

Nordic Dog Symposium 2017

PART 2



Speakers' Corner

From left to right: Cris Carles, Turid Rugaas, Daniel Mills
Manja Leißner, Martin Fischer



Above: Alexandra
Horowitz and Martin
Fischer



Many thanks to roving angel Agnes
Vaelidalo, for helping to arrange it all
and keeping us organised!

Learning was not limited to the talks. Vivid discussions continued throughout every break during the weekend.

Dogs in motion

Prof Martin S Fischer, Germany

Professor of Systematic Zoology and Evolutionary Biology

Prof Martin S Fischer is Head of the Institute of Systematic Zoology and Evolutionary Biology with Phylectic Museum, Friedrich Schiller University Jena in Germany. He is perhaps best known for the phenomenally successful book Dogs in Motion in 2011. In close co-operation with two illustrators, more than 100 pictures were created for the book as well as its own visual language. Included is a DVD with extensive footage containing high speed videos of selected thoroughbred dogs, X-ray films and many animations. The book was awarded the Global Illustrator Award in 2016 at the Frankfurter Buchmesse.



Martin started by explaining how he came to work with functional anatomy in dogs, which he has been doing for the past 11 years. Before that, his main sphere of interest was motion in mammals, reptiles and birds. He finds that the work that Turid has been doing over the past 30 years is greatly supportive of his research.

Another recent study showed that when chimpanzees go to war, the bonding system of the group acting together causes their oxytocin levels to rise significantly.

An aside: Dogs hijack the human bonding pathway

PART 1: DOGS IN MOTION

Energy consumption during locomotion

Martin shared an astonishing set of figures that show that a dog on a leash, walking beside us or running alongside a bicycle, consumes only 5-10% of its daily energy doing a set form of physical exercise. By contrast, a free-running dog like a working or hunting dog uses 20%. However, that extra 10-15% of daily energy consumption is not used by muscular activity, but by the dog's brain. So the idea of taking the dog out for a two-hour run in order to use up energy is a misnomer; it cannot use more than that 5-10%. Therefore, if dogs are going to move around a lot, they need to do it efficiently and in a cost-effective manner.

The Jena study of dogs in motion

The normal daily range a wolf is 40-60 km. A healthy dog of the same size can easily have the same range without showing exhaustion. Martin introduced us to a study they have done that is so recent that it has never before been presented to an international audience. Some of the results were less than a month old.

Motion capture systems using infrared

Martin and his team looked at 32 breeds of dog, just regular dogs from the breed rather than show specimens. Some of these breeds Martin had never even heard of; the dogs were selected based solely on body shape and size. They studied the different gaits: walking, trotting, and pacing. Concerning pacing, they found that in dogs taller than 40 cm at the withers, there are individuals that pace, and it is a natural gait in individuals who have done it for the first few months of their lives. There has been a lot of discussion as to whether this gait is natural or not. In horses, they have found a gene, DMRT3, that causes the horse to pace or amble, and these horses are especially valued for long-distance travel. It has been found in mice, but not in dogs to date. However, animals that have

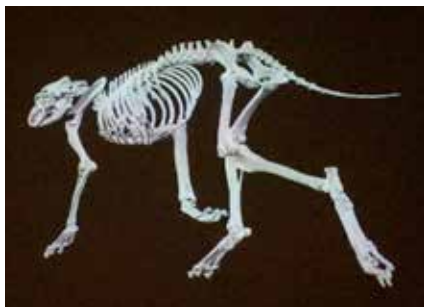


Downloaded from www.aspenmag.org on April 17, 2015

Dogs hijack the human bonding pathway

Oxytocin facilitates social connections between humans and dogs.

Before delving into the main subject, Martin mentioned an interesting article he read recently in the magazine Science. Japanese scientists have published a paper showing that during the first six months after birth, women have higher oxytocin levels when looking into the eyes of their dog than when looking into the eyes of their baby. This effect only lasts for the first six months. It is an amazing finding that confirms the very special relationship we have with our dogs. Looking directly into the eyes of any other animal species is virtually impossible. Nobody would try it with a gorilla! According to Coppinger & Coppinger, we were domesticated by the dog, not the other way around. They came with us, and along the way they learned that they can get a good meal if they look into our eyes. How many times have you been able to resist your dog doing that?



Screenshot from video showing a turning dog skeleton. Produced with Jurassic Park software from Jena Study videographs.

it are found to be more economical in motion, and pacing dogs (those often excluded from shows and breeding!) are motorally more talented than non-pacing dogs.

Every dog in the study (n=327) was fitted with external markers. Dr Karin Lilje, who placed the markers, worked for five years exclusively on this project. She also incidentally measured the limbs of each dog (see *Limb proportions* at the end of this summary). The problem was that the markers were placed on the skin of the dog, so they moved along with the skin, giving inaccurate results, especially in dogs with a high wobbling mass or lots of skin.

High frequency x-ray videography

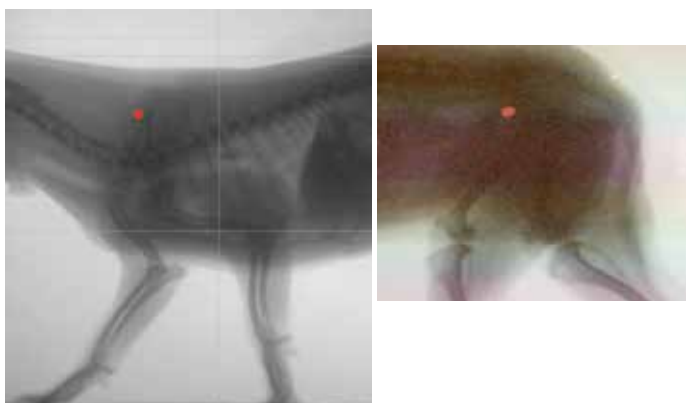
Up to 2000 x-ray frames/sec

The ability of Martin's department in Germany to obtain this high-quality videography equipment was a breakthrough. Using the same software as the makers of Jurassic Park, they turned their X-ray findings into 3D moving skeletons.

