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RESEARCH PAPER

An equine pain face

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Abstract

Objective The objective of this study was to investigate the existence of an equine pain face and to describe this in detail.

Study design Semi-randomized, controlled, crossover trial.

Animals Six adult horses.

Methods Pain was induced with two noxious stimuli, a tourniquet on the antebrachium and topical application of capsaicin. All horses participated in two control trials and received both noxious stimuli twice, once with and once without an observer present. During all sessions their pain state was scored. The horses were filmed and the close-up video recordings of the faces were analysed for alterations in behaviour and facial expressions. Still images from the trials were evaluated for the presence of each of the specific pain face features identified from the video analysis.

Results Both noxious challenges were effective in producing a pain response resulting in significantly increased pain scores. Alterations in facial expressions were observed in all horses during all noxious stimulations. The number of pain face features present on the still images from the noxious challenges were significantly higher than for the control trial ($p = 0.0001$). Facial expressions representative for control and pain trials were condensed into explanatory illustrations. During pain sessions with an observer present, the horses increased their contact-seeking behavior.

Conclusions and clinical relevance An equine pain face comprising 'low' and/or 'asymmetrical' ears, an angled appearance of the eyes, a withdrawn and/or tense stare, mediolaterally dilated nostrils and tension of the lips, chin and certain facial muscles can be recognized in horses during induced acute pain. This description of an equine pain face may be useful for improving tools for pain recognition in horses with mild to moderate pain.

Keywords experimental study, horses, pain behavior, pain evaluation, pain face.

Introduction

There is as yet no universally implemented pain scale for assessing pain in horses. The attempts that have been made all include behavioural cues, as physiological measures cannot stand alone (Price et al. 2003; Pritchett et al. 2003; Bussieres et al. 2008; Lindegaard et al. 2010; Graubner et al. 2011). Challenges in pain assessment are numerous including problems with recognizing early or subtle signs of pain and possible suppression of pain behaviour due to potentially threatening stimuli (Taylor et al. 2002).

Humans are endowed with an evolutionarily developed skill for recognizing emotions through facial expressions (Deyo et al. 2004; Kadosh & Johnson

2007). These expressions change when experiencing pain, making them sensitive pain indicators. Even when adult persons are asked to conceal their pain, facial expressions will continue to leak that information (Prkachin & Mercer 1989). Furthermore, facial expressions are considered to be the most consistent pain expression in children (Poole & Craig 1992).

Charles Darwin predicted that nonhuman animals could exhibit similar facial expressions in response to emotional states as humans do (Darwin 1872), but only recently have facial expressions been proposed as a method for evaluating pain in animals (Flecknell 2010). A Mouse Grimace Scale (Langford et al. 2010) and later a rat and rabbit scale have been developed (Sotocinal et al. 2011; Keating et al. 2012). Facial expressions of pain in horses have previously been based on observations by experienced horse practitioners, rather than on systematic investigations (Fraser 1969; Sanford et al. 1986; Taylor et al. 2002). Love et al. (2011) used kinematic analysis to determine that certain facial expressions of horses changed during injections and these findings were very recently corroborated in a study describing the Horse Grimace Scale for horses undergoing castration (Dalla Costa et al. 2014). Facial expressions of pain may be a valuable addendum to existing pain evaluation tools. However, it is of great importance to differentiate changes in facial expressions due to pain from changes due to stress (Love 2009), analgesics, anaesthetics (Seibert et al. 2003; Ashley et al. 2005) and other interfering factors, such as the influence of humans.

The objectives of the present study were to investigate the facial expressions in horses during induced acute pain and to describe these facial cues in detail. In order to be able to identify the facial expressions of pain, this study was planned to preclude stress and to avoid treatment with anaesthetics or analgesics. Pain was induced using two noxious stimuli, a tourniquet on the antebrachium and topical application of capsaicin. These methods are well described in human pain research but are to the authors' knowledge novel methods for pain induction in horses. Our hypotheses were that horses display facial expressions of pain similar to other mammals and that these expressions are moderated in the presence of humans.

Materials and methods

The experimental protocol was approved by the Danish Animal Experiments Inspectorate.

Study design

The study was conducted as a semi-randomized, controlled, crossover trial, which was randomized into two blocks on the parameter observer; in the 'no-observer' trials, the observer was not visible or audible to the horses. The treatment sequence was the same for all horses (Table 1). Each horse participated in six trials, two control trials with no noxious stimulus and four pain trials with two different noxious stimuli; each noxious stimuli with and without an observer present. All trials were performed with the horses standing in a narrow, rectangular area of the stable, restrained by a neck collar and with a grey screen on the right side. The three youngest horses displayed very exploratory behaviour due to the degree of freedom allowed by the neck collar and wore an ordinary halter in some trials. The time of treatment was constant for each individual horse, with three horses before midday and three horses after midday. Two horses, one from each block, received a noxious stimulus every day for four consecutive days; four horses had one resting day between trials.

Animals

Six healthy horses of different breeds, five mares and one gelding, aged 3–14 years were included in the study. The horses were housed in the research facility of the University of Copenhagen in 3 × 4 m stalls at a constant temperature of 13 ± 1 °C. They were fed a grain mixture twice daily as well as hay and water *ad libitum* and were turned out into a paddock for approximately 2 hours prior to the

Table 1 Block randomization and treatment sequences for all horses

Trial	Block 1 (n = 3)	Block 2 (n = 3)
Control I (no noxious stimuli)	With observer	No observer
Control II (no noxious stimuli)	No observer	With observer
Tourniquet I (right thoracic limb)	With observer	No observer
Capsaicin I (right shoulder / left thigh)	No observer	With observer
Tourniquet II (left thoracic limb)	No observer	With observer
Capsaicin II (left shoulder / right thigh)	With observer	No observer