

## **The difference between pain and discomfort in horses**

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Aim of this lecture is to highlight the difference between pain and discomfort in horses and, on the base of the available scientific evidence, discuss whether currently available metrology instruments would allow distinguishing them and measuring their severity degree.

As a first step, it is essential to verify whether there is a consensus about meanings. For "Pain" there is a broadly accepted definition provided by the International Association for the Study of Pain stating that "pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage". On the contrary, for "Discomfort" a broadly accepted definition is missing. It is commonly described as a "feeling of being uncomfortable physically or mentally, or something that causes this feeling" (Cambridge Dictionary) or as a "lack of ease, slight pain, mental uneasiness, lack of comfort, make uneasy" (the concise Oxford Dictionary). A recent publication from the field of human nursing care and pain management, has performed a concept analysis of discomfort by reviewing a large body of medical literature (Ashkenazy & DeKeyser Ganz 2019). Following rigorous criteria, the authors provide an accurate theoretical and operational definition of discomfort: "Discomfort can be physical or psychological and is characterized by an unpleasant feeling resulting in a natural response of avoidance or reduction of the source of discomfort. Pain is one of the causes of discomfort, but not every discomfort can be attributed to pain. It is identified by self report or observation. Discomfort in noncommunicative patients is assessed and measured via behavioural expression, also used to describe pain and agitation, leading to discomfort being interpreted as pain in some conditions". Measuring and addressing discomfort seems necessary to provide optimal quality of care in clinical settings.

In the context of equine medicine, a considerable growth of interest in understanding and characterizing pain and painful conditions has been taking place in the last two decades. Sensory and emotional aspects of the pain experience should be investigated as separate but indispensable entities.

For muscular-skeletal conditions, lameness quantification, with or without modulatory interventions (i.e. flexion tests, diagnostic anaesthesia, hoof test) is the gold-standard and most commonly applied method to assess pain severity. The assumption is that gait asymmetry and lameness are proxies for pain and that lameness resolution or reduction indicates improvement. Subjective scales are routinely applied (Dyson 2011) but more and more objective gait analysis methods have been developed and are available for practice and research settings (Keegan et al. 2012; Nauwelaerts et al. 2017; Marunova et al. 2021; Lawin et al. 2023).

Despite the undiscussed role of gait abnormalities in pain phenotyping of horses as athletes and sport partners, experiences from human and small animal medicine show that other dimensions have to be considered in the characterization of pain.

Recently, a symposium was held in Iceland with the scope of bringing together scientists interested in equine pain recognition and management and to summarize the current evidence (Havemeier Foundation Equine Pain Symposium, Reykjavik, August 2022). Briefly, it was highlighted that at present no gold standard exists to measure equine pain. Emotional and affective components of the pain experience profoundly affect the quality of life of

affected individuals and big efforts are currently done to reveal them in horses. Facial features of pain expression have been characterized and proposed in the context of perioperative pain medicine and equine welfare (Dalla Costa et al. 2014; Dalla Costa et al. 2016), but their specificity for pain is still questionable. Similarly, behaviours indicating discomfort have been identified (Torcivia & McDonnell 2021). Through remote prolonged video recording it is possible to get the best overview of discomfort behaviors accompanying conditions of different origin (physical and psychological) but whether pain, discomfort or both can be picked up and differentiated with certainty is still matter of debate and more research is needed.

Concerns and debate around the horse as athlete and his welfare has motivated a large body of research around the possibility to identify indices of discomfort and pain while the animals are being ridden (Dyson et al. 2018). The appearance and co-occurrence of discomfort behaviours can provide important indications to the veterinary practitioners, but using the proposed ethogram as a direct pain quantification method would not be adequate and is not the purpose of the developed tool.

Several condition-specific multidimensional pain scales, including physiological and behavioural items, have been developed in the past years with the goal of improving pain management by allowing an individualized approach to therapy. Most of them are dedicated to pain quantification in perioperative hospital settings (Graubner et al. 2011; Ortolani et al. 2021), while some are thought for practitioners to monitor the progress of severe painful pathologies like laminitis, colic or arthritis (Bussieres et al. 2008; Dalla Costa et al. 2016; VanDierendonck & van Loon 2016). A critical appraisal of the actually available scales has shown that, despite their ability to signal the need for pain medication in postoperative settings, more work is necessary to improve and optimize these instruments, which have poor internal consistencies and sensitivity (Barreto da Rocha et al. 2021). So far, only one publication deals with quantification of equine chronic pain, but its validity applies mostly to the context of a geriatric, poor welfare equine population rather than to assist in the recognition of subtle behavioural changes due to the presence of focal conditions like for example osteoarthritis or soft tissue pathologies (van Loon & Macri 2021).

Additional quantitative information about sensory aspects of pain, response to analgesics and other treatment modalities can be gained through the application of so called quantitative sensory testing (QST) methods. For horses, QST has been proposed to assess muscular pain (for example back pain) (Pongratz & Licka 2017), to evaluate response to local treatments or experimental surgery and to evaluate efficacy of analgesic drugs (Hausler 2020). Mechanical, thermal and electrical stimulations have been investigated and applied in numerous studies (Veres-Nyeki et al. 2021). Each modality has specific fields of application, but all can contribute to characterize the individual pain phenotype. Psychophysical but also quite advanced neurophysiological and dynamic tools have been proposed in the equine literature (Spadavecchia et al. 2004; Veres-Nyeki et al. 2013). While their use might help to clarify specific aspect of nociception and pain processing in horses, they are currently reserved to experimental settings.

Novel ongoing research points toward automated pain recognition in horses. Through machine learning and artificial intelligence, gait analysis is carried out but also facial and postural expressions of pain are recognized and monitored. One important and fundamental question remains unanswered: who tells the machine what is pain and what is not? Or what is pain and what is "simply" discomfort and does not need analgesic treatment?

As both pain and discomfort have consequences on behavioural expression and no instruments are currently available to differentiate them, it is still in the hand of the equine clinician to identify the cause of suffering and treat the source. From small animal medicine, we have learned to introduce the owner in the equation. Specific owners questionnaires, client specific outcome measures and visual analogue scales are routinely used in clinical context and in research. Recent own experience shows that this is feasible and promising in horses as well.

Thus, in conclusion, 1) scientific evidence for the quantification of pain and discomfort in horses is growing; 2) some sensory and emotional aspects of pain can be reliably quantified; however, 3) there is still need for further work to differentiate pain and discomfort, mostly when using behavioural indicators and facial expression.

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