



# Effect of Rider:Horse Weight Ratio on Equine Behaviour during Mounting

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## About Me

- BS Equine Studies from University of New Hampshire
- MSc Equine Science from University Edinburgh
- Master's dissertation - data collected at High Hopes
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## Pain & Stress

- There is an inextricable link between pain and stress (Rhudy, 2016)
- Behavioural compliance is not correlated with physiological stress indicators (Squibb et al., 2018)

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## EQUUS-FAP

- Developed using colicing horses and pain-free controls
- Observers blinded to analgesic treatment, not diagnosis
- Cutoff score of 4: sensitivity 87.5, specificity 88.0
- (van Loon and Van Dierendonck, 2015)
- Validated for head-related pain, similar results - 80 & 70
- (van Loon and Van Dierendonck, 2017)

Facial Action Units	Categories	Score
Head	Normal head movement	0
	Less movement/increased movement	1
	No movement/strongly increased movement	2
Eyelids	Opened, sclera can be seen in case of eye/head movement	0
	More opened eyes/tightening of eyelids	1
	Obviously more opened eyes/obvious tightening of eyelids	2
Focus	Focused on environment	0
	Less focused on environment	1
	Not focused on environment	2
Nostrils	Relaxed	0
	A bit more opened	1
	Obviously more opened, nostril flaring and possibly audible breathing	2
Corners mouth/lips	Relaxed	0
	Lifted slightly	1
	Obviously lifted	2

(van Loon and Van Dierendonck, 2015)

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## Horse Grimace Scale

- Standardized pain scale using only face
- Horses following castration- does not control for stress
- Overall accuracy: 73.3%
- (Dalla Costa et al., 2014)
- Fear is associated with higher HGS scores
- (Dalla Costa et al., 2017)

Stiffly backwards ears			Orbital tightening		
					
Not present (0)	Moderately present (1)	Obviously present (2)	Not present (0)	Moderately present (1)	Obviously present (2)
The ears are held stiffly and turned backwards. As a result, the space between the ears may appear wider relative to baseline.			The eyelid is partially or completely closed. Any eyelid closure that reduces the eye size by more than half should be coded as "obviously present" or "2".		
Tension above the eye area			Prominent strained chewing muscles		
					
Not present (0)	Moderately present (1)	Obviously present (2)	Not present (0)	Moderately present (1)	Obviously present (2)
The contraction of the muscles in the area above the eye causes the increased visibility of the underlying bone surfaces. If temporal crest bone is clearly visible should be coded as "obviously present" or "2".			Straining chewing muscles are clearly visible as an increase tension above the mouth. If chewing muscles are clearly prominent and recognizable the score should be coded as "obviously present" or "2".		
Mouth strained and pronounced chin			Strained nostrils and flattening of the profile		
					
Not present (0)	Moderately present (1)	Obviously present (2)	Not present (0)	Moderately present (1)	Obviously present (2)
Strained mouth is clearly visible when upper lip is drawn back and lower lip causes a pronounced "chin".			Nostrils look strained and slightly dilated, the profile of the nose flattens and lips elongate.		

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## Equine Pain Face

- Crossover trial study, semi-randomized
- Control, tourniquet, capsaicin cream
- Asymmetrical/low ears
- Angled eye
- Withdrawn, tense stare
- Square-like nostrils
- Tensed muzzle
- Tensed mimic muscles
- (Gleerup et al., 2015)



Left to right: pain free horse; painful horse with asymmetrical ears; painful horse with lowered ears (Gleerup et al., 2015)

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## FEReq

- Designed an ethogram of facial expressions during riding
- Images assessed to form initial ethogram
- Assessed for consistency and refined
- (Mullard et al., 2017)
- Assessed lame versus non-lame horses to develop pain score
- Trained, blinded assessor scored horses
- Significant difference between lame (9) and non-lame (6), not before and after analgesia
- (Dyson et al., 2017)



A-C lame, D non-lame (Dyson et al., 2017)

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## RHpE

- FEReq protocol used to develop whole-body ethogram using videos
- Walk, trot, canter, including 10m circles
- Score of 8/24: likely musculoskeletal pain
  - Sensitivity: 86
  - Specificity: 80
- (Dyson, 2022)
- Dressage phase of 3-day eventing (Dyson and Ellis, 2020)
- Before and after diagnostic anaesthesia (Dyson and Pollard, 2023)
- Lame versus non-lame horses (Dyson and Pollard, 2020)
- World Cup Grand Prix dressage (Dyson and Pollard, 2021)



Clockwise: spooking; rearing, intense stare; head above vertical, ears back, tail swishing; mouth open with teeth separated (Dyson, 2022)

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## RHpE

### Ridden Horse Pain Ethogram (Dyson et al., 2018)

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 °) for ≥10**
4. **Head behind vertical (>10 °) for ≥10s**
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) for ≥5s; repeatedly lay flat
7. Eye lids closed or half closed for 2–5s; repeated rapid blinking
8. Sclera exposed repeatedly
9. Intense stare (glazed expression, 'zoned out') for ≥5s
10. Mouth opening ± shutting repeatedly with separation of teeth, for ≥10s
11. Tongue exposed, protruding or hanging out, and/or moving in and out > once
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; during transitions
15. A rushed gait (frequency of trot steps > 40/15s); irregular rhythm in trot or canter; repeated changes of speed in trot or canter
16. Gait too slow (frequency of trot steps <35/15s); passage-like trot
17. Hindlimbs do not follow tracks of forelimbs but deviated to left or right; on 3 tracks in trot or canter
18. Canter repeated leg changes: repeated strike off wrong leg; change of leg in front and /or behind (disunited)
19. Spontaneous changes of gait (e.g., breaks from canter to trot or trot to canter) > once
20. Stumbles or trips repeatedly; repeated bilateral hindlimb toe drag
21. Sudden change of direction, against rider direction; spooking
22. Reluctant to move forward (has to be kicked ± verbal encouragement), stops spontaneously
23. Rearing (both forelimbs off the ground)
24. Bucking or kicking backwards (one or both hindlimbs)

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## Horse & Rider Weight

- Obese horses: Henneke BCS 7+ (Knowles and Grieve, 2020), prevalence 20.6-45% (Challinor, Randle, and Williams, 2021)
- Obese humans: BMI 29+ (Oliver and Lee, 2005), prevalence 29% (NHS England Digital, 2019)
- Survey: 47% of riders felt that 16-20% of horse's own bodyweight was appropriate maximum, only 12% fell within this range (Challinor, Randle, and Williams, 2021)
- Treadmill study: 75 kg weights increased back extension (de Cocq, van Weeren, and Back, 2004)
- Icelandic horses in tolt: significant increase in workload when relative weight increases from 20-30% (Stefansdottir et al., 2017; Gunnarsson et al., 2017)
- Trotting straight: increasing rider weight correlated with decreasing symmetry (Matsuura et al., 2013)
- Christensen et al., 2020 versus Dyson et al., 2020: behaviour changes and lameness

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## Mounting

- Observed behaviours: avoiding block, rooting against reins, back hollowing, walking off without rider cueing
- 66% of owners felt their horse had no abnormal behaviours during mounting; 52% of horses walked off without riding cueing
- (Dyson et al., 2022a; Dyson et al., 2022b)



Photo courtesy of The Horse (Telatin, 2015)

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## Aims of this Study

1. Observe behaviours and facial expressions demonstrated by horses during mounting by various riders
2. Assess the relationship between relative rider weight and horse behavior and facial expressions

Alternative Hypothesis: increased rider weight relative to horse weight will increase or decrease the frequency of avoidance behaviours in the riding horse during mounting

Null Hypothesis: increased rider weight relative to horse weight will not increase or decrease the frequency of avoidance behaviours in the riding horse during mounting

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## Methods: Subjects & Materials



- School horses
- Staff riders
- Mounting ramp: 89cm
- Relative rider weight
- Scoring system

1.	Repeated (2+) changes of head position (up/down)
2.	Pulling down against the reins
3.	Head position changes regularly, tossed or twisted from side to side, corrected constantly
4.	Ears rotated back behind vertical or flat (both or one only) $\geq 2s$ ; repeatedly lay flat
5.	Eyelids closed or half closed for 2s
6.	Sclera exposed repeatedly (2+ times, or for $\geq 3s$ )
7.	Intense stare (glazed expression, 'zoned out') for $\geq 3s$
8.	Mouth opening + shutting repeatedly (2+) with separation of teeth, for $\geq 3s$
9.	Tongue exposed, protruding or hanging out, and/or moving in and out repeatedly (2+ times)
10.	Tail clamped tightly to middle or held to one side
11.	Minor tail swishing; flicking side to side
12.	Large tail swishing; repeatedly up and down/ side to side/ circular
13.	Requires additional physical aid to motivate walking away from mounting block (one point per additional physical aid)
14.	Moves forward without being asked by rider, of horse's own volition
15.	Steps or swings away from mounting block sideways without being asked to do so
16.	Fidgets while standing: lifts and replaces feet, steps forward and back or sideways
17.	Bites at or bites handler
18.	Reluctance to approach mounting block: requires whip or repeated tugging on the reins ( $>2$ tugs)
19.	Hollowing of the back
20.	Teeth grinding, chewing
21.	Yawning
22.	Snorting: strong exhale from nostrils with noise

Scoring criteria adapted from Dyson, 2021, Dyson et al., 2022a, and Glerup et al. 2015

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## Methods: Procedure

- Weight tape horse
- Weigh rider
- Film mount
- Watch & score
- Repeated measures study
- Each horse is their own control

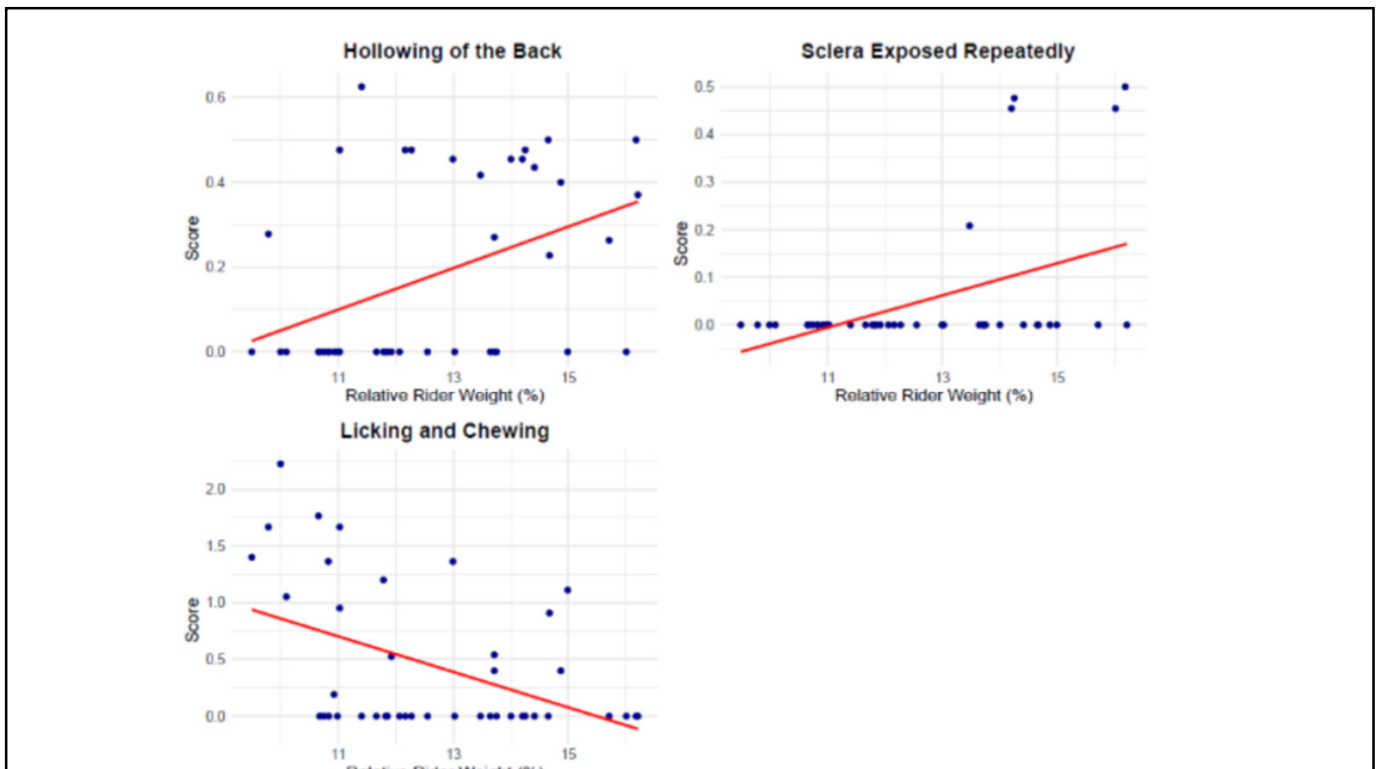


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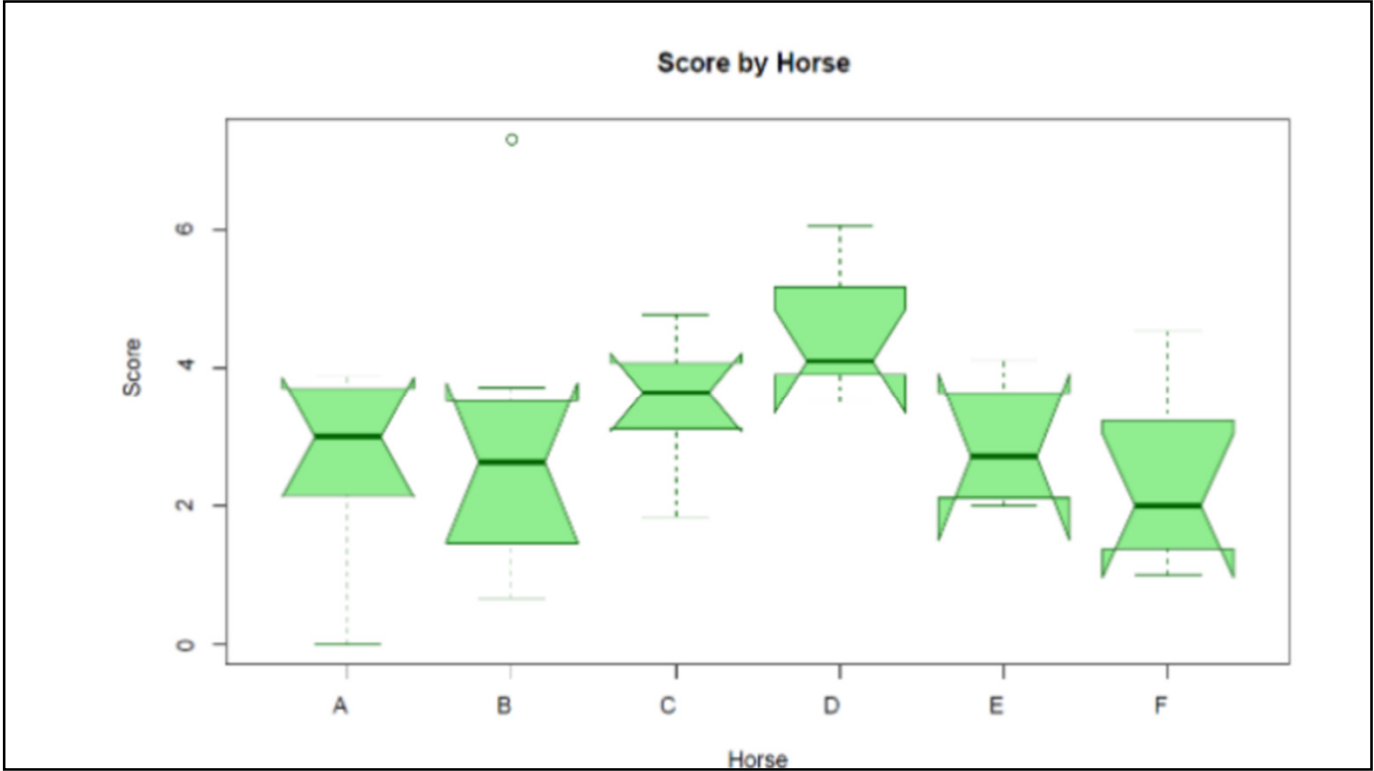
## Results

- High intra-rater reliability
- No statistically significant relationship between summed behavior score and relative rider weight
- But relationships with individual behaviors
  - Hollowing of the back - positive
  - Repeated exposure of the sclera - positive
  - Licking and chewing - negative

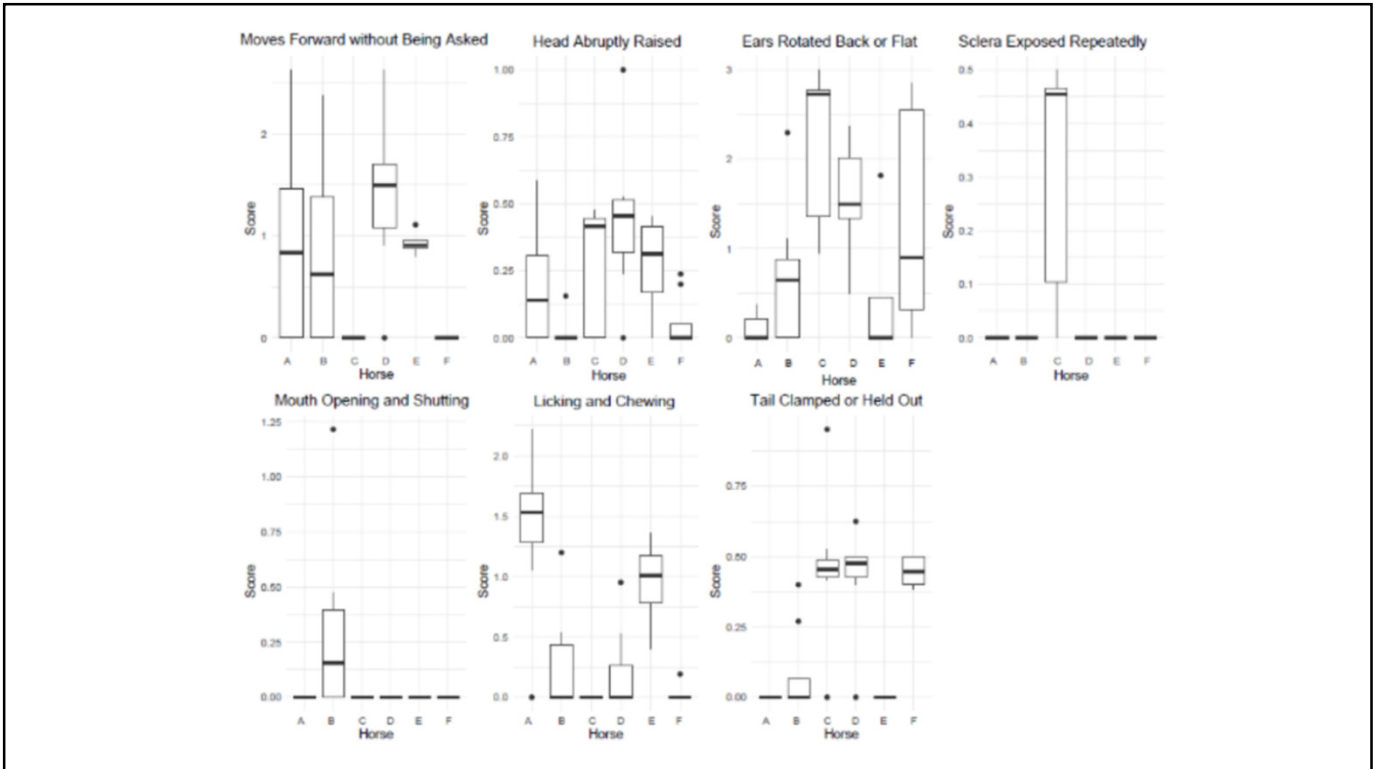
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## Principal Components Analysis

1. Anticipation: mouth opening, repeated head movement, minor tail swishing
2. Aversion: ears back, stiff tails, fidgeting, tongue movement
3. Discomfort: ears back, visible sclera, reluctance to walk on
4. Nervous tension: minor tail swishing, fidgeting, side-stepping
5. Avoidance of discomfort: moving forward, fidgeting, raising head, hollowing back

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## Discussion

- Individual horses tended to have discernible profiles and behavior scores
- Behavioral clusters may indicate negative associations
- Many behaviors identified are associated with discomfort, stress, or pain
- Certain behaviors were correlated with increasing relative rider weight

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