

Horse Council Conference Jan. 2012

Dr. Andrew McLean, PhD

Intro: Dr. McLean is an Australian nation who came up through Pony Club and competed in upper level eventing. He sold one of his international level eventers in order to buy the 90 acre property he now runs with his family. At their facility they have an indoor ring, outdoor dressage a jumper rings, and a cross country field. Dr. McLean's son is currently based in Europe and is competing in dressage at the Grand Prix level. Dr. McLean competed at the national level until starting his academic career in animal behaviour; he continued to train difficult horses and travelled extensively doing this while working towards his PhD on equine cognition learning. Today he continues to run his equestrian centre in Australia, he is founder of International Society for Equitation Science (ISES), he recently published a peer reviewed academic text (the first book of its kind on how horses learn), and he travels internationally working with horses in such diverse settings as the Australian Pony Club, Belgian Police horses, and Irish riding horses. He is also currently run a study in Nepal on elephant learning behaviours.

Learning Theory Applied to Horse Training

How does the horse learn the things we try to teach him?

Being systematic is VERY important.

Previously, we used a system that started with COMMON SENSE, which in turn progressed to become TRADITION; now we can use scientific data to add LOGIC to that learning continuum.

Tradition can take us so far, but it has its pitfalls.

1. there is science behind riding and training

2. this includes:

- learning theory
- ethology (Natural Horsemanship; based on instinct/instinctive behaviours)
- cognition
- biomechanics
- human psychology (includes fear, etc.)
- sports science

The heart rate of horse and rider are synchronous during riding. If the horse's heart rate rises (approaching a jump, etc.) the rider's does likewise, a vice versa.

Therefore, when we show signs of tension, all hell breaks loose; horses become attuned to that (like when a horse warms up well but gets tense entering the dressage ring). This is Classical Conditioning.

Identify what can be measured/defined.

This does not deny the unmeasurables: rapport, love, trust, elegance, harmony, etc.

Human Safety Implications When Working with Horses:

The horse is the most dangerous animal in the western world.

There is one death per million people in any given population due to horses.

A serious horse accident happens every 350 hours. That makes the horse twenty times more dangerous than the motorcycle.

Children have the highest injury rate.

25% of all deaths in sport are horse-related.

Children are more likely to suffer head and neck injuries from horses.

Horse behaviour is implicated in 61% of horse-related accidents (Williams and Ashby, 1995).

Horse Behaviour and Training

Ethology: the study of natural behaviours (e.g., Horse Whisperer)

- There are limits to it; it does not answer all the questions
- Instinct only gives us a template on which behaviour sits. Beyond that, behaviour is either *enhanced* or *denied* through learning.
 - o Some animals will be born with a particular genetic response (e.g., a high fear response). **Learning can trump this. Learning is the new frontier.**

Cognition: we see things differently than horses.

- Horses live only in the period of 'now' – they don't see the future or retain the past.

Learning theory: there is a lot of association.

When you train horses you are doing negative reinforcement (big time).

-use reins and legs: pressure is ON (those are your tools) and RELEASE (that is what the horse wants to get)

- to the horse, the removal of pressure is the reward

Tony Glasgow: if we use horses for sports they have certain **rights** – not to be in pain, not to suffer or be afraid.

Ethology is based in Europe.

Learning Theory is based in America

- B. F. Skinner et al

Brain

The horse and human brain are very different.

Humans:

The front part (pre frontal cortex) – we think, imagine, project, understand time, plan

- People who are born without a pre-frontal cortex can be trained to do the above to a degree
- If a person's pre-frontal cortex is damaged or destroyed (tumour, etc.), other parts of the brain can take over and do the above jobs.
- In humans, the brain is unlike that of any other animal:
 - o Position
 - o Cell structure: dopamine (transmitter); this produces depression, drug addiction
 - o Density of cells: unlike anything else in existence re: density
 - Part of this affects our memory – it is not as good as we would think (e.g., draw a \$5 without looking at one first)

Conversely:

Horse: **is very observant**. This results in him shying a lot. He uploads and remembers very distinctly everything about his environment. The horse has an *extremely sophisticated ability* in this sphere.

BUT: there is NO pre-frontal cortex in any grazing animal.