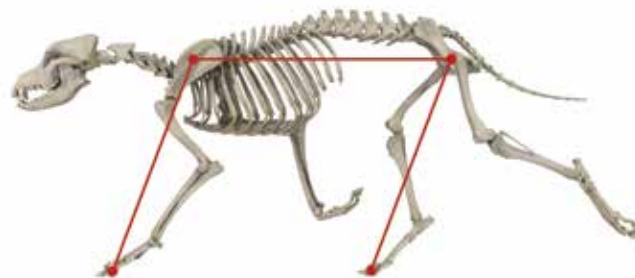
Position of pivots

It was fascinating to watch the position of a red dot on the x-ray as a dog moved on the treadmill. The dot started where the dark lines of the shoulder blades (the scapular spine) meet. But as the dog moved forward, the dot stayed absolutely horizontal, passing right through the hip joint.

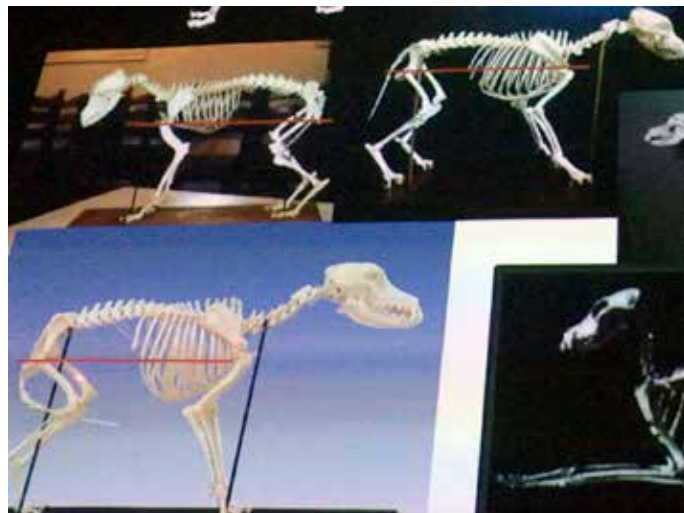
The basic misunderstanding, when dogs were studied earlier, was that like us, they move their arm at the shoulder joint. They don't; they move it at the *shoulder blade*.



Martin used a model of a forelimb to show how it works like a pendulum, swinging from the shoulder blade. He explained that this setup is true in many animals from the elephant to the rat, and is designed for economy of motion. The higher the pivot, the smaller the angle (less energy) the animal needs in order to create a certain step length.



The beauty of a correctly positioned dog in motion.

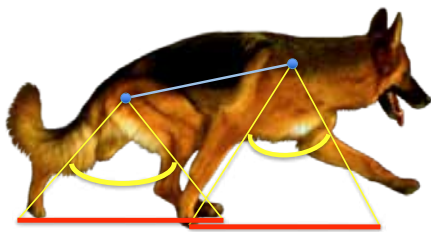


Skeletons mounted in vet schools around the world invariably have the hip joint at the level of the shoulder, which is lower than the shoulder blade. Look at how deformed the hind leg must be to place the hip that far down.

In the German Shepherd, for example, the standard says that he should move "flat over the ground, which conveys the impression of effortless forward movement." However, it was thought that achieving economy of movement meant taking bigger steps. And in order to achieve that, they lowered the hip joint. It is this misunderstanding alone that has brought about the sloped back of the German Shepherd. Martin shared that just the previous night he had received an email from a leading German Shepherd expert in Australia, who said that the clock must be turned back because of this over-exaggeration.



Holding a forelimb model at the "shoulder blade" (circular part at top), Martin shows how it works as a pendulum with very little effort.



The drawing shows how much more work a German Shepherd has to do with each step (greater angle) because of the slope of the back.



The red areas show how the movement of the shoulder blade matches that of the hip.



The red areas show how the upper third of each limb moves almost exactly parallel to the lower third.



The overlooked major player: The shoulder blade

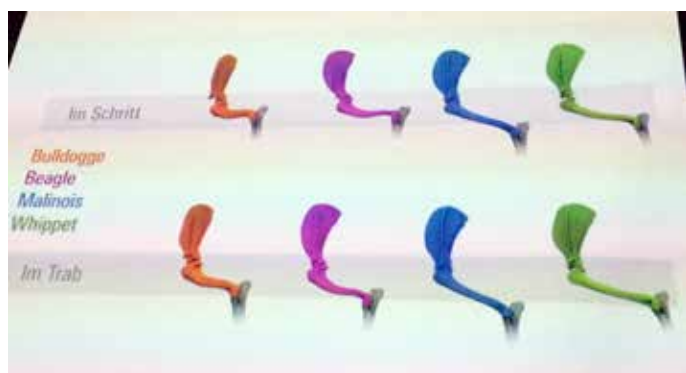
An amazing thing that Martin and his team discovered, quite by accident because the dog was reaching the end of the treadmill and therefore taking small steps, was that there is virtually no movement in the shoulder joint; it is all in the shoulder blade. There is a bit of movement, but the contribution of the shoulder and elbow joint is only around 25-30°C; the rest comes from the shoulder blade.



The importance of the shoulder blade is very clear in this whippet.

The interesting thing about the shoulder blade is that it is a force-driven joint. It is only the forces of the muscles that move the shoulder blade; it is what they are there for, and it is very important. It means that the movement in a big dog will be very similar to that in a tiny dog. In other words, there is no breed-specific locomotion. To illustrate this

point, Martin showed us an animation of the limbs of four different breeds, seen in side-view. They were remarkably similar.



Matched motion

Another breathtaking video of a dog skeleton moving, achieved by matching the skeleton to moving x-rays, showed that 1) the position of the shoulder blade matches that of the hip, and 2) the first segment of each limb matches that of the third. It remains virtually parallel throughout the entire movement, especially at touchdown. Galloping changes the order of placement, but not the kinematics, so the internal behaviour of the limb is the same.

