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# Recognizing Shutdown

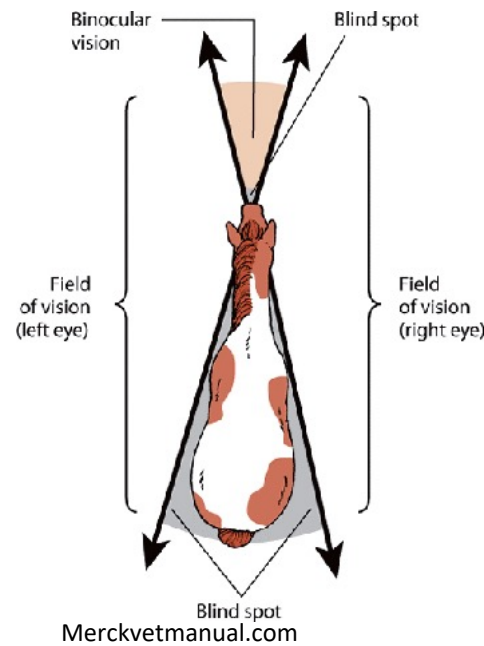
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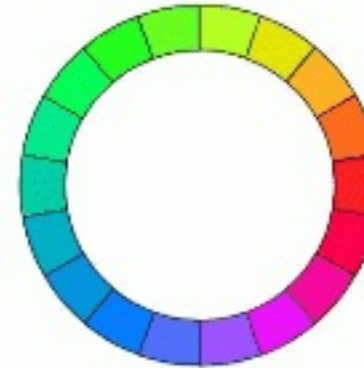
*“Could be worse. Not sure how, but it could be.”*

– Eeyore

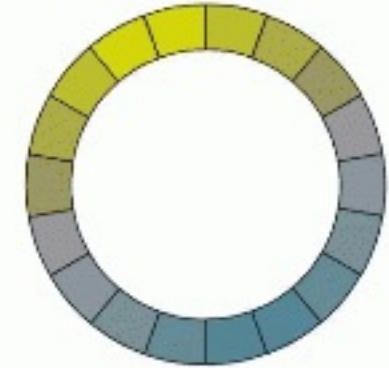
# Equine Perception



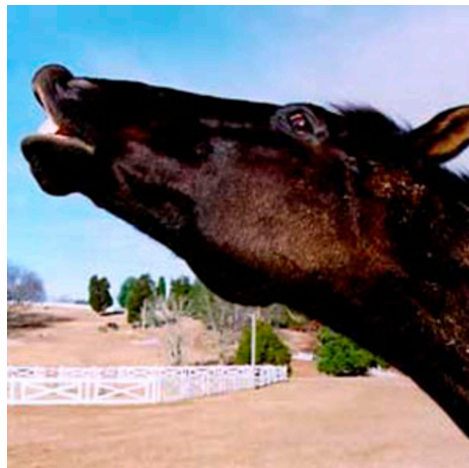
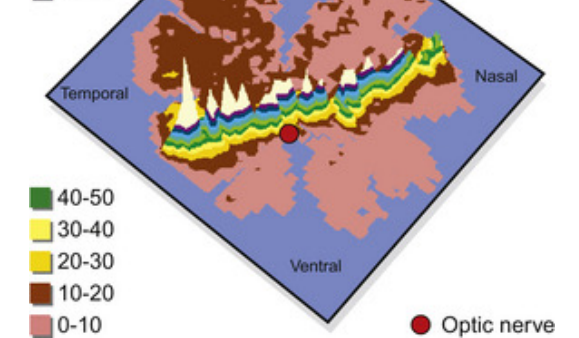
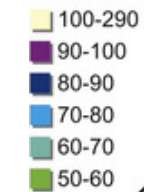
Human Trichromatic Color Vision



