<tr><td>This leads to Separation Anxiety and the creation of alternative coping strategies, which oftentimes manifest themselves in "problem behaviors"</td></tr>
<tr><td>SECURE ATTACHMENT</td><td>INSECURE ATTACHMENT</td><td>LACK OF ATTACHMENT</td></tr>
</table>

Looking at the above chart, can you see just how important it is that when we are with our dogs we recognize and respond to their emotional needs in that moment, whether they ask for it or not? Following through with this in a timely manner builds the confidence that will help them get through the challenges of life even when we are not there. Helping the dog feel heard, wanted and acknowledged helps the dog feel safe in THEIR ways!

And thus, the PANIC/GRIEF System works in perfect symbiosis with the CARE System to assists the social bonding process when the exhibited desperation arouses the CARE instinct in the caretaker.

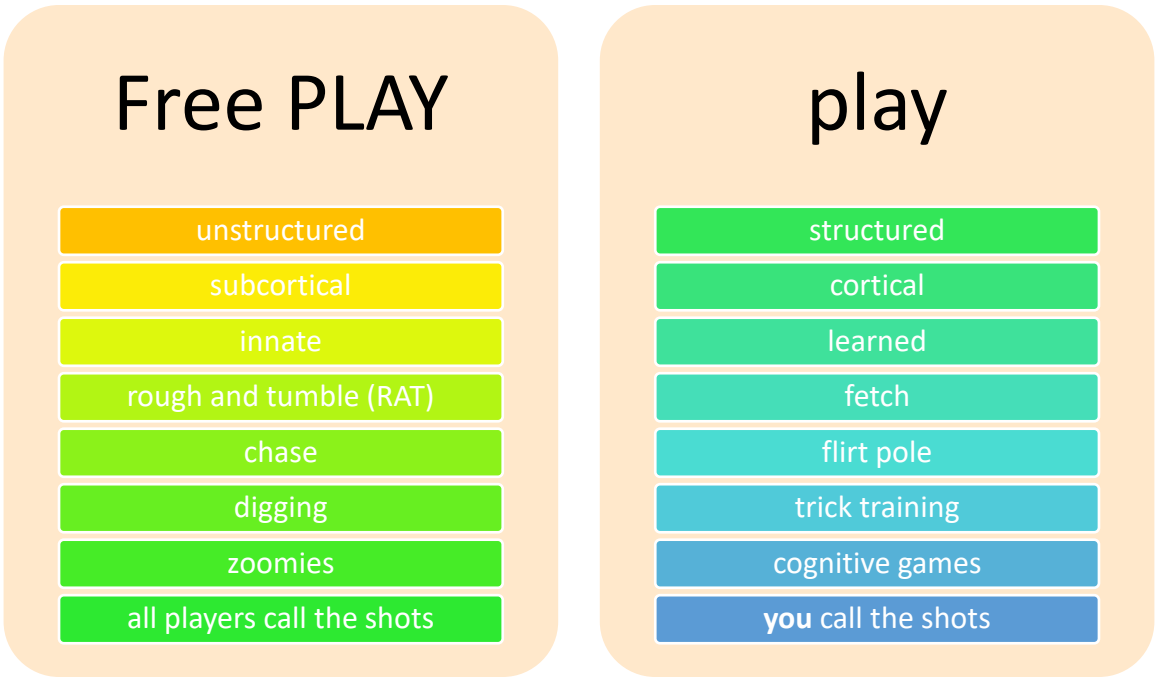
PLAY – TO LEARN SOCIAL RULES IN THE MOST FUN WAY

*"When children are asked what they like to do more than anything else, the most common answer is **to play!** It brings them great joy. And roughhousing is the most fun of all ..."*

-Jaak Panksepp, AN 280

Rough and tumble play – body acrobatics – screeching and screaming – laughing – kicking – running – huffing and puffing – grabbing – tumbling, falling and getting back up – more running – more laughing – more screaming – and sometimes even tears. Hopefully, we all remember the good ol' days when we didn't have a worry in the world and the highlight of the day was to get physical. This kind of play could almost be mistaken for aggression, but when you look closely, it isn't hard to see the difference. All young animals (including humans) play. They are hardwired to play. It's what they do. And play, especially rough and tumble play, is an amazing learning medium that regulates a young one's emotional, mental, social, cognitive and physical well-being, and whether the animal is human, cat, horse, piglet or dog, rough and tumble play is similar ... similar across the board of **all** mammalian species. And since we all love a happy dog, we are eager to introduce PLAY as the final of the 7 primary emotional systems. It may be the youngest of these systems on the evolutionary time scale, but don't underestimate the importance of PLAY for one second, for it is a vital ingredient to building friendships. But how is PLAY an emotion, you may ask: Isn't it just something we do? Now, think about this for a second. Have you ever felt an urge to play, yet had to suppress it for whatever reason? It's this urge to do something that has affective value, whether we can engage in that behavior or not. And since we are not born with a genetic imprint of social rules, we have to learn how to be social. And it so happens that PLAY is the most powerful system to teach positive interactions. Again, the urge is innate and it has affective value; and meeting all of Dr. Panksepp's 6 criteria all emotional systems have in common, PLAY qualifies.

