Topic Summary

There has been significant interest in studying equine pain in recent years as assessment of horse welfare comes with difficulties (Taylor et al. 2002; van Loon and Van Dierendonck 2018). Being prey animals, horses typically try and conceal any signs of weakness as to not attract predators (Pritchett et al. 2002). While this behaviour is beneficial in the wild, it has made it increasingly difficult for even experienced handlers to properly identify signs of distress in their animals and be able to seek proper treatment (Mullard et al. 2016). Historically, equine experts have looked at gait and posture abnormalities to signal pain, however, these obvious outward displays are rare as horses can overcompensate for them until they're hardly noticeable (Mullard et al. 2016). Facial indicators are now being looked at as a possible assessment tool as they are innate responses to pain that cannot be easily hidden (Dalla Costa et al. 2014).

One of the main concentrations of researchers in the field of equine pain has been to determine the underlying musculature involved in making facial expressions (Hintze et al. 2016; Wathan et al. 2015). To do so, researchers observe video footage of healthy horses to catalog typically occurring facial expressions, followed by looking at horses that are known to be in pain (such as horses immediately following surgery) to determine how their facial expressions have changed (Dalla Costa et al. 2014; Mullard et al. 2016; Wathan et al. 2015). Regardless of the source of pain, ocular and mandibular muscles were found to contract to communicate discomfort (Wathan et al. 2015). Some specific facial indicators research has found to convey pain include tension above the eyes and general squinting, as well as straining of the jaw, mouth, and chin (Dalla Costa et al. 2014; Gleerup et al. 2015; Wathan et al. 2015).

With an interest in understanding the role of the nervous system in triggering facial expressions of pain, studies have been conducted to better understand the neuronal mechanism

behind pain sensation and perception (Viñuela-Fernández et al. 2007). To study neural pathways, researchers may use Quantitative Sensory Testing (QST) methods to stimulate nerves and record their response to determine function (Viñuela-Fernández et al. 2007). Studies have found that when noxious (painful) stimuli are sensed by free nerve endings, they are conducted towards the spinal cord where they are eventually detected by the brain (Viñuela-Fernández et al. 2007). Researchers have found that thin-myelinated Aδ fibers and unmyelinated C fibers are responsible for detecting all painful stimuli in not only horses, but other vertebrates as well (Viñuela-Fernández et al. 2007). Most of the research conducted on pain mechanisms has been done with mice and dogs as they are easier to study than horses; however, as the pain processing pathway was found to be highly conserved among species the information has been applied to horses (Viñuela-Fernández et al. 2007).

Following the understanding that horses make facial expressions when in pain, and the mechanism behind experiencing pain, research was focused on determining whether horses could distinguish between different facial expressions (Wathan et al. 2016). By showing horses photographs of unfamiliar horses with either relaxed/positive or aggressive facial expressions, it was found that the animals always went towards the photograph displaying a positive facial expression (Wathan et al. 2016). Using these results, researchers were able to suggest that horses are both aware of and can understand the meaning behind facial expressions made by other members of their species (Wathan et al. 2016).

Through my review of the research, the main gap identified in the field is why certain facial expressions such as contraction of eye/mouth muscles have been evolutionarily conserved to depict pain. Moreover, while horses were found to be aware of other animals making facial expressions, it has not been identified how aware and in control they are of facial expressions

they make themselves. By having more research conducted to answer these questions, I believe that more progress can be made in not just identifying the presence of pain in horses, but the intensity and type of pain as well.

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