But what about the standing dog? Amazingly, the matching feature remains there as well.

What does this mean for muscles?

All of us understand that motion means muscular work, and that muscles extend and shorten as they work. But several groups looking at the calf muscles and the long head of the triceps in dogs have found that these muscles stay the same length when working. Martin illustrated that if you hang from a bar and swing, the muscles stay at the same length, but if you lean on a table, different muscles work (become longer or shorter) depending on how you bend or straighten your arm. Keeping muscles at the same length is called isometric behaviour, and this is what a dog does during locomotion. The dog has very large back muscles (M. latissimus dorsi) which do not get activated when the dog runs horizontally, but is strongly activated if the dog is running up a slope, against gravity. So having a dog on an underwater treadmill will not work this back muscle, because gravity is being removed. What is being trained is the muscles that move the limb forward, but they are not the ones really involved!

PART 2: THE NEW ASPECT—ROTATION

Up until now, the discussion has been on linear movement. But dogs also have three-dimensional movement, and this is what Martin's latest study is concerned with. Bones are not flat; they are somewhat cylindrical, and when the muscles pull on them, they turn. This is called torque, and it occurs in all joints.

Heel Study on Joint Dynamics

The study is sponsored by Heel, and involves placing markers differently to the earlier study. In the previous study, markers were placed on the joint. Now, the markers are not only on the joint, but also directly on the limb, and their shape is different. The markers have a T shape, which gives better accuracy when the limb turns.



Equipment used in the study sponsored by Heel



Whippet wearing the new T-markers

The dogs come to the laboratory first for placement of the markers. They are then taken to the Hanover vet school, which has a unique treadmill that can measure the full movement of each limb.

The animations we saw show very clearly how similar most dogs are in the way they move. But when compared to the bulldog, it quickly became clear that the way that type of dog moves is very, very different. For example, when a French bulldog is walking, the knee rotates outwards, while the foot faces forward. Not surprisingly, French bulldogs have the most problems with cruciate ligaments. The shape of the chest also causes major issues with the front limbs, and Martin believes that breeds like the Boxer and Rottweiler are far less handicapped by the shape of their face than by the shape of their body. Walking like they do costs huge amounts of energy, because they are far more three-dimensional than e.g. a whippet. Add to that their difficulties breathing, and there is a huge handicap. Martin believes, but this is just an idea, that these breeds were selected originally for having the best manoeuvrability. This meant that they were selected more for body shape, whereas the German Shepherd was bred for endurance—mistakenly, as it turns out.

The spring in your step — gummy bears and pogo sticks

When a dog trots, there is a damping mechanism, a bit like the pogo-sticks we grew up with. The bigger and heavier you are, the more you bounce. This elastic energy has to be stored somewhere, and it has long been thought that this is in the tendons. We all learned in school that antelopes can jump simply by falling into their tendons and letting go. More recently, however, it has been calculated that the storage of elastic energy in tendons might not be enough. The answer, in fact, may be in the *fascia*.

Most of us have eaten gummy bears, or their equivalent—these sticky, gooey sweets that you can stretch and squeeze and they bounce back into shape. They are simple collagen combined with colouring and sugar, and it doesn't matter how many times you stretch or squeeze a gummy bear, it regains its shape.

FASCIA

Fascia are 100% collagen. The molecule that makes up fascia, as well as gummy bears, is helical (spiral), which is why it always returns to its original shape—it stores elastic energy.

French surgeon Jean-Claude Guimberteau has been looking at fascia on a level nobody has ever seen before. Fascia is an extraordinarily difficult thing to define. It is a dense layer within a continuous connective tissue, and nothing else. It is a *part* of our connective tissue, but not a separate layer. Still (1899) described it as follows: "It sheathes, permeates, divides and subdivides every portion of all animal bodies, surrounding and penetrating every muscle and all its fibres."

Fascia serve as power transmission, conduct lymph, possess the highest number of different types of receptors, have numerous free nerve endings, and act on the vegetative (autonomic) nervous system. When we have muscular pain, it is not the muscle cell itself giving off the pain; it is the connective tissue, with its high number of receptors.

This is why physiotherapists are so successful working with dogs and horses, because they directly or indirectly work with connective tissue. Vets, by comparison, work more at the bone and muscle level.

This is where stress comes in, because stress has an impact on connective tissue. It is the boundary where the physical and psychological meet. This is why people working with connective tissue have an enormously relaxing effect on their clients. Yoga works on connective tissue, which is why it is so relaxing.

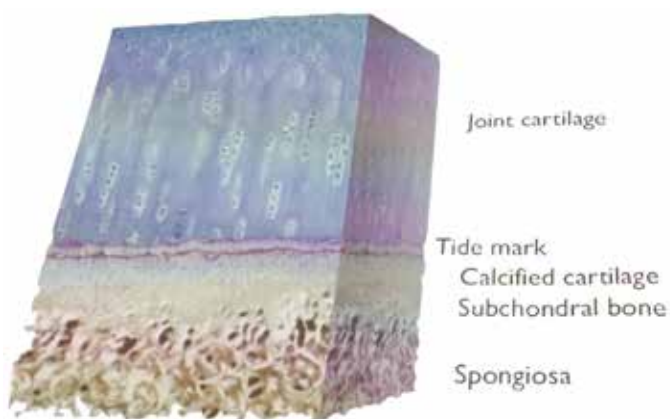
Martin told us about one of his students who wanted to see the superficial fascia and worked for several months on dissecting one dog. She ended up with a thin layer, in the shape of the dog, that could have been rolled up into a sheet. It is the first complete preparation ever done, but could only be done by cutting in different places, and it did not include the fascial system above or below. But what it did show is that, for example, if you pull the fascia in the hind leg, it will stretch something in the neck. If you have pain in the leg, it can come from somewhere completely different.