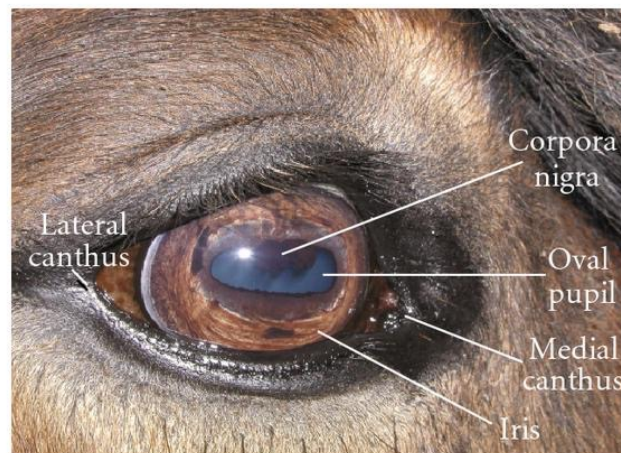
Horse Dichromatic Color Vision



Ganglion cell density per 250 × 250 micron square



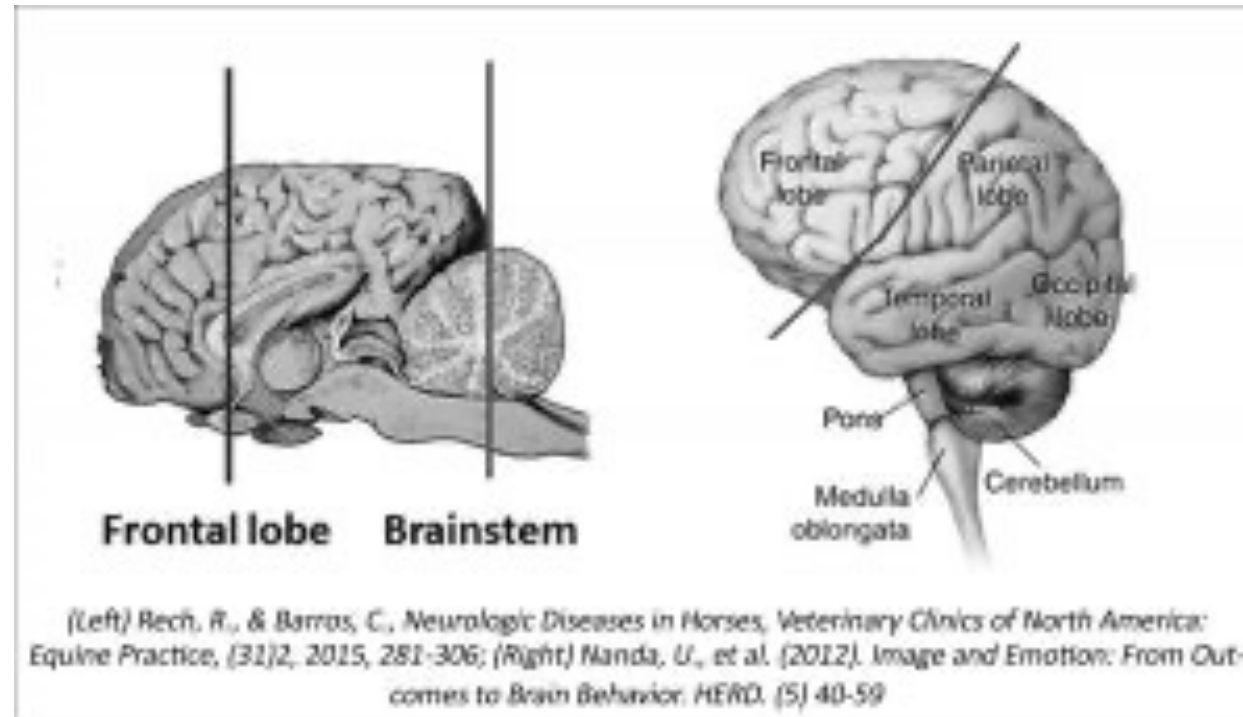
<https://www.equinesearch.com/discoverhorses/horse-smell>



<https://www.hindawi.com/journals/ijz/2009/721798/>

<https://veteriankey.com/perception/>

# Equine Perception



The bigger the frontal lobes, the more capable the species is of 'goal directed' behaviors (the ability to analyze information and act accordingly)  
The frontal lobes are relatively small in the horse, meaning it is more likely to react in the moment.