Dr. Jaak Panksepp, the man who tickled rats and made them chirp in laughter, has put a new spin on play when he discovered the *"distinct neural systems devoted to the generation of roughhousing or rough and tumble (RAT) play".* Mammals do not have to acquire an urge for play, they are **born** with it. And just as before, whenever we talk about the innateness of play and the emotional system as opposed to the cognitive type of structured play, we refer to it as PLAY.



Isn't it sad then how play has somewhat gotten lost in our (western) culture? Sad, because suppression of play and play deprivation cause such severe behavioral issues, and we rarely even realize the devastating effects until it seems almost too late. In fact, Dr. Stuart Brown, founder of the National Institute for Play, claims that the opposite of play is not work but depression. Throughout his work, Dr. Brown describes the beginning point of play between mother and infant as the exact moment when mother and child lock eyes just as the baby is old enough to have a "social smile". That moment, *"... causes a spontaneous eruption of joy in the mother and she begins to babble, goo and smile, and so does the baby; parts of their brains become attuned. And every bit of more complex play builds on this base for us humans."* Naturally, play is not just for the young. Even though play, especially rough and tumble play, becomes less frequent with maturity, adult animals still play.

From a canine social point of view, play will help young dogs find their niche in life, figure things out, teach them about manners, bite inhibition and body language, as well as bodily control and good reflexes. Play also builds confidence, while play deprivation causes increased fearfulness in social situations. Naturally, the earliest stages of play in canines are quite different than those in humans. Whereas, as mentioned above, a human mother responds joyfully to her infant's earliest social smiles, wobbly, squirmy little puppies are all about nudging, pawing, mouthing, shoving and climbing over each other as well as their mom. This stage usually becomes observable to human dog parents at about 3 – 4 weeks after the pups' birth. During play, the pups bully and they vocalize. And yes, they can be quite vicious, which is only magnified by their razor-sharp Piranha teeth. Yet, as mean as puppy play may seem, this is probably the single most

important stage in a young dog's life ... any dog's life, really. It's this type of play that brings the most joy and teaches them how to be a **dog**. As Dr. Panksepp liked to put it in his own poetic way: *"Play lights up the brain like a Christmas tree!"* The beauty of rough and tumble play is that it involves all senses in the most carefree, exhilarating ways, which creates brain experiences and social memories with lightning speed.

By now you already know how immensely important the pleasures of touch are for the promotion of social motivation. And what better, more delightful way to touch than to engage in rough and tumble play. After all, the mammalian skin with its specialized receptors (such as in "tickle-skin") is made for detecting social contact; it's made to feel, to be touched, to collect, then quickly pass on to the brain the sensation, the intensity and the nature of touch. No, not all dogs feel safe enough to play, but they do have the innate urge, and that's what we need to remember.

The neural anatomy of PLAY: PLAY appears to be associated with somatosensory information processing in the midbrain, thalamus and cortex. (somatosensory is defined as sensations arising from pressure, warmth and pain). The chemistries primarily involved in PLAY are:

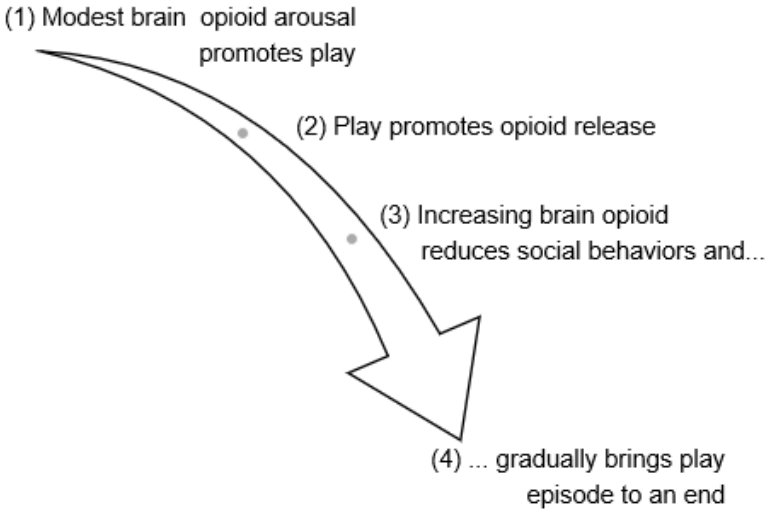
(1) To **arouse** PLAY: acetylcholine, glutamate and opioids
(2) **During** PLAY: there is a widespread release of opioids in the nervous system
(3) Neurochemistries that **decrease** impulses to PLAY: serotonin, norepinephrine and GABA; and even oxytocin is linked to a reduction in play behaviors
(4) Higher doses of opioids **reduce** all social behaviors, including PLAY
(5) And with these higher doses of opioids, PLAY gradually comes to an end

Needless to say, the PLAY System allows other emotional systems to intervene. In dogs, play solicitation is oftentimes observed as play bows, which may lead to play or may not be reciprocated. As for sensory motivators, touch appears to be key to sustaining normal play. "Wrestling" in dogs is usually a game of fairness, in which dogs take turns in who gets to be on top and gets to pin the other to the ground. If one of the dogs becomes an unfair playing "bully" who refuses to relinquish "top" position, play may gradually diminish or even turn ugly. When play behavior turns aggressive, RAGE and FEAR Systems are activated and the dog may even seek emotional support from a trusted source (PANIC/GRIEF). However, as long as PLAY prevails, it represents a positive reward for all participants, leaving them eager to experience the joyous rewards of PLAY again in the future.

Dog parks are great place to observe a myriad of emotional behaviors triggered during rough and tumble play and a game of chase. The biggest problems arise when dogs **play unfair** or **for too long**, and **when their humans neglect supervision**, especially to the point that they do not

recognize when their dogs SEEK safety and comfort (through CARE). Watch how, when play continues after the PLAY urge is satisfied, play gradually turns into bullying and results in physical confrontations. And watch how their athleticism, when play is fair and mutual: running towards and away from one another, jumping sideways, sometimes mowing each other down, which leads to a frenzy of chasing and being chased. As long as it stays fair, the dogs will take turns, they will pause between spurts of activity and initiate role reversals. They will pivot rapidly, tumble and roll, and they will playfully fight each other to the "death", pin each other to the ground, growl, snarl, bark and yip.

The effect of opioid release during rough and tumble play



Oxytocin & Serotonin also reduce PLAY

Glutamate during PLAY assures that learning happens

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Human-Dog Play

Now that we have established the fundamental importance of play for not only young but ALL dogs, let us explore another aspect of the puppy PLAY equation: the human. We are neotenous (juvenile) creatures by nature; as such, we enjoy much longer childhoods than most other species, and our instinctual playfulness is rather complex in that it is notably influenced by our relatively focused cognitive brain. Still, no matter how cognitive our playstyle has become, the "energy" for our playfulness originates in the same primal PLAY circuit as that of other mammals. We have many styles of play to choose from, but thinking of play with dogs, we are mostly interested in exploring play styles we can safely engage in that actually **benefit** them: Free PLAY.

What makes dogs such ideal companions for us is that they crave our attention, that they bond with us on very deep levels through the emotional systems of CARE and PANIC/GRIEF, and that they maintain their playful nature way into adulthood, just as humans do?

Given how positive touch affects the neurochemistries in a dog (see The CARE System), given the effects on bonding and trust building as well as the stress-reducing properties, is it any wonder that physical play, whether between two or more dogs or human and dog, brings such joy to our canines? In fact, specialized skin zones that signal play into the nervous system have been identified in some tested mammals. These skin zones which send information to specific parts of the brain to communicate playful intentions between animals are known as “play skin” or “tickle skin”. We have those skin zones, and considering a dog’s responses to playful touch, we have every reason to assume that dogs have play or tickle skin, as well.

Now, if play bows are the primary play signal between two dogs, how do they possibly recognize our intentions when we try to solicit play? Well, the PLAY System is an incredible teacher, and the dog quickly picks up and memorizes a vast variety of human play signals, be it certain gestures or a specific tone of voice. And if the dog is already in a playful mood, even just looking at the dog may trigger play behaviors.

Rough and tumble (RAT) play between us and our dogs is just as welcome and beneficial as it is between just dogs. In fact, dogs are very good in learning our individual play styles and predicting our next move. But play can also be beneficial in helping a dog deal with stressful situations. Though dogs react differently to stress, in a well-established relationship built on trust, the following 3-step process ending in play can be quite effective in building resiliency:

Step 1: Allowing a dog to cope with the trigger in the dog’s way

Step 2: Offering CARE in form of comfort touch, which increases the release of oxytocin and brain opioids

Step 3: If and when the dog feels safe enough, arouse the dog’s PLAY System by encouraging play behaviors (rolling, digging, careful and gentle physical play, etc.); join the dog in this type of play, and engage.

Given the importance of PLAY, we would like to address a few key points associated with it:

- Depriving puppies of developmentally normal play may lead to sometimes severe behavioral issues
- Play, in general, requires dogs to make (split-second) decisions, which is very empowering. Empowerment builds resiliency

- Positive touch promotes bonding, increases resiliency and the feel of safety, and encourages future engagement – the most joyful experience of touch is that of rough and tumble play
- Environmental influences that can reduce play:
  - Fear
  - Anger
  - Separation distress
  - Hunger
  - Illness
  - other events that evoke negative emotional or physical states
- When animals are healthy and feel good and safe, play is a welcome behavioral pastime. When they feel bad, it is not.
- Brain opioids increase feelings of “social strength”, together with oxytocin it increases an animal’s self-confidence; brain opioids are a vital chemical component of PLAY
- Dogs prefer the company of other dogs that have a healthy play history as opposed to dogs that don’t
- Dogs prefer places where they have experienced PLAY before
- Dogs prefer the company of other dogs or humans they have played with in the past

The following table summarizes all 7 primary emotional systems.

	General brain region of circuit	Primary neurochemistries (there may be others involved)	Evoked feelings	Observable canine behaviors	Behavioral characteristics
SEEKING	Lateral Hypothalamus	Dopamine (very low levels = depression low levels = less activity high levels = more activity very high levels = manic behaviors) Glutamate (and others) fuel the appetitive learning process	Appetitive urge to move forward and pursue "reward"	All exploratory behaviors	Positive emotion Appetitive phase = SEEKING urge and Seeking behaviors Consummatory phase = "consummation" of reinforcing experience
RAGE	Amygdala Hypothalamus Periaqueductal gray of the midbrain (PAG)	Serotonin (low levels of) Testosterone Various others	Anger Aggression	Affective attack behaviors Intermale aggression Predatory attack (driven by SEEKING)	Can start as a positive emotion then become something else
FEAR	Amygdala Hypothalamus PAG Possibility of others	Glutamate Opioids Various neuropeptides	Fear Anxiety	Freeze (experience of mild fear) Flight (experience of intense fear)	Negative emotion Innate triggers: Pain, possibly natural scents of predators Conditioned triggers: Neutral stimuli paired with aversive stimuli If given the opportunity, dogs will attempt to escape from and avoid environments where they experience fear and have experienced fear in the past; if they cannot escape, they will freeze The intensity of fear is modulated by pain, hunger, thirst and other bodily needs
LUST	Gender-specific Preoptic area (POA) Hypothalamus PAG Lower reaches of the spinal cord for sexual reflexes	Testosterone Vasopressin Estrogen Oxytocin Various others	Lust	Courting Mating	Positive emotion
CARE	Gender-specific Paraventricular Nucleus (PVN of the hypothalamus POA Various others	Oxytocin Opioids (Endorphins) Dopamine (task specific)	"Love" Desire to bond Loyalty Confidence	Human-provided behaviors: Comfort touch Help meet emotional, cognitive, physical needs	Positive emotion that creates bonding, helps relieve stress, builds trust, confidence and resiliency
PANIC/ GRIEF	Preoptic area Bed nucleus of the stria terminalis Dorsomedial thalamus PAG	Oxytocin (lack of) Opioids (lack of)	Separation distress / anxiety Feeling of loss / grief Loneliness	Separation call Destructiveness	Negative emotion that triggers a CARE response in the care-giver
PLAY (RAT)	Midbrain Thalamus Cortex	Opioids Acetylcholine Glutamate Reduce Play: Serotonin Norepinephrine GABE	Joy	Play bows Rough and Tumble (RAT) Digging Rolling Many others	Random play behaviors that seem to have no purpose Positive emotion Dogs create an attachment to places they have played at in the past Dogs prefer the company of dogs and people they have played with in the past

Assignment

1. How do you recognize whether a dog is more aroused by FEAR or PANIC/GRIEF?

2. In your own words, what is the difference between PLAY and play?

3. Why is the pain of PANIC/GRIEF vital for bonding?

4. What questions do **you** have that will help you clarify the Primary Emotional Systems?

Module 5 – Social creature comfort

"Learning is a profoundly social experience."
-Dan Siegel; We feel, therefore we learn

When talking about emotions, we must also take into consideration the cognitive abilities of the animal and the sociophysiology involved in their interactions with others. Dogs have been found to have "social flexibility", that is, they are able to use different "social strategies" and adapt to diverse "social environments" (Udell & Brubaker, 2016). Throughout their evolutionary history, cooperativeness has been one of the prevailing traits. Prior to this, there was already a social structure, albeit different to the current domestic dog's social structure, which is still being researched. Although domestic dogs are considered scavengers, that is to say, they do not hunt in groups and instead may at times hunt small prey, they still benefit substantially from being cooperative with one another –and humans (Hare & Woods, 2013).

Humans and dogs have been evolutionary partners for many thousands of years. Throughout the course of time, and as they have become socially related to humans, dogs seem to have developed cognitive abilities that facilitate the communication between both species. Although influenced by the environment, individual differences, experience and breed (Udell & Brubaker, 2016), dogs' affinity and acute sensitivity to human gestures and general demeanor is a fascinating phenomenon. This can be observed throughout developmental stages in dogs as they learn to understand human's pointing gestures and follow gaze, as well as being able to pay attention to what humans are looking at and using "attention-getters" (Horowitz, 2009). They have been found to be sensitive to our body language and can be generally adept at reading us.

Additionally, dogs have a highly developed olfactory system. For instance, among other things dogs can perceive through their olfactory system, they can perceive small changes in odor (Horowitz, 2009); dogs can even smell emotions. Humans and dogs have coevolved, ultimately becoming social partners. During social interactions, information related to emotional states is transmitted, and even when this is not necessarily transmitted with "communicative intent" it can still be perceived by a dog's olfactory system (D'Aniello, Semin, Aria, Alterisio, & Scandurra, 2017), thus giving it an important role during interactions and involving it in recognizing social rewards and forming positive expectation, when exposed to the odor of a familiar human (Berns, Brooks, & Spivak, 2015). Therefore, it would be safe to say that it is important to pay attention to how human behaviors (and all the physiological changes that can take place) could potentially affect dogs during their interactions.

"We feel, therefore we learn" – in other words: because we feel, we learn. Think about that for a second. Remember when we talked about raw affect being "objectless" and environmental events being "affect neutral" until raw affect and environmental events are experienced together? Paired in a way that leaves an everlasting impression on one's mind? That's when learning happens, memories are built and higher-order feelings are created. And what makes learning a "profoundly social experience"? We may strive for individualism, and some may even successfully resist peer pressure – but only to a degree. In the end, whether we like it or not, we need one another. We need acceptance, we need to feel understood, we need to feel connected – we need to feel heard, wanted and acknowledged! Have you ever noticed how people who choose solitude over human company surround themselves with animals? They do that for connection. One might not like other people, but when all is said and done, the need for social and emotional connection is there, it is innate; we all have it, and dogs have it, too.

Whatever social need dogs fulfill in your life, we are happy you have found canine friendship. We are happy you have chosen a path that helps you teach others the importance of recognizing and meeting their dogs' social needs as well.

While some of us are social butterflies and quickly light up a room full of people with their mere presence, others are less comfortable in crowds, and being social takes more of a conscious, even cognitive effort. If you are in the first group, great. You got it made. But if you are one of the humble, shy ones that would rather disappear in the shadows of society then attract attention, then you know just how stressful being thrown into the proverbial deep-end of societal etiquette can be. And again, it's no different for dogs.

Humans and dogs are fundamentally social species. Though we cannot yet verify any of the many theories about the exact origins of our inter-species social bond, the end result is quite astonishing in its own right. Here we are today, two completely different species which, through many thousands of years of symbiotic evolutionary changes, are now seemingly "connected by the social hip". To most of us, humanity without canines is near unimaginable, and finally, with the help of steadily advancing scientific research, we are able to determine how the canine-human relationship has inadvertently influenced the shaping of the modern canine brain. How interesting it would be to learn how the same relationship has helped shape our brain, and the extent to which this partnership with the dog has promoted us to becoming who and what we are today. Without a doubt, we wouldn't be the same.

Social Neuroscience is still a relatively new inter-disciplinary field that focuses on how the brain mediates primarily human social functions. It is not easy to study the inner workings of the brain. It is not easy to map out how various social interactions, even just social thoughts are

carried out in the different areas of the brain. But slowly, science is gaining more insight into what Dr. Dan Siegel refers to as the "social organ of the body": the brain. And since dogs are such an integral part of our social lives, this type of research does not stop with humans. More and more non-invasive tests shed new light on the phenomenon of the dog-human connection. And the more scientific evidence we gather, the more we find that we are not that different after all.