THE IMPORTANCE OF VARIED MOVEMENT

As mentioned earlier, the contribution of the elbow and shoulder joints is only about 5-15%. However, if a dog is making only pendular movements, like walking on a leash or running beside a bicycle, these are stereotypical movements like a tiger pacing in a zoo. Joints are not made for that, and Martin explained why.

In a joint like the knee, there is a small amount of fluid, called the synovial fluid. It has two functions—a mechanical one (dampening impact) and a nourishing one. The second one is often overlooked.

In a joint, the bone is fed by the vascular system and gets nutrients from the blood. Between the bone and the cartilage is an area known as the tidemark. Anything above the tidemark, like the cartilage, does not get its nutrients from the blood. It gets them from the synovial fluid, and the way it does that is by acting like a sponge. If you squeeze a sponge, any liquid it holds will come out of it. But when you let go, fluid is sucked in. This squishing action releases and sucks up synovial fluid. So when the joint is loaded with the animal's weight, then released, the fluid moves into and out of the cartilage.



Everything below the tidemark is fed by the vascular (blood) system. Everything above it is not; it is nourished instead by the synovial fluid.

The consequence is that without physiological loading, there is no nutrition, and damage occurs within weeks. This is known as starving cartilage, and starving cartilage calcifies almost immediately. This is called nephrosis. Sadly, nephrosis is a one-way ticket; there is no way back. Calcified cartilage is lost cartilage.

So loading is essential, and loading only occurs during movement. But if a joint is always loaded in the same way, like running beside a bicycle or walking on a leash, only the same few parts of the joint will be nourished. The answer is to have dogs freely ranging and running around, because it is exactly when a dog is making a curve, or braking etc., that it makes all the different parts of the joint come into contact, loaded and nourished.

THE IMPORTANCE OF THE HIP JOINT

In a moving x-ray of a dog, we could see that there is not much movement in the knee joint; it is the hip joint that moves the hind leg. The hind foot makes contact with the

ground, pushes up via the hip joint and the sacroiliac joint, and the hip joint then pushes the body forward. This is what makes the body move; the hip joint transmits the power from the foot to the nose. This is why hip dysplasia is so disastrous for dogs, whereas elbow dysplasia is not. Sometimes it even overlooked, because dogs can deal with elbow dysplasia in a much better way than hip dysplasia.

THE STIFLE JOINT

In September 2015, Martin and his co-workers published a book on lameness. Then they realised they had made a mistake; they had overlooked the rotation of the stifle joint (knee). In the beagle, there is a 20° inward rotation of the femur, and a 10° outward rotation. (In the French bulldog it could be up to 50° but this has yet to be confirmed.) At any rate, there is a systemic torsion of 30° with every step in the beagle, possibly less with the whippet.

And this is why the menisci also show some rotation. This is an amazing feature, which has only recently come to light.

Idiomotion

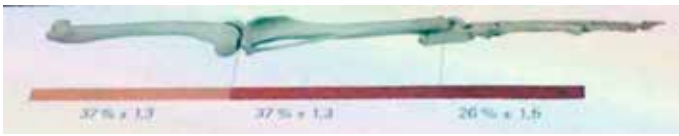
A dog's life is not just about locomotion, it is also about idiomotion—all the other movements. Martin illustrated this with a breathtaking x-ray based animation of a dog scratching its ear. If we had ever had any doubt about the importance of a ball-and-socket joint in the hip, this dispelled it completely.



This is what a dog looks like when it is scratching its ear.

Limb proportions

An unexpected finding that emerged in the studies by Martin and his team was that the length of the upper and lower bone of the limbs in different dog breeds is always almost 1:1. What varies is the middle bone. In forelimb measurements, in the past the shoulder blade was always left out, but now when it is included, the same is true; the proportion of the humerus, or upper arm, is always the same.



Diagrams showing the proportions of the lower (L) and upper (R) limbs of the dog.

Evolution favours the mean

Martin ended his talk with a word about breeding. Evolution always favours the mean, but in breeding, we have taken things to their extreme. The bigger the better, or the smaller the sweeter. But in breeding, we should focus on the middle ground.

And finally, on a humorous note, Martin showed us a letter they had received from Buckingham Palace, thanking him for his book *Dogs in Motion*, which includes studies of the Pembroke Welsh Corgi.

Not disobedient or nasty dogs

Prof Daniel Mills, UK
Professor of Veterinary Behavioural Medicine

Daniel Mills is a RCVS, European and ASAB recognised specialist in clinical animal behaviour. He has been developing and exploring new interventions for behaviour problems, such as pheromonotherapy, and the use of mirrors to control stereotypic weaving in horses. His research is driven by a strong interest in comparative psychology and the value of the individual animal and its interaction with the environment. His research into our relationship with animals focuses on a multidisciplinary approach including collaborations with biologists, health care professionals, psychologists, lawyers and economists. Recent projects include examining the effect of pet dogs on families with an autistic child, the economic significance of pet dogs in the UK, the position of the cat in UK legislation, and matching dogs with potential adopters.



Introduction

Much of Daniel's talk covered studies and results that are not yet in the public domain, and which therefore cannot be summarised here.

Daniel started by explaining his interest in animal behaviour, particularly their emotional world. A qualified vet, he still holds clinics one day a week. Much of his work has been built around the idea of understanding individual differences. Traditionally in science, studies are done comparing one population with another, but in his clinical work, it's very much about the individual. In very many cases that they see, the client says, "But I've had dogs before, and I treated them all the same. Why is this one different?" That, says Daniel, encapsulates what his research is about.

Daniel's interest in individuality extends to individual differences within breeds. His team recently published some work where they looked at differences between Collies and Labradors. Interestingly, the variation *within* a breed

completely swamps the variation between them. If one then divides them into working lines and show lines, the working lines are much more homogeneous and limited in their variability, and they are more distinctive. The show lines have almost become a breed in their own right.