**This is not to say that horses lack intelligence, but that they think and respond differently.**



# Equine Perception

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\*Thalamus → sensory information from eyes, nose, ears and skin → cook within the brain = this is what is happening to me.

\* Information → amygdala (primal low road) AND cortex (conscious high road) = amygdala is milliseconds faster (emotion versus evaluation)

\* **Amygdala = Brain's Smoke Detector** – Immediate and automatically, with feedback from hippocampus (relates new input to past experiences)

\*Past experiences of pain/discomfort can lead to anticipation of pain **EVEN** when no longer present!!





\* Amygdala senses threat → sends message to hypothalamus and autonomic nervous system = whole body response

(EVEN BEFORE WE ARE CONSCIOUSLY AWARE)



<https://www.pinterest.com/pin/536069161865616876/>




# Analyzing Emotions

“The option to anthropomorphize provides us the ability to empathize.”

– Susan Friedman

I’ve seen horses who were worried, scared or troubles. I’ve never seen a disrespectful horse.

– Mark Rashid



Anxiety often occurs when a horse’s living circumstances do not match their **natural instincts**.

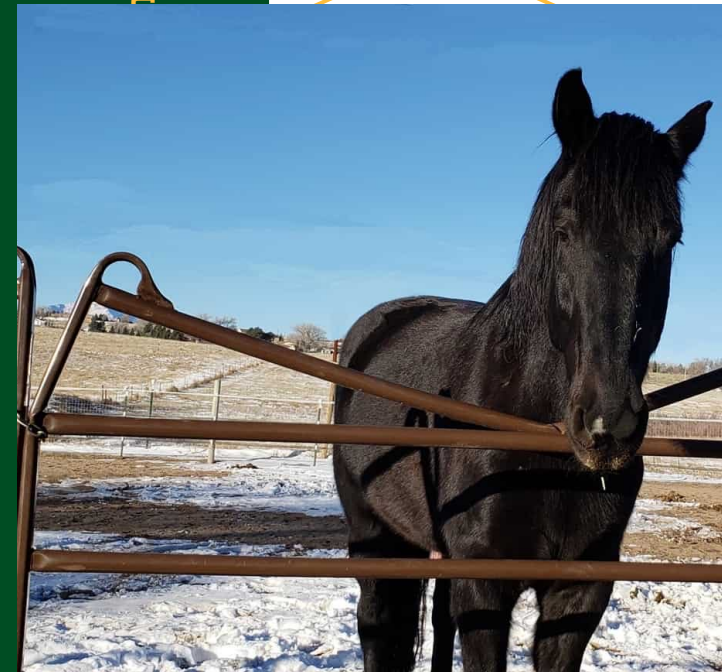
<https://ka-hi.com/blog/animal-health/horse-anxiety/>



# The Informing Factors

- Unhealthy “home” life
- Pain
- Fear/Frustration
- Learned Behavior

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annablackecom



<https://www.youtube.com/watch?v=5B6BUfKNKpo>



Ben's Equestrian (Facebook)