Raw emotions, as well as their ensuing feelings play an immensely big role in our social bond with the canine species. When we engage in positive ways, oxytocin levels in human and dog rise and pave the way for deeper bonding; and the simultaneous release of endogenous opioids give us an all-around good, warm feeling. And so it shouldn't come as a surprise when a study published in *Social Cognitive and Affective Neuroscience* in 2016 concluded that a vast majority of canine participants in three independent experiments preferred to receive praise over a food reward.

While oxytocin and opioids are crucial for bonding, there is more to social interactions:

(1) In a relationship, we share information (Dan Siegel). Naturally, this sharing of brain information is easier between members of the same species, especially when they speak the same language. But that's hardly the case when we try to bridge a communication's barrier between let's say human and dog. A first step for information exchange is to acknowledge and accept that no matter how integrated dog and human are in each other's lives, no matter how many traits we share, we are not the same; yet, that shouldn't stop us from seeking better ways to connect.

(2) A relationship is really not a relationship unless we engage with one another, especially in positive ways. Dogs know when their humans regard them as meaningful companions. They know whether their humans "get them" or not. And thus, their humans' attitude towards them can have a direct effect on stress levels and subsequently on behaviors. And when we consistently misinterpret canine behaviors or even temperament, we may develop unrealistic expectations, which can quickly lead to frustrations in us as well as in the dogs. See how it all flows together, where one thing can lead to another? That's because we are all social animals and what one does and feels, affects another.

(3) Social Neuroscience explores the social function of the mind by identifying why we connect, how we connect, and how the brain stores information about our various social acquaintances based on likeability (Social Neuroscience - Mahzarin Banaji, 2013). In a very generalized way, information about those closest to us goes into a different brain "chamber" than information about acquaintances we would rather keep at a distance. This allows us to quickly retrieve neural information about people we know, and send signals throughout the brain to prepare for bodily responses to the mere mention of someone's name and also prepare for the possibility of more personal interactions. Though a dog's cortex is less

complex than ours, there is no valid reason for us to assume that this social categorization would work much differently in a canine brain. And since this likability scale is a bit like rewards and punishments, only in a social sense, should ask ourselves: what can we possibly do to earn a spot in our dog's most favorable neural "chamber" and become someone the dog actually **wants** to be with, wants to seek out for fun, comfort and safety, and when we need it even comfort us.

While the early stages of puppyhood are the most crucial, many dogs come into our lives as adolescent or adult dogs. Sometimes we know their past, but more often than not we don't find out that they have had challenging prior experiences with humans until later. Since the rules of Social Neuroscience are very much the same regardless of a dog's life stage, we should never underestimate just how receptive the brain is to social learning.

The window to establish the foundation for a secure and confident partnership is small in a young dog. Socialization to various sounds, scents, feels and sights, objects, other animals and humans can put a puppy on the right path. Puppy socialization, however, is not merely about exposure but about **positive** exposure, as well as exposure to **very mild** forms of stress triggers to help build resiliency. Puppy socialization also includes that we allow the pup to make choices, explore on THEIR terms (yes, with supervision for general safety), learn through trial and error, habituation and making associations. But most of all, socialization should also include that we spend emotionally meaningful time with our dogs, during which we boost their confidence by meeting not just their physical but also their emotional needs in the moment.

Before we learned about neuroplasticity, we believed that if we missed this window of opportunity during the most vulnerable time, the issues of socialization would then become matters of social management. Today we know that all is not lost. You actually **can** teach an old dog new tricks. If we pay extra attention to social and emotional needs, we can indeed help reshape a dog's brain throughout their lifetime. Little pups are adorable, we want to cuddle them and love on them ... that certainly imprints their brain and puts the pups on a specific life path. Then they hit adolescence; at that point they are very much like human teenagers; stuck somewhere between innocent pup and responsible adult. Everything is more emotional and dramatic, and responses to triggers can seem unreasonable and "explosive" to a human but are perfectly plausible from the dog's point of view and largely involuntary. But more mature dogs can "act out", too. Of course, developmental stages play a huge role, but honestly, what dogs of any age need most when they "act out" is **us**; we are their trusted source, their caretaker, their human support when bad things happen, because more often than not "acting out" is a cry for connection.

When we don't pay attention, when we put our dog in a "time out", confine and/or isolate the dog during stressful events, or when we try to (mildly or harshly) correct the dog, what are

we telling them? That they can rely on us and trust us to keep them safe and that we "have their backs" no matter what? Not hardly! Rather, we are telling them that in times when they need us most they cannot count on us. We are telling them that they are on their own. We are telling them that it is best for them to not need us.

