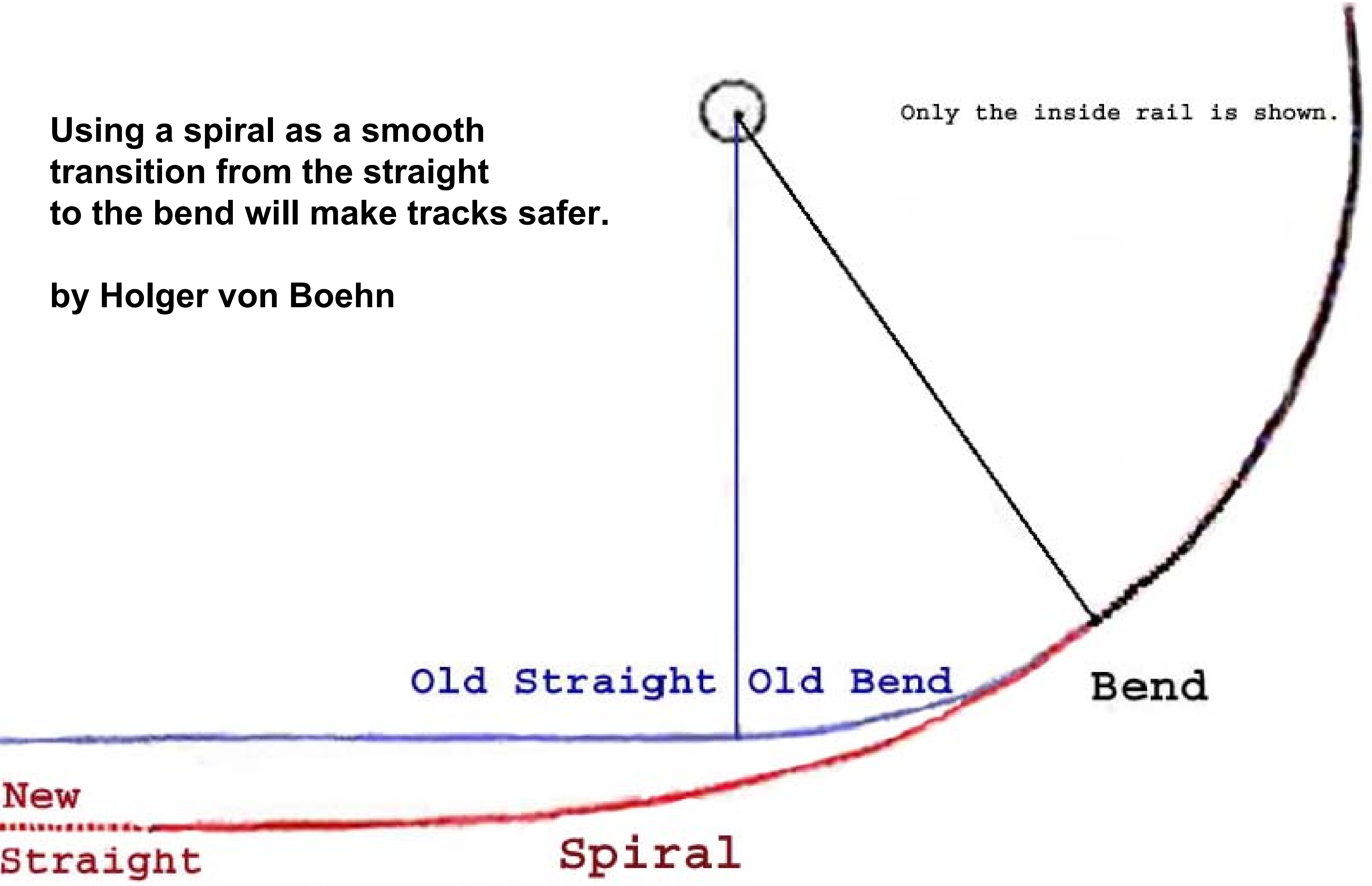
A new trackdesign for safer greyhound racing

Using a spiral as a smooth transition from the straight to the bend will make tracks safer.

by Holger von Boehn



Spirals make bends safer and easier to drive through

All high speed road and railway engineers around the globe are using spirals as transition from the straight to the bend to make the bends safer and easier to drive through.

There are some tracks where greyhounds do have problems with the bends and I am wondering why they do not use spirals to solve the problem.

The transitions from the straights into the bends need even more attention and they have to be in perfect harmony with the laws of physics and track greyhound racing. My background is in physics, and I wrote my first article about the dynamics of greyhound racing in a spiral bend in the 1970s. So I hope that my advice is welcome.

Velodromes prove how safe sharp bends can be build

Cyclists and greyhounds race at a similar speed and they have similar problems to navigate a sharp bend in a stadium.

I asked Ralph Schuermann's advice , who is known as the world's most experienced velodrome and cycle-track designer. More than 110 tracks have been designed by the Schuermanns all around the world.

Ralph encouraged me and confirmed that spirals and banking are imperative for safer greyhound tracks.

What happens in the first and third turn without a spiral ?

It is best seen on tracks with small radii like Wimbledon.
All dogs have to reduce their speed in the turn and the sharper the turn, the more they have to do so. What happens in detail:

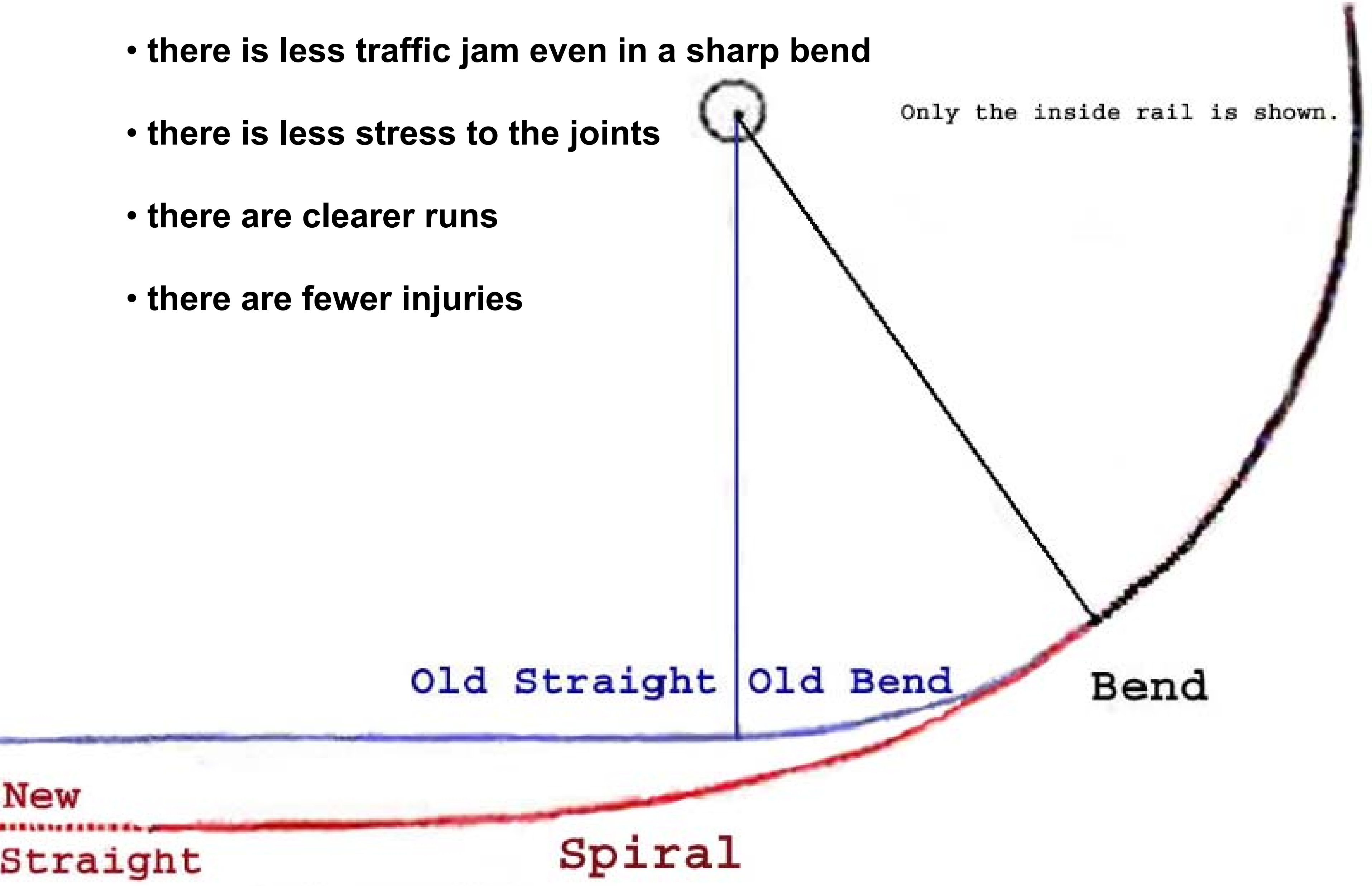
- the dogs have to brake (hard stress to the joints)
- the dogs have to change direction and run in a tilted position
- centrifugal force exerts extra stress