Pinterest.com



# The Five Domains of Welfare

## Physical / Functional Domains

### Survival-Related Factors (Nutrition, Environment & Health)

Nutrition		Environment		Health		Behaviour	
<b>Restrictions:</b>	<b>Opportunities:</b>	<b>Unavoidable/Imposed conditions:</b>	<b>Available conditions:</b>	<b>Presence of:</b>	<b>Little or no:</b>	<b>Exercise of 'agency' impeded by:</b>	<b>'Agency' exercised via:</b>
Water intake Food intake Food quality Food variety  Voluntary over eating Force feeding	Drink enough water Eat enough food Eat a balanced diet Eat a variety of foods  Eating correct quantities	Thermal extremes Unsuitable substrate Close confinement Atmospheric pollutants: CO <sub>2</sub> , ammonia, dust, smoke  Unpleasant/strong odours Light: inappropriate intensity Loud/otherwise unpleasant noise  Environmental monotony: ambient, physical, lighting  Unpredictable events	Thermally tolerable Suitable substrate Space for freer movement Fresh air  Pleasant/tolerable odours Light intensity tolerable Noise exposure acceptable  Normal environmental variability  Predictability	Disease: acute, chronic Injury: acute, chronic, husbandry mutilations Functional impairment: due to limb amputation, or lung, heart, vascular kidney, neural or other problems Poisons  Obesity/leanness  Poor physical fitness: muscle de-conditioning	Disease Injury  Functional impairment  Poisoning  Body condition appropriate Good fitness level	Invariant, barren environment (ambient, physical biotic) Inescapable sensory impositions Choices markedly restricted  Constraints on environment-focused activity Constraints on animal-to-animal interactive activity  Limits on threat avoidance, escape or defensive activity Limitations on sleep/rest	Varied, novel engaging environmental challenges  Congenial sensory inputs Available engaging choices Free movement Exploration Foraging/hunting Bonding/reaffirming bonds Rearing young Playing Sexual activity Using refuges, retreat or defensive attack Sufficient sleep/rest

## Affective Experience Domain

### Mental State

Negative	Positive	Negative	Positive	Negative	Positive	Negative	Positive
Thirst  Hunger (general)  Hunger (salt)  Malnutrition malaise Bloated, over full Gastrointestinal pain	Wetting/quenching pleasure of drinking Pleasure of different tastes/smells/textures Pleasure of salt taste Masticatory pleasures Post prandial satiety  Gastrointestinal comfort	Forms of discomfort: Thermal: chilling, overheating Physical: joint pain, skin irritation Physical: stiffness, muscle tension Respiratory: e.g. breathlessness Olfactory Auditory: impairment, pain Visual: glare/darkness eye strain  Malaise from unnatural constancy	Forms of comfort: Thermal Physical Respiratory Olfactory Auditory, Visual  Variety related comfort	Breathlessness Pain: many types Debility, weakness Sickness, malaise Nausea Dizziness  Physical exhaustion	Comfort of good health and high functional capacity     Vitality of fitness	Anger, frustration Boredom, helplessness Loneliness, isolation  Depression Sexual frustration  Anxiety, fearfulness, panic, anger Neophobia Exhaustion	Calmness Engaged, in control Affectionate sociability Maternally rewarded Excitation/playfulness Sexual gratification  Secure/protected/confident Likes novelty Energised/refreshed







# The Four Questions of Behavior

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## Tinderbergen's 4 Questions

### Proximate Questions (the how):

1. **Mechanism (causation)** – the physiology of behavior
2. **Development (ontogeny)** – how behavior develops over lifetime

### Ultimate Questions (the why):

3. **Function (adaptation)** – contribution to survival/reproduction
4. **Evolution (phylogeny)** – how a behavior has evolved



# The Nervous System



Relaxed → Tension → Unresolved Tension → Unresolved Conflict → Fight/Fight/Freeze



