

## **Assessing Pain in Horses Using Facial Expression**

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*Explores the possibility of assessing pain in horses by using facial recognition.*

Effective pain management is important for the welfare of animals and assists in assessing recovery from injury and disease (Sellon *et al.*, 2004). Reliable pain assessment scales have been developed for humans that are based on an individual's description of the quality, location and intensity of their pain. Assessment of pain in animals poses challenges as there is a reliance on observation of often very subtle changes in behaviour or physiological parameters, which can be variable depending on the type of pain and species of animal (Ashley *et al.*, 2005). Additional challenges may arise with pain assessment in horses because they have evolved to mask pain in general, most likely to reduce their apparent vulnerability to predators (Taylor *et al.*, 2002).

Pain in horses has traditionally been assessed using behavioural and physiological parameters. A recent review of pain assessment in horses by de Grauw & Loon (2016) found that physiological parameters, such as heart rate and respiratory rate, are influenced by factors other than pain e.g. dehydration, stress and temperature. These authors' recommendation was that physiological parameters should be incorporated into pain assessment systems that include behavioural components. Several pain assessment systems for horses have been developed that attempt to incorporate the current knowledge base with systematic and defined procedures. Composite pain scales (CPS) that take into account multiple variables have also been developed. Most CPS have been

evaluated when used post-surgically and their efficacy has been demonstrated in a number of studies (Bussieres *et al.*, 2008; Pritchett *et al.*, 2003; Sutton *et al.*, 2012).

Although use of CPS has resulted in increased sensitivity and specificity in pain assessment (Prunier *et al.*, 2013), there are practical issues associated with their use e.g. the level of training, operator experience and time required to administer correctly. Recently, attention has turned to the identification of pain in animals by observing facial expression. Scales have been developed for use with mice, rats and rabbits (Keating *et al.*, 2012; Langford *et al.*, 2010; Sotocinal *et al.*, 2011).

Previous studies have identified particular changes in the facial expression of horses during injections, with somatic pain and when undergoing castration. These changes include asymmetrical/low ears or ears held stiffly backwards, angled eyes with tension in the muscles surrounding the eyes, withdrawn and intense eyes, strained/square-like nostrils and tension of the muzzle and muscles on the lateral aspect of the head (Dalla Costa *et al.*, 2014). A study by Glerup *et al.*, (2015) investigated the existence of an equine pain face by using a semi-randomized controlled crossover design. Six horses were administered two noxious stimuli (a tourniquet on the antebrachium and application of a topical irritant on the hindlimb) with and without an observer present. Video footage and still images of the horse's face were recorded during each trial and were reviewed and analysed for behavioural changes and facial expression. Findings indicated that the previously identified pain facial features were present on all

occasions that the noxious stimuli were administered. The presence of an observer had no effect on facial expression. This study built on previous work as its authors had controlled for the confounding effects of stress or analgesia on facial expressions of pain and the effect of other possible interfering factors, such as the presence of humans. However, the small sample size and the controlled nature of the pain inducement limited generalizability.

van Loon and Dierendonck (2015) constructed a composite facial expression pain scale - the Equine University Utrecht Scale for the Facial Assessment of Pain (EQUUS-FAP) that can be used in a systematic fashion. The EQUUS-FAP was evaluated alongside a broad based behaviour scale designed to assess for acute colic pain – the Equine Utrecht University Scale for Composite Pain Assessment (EQUUS –COMPASS). A cohort follow-up study was performed using 25 adult horses with acute colic and 25 healthy controls. Composite pain scores were assessed using direct observations. Visual Analog Scores (VAS) were assessed from video records. Colic patients were assessed three times throughout their hospitalisation using EQUUS-COMPASS and EQUUS-FAP. Both tools showed high inter-observer reliability and good sensitivity and specificity for differentiating between colic patients and controls and also for differentiating between colic patients that required surgical treatment and those that could be managed medically. This study provides further evidence for the utility of a pain assessment tool based on facial expression, although it is important to note that the raters were not blinded to the horses clinical status.

The aforementioned studies are based on observed changes in facial expression in horses that have been in pain. Thus, the changes in facial expression have been in one context only. Wathan et al., (2015) describe the development of the Facial Action Coding System (FACS): a systematic method for identifying and coding expressions with an anatomical basis i.e. muscle movement and changes in facial musculature. This was achieved by dissecting the head of one horse to isolate the facial musculature, and then classifying each muscle in terms of its attachments to other tissue. Using fifteen hours of video footage from a sample of 86 horses, each facial movement was coded according to previous FACS systems used in other species. Seventeen defined Action Units were identified. Average inter-rater reliability of coders trained to use the system was high (0.86). This comprehensive anatomically based coding system may prove a useful adjunct in the assessment of pain, especially mild pain, in horses.

### Conclusions

There is evidence for the use of facial expression as a method of pain assessment in horses. Research has demonstrated that there are particular facial changes associated with pain that are not attributable to stress or analgesia and are observable even in the presence of humans. A pain assessment scale based on facial expression has the added advantage of being relatively accessible for non-professionals and to be time efficient. Further research into the ability of such a scale to identify degree of pain, along with further evaluation of inter-observer reliability in a number of contexts is warranted.

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