To do it all at the same point and at the same time causes a lot of injuries and traffic jams. Faster dogs from behind run into the leading dogs. A homogenous field often does not have a clear run.

Much bigger radii like in Australia are only a partial solution. There is still the problem that there is an increasing cross fall in the straight.

Through the smooth transition in a spiral bend

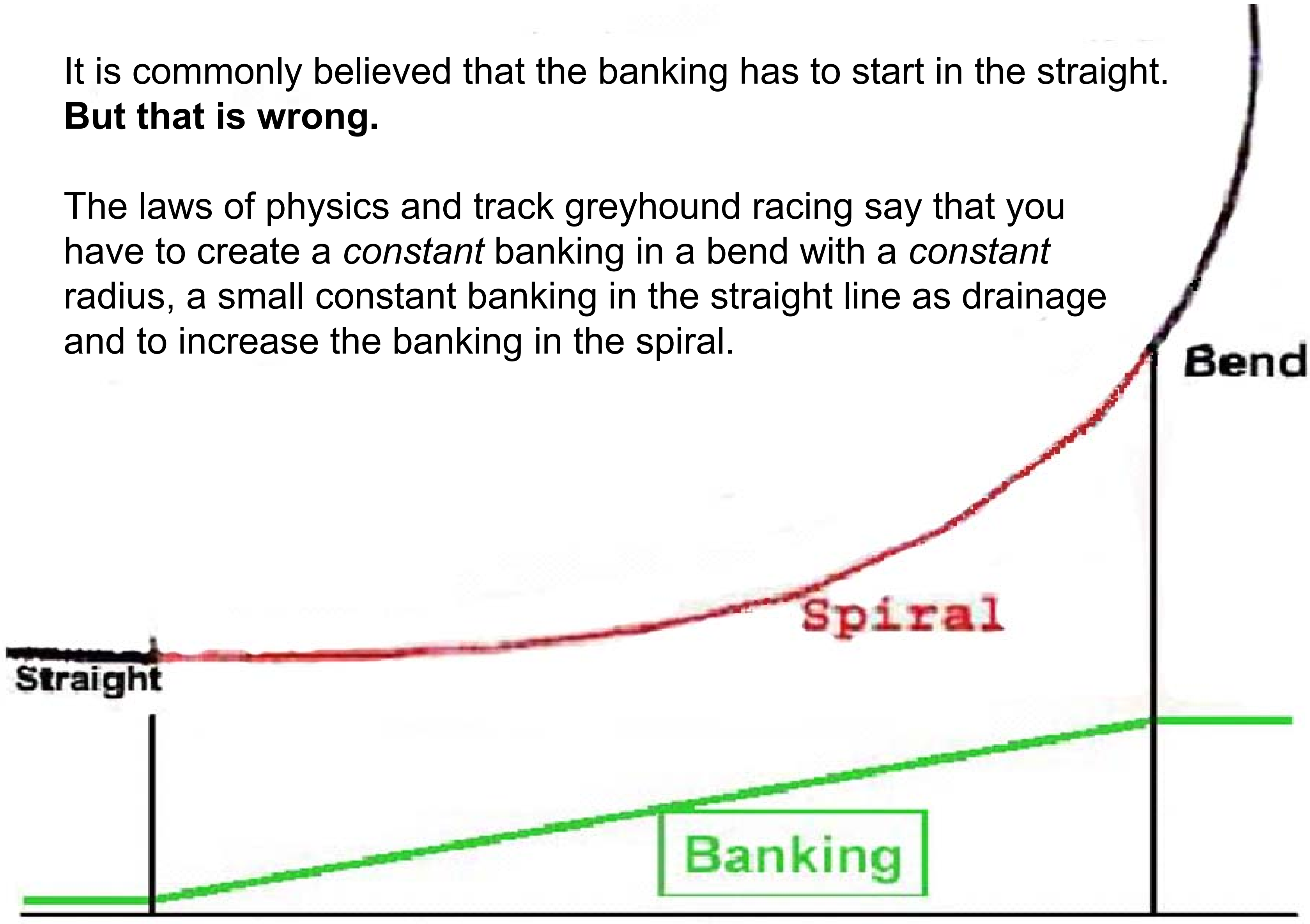
- there is less traffic jam even in a sharp bend
- there is less stress to the joints
- there are clearer runs
- there are fewer injuries



Banking in harmony with the laws of physics

It is commonly believed that the banking has to start in the straight.
But that is wrong.

The laws of physics and track greyhound racing say that you have to create a *constant* banking in a bend with a *constant* radius, a small constant banking in the straight line as drainage and to increase the banking in the spiral.



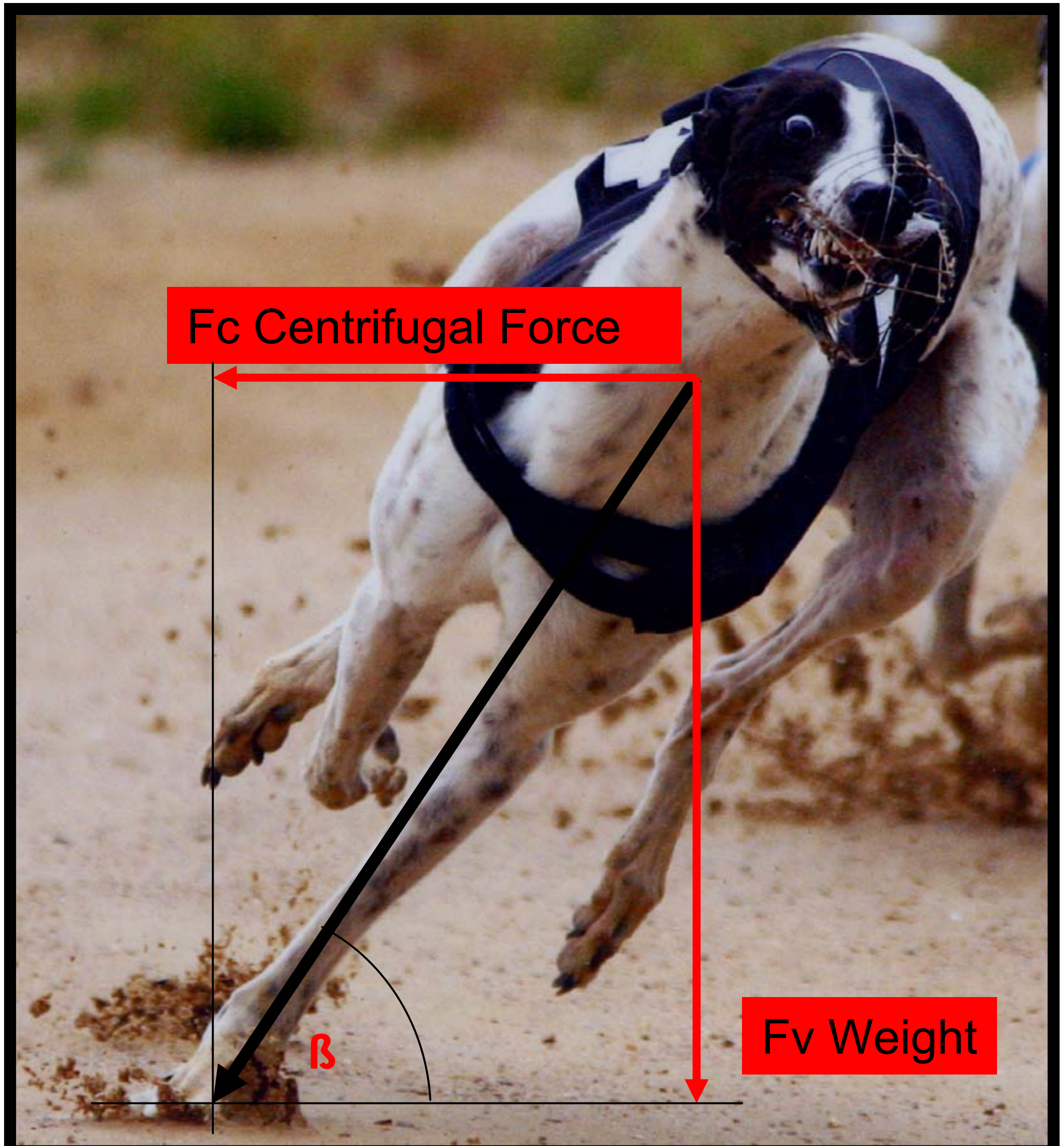
Increasing cross fall in the spiral allows higher banking