"Time out" is what we like to use with our children, and it has become a preferred way to deal with doggie "tantrums" as well. The turmoil during "time out" in dogs is the same our children experience: temporary loneliness, emotional abandonment and let-down. Sadly, we tend to use adult human (neocortical) logic to deal with subcortical involuntary emotional issues of child and dog. Due to a less complex neocortex (compared to that of a more mature human), using human logic to reason with a dog of any age is unhelpful, if not counter-productive, and will set human and dog up for social failure.

Building a relationship means being there for one another, comforting, playing, spending time and simply being together.

Social attachments

It seems that humans have to measure everything, and thus, researchers even found a way to measure the emotional bond that develops between infant child and caregiver, which then led to various models of measuring social attachment bonds between dog and owner (page ...). One interesting takeaway from these studies is how our attitudes can directly affect our dogs' behaviors. First off, the greater your ability and willingness to

- perceive and make sense of your dog's signals, then
- respond in a timely and effective manner

the more attuned you are to your dog's actual moment to moment needs, which explains why our attitude towards our dogs plays such a big role in our dogs' behaviors. Indeed, the way you look at a dog and the "place" you give them in your world has such a great impact on the dog that it even shows in salivary cortisol (stress hormone) concentrations. So, when you accept your dog as a true family member and a meaningful companion, and you meet them with positive attitudes, you may actually reduce your dog's stress level. Unfortunately, it is easy to misread a dog's behaviors or even their temperament, which can then lead to unrealistic expectations, and ultimately to a breakdown in the relationship. For example, a doggie parent may:

- mistake **play signals** for signs of aggressions
- mistake the lack of **play signals** for impulse control
- misread **calming / stress signals** in multiple ways or miss them altogether
- associate **trainability** with the dog's ability to learn rather than the teaching style

- focus so much on obvious things like behaviors and health issues that underlying causes, such as **acute stress** are missed

We used to think that good relationships started with good training; but that was when we knew little about the brain. Affective and Social Neurosciences show us in their distinct ways how our minds connect, and guess what - training in and by itself doesn't really contribute much to that effect. Mostly, training just affects the levels of stress hormones; the lower the levels, the more receptive you and your dog are for a more positive relationship. In other words, it's not the training per se, but the level of stress that determines whether or not bonding is even an option. And that's where your CARE System comes into play, and your dog's PANIC/GRIEF System. And if all goes well, your bonding experiences lead to what is known as a *secure attachment bond.*

In the human version of a secure attachment bond, the child would feel secure with you, understood and calm so that the child can develop with confidence. In his book *No Drama Discipline* Dr. Dan Siegel has formulated what he refers to as the four S's to help caregivers achieve this secure attachment bond with their children: **S**een, **S**ooth, **S**afe and **S**ecurity.

Now, let's see what this means, and how it also applies to you and your dog.

The four S's	**You and your child**	**You and your dog**
Seen	Do you truly see your child's **emotions**, positive or negative, and do you strive to understand what's happening beneath the behavior?	Can you recognize the primary emotional state your dog is in and understand what's happening beneath the observable behavior?
Sooth	This refers to allowing your child to cope in their own way but to be there and **comfort** when they need you so they'll know they won't ever have to suffer alone	Same here – allowing your dog to cope with stressors in THEIR way but with your emotional support. This goes back to L.A.M.B. – Look At Me Buddy
Safe	How do you help your child feel **safe**?	Help your dog feel safe WITH you but in THEIR way
Security	Achieving the first three leads to secure attachment	Achieving these will lead to a better emotional connection, a more fulfilling relationship and a more secure bond

Naturally, just as there is no perfect parenting, we will make mistakes in how we handle our dogs. So, your goal shouldn't be to achieve perfection, but to move in the right general direction. And if you make mistakes along the way, don't beat yourself up. Recovery isn't just for dogs, and

relationships can be repaired - but not unless you take a deep breath and forgive yourself for not being super-perfect.

Communication

When we communicate with our dogs, it is really easy to forget that dogs are not human. It's alright to talk to them the way you talk to a toddler, since it's a great way to fully engage with your dog, but your expectations should match your dog's individual needs and abilities, not those of a human. After all, we are talking about an entirely different species. On the other hand, how different are we really? Of course, on the surface we couldn't be more unalike; yet through thousands and thousands of years of living, hunting and working side by side, evolution has slowly peeled back layer after layer of social and emotional uniqueness. How and why this happened remains a mystery.