- |  |  |  |   |   |
|--|--|--|---|---|
| <ul style="list-style-type: none"> <li>• Almond eyes</li> <li>• Relaxed tail</li> <li>• Elongated nostrils</li> <li>• Relaxed lips</li> <li>• Mid-low to low head-neck position</li> </ul> | <ul style="list-style-type: none"> <li>• Blinking</li> <li>• Looking away</li> <li>• Half-closing eyes</li> <li>• Chewing</li> <li>• Yawning</li> <li>• Neck shake</li> <li>• See-saw lowering</li> <li>• Curving</li> <li>• Eating</li> </ul> | <ul style="list-style-type: none"> <li>• Self-biting</li> <li>• Licking objects</li> <li>• Pawing</li> <li>• Quick rolling</li> <li>• Head swing</li> <li>• Rubbing head on foreleg</li> <li>• Sniffing or stirring ground without eating</li> </ul> | <ul style="list-style-type: none"> <li>• High head-neck position</li> <li>• Triangulated eyes</li> <li>• Clenched lips</li> <li>• Round nostrils</li> <li>• Active ears</li> <li>• Carried or clenched tail</li> <li>• Frequent defecation</li> <li>• Pacing</li> <li>• Rushed or reduced eating or drinking</li> <li>• Startle easily</li> </ul> | <ul style="list-style-type: none"> <li>• Moving away from stimulus</li> <li>• Biting</li> <li>• Kicking</li> <li>• Chasing away</li> <li>• Bucking/Rearing</li> <li>• Arched Neck</li> <li>OR</li> <li>• Weaving</li> <li>• Cribbing</li> <li>• Nodding</li> <li>• Horizontal head-neck position</li> <li>• Half closed eyes</li> <li>• Little facial expression</li> </ul> |
|--|--|--|---|---|





# The Personality of the EAS Horse

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- ✓ Willing
  - ✓ Compliant
  - ✓ Quiet
  - ✓ Tolerant
- =
- Lower Thresholds  
Less Expressive

**Despite the absence of clear and obvious behavioral indicators, stress can still be present!**

## Long term affects of chronic stress (Fear Free, 2018)

- Immunosuppression
- Delayed wound healing
- Ulcers/ Digestive Issues
- Muscle wasting
- Progression of Behavior Disorders



# Behavioral Indicators in the EAS Horse

More frequent = More indicative of Stress

	2	4	6	8	2	4	6	8
Behavior Coding Unit	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
Bite Threat								
Ears Pin								
Head Raise								
Head Turn w/Ears Pen								
Head Toss								
Itching Head/Neck								
Jaw Stretch/ Body Stretch								
Kick Threat								
Licking/Chewing								
Lowering Head/Neck								
Neck/Body Shake								
Pawing								
Step Forward/ Step Back								
Tail Swoosh								

Preliminary work!

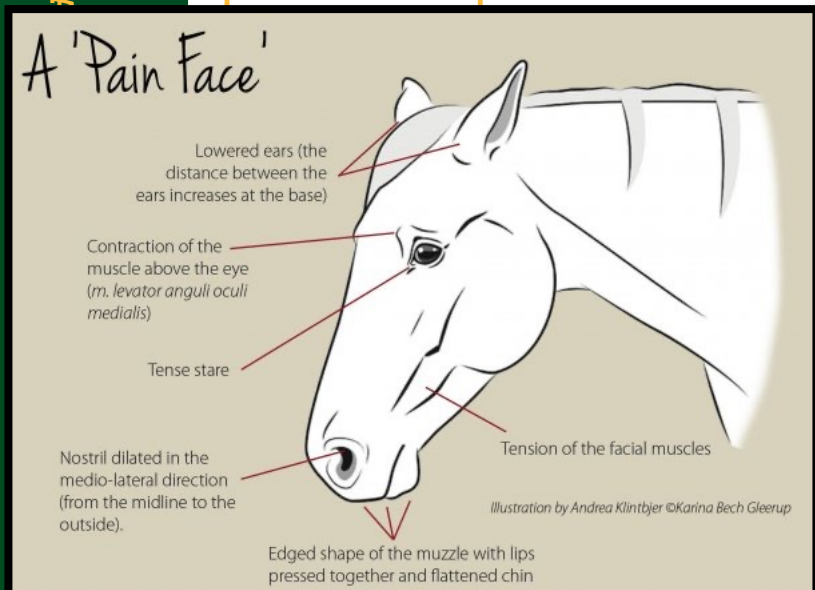




# Behavioral Indicators in the EAS Horse

## Horse Grimace Scale (Dalla Costa et al, 2014)

Facial Coding Unit	Score
Ears Stiffly Backwards	0 - 2
Orbital Tightening	0 - 2
Tension Above Eye Area	0 - 2
Prominent Strained Chewing Muscles	0 - 2
Strained Nostrils and Flattening of Profile	0 - 2
Mouth Strained and Pronounced Chin	0 - 2
<b>Total Pain Score</b>	
<b>Tail Carriage (relaxed, light, medium, high)</b>	