- E.g., the elephant has to use his trunk as a tool; he has a memory for this. He needs a pre-frontal cortex.
- The horse has no memory for instruction over a period of a few seconds; they cannot carry ideas with them.
- Predators have to think/plan ahead (the tiger has to predict where his prey might run).
- The horse needs a good long-term memory of place/where food is
 - o Grass does not hide. He does not have to predict where it will go.
- Dogs have object permanence (if you throw a ball over a fence, he can remember it went there without needing to have it in his sight; he can then formulate a plan to go find the ball he cannot see).
 - o The horse cannot do this
- The horse is like a 2 year old child
 - o It's dangerous because it doesn't understand danger

- It likes to run away, etc.

Humans:

- Conscious; have time
- Imagination: can extrapolate
- Have recall memory: this allows for planning and tool use
- Have episodic memory
 - If a horse trailer crashes, bring another trailer and the horse will usually get in; if a plane crashes, people are usually very leery of getting on another plane, ever.
 - Once the horse trailer starts moving, this is when the horse who was in the crash usually freaks out. He is responding to the stimulus of moving.

Horse:

- Has a high degree of recognition memory
 - It is context specific
 - E.g., going into the dressage ring and getting tense
 - In this case, you need to re-train the RIDER
 - THEN you need to re-train the horse
 - Horses with behaviour problems need to have the correct behaviour re-installed
 - For the rider:
 - Must visualize doing it right. If you make a mistake, re-start.
 - Use relaxation therapy

With horses, for the fastest learning to occur:

- Teach him in the same place
- Make only one step/change at a time
 - When jumping: change one fence at a time, OR change height, OR change pace

Ethological considerations:

Horses have some hard wired behaviours:

- These are relevant to their welfare and training
 - Social organization
 - We have been taught that horse are herd animals
 - However, within a herd they will typically stick to small groups:
 - Often sorted by family
 - Or age/sex (all the young colts get kicked out of the larger group)
 - Or colour!

- Response: relaxation. No change in heart rate.
 - If the horse is fearful, the best thing is to slow the horse's legs
 - Teach the horse to lengthen stride at the walk
 - Give the aid every 3rd step (nudge-2-3; nudge-2-3)
 - Lengthen = relaxation
 - Tension = contraction
 - Do transitions within a gait (trot longer, then shorten, or slow down, stay there, release the reins and maintain the pace)

The horse is wired for fear.

- It has the largest amygdala of all domestic animals
- The horse has strong projections from the amygdala to the jaw (Takeuchi et al, 1998)
 - Hence bit evasions such as locking, and crossing jaws, biting, opening mouth, etc.

Learning Theory: Training

Horses observe subtle reactions

- E.g., Hans the Clever Horse

Learning

- Behaviour changes as a result of experience
- It is adaptive

Training

- Behaviour changes as a result of human interaction

Learning Theory

- The body of knowledge that describes the learning process in an organism
 - E.g., ants can recognize/tell time

Learning has two Categories

1. Non associative:
 - a. Single stimulus
 - i. Habituation – e.g., training to accept the saddle (an ultimately non-threatening item)
 - ii. Sensitization
2. Associative
 - a. The association between stimuli becomes established
 - i. Operant conditioning

ii. Classical conditioning

Habituation:

- Learning not to react to a stimuli
 - Regular events have less effect than irregular ones
 - Fear is rewarded by FAST LEGS and DISTANCE
 - The further and faster a horse shies, the more he records it to memory and reacts that way the next time
 - It's not the OBJECT, it's the previous REACTION to that object that sticks with him
 - You must be able to STOP his legs and SLOW him down. Then he won't be scared of it.
 - Example: Mustang experiment. This lasts for a while; the longer you do it, the longer the effect lasts.
 - This is why people use hobbles or leg ropes on a hind leg

The possible outcomes:

- 1. Primitive: the horse gets used to things
- 2. Adaptive: they adapt to it through training
- 3. Inhibited by fear
 - Don't train fear responses into young horses
 - You can't control things that happen out in the paddock; that's not your problem
 - Don't be part of the problem; don't become the trigger
 - Fear is INDELIBLE
 - The horse cannot forget it
 - The horse CAN suppress it
 - If the horse is experiencing a fear response, they won't learn well, won't try
 - The fearful horse takes longer to learn
 - Fear destroys creativity
- 4. Implicit Foundation Training
 - If a horse is afraid of legs –
 - add legs, rub him with legs, when the horse moves, rub him, when he stops, take the legs off – (this is for a horse that bolts from leg pressure)
 - step two: rub him with the legs, then ask him to rein back = overshadowing
 - his fear is overshadowed by another command
 - you want to choose a response that is likely to happen

Operant Conditioning

Response probable

Negative reinforcement

(spur, released when horse moves)

positive reinforcement

(stroking, praising)

Aversive stimuli

(poke)

=Learned helplessness

attractive stimuli

(food)

negative punishment

(not often used)

Response unlikely

An example of a positive would be hitting a horse when he bites.

Learned helplessness

Overuse of spurs and whips causes this

- the animal becomes immune to pain
 - o it is sustained, unpredictable to the horse, inescapable
- examples of this in humans is self-cutting and burning; over time, the physical pain is tolerated by the individual
- therefore, if the average rein pressure is 5 kg. (as measured by Clayton), then
 - o our goal as riders should be to work toward light aids
- physical effects of strong, relentless pressure:
 - o habituate
 - o colic
 - increased incidence
 - increased risk of dying from each episode
 - o immunological and physiological problems
 - high rate of skin disorders in stressed horses

Recipe for learned helplessness:

1. Aversive stimulus is unpredictable
2. Aversive stimulus is uncontrollable
3. Aversive stimulus is inescapable
 - E.g., nose behind the vertical
 - E.g., Rollkur: the horse is hollow in the loins but up in the shoulder

Horse's welfare is as important or more important than ours as he has no voice

Operant Conditioning: used in all training systems

1. Animal sees the cue (trigger)
2. Animal is motivated to perform the response (e.g., pulling)
3. Animal gets a reward (freedom from pressure or food)

The Operant Contingency

Operant Conditioning: negative reinforcement

- Removing aversive stimulus on getting the correct response
 - o Apply spur to make horse go; horse goes; spur pressure removed
- Pressure release:
 - o When using intermittent pressure, make sure there are no gaps or reductions in rhythm
 - Elephant study: Asian religion dictates that the elephant is born with all the knowledge it requires, and must be beaten into submission until it will do what is required

Operant Conditioning: positive reinforcement

- Adding something attractive immediate upon correct response (food, clicker, pat, etc.)
 - o For the pat, say "Good boy/girl", pause 2 seconds then pat
 - Pause then pat more effective than simultaneous voice and pat
 - Scratch on withers more effective than pat on neck
 - Pat on neck relatively ineffective, comparatively
 - The horse is the only animal on the planet whose sympathetic nervous system connects directly to the vagus nerve of the heart
 - o This reward will drop the heartbeat by 10 bpm
 - o Clicker training is good for children
 - Teaches timing
 - It is an easier way to observe and learn about the horse than riding it – fewer skills required
 - Teaches respect for the horse's intelligence

Classical Conditioning

- Regular events that precede specific cues
 - o Behaviour eventually triggers them (e.g., voice, light aid, etc.)
 - o Walk on: associate a related event with something they already know
 - Be careful about timing
 - o Can learn bad things as a trigger
 - Tension at shows, etc.

Shaping

(Go/Stop/Turn sideways)

1. A basic attempt
2. Obedience (for lack of a better word)
 - a. Immediate response from a light aid
3. Speed control
 - a. Maintain speed, gait, tempo and stride length
4. Line control
 - a. Maintain line and straightness
5. Outline and maintain head and neck posture
6. Performing wherever and whenever required

Each is the product of the correct training of the one before.

Similar to the German Training Scale

Order of Training

Movements: (shoulder in, half pass, etc.)

Other aids: seat, position

Light pressure to the aids

Pressure: NR

Go #3 Turn hindlegs #1 Turn forelegs #2 Stop #3

Operant origins of movements

Questions:

Imprinting (Robert Miller):

- Process is under scrutiny
- Not acknowledged in mammals; more in birds
 - mother figure
 - irreversible
 - wants to mate with the object of its imprinting when its older
- Early training is what horses are good at
 - habituate him to things; this mitigates fear
- Imprinted horses are not as easy to deal with as yearlings

Orphans:

- Don't learn socialization from other horses
- Can be dangerous to humans when they are older; can push them around
- Can be in danger from other horses when in the field

Holland study on horses in good settings:

- Group housing horses in groups of 6-7
 - they windsuck and weave less
 - to further reduce windsucking/weaving, have access to grass/hay 24/7
- We isolate horses too much in paddocks
 - horses self-isolate those with behaviour problems

Weaning:

- Do it gradually; this is more for the mother than the baby

Fire:

- Have a good fire plan in place