This brings us to the problem of stereotyping. In the UK, for example, all Pitbulls, and anything that looks like a bull type, get vilified. It has to do with perception, not just with people's knowledge. It is the type and extent of people's experiences that really shapes their willingness to stereotype, to decide how an animal is going to behave based on its appearance. When the Dangerous Dogs Act came into force in the UK, anyone having a Pitbull had to get it registered or euthanized, and ownership could not be transferred. In one sad case that Daniel had, a couple owned a Pitbull that they had rescued—a lovely, gentle dog that got on very well with people and less so with other dogs. He was registered in the husband's name. After the husband died, the widow was not allowed to keep the dog and it had to be put down.

Understanding emotions

One of the things that Daniel and his team are particularly interested in is the components of emotion. These are the contexts that trigger not only emotional reactions, but what type of response the animal shows.

It is important to understand behavioural *tendencies*, rather than the behaviours themselves, because when we have a particular emotion, we might express it in different ways. Daniel described an experiment they are conducting, which is not yet published, where they use morphometrics (placing markers on the animal) to detect what is going on in an animal's face. Their current data is very encouraging.

Do dogs have a positive economic impact?

Another area that Daniel has become increasingly interested in is looking at how pets benefit society. Politicians tend to relegate the economic impact of dogs to what they cost the economy, e.g. what an outbreak of rabies could mean to the budget, rather than any financial benefits they might bring. Daniel and his co-workers have started working with economists to try to put a figure on the benefits of pets, and at the end of 2016 they published a small book that is starting to gain attention. They used a very conservative model to estimate that in the UK alone, cat and dog ownership probably saves the National Health Service around 2.5 billion pounds (nearly 3 billion euros) a year. Now politicians are starting to get interested.

PART 1: NOT DISOBEDIENT OR NASTY DOGS

We watched a video by KATHY SDAO, a well-known trainer in the US, in which she was training her own dog. She was teaching it to spin in response to her putting one foot forward. The dog lost interest and wouldn't perform, at which point many people would think that the dog was being "disobedient." The reality is, this is an old dog with arthritic joints and a back problem. All too often, a dog in this situation would be scolded. The truth of the matter is that dogs are very sociable by nature, and they work incredibly hard to fit in with us, far more than we give them credit for. Scolding the dog is the best way to ensure that it happens again, because we are reinforcing the stimulus. This is known as **social enhancement**. In the dog's mind, if something he has done is interesting to the human, he will want to do it again, to try to fit in.

Fitting in with us is the default of dogs. They work hard to observe people, and they spend enormous amounts of time watching us and anticipating our routines. If we are erratic in our behaviour, it becomes much harder for them, and they are much more likely to get stressed. If we are giving ambiguous signs, like threatening the dog with our body language while speaking with a nice tone, it confuses the dog. Dogs never set out to be "nasty". If they are not behaving in the way we expect, then we need to be looking at medical issues.



Dogs are very sociable by nature. They work incredibly hard to fit in with us, far more than we give them credit for.

In one case, the owner told Daniel that her dog refused to sit in class. He recommended that she have the hips X-rayed, and one of them was found to be dislocated.

Dealing with behaviour is a multi-disciplinary issue

"Why does my dog hate vets so much?" "Why is he such a grump these days?" "Why won't my dog get up when asked?" "Why doesn't she like being cuddled?" "Why doesn't he like going out in the car?" "Why does my dog seem to overreact to minor events?" "Why doesn't she seem happy after a good walk?" "Why does my dog seem like a Jekyll & Hyde, all moody?" "Why does my dog scratch the floors and walls?" These are some of the myriads of questions vets get asked—but many have little understanding of behaviour.

It requires people with lots of different approaches to solve some of these issues. When there is a behavioural problem with a dog, the first question to ask is *why*. And in pretty much all of the cases above, the reason is pain.

We were shown a video of a Jack Russell showing aggressive behaviour when being stroked on the head. Otherwise, he was a very happy little guy. It was clear that even when a hand approached his head, he wanted to shy away. When he was x-rayed, he was found to have a lesion of the neck, with ossification of the intervertebral disc.

You can train a dog not to show pain, but it doesn't stop it being in pain.

A case in point: Tet

If there is no improvement with behaviour modification therapy, always refer the dog to a vet. This is what happened with Tet (not the dog's real name), a 5-year-old border collie who had been with his owner since 12 weeks of age. He had a history of aggressive behaviour towards either the male or female owner in various contexts—when they were moving around the house, or near the food or water bowl, or preparing to leave.

He displayed aggressive behaviour towards other dogs on walks. The owners also reported that already as a puppy, Tet had a dislike of having his rear end handled.

Because Tet could be aggressive at the vet's, he had never had much of an examination. When walking around the room at Daniel's clinic, they noticed he was a bit stiff.

Never lead the owners when asking questions

It is very easy to say to an owner, "I guess he has difficulty getting up on the furniture, doesn't he?" To which the owner will reply, "Oh yes!" They often want to affirm what the vet or behaviourist believes. We have to be careful in our questioning technique.

After some gentle probing, the owners volunteered that Tet didn't like jumping into the car. They also remembered that the stiffness seemed worse after exercise. Upon further questioning it was decided to do an X-ray of Tet's rear end. The dog had severe clear hip dysplasia and osteoarthritis, and he had been living with it since puppyhood.

The decision was taken to start Tet on a course of painkillers, then see what was left that could be managed behaviourally. It is important to have a conversation with owners, because they are often very keen to engage—especially if it means they have to do less. One of the golden rules is get the owners to do as little as possible to correct the animal's behaviour.

After just one month, the owner reported that Tet had become more relaxed and gentle, more affectionate, and full of energy most of the time, except sometimes after a walk. He had also stopped guarding food and drink. This was all without behaviour management. He still reacted to dogs outdoors, but if a dog has a musculoskeletal problem and it meets other dogs, they get quite excited again. This tenses the muscles, which causes pain. Even if there is no longer much pain, the association has been formed with the presence of other dogs eliciting pain. The owners were given advice with a couple of other minor issues, and the painkillers were continued. The overall results were very good.