Credit: Karina Beck and Cristina Wilkins



## Horse Grimace Scale (Dalla Costa et al, 2014)



Facial Coding Unit	Score
Ears stiffly backwards	2
Orbital tightening	2
Tension above eye area	0
Prominent strained chewing muscles	2
Mouth strained and pronounced chin	1
Strained nostrils and flattening of the profile	1
<b>Total pain score</b>	<b>8</b>





**Table 1.** The Ridden Horse Pain Ethogram, adapted from Dyson et al. 2018 [5]. Assessments were made in walk, trot and canter and on the left and right reins. A total behaviour score of  $\geq 8$  (out of 24) is likely to indicate the presence of musculoskeletal pain (Dyson et al. 2018 [5,6]). s = seconds.

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- \* 1. Repeated changes of head position (up/down), not in rhythm with the trot
  2. Head tilted or tilting repeatedly
  3. Head in front of vertical ( $>30^\circ$ ) for  $\geq 10$  s
  4. Head behind vertical ( $>10^\circ$ ) for  $\geq 10$  s
  5. Head position changes regularly, tossed or twisted from side to side, corrected constantly
  - \* 6. Ears rotated back behind vertical or flat (both or one only)  $\geq 5$  s; repeatedly lay flat
  - \* 7. Eye lids closed or half closed for 2–5 s; frequent blinking
  8. Sclera exposed repeatedly
  - \* 9. Intense stare (glazed expression, 'zoned out') for  $\geq 5$  s
  10. Mouth opening  $\pm$  shutting repeatedly with separation of teeth, for  $\geq 10$  s
  11. Tongue exposed, protruding or hanging out, and/or moving in and out repeatedly
  12. Bit pulled through the mouth on one side (left or right), repeatedly
  - \* 13. Tail clamped tightly to middle or held to one side
  14. Tail swishing large movements: repeatedly up and down/side to side/circular; repeatedly during transitions
  15. A rushed gait (frequency of trot steps  $> 40/15$  s); irregular rhythm in trot or canter; repeated changes of speed in trot or canter
  16. Gait too slow (frequency of trot steps  $< 35/15$  s); passage-like trot
  17. Hindlimbs do not follow tracks of forelimbs but repeatedly deviated to left or right; on three tracks in trot or canter
  18. Canter repeated leg changes in front and/or behind; repeated strike off on wrong leg; disunited
  19. Spontaneous changes of gait (e.g., breaks from canter to trot, or trot to canter)
  - \* 20. Stumbles or trips more than once; repeated bilateral hindlimb toe drag
  21. Sudden change of direction, against rider's direction; spooking
  - \* 22. Reluctance to move forwards (has to be kicked  $\pm$  verbal encouragement), stops spontaneously
  23. Rearing (both forelimbs off the ground)
  24. Bucking or kicking backwards (one or both hindlimbs)
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# Behavioral Indicators in the EAS Horse

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## Future Work:

- Pairing physiological markers w/behavioral signs
  - ✓ HRV, Cortisol, Thermal Imaging
  - ✓ Validating a coding instrument
  
- Interventions for relieving signs of stress
  - ✓ Body work, management, enrichment
  
- “Equine Behavior” Training for Handlers
  - ✓ Tools for safe and relaxed handling
  - ✓ Improving the experience for horses

# Questions?

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A little consideration, a little thought  
for others, makes all the difference.”

- Eeyore



# References

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