Only with a spiral can you achieve the best possible banking. Too little banking is one of the main causes for injuries, the sand can not withstand the power of the greyhound feet in the bend. Richard Winnings from Derby Lane told me that injuries were significantly reduced by higher banking.

The influence of small banking is overrated by people. A banking with 14° reduces the force parallel to the surface only by 3%. If the force parallel to the surface is too high for that ground, then the dog will slip.

With the form of the spiral and the increasing banking in the spiral the dogs are guided into the bend, so there will be clearer runs and fewer injuries.

The kinematics of greyhound racing in the bend



tan ß = Fv / Fc

ß = arctan (Fv / Fc)

Fv = weight

1 kp = 9,806 N [Newton]

Fc = m*(v^2) / r

V = sqt (r*Fc/m)

with m= Fv[kp] /9,806 =>

V = sqt (r*9.806/ tan ß)

Example:

V = sqt (r*9,81/ tan ß)

r = 42 m

tan ß = 7.1 / 4.8 = 1.48

ß = 56°

The speed in this bend is:

V = 16.7 m/sec and

with mass m = 32 kg,

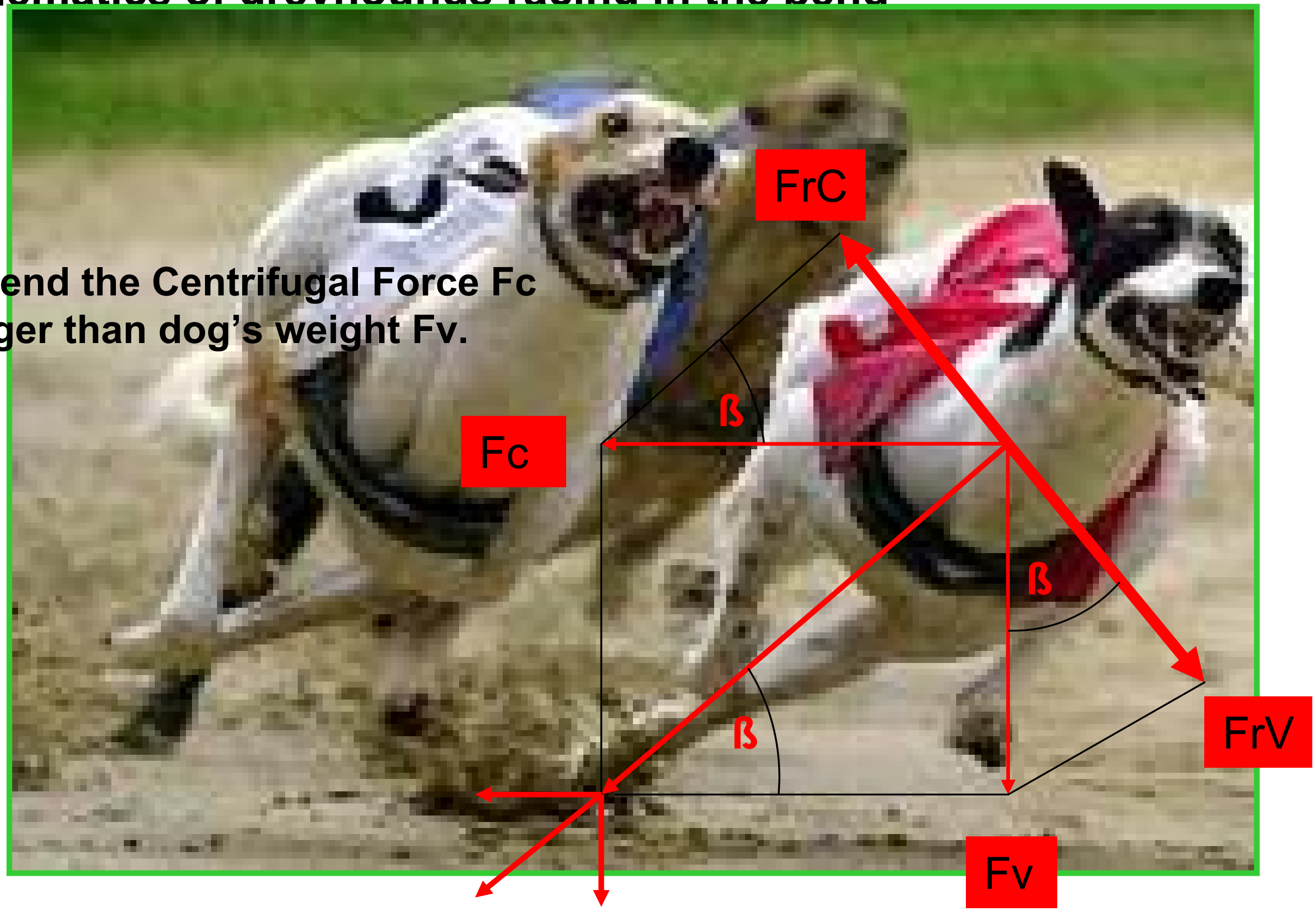
the centrifugal force is:

