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Exploring horse owners' and caretakers' perceptions of emotions and associated behaviors in horses

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ABSTRACT

Attribution of emotions to horses, as well as understanding how environmental factors may influence such states, may influence owners' and caretakers' attitudes toward horse welfare. This, in turn, may influence how they manage and treat their animals. The aim of this study was to explore the views of Brazilian horse owners and caretakers regarding horse sentience, the contexts or events that may elicit different emotions, and the behaviors they believed to be an expression of these emotions. Survey participants were recruited and invited to participate online through vehicles with national coverage. The questionnaire obtained demographic information of the participants, a closed question asking participants to state their belief in horses' emotions, and two open questions requesting, respectively, a situation in which participants believed their horse had expressed pain and other emotions quoted in the questionnaire. Participants (412 men and 275 women) identified themselves as owners (81%), horse riding instructors (8%), horse centers' administrators (5%), veterinarians, or animal scientists, including students and professionals (6%) and most (63%) as experienced in the equestrian world. Most participants believed that horses have full capacity to feel pain (94%), fear (92%), and joy (77%), and some that horses have full capacity to feel boredom (65%) and jealousy (41%). More women than men believed that horses express pain, jealousy, sadness, anxiety, and boredom. More participants who identified themselves as "horse owners" believed that horses are able to feel jealousy than did non-horse owners. Analysis of the open responses suggests that participants' attribution of emotional capacity to horses is in large part based on their experience with horses. Some of the behaviors described as examples of expression of pain, joy, and jealously suggest that many believed that horses are aware of their emotions. Some accounts suggested anthropomorphic projections, but others have support in scientific research. The lay understanding of horses' emotional states and the associated contexts that elicit them may be used to educate horse owners and caretakers regarding environmental restrictions and negative human-animal interactions to which they expose horses in daily management. Our findings suggest that there is a lay knowledge base to educate those involved in the daily management of horses to change behaviors, for example, avoiding or minimizing events involving pain, fear, and boredom, and facilitating those that cause positive affective states.

Introduction

Brazil has an estimated population of 5 million horses that contribute approximately 5 billion US dollars to the economy, including 600,000 direct and 2.4 million indirect jobs. An estimated 1.1 million horses are used in recreation, sports, and as companion animals (Lima and Cintra, 2016). Horses used for these purposes often present a high frequency of abnormal and stereotypic behaviors, varying from 12% to over 50% of the horses in different studies (McGreevy et al., 1995; Leme et al., 2014; Luescher et al., 1998; Waters et al., 2002), which indicates poor welfare. These behaviors are related to inappropriate management, such as individual housing in stables for up to 24 h/day, a high proportion of concentrate feeding, and inadequate exercise regimens (Leme et al., 2014; Visser and Van Wijk-Jansen, 2012).

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A clear and strong relationship between humans' beliefs and attitudes toward animals and the way they treat these animals has been confirmed in several species, including horses (Hausberger et al., 2008; Hemsworth and Coleman, 2012; Hemsworth et al., 2015). Beliefs are antecedents of attitudes, which in turn influence people's behaviors (Ajzen and Fishbein, 1980). Belief in animal mind—defined as attribution of mental capacities such as intellect, the ability to reason, and feelings of emotion—is strongly associated with attitudes regarding the use of animals (Knight et al., 2004). Attitudes toward animal use and animal sentience are also influenced by a myriad of factors, including gender (Cornish et al., 2016; Knight et al., 2004; Walker et al., 2014b), familiarity with animals and animal ownership (Morris et al., 2012; Walker et al., 2014a; Wilkins et al., 2015), and prior contact with animals (Hecht et al., 2012; Morris et al., 2012; Walker et al., 2014a). Attribution of emotions to horses and the understanding of how environmental factors may influence such states may influence owners' and caretakers' attitudes toward horse welfare. This, in turn, may influence how they manage and treat their animals (Bradshaw and Casey, 2007; Edgar and Mullan, 2011). For example, recognition of pain in animals is positively related to the use of methods to prevent or minimize it (Hewson et al., 2007; Huxley and Whay, 2006; Fajt et al., 2011; Hötzel and Sneddon, 2013). In contrast, considering animals jealous, guilty, or fearful may lead owners or caregivers to treat them in different ways according to how they understand these behaviors or characteristics of the animals (Bradshaw and Casey, 2007; Hecht et al., 2012).

Emotions have been described as states elicited by rewards (i.e., stimuli the animal will work to get) and punishers (i.e., stimuli the animal will work to escape or avoid) (Rolls, 2014). Emotional experiences can be positive (pleasant) or negative (unpleasant) and of high or low activation or arousal (Mendl et al., 2010b; Scherer, 2005). Emotions evolved as adaptations in various species and are regulators of social interactions; recognizing emotions in animals is also fundamental to bond individuals of different species (Bekoff, 2008) as is the case of the human-horse relationships. Considering a concept of animal welfare based on science and social ethics (Fraser et al., 1997), understanding "folk animal psychology," or the way lay people perceive animal emotions, may be an important aspect of animal welfare (Watanabe, 2007).

The aim of this study was to explore the views of Brazilian horse owners and caretakers regarding horse sentience, the contexts, or events that may elicit different emotions, and the behaviors that may express these emotions.

Materials and methods

Survey participants were recruited and invited to participate through Facebook, websites, and newsletters dedicated to horse enthusiasts' interest. Invitations were also distributed to the mailing list of a horse magazine with national coverage. The questionnaire was available between December 2014 and March 2015. Participation was voluntary, and the identity of all participants was anonymous. Research involving humans in Brazil is regulated by Regulations n. 466/2012 and 510/2016 from CNS, the Brazilian National Health Council, which exempt online surveys that do not identify participants from evaluation by Ethic Committees. All procedures followed the ethical principles established by these regulations.

The questionnaire started with demographic information of the participants (gender, age, state of residence, schooling, origin—rural or urban—, relationship with horses—horse riding instructor, caretaker, administrator, owner—, and experience in the equestrian world; no personal identification was requested). This information was followed by a closed question asking participants to state their belief in horses' emotions (fear, joy, jealousy, sadness, anxiety, loneliness, pain, and boredom) on a Likert scale (total capacity, some capacity, intermediate, little capacity, no capacity). The questionnaire also contained two open questions requesting, respectively, a situation in which participants believed their horse had expressed pain ("Please describe some situation where your horse expressed pain"), and an example of a situation in which the horse had expressed some of the other emotions quoted in the questionnaire ("If you want, you may use the space below to share some situation in which your horse expressed feelings like joy, sadness, jealