METHODS FOR PAIN ASSESSMENT AND THEIR APPLICATIONS IN HORSES

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Objectives

This final degree project aims to collect the pain assessment methods described in equine species and which are their clinical applications.

Definition of pain

"Pain is an aversive sensory experience caused by actual or potential injury that elicits protective and vegetative reactions, results in learned behaviour, and may modify species specific behaviour" (Zimmerman 1986)

Tools used to assess pain

- Behaviour changes: posture, gait, inactivity/activity, sweating, vocalizations, protection or observation of the painful area,...
- Physiological parameters: heart rate, respiratory rate, blood pressure, temperature, cortisol, beta-endorphins, catecholamines,...
- Pain scales: Visual Analogue Scale (VAS), Simple Descriptive Scale (SDS), Numerical Rating Scale (NRS), Time Budget Analysis (TBA), Composite Pain Scale (CPS) and Grimace Scales.

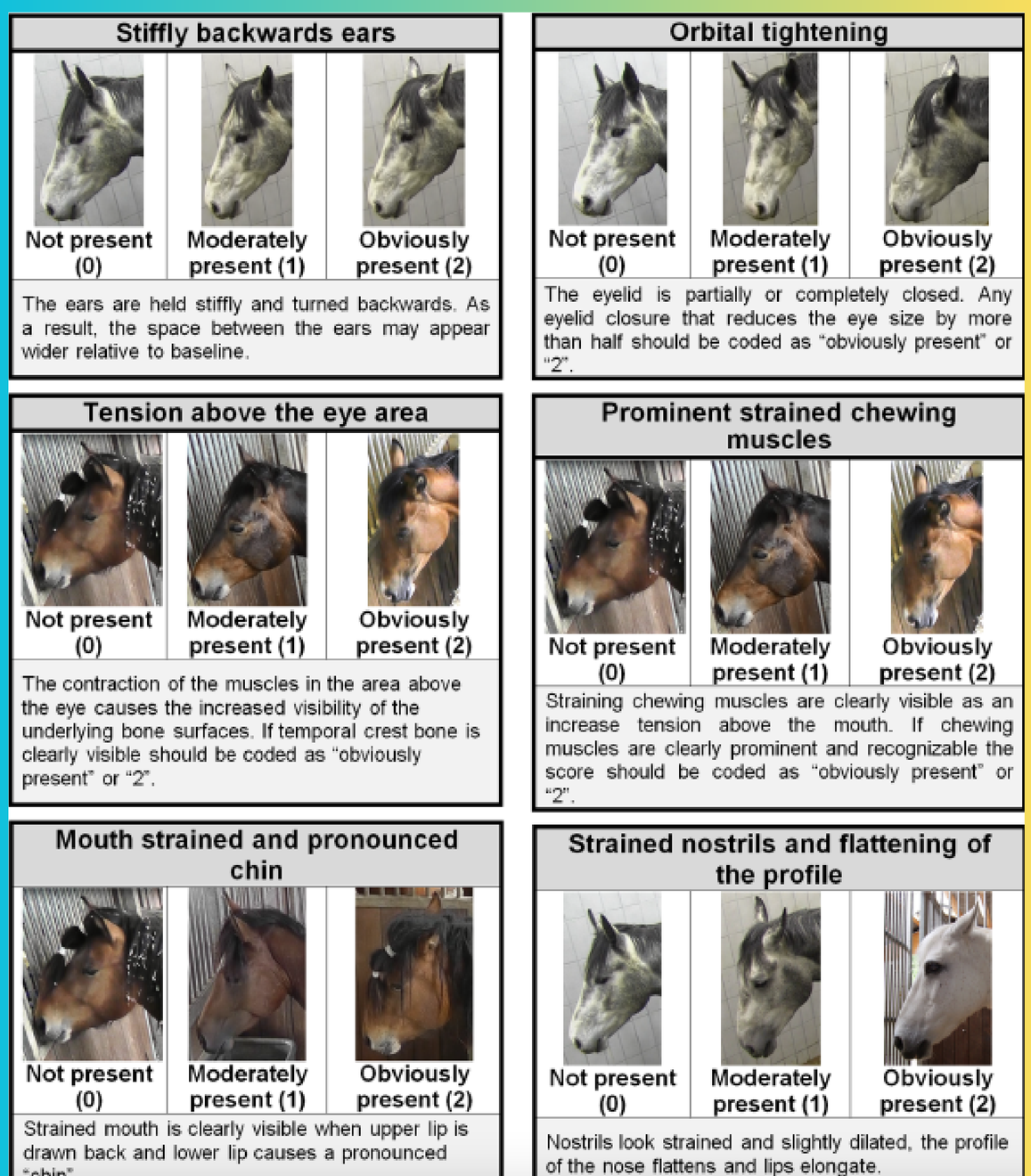

Figure 1. Horse Grimace Scale (HGS) described by Dalla Costa *et al.* (2014).

Musculoskeletal pain systems

- Behaviour and posture: resistance to be strapped/mounted/ touched and position of the head, limbs and trunk,...
- Palpation and trigger points: joint, bone and myofascial.
- Flexion and extension: amount of flexion achieved, duration of flexion tolerated and response to increased weight.
- Flexion test: changes observed after flexing the limb for one minute.
- Treatment response: diagnostic anesthesia.
- Pain scales: American Association of Equine Practiotioners (AAEP) lameness scale, Obel scale, modified-Obel, Horse Grimace Scale (HGS), Equine Utrecht University Scale of Facial Assessment of Pain (EQUUS-FAP) and Ridden Horse Pain Ethogram (RHpE).

Table 1. American Association of Equine Practitioners (AAEP) lameness scale (Daglish & Mama 2016).

AAEP lameness scale	
Grade 0	Lameness not perceptible under any circumstances
Grade 1	Lameness is difficult to observe and is not consistently apparent, regardless of circumstances (eg, under saddle, circling, inclines, hard surfaces).
Grade 2	Lameness is difficult to observe at a walk or when trotting in a straight line but is consistently apparent under certain circumstances (eg, weight-carrying, circling, inclines, hard surfaces).
Grade 3	Lameness is consistently observable at a trot under all circumstances.
Grade 4	Lameness is obvious at a walk.
Grade 5	Lameness produces minimal weight bearing in motion and/or at rest or a complete inability to move.

Table 2. Obel scale (Dalla Costa *et al.* 2016).

Obel Grade	Description
0	No gait abnormalities
1	The horse exhibits a normal gait at a walk. The trot shows a shortened stride with an audible cadence abnormality, but shows even head and neck lifting for each foot.
2	The walk is stilted, but shows no abnormal head or neck lifting. The trot shows obvious lameness with uneven head and neck lifting. A forefoot can be lifted off the ground easily.
3	The lameness is obvious at a walk and trot. The horse resists attempts to have a forefoot lifted and is reluctant to move.
4	The horse experiences difficulty bearing weight at rest or is very reluctant to move.

Conclusions

- The most objective and reliable scales are HGS and CPS.
- The AAEP scale for lameness assessment shows a low objectivity and the 5 grades described are not enough to characterize a lameness.
- The physical parameters and behavioural changes can be useful when are used in combination with other techniques, but they are not very specific by themselves.
- Future investigations would should direct their searches towards possible specific biomarker of pain, applicable to any equine pathology.
- New researches about myofascial pain and how to assess it in horses are also important.

Future methods

- Computational automated classifier: picture capture sensors transformed into algorithms.
- Heart Rate Variability (HRV): noninvasive technique to detect changes in the autonomous nervous system.
- Biomarkers: microRNA (miR-145).