Dogs are incredibly well adapted, and skillfully utilize our social communication behaviors to their advantage. Way more so than their closest genetic relative... the wolf, and even more than our own closest genetic relative... the chimpanzee. While, within their family packs, wolves are masterful communicators and seem to excel in cooperation and teamwork, evolution made sure that dogs rely more on humans for cooperation and help than they do on other dogs. And that means that, even though there are always exceptions to the rule, teamwork between dogs is nothing to brag about. Teamwork between human and dog? Now, that's a different story altogether. Studies have shown that dogs are quite accustomed to using eye contact when they need our assistance. Their problem solving skills are actually pretty good that way ... if you can't solve it yourself, ask your human. It's part of the plan; it's part of our social bond.

Reiterating relationships

Now that we have a better understanding of our connection with dogs, let's go over the real life aspect of our relationships with dogs one more time.

It's probably fair to say that most of us love how dogs love us "unconditionally". Do we always deserve this unconditional love? How could we possibly become more deserving? The following is probably one of the most important quotes to keep with you ... at all times:

The relationship with your dog should be at the center of everything you do!
by Dr. Dan Siegel (adapted through ADB to fit our bond with dogs)

One more time: **The relationship with your dog should be at the center of everything you do!** ... whether you play, train, deal with reactivity or just go about your day. No, this doesn't mean that your dog should run your life; it means that you should **connect** with them, give them your attention and recognize their needs, and learn how your dog communicates. Respecting the way your dog copes with triggers and showing them that you have their backs goes a long way in helping them feel safe. In fact, when your dog "acts out", that's when they truly need you, need to connect with you so they can feel secure and safe. Regardless of your dog's history, regardless of breed, gender, age or size, this need of emotional and social connection is strong, and leaving that need unmet can cause all kinds of emotional turmoil which, unfortunately, surfaces as behaviors you will probably not enjoy all too much.

How you respond to your dog's reactive or mischievous behavior in the moment will greatly impact how the whole scene unfolds. How you respond to your dog's behavior immediately following the incident will greatly impact future moments of reactivity and "mischief".
by Dr. Dan Siegel (adapted by ADB to fit our bond with dogs)

Now, when your dog "acts out", remember that you are the one with the more complex cortex. Stay calm. Take a deep breath. Do whatever it takes to put yourself in a frame of mind that will **help your dog cope** with a trigger, rather than become a trigger yourself. Remember that everything you do and don't do is a teaching moment for your dog ... actually for both of you. And everything you do and don't can change your dog's brain, and yours too.

At times you might wonder if your dog is genetically predisposed to specific behaviors; it's the infamous question of **Nature vs. Nurture**. No doubt, genes are involved in the intensity of raw emotions felt, which then surface as specific behaviors, and we cannot change these genes. But there is a process called epigenetics that allows us to change the way experience will get these genes to be expressed. And that, in turn, impacts the growth of neurons. In other words, regardless of genetics, with the help of repeated experiences, you can actually help shape your dog's brain either in a positive or in a negative way, which then determines how your dog will respond to events. So, if you want your dog to become more resilient, it might be a good idea to allow them to feel whatever it is they feel; allow them to express themselves and experience the world, even if it's a less comfortable moment, provided you are not flooding your dog.

Experience can shape a brain despite genetic pre-set
by Dr. Dan Siegel

Connecting with your dog on an emotional level, paying attention to your dog's emotions teaches your dog that their "inner life" (as Dan Siegel puts it) is important. It allows your dog to feel heard, wanted and acknowledged, whereas lack of emotional consideration causes a feeling of loneliness, which, as we know, is directly associated with separation distress/anxiety.

Naturally, there will be times when you (depending on your dog handling methods and skills) feel that a quick correction, redirection or even avoidance of a specific stressor is a lot more effective or efficient, and even allows you to deal with an immediate surge of stress within yourself. But the more often you put emotional connection and relationship above all else, the more secure your dog will feel in your presence, which helps build confidence in the world they live in, as well as in you.

A word about training and setting goals: Social Neuroscience is all about relationships; how they develop in the brain, how they are categorized and maintained in the brain, how they interact with the primary emotional systems and how they promote behaviors and influence social learning and memories. All social interactions are in one way or another based on relationship and involve all areas of the brain. Needless to say, not all relationships are positive or "good"; yet when we deal with dogs, it's the "good" and positive relationships we want to aim for.

But humans have focus; humans want to control; and humans like to set and work towards goals.

It appears that the activity of training a dog is perfectly suited to satisfy all three of these human qualities. Though some trainers are beginning to invest themselves emotionally, training per se is still largely done without true connection and without consideration of the relationship.

However, relationships are the innate foundation of all social interactions. Relationships exist.

Assignment

In less than 500 words, how has Module 5 changed your mindset about training, behavior modification and relationships?