Prevalence of medical conditions in behavioural problems

One of the first reports on the relationship between behaviour and medical issues, in the early 1980s, reported that about 5% of cases with behavioural problems had a medical issue. But as awareness grows, so does the prevalence. Norwegian vet Torbjørn Owren suggested that it was closer to 20%, and a recent review by Daniel's clinic put it at around 23%. This is expected to rise as vets become increas-

ingly aware of the relation between the two. The most common problems reported in dogs with medical issues are aggression and destructiveness. In cats, it is mostly aggression and house soiling.

You can train a dog not to show pain, but it doesn't stop it being in pain.

Because dogs try so hard to fit in with us, and because they can be "taught" not to show pain, what owners end up with is a ticking time bomb. Sooner or later, if all the signs are ignored, the dog simply cannot cope any longer and has to express itself in a way that people will understand.

A centric study looked generally at dogs in some kind of pain, and found that around half of them had deep somatic pain. Muscular and fascial pain is still difficult to pick up, because our understanding of it is still in its infancy. Daniel had a lot of praise for physiotherapist **Julia Robertson**, whom we were fortunate to have at the Dog Symposium in 2014. We look forward very much to hearing her again in 2018.



If you are in discomfort, it takes an awful lot to have to get up out of somebody's way.

The nice thing about dogs is that they are meant to be symmetrical. If you draw a line down the middle of the back, do both sides appear to move in the same way? If not, then something isn't right. It could be a physical limitation, or more likely some form of inhibition due to discomfort rather than development. During development, dogs are pretty good at making themselves symmetrical.

It is important to look for an untypical age of onset, or unusual clusters of signs, such as overreaction to an otherwise not-so-bad experience.

Daniel described a qualitative study carried out by one of his students from Brazil. Dogs with developmental musculoskeletal problems often showed behavioural problems before one year of age, and were considered unpredictable. It's amazing just how much our dogs put up with. Just think; if you are in discomfort and someone comes up to you, it takes a lot to get up and move out of the way. How does the dog show it? He may growl a bit; it's his way of asking you to back away. But it's amazing how many people bring such dogs to veterinary clinics thinking he's aggressive. They even ask the vet to stop the dog growling, but Daniel said he will never do that. It is the dog's way of communicating. The study showed the same with biting, but interestingly, dogs with these problems tended to bite less severely than controls, and tended to bite extremities rather than the face or neck.



If a dog with noise fears is not getting better with behaviour modification, pain could be an issue.

Mead and painkillers

Mead (not her real name) was a 5-year-old female neutered Airedale. The owner had had her for six months. From a young age, she had been afraid of fireworks. During the previous year, the fear had become generalised to noise in the home, like someone coughing, the washer pinging at the end of its cycle, or someone closing a glasses case. It was an unusual age of onset, and the owners reported that Mead was reluctant to engage in physical activities, which is uncommon for the breed. Daniel explained the examination steps they took, and why they eventually put Mead on Gabapentin, which for neuropathic pain, even though they couldn't find anything specific. His quality of life improved significantly, including his reactions to noise. They now felt they were in a much better position to draw up a behaviour modification plan, to work with what was left of the problem.

Daniel described a study they have just started for a drug company, on a new drug for anxiety in dogs. The study looks at fears and, in many cases, at a massive generalisation of the response—for example, a dog being afraid of a loud noise in a field, then being afraid to get into the car.

The point to take home is that if a dog with noise fears is not getting better with behaviour modification, pain could be an issue. It is a good starting point.

A useful little catalogue of things to look for, according to a muscle therapist, are: gait; posture; change in positions; problems grooming; coat changes; skin flinching – myofascial pain – exaggerated panniculus response; performance



If we ask owners to do too much, they don't do anything really well.

issues; change in behaviour; increased anxiety; and a change in the activities of daily living. One suggestion is to keep a **daily comfort diary** for dogs. This can be Googled online, and helps keep track of subtle changes that might otherwise be missed.

Daniel wrapped up his first session as follows:

"I've chosen these cases because they have minimal or very little behavioural modification associated with them. Dogs will offer solutions to you. If they're not offering the right solution, if their behaviour when you ask them to do something isn't fitting in with you, even when you make it quite clear, you have to ask yourself why that is. They are offering the solution that they think works best in evaluating their own needs and your needs as they can evaluate them. Most of the time, dogs are incredibly good... they watch and try to fit in. If the dog isn't fitting in, just ask yourself why. Just because it's not showing pain, please don't think that it's not in pain."

PART 2: SEPARATION ANXIETY

One of the key things Daniel pointed out is that if we ask owners to do too much, they don't do anything really well.



*Separation anxiety is often talked about as if it were a diagnosis. It is not. It is a **presenting complaint**.*

Karen Overall, who spoke at the Dog Symposium in 2014, talks about necessary criteria that have to be present for an animal to have separation anxiety. If they are present, the animal definitely has the condition, but they are not always present. In 1997 she listed the criteria as follows:

*Physical or behavioural signs of distress exhibited by the animal only in the absence of lack of access to the client. Consistent destruction, elimination, vocalisation and/or salivation exhibited only in the virtual or actual absence of the client; **the behaviour is most severe in the first 15-20 minutes of separation**. Many anxiety-related behaviours may become apparent with the client displaying behaviour associated with the intention to leave.*

Daniel explained that he has a problem with "the first 15 to 20 minutes," because a number of studies have shown that

dogs actually have natural activity patterns for about 20 to 25 minutes after the owners leave. So if you leave them, they will naturally calm down in about 20 to 25 minutes, and it is part of the dog's normal cycle.



Dogs tend to show activity patterns for 20-25 minutes after the owner leaves. It is part of the dog's normal cycle and they will naturally calm down. (The rabbit in the picture is a toy.)

French researcher **Patrick Pageat** has a slightly different definition. He talks about the *"Persistence of the primary maternal bond, illustrated by onset at end of the juvenile period (16-20 weeks old), rituals associated with leaving and returning home, persistence of juvenile behaviours, separation-related problems, and signs of over-attachment."*

Hyper-attachment?

Daniel said that it has become quite popular to talk about hyper-attachment in dogs. But there may be something else going on. We watched a video of a dog attacking a door after his owners had left, but it was not the normal exit door, nor was it the correct part of the door; he was attacking the hinges of another door in the house. This, Daniel explained, was displacement behaviour. We don't know the reason for it, as it was a YouTube video, but in another case where the dog was engaging in this sort of activity, it was an extreme fear of thunderstorms. He didn't want to stay inside, but neither did he want to escape. Daniel put us in the mind of a dog in that situation:



For many dogs, being inside during a thunderstorm is like sitting in a cardboard box with grenades going off all around you.

"If you're inside and you have no control over anything outside, you only have control over the space you can see. If you hear a big crash outside, you might think, "Oh, I'm glad I'm in here!" And then the next one is "over there," somewhere else. It's rolled around. You don't know that the next one is not going to happen right in front of your face. And that, for a dog, must be incredibly scary. Dogs with some of these thunderstorm fears, when there's a thunderstorm like this, they don't know if they want to be inside or outside the house. It's like being in a cardboard box with grenades going off all around you. You get into a conflict of motivation, and

they can then do these very intensive behaviours that are what we call displacement behaviours."

In a survey that Daniel and his team carried out, 16% of respondents said that their dog barked when left alone, and 23% that their dog had house-soiled even though it was housetrained. Similar figures are reported in the US. The general consensus is that about 20% of dogs probably suffer from separation anxiety. Being separated from people is quite hard for a dog, because they are so focused on watching us. In a Norwegian study, 60% of dogs with separation anxiety were males, and neutering seemed to make it worse. It is possible that neutering females increases the risk also.

Common treatments for separation anxiety

Generally, if somebody has a dog with separation anxiety, they are given quite a number of exercises to do: Distance yourself from your dog, and only interact on your terms when he is calm. Encourage independent activity by giving him things to do. Give the dog desensitisation and counter-conditioning to being left alone. Wait until the dog is calm before leaving, and keep your departures unpredictable. But in another exercise, you are supposed to give the dog a "comfort cue" (treat) before leaving. How does that make your departure unpredictable? When you return, wait until the dog is calm before you greet him. And then there are a range of medications and dietary interventions that may be helpful in the right conditions. Imagine the owner trying to do all of these things and getting them right. It might be possible if you have three years of training, but most of them don't have any. The average owner is not going to get it right. So it should be the last thing we do, even if it has proved to have reasonably good results when done properly and consistently.

Medication

The drugs most commonly prescribed for separation anxiety tend to focus on boosting serotonin in the brain. The main two are clomipramine and fluoxetine.

Several good trials show that these drugs seem to speed up the regular response to behaviour modification. What caused Daniel some concern was that because they work through serotonin, the dog is affected by one of two possible mechanisms:

- If you give an animal enough serotonin, you can stop it doing all sorts of things. You simply raise the behavioural thresholds. It doesn't necessarily improve the welfare of the animal; it just makes it more restrained. Or,
- The drug really is doing something about mood. There is a theory that loss of attachment is like opiate withdrawal. Serotonin helps to boost and buffer against that withdrawal process. In that case, you are improving the welfare of the animal.

This needed to be tested, and Daniel described in detail a cognitive study they have carried out using food bowls to tease out different types of mood in dogs. They ran a study

with a group of dogs that were known to have a particular form of separation anxiety, and a control group. The treatment group received fluoxetine and a behaviour modification programme. The premise was that if the dogs on fluoxetine were only reacting to the inhibitory side-effects (No. 1 above), they would not only start off worse than the controls, but perform more poorly as the tests progressed. Somewhat to their surprise, they found that the dogs on fluoxetine started off worse as expected, but as the test progressed, they were not only as good as the control group, but even more optimistic (No. 2 above).

So, Fluoxetine seems to be improving the mood of the dogs, which to Daniel was a big relief. While he is a vet, he is not a great advocate of using too much medication.

How reliable are these treatments for separation anxiety? What studies show is that **the drug does not cure the problem. It speeds up the rate of response to behaviour modification therapy—if such therapy is going to work at all.** The recommended dose is 1-2 mg/kg once a day.

However, about 15% of dogs do not respond to the drug and behaviour modification therapy. Daniel is particularly interested in that 15%, and what it is that makes them different. This is an ongoing study.

Some golden rules of treatment

- Check that the dog is physically healthy.
- If there are any cognisant conditions like fear, manage it appropriately, but do *not* assume that an apparent relapse is necessarily the same condition. It is very common for a dog who was improving to have what the owner calls a “relapse” sometime later. It may, in fact, be a completely new event and not even the same condition that was treated before.
- Bear in mind that *containing* the problem is not the same as *resolving* it. Just shoving the dog in a crate is not a solution. It might be necessary in the short term, if there is a lot of destruction, but is not a solution.



Golden rule 1: Do no harm. Stop all punishment, because that never gets you anywhere.

Golden rule 2: Get the owner to do as little as possible.

What about serotonin through natural foods?

In reply to a question from the audience, Daniel explained that with drugs, the content and dosage are known exactly, which makes them much safer. Serotonin can be boosted using tryptophan, but the uptake of tryptophan is dependent on a whole range of other amino acids like leucine, isoleucine etc. Even if a dog gets a lot of tryptophan, if its diet is full of leucine and isoleucine, it will actually get less tryptophan. Also, some of the compounds in the conversion chain between tryptophan and serotonin are very toxic to dogs. Thus the drugs are safer and more reliable in their effects. Serotonin management through diet can be done, but it requires a lot of expertise and the risks are greater.

The emotions of separation anxiety

From a conceptual point of view, what does a dog do when he is alone and distressed? He doesn't like it, so there will be a normal stress response. But there may be different reasons *why* he doesn't like it, and this is where understanding the different emotions comes in.

The approach Daniel and his co-workers have developed is grounded in neurophysiology. They have recognised at least three emotional systems that are quite important—apart from pain, which is the first thing to deal with.

A dog left alone is going to try and cope. He does this by mounting a response, an effort to control his situation. He becomes highly aroused, which is reflected in an increase in the sympathetic nervous system, the fight or flight mechanism. The three emotions that occur are very different. They are panic, fear and frustration.

- **Panic** here is used in the neuro-affective sense. It is associated with attachment. It is the loss of the sense of safety and security. It is, in a way, what happens when you get homesick, or lovesick; it is the breaking of a bond. Neurophysiologically, it is quite different from fear.
- **Fear** means that the animal is trying to escape from something unpleasant. The response is to try and establish contact with sources of safety and security. This happens a lot in opiate systems.
- **Frustration** is not having something that you want, such as safety, or something interesting. Running away from something is not the same as running towards it.

Daniel described a questionnaire-based study that is currently looking at these emotions in dogs. The study is unpublished and cannot be detailed here.

When a person asks for help in regard to a dog that has separation anxiety, it does not necessarily mean that it's an anxiety-related problem; it could be a depressive related issue. It could be a fear-related issue, or it could be an attachment related issue, which is not the same as typical anxiety.

One of the most critical things with handling any case is to separate people's perceptions from their objective descriptions. One of Daniel's PhD students did a range of studies, which showed that dogs showing anxiety *before* the owners left also exhibited more signs *after* they left. They found that pre-departure distress is an important sign. It is helpful to obtain either video or sound recording of the dogs, as their tone of vocalisation reveals a lot. Threatening barks tend to be deeper, but dogs left alone tend to have a higher pitch.

The safe haven

This is where provision of a "safe haven" is a very good idea. A "safe haven" is not the same as a bolthole. A bolthole is somewhere you go, hoping the scary thing will go away. A safe haven is a place you go knowing that you will be safe and secure. The most important thing is for the dog to feel that he is in control; just shutting him in a crate removes that. The safe haven is inviolable. If the dog is there, and you ask if he wants to go for a walk but he stays there, on no account do you drag him out of there. He needs to know that while he is there he is in control, that no harm will happen to him, and that nothing will be imposed.

One of the things that can also help here is pheromone products. A pheromone is a chemical that the mother produces shortly after whelping, and it seems to orient pups so they know that it is a safe place to be. It stops them wandering off when the mother goes away for a while.

Other signs

Daniel took us through some other issues with separation. Vocalisation is not always because of distress. It could be other factors, like another dog barking nearby which the owners don't hear. Elimination is not always because of distress either, especially if the dog left alone for 12 hours. Also, a surprising number of people think that dogs house-train themselves. There are a whole range of reasons for dogs eliminating inside.

Attachment

Attachment is a particularly close bond. Neurochemically, a baby is attached to its mother, not the other way around, because the attachment bond is one of safety and security. It is an asymmetrical relationship, and dogs often have preference for one individual, or several individuals or objects. They show signs of distress when separated, and we know from the literature, particularly in people, that the frequency and intensity of these attachments can increase at times of illness or distress. In dogs who go through rescue centres, this may feature quite strongly. After the stress of the shelter, attachments to their new owners form very quickly; some studies suggest that it can take 40 minutes or less. It also depends on the amount of interaction the person gives. Evolutionarily, it may have its origins with pain, which explains the link with opiate systems and with painkillers. Heartbreak hurts; it is a form of pain.

What attachment implies is that the animal has an exceptionally strong attachment bond, that the individual cannot cope without a carer. The carer gives the support, because the dependent—the dog—is deficient in his need for safe-

ty. The behaviours are an attempt to bring back and engage with the carer. This implies that the problem is a lack of security within the dog, which is exacerbated by the absence of the attachment figure. It also explains why people say that the owner has to be more distancing and teach the dog to be more independent. However, with these dogs that seem to be clingy, is it really that they just have an excessive need for safety or security, or could it be that, just like any other dog, they need safety and security but the owner doesn't provide it? If you don't get something that you want, what do you do? You try a bit harder. So, rather than seeing it as a deficit in the animal, the dog may simply be trying to get something which any normal dog would want.

Daniel described several studies that provide evidence of this. A Hungarian group did a study where they looked at owners' attachment styles with other people. They looked at owners' personality traits and the personality of the dog. It was a good sample size, and they found that owners with more avoidance-type personalities were more likely to have a dog with separation-related problems. This was not needy owners indulging their dogs. There is something about the way they are structuring their interactions. This avoidance style tends to mean that the owners are keeping distance from the dog at times—and one of the things that dogs really like is to be able to predict their owners, so they can have an easy life. If owners are being told to do these exercises where they sometimes dismiss the dog, what kind of message does that send to the dog?

Daniel and his team have therefore developed an attachment questionnaire for pets. It describes the sort of relationship they have, and distinguishes between anxious and ambivalent attachment. They have also developed a series of questions asking about the person's caring style. The preliminary results reinforce the results of the Hungarian study, but development of the questionnaire is still ongoing.

Finally, we watched a fascinating video of the heat in a dog's ears when its owners are away. Military grade thermography cameras showed that this dog, who has severe separation anxiety, had a rise in the temperature of its left ear when it heard its owners coming home. The right side of the brain tends to process the more negative things in life (so the right ear was warmer when the owners were away); the left side of the brain processes the more positive things, so the left ear lit up when the owners returned. Of course it's more complicated than that, and the results are in their early stage, but hopefully Daniel will return to give us more on that. Stay tuned!