Fc = m*(v^2) / r

= 32 *(16,7^2)/ 42

= 212 [Newton] = 21.6 [kp]

The kinematics of greyhounds racing in the bend



In this bend the Centrifugal Force Fc is stronger than dog's weight Fv.

In the bend the centrifugal force pulls the dog outwards and the dog has to incline to the inside until there is a balance for the moment of force around his feet: **FrC has to be equal to FrV**.

With FrC = Fc*sin ß and FrV = Fv *cos ß => Fc*sin ß = Fv *cos ß

Fv/Fc= sin ß/ cos ß = tan ß

quod erat demonstrandum

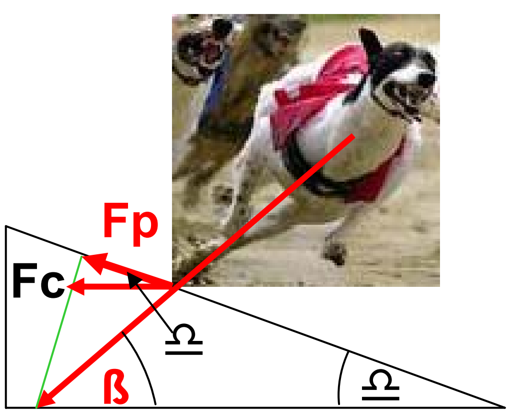
The influence of the radius to the centrifugal force.

At Wimbledon racetrack the centrifugal force that the sand and the greyhound have to withstand is 23.2 /16.4 = 1.4 times as strong as at Sandown.

With m = 32 kg and the assumption that on both tracks v = 16 m/sec:
Fc(r = 36 m) =m*(v^2) / r =32*16*16 /36 = 228[N] = 23.2 kp at Wimbledon;
Fc(r = 51 m) = 161[N] =16.4 kp at Sandown

The influence of the banking to the force parallel to the surface

Fp = Fc* cos ♎.



The reduction of forces parallel to the surface by small banking is not as great as people believe.
If the force parallel to the surface is too high for that ground, then the dog will slip.
A banking with14° reduces the force only by 3%.

With ß= 38°; Banking ♎= 14°; Fv= 32
Fc = Fv / tan ß = 32 / 0,78 = 41 kp
Fp =Fc* cos 14°= Fc * 0,97 = 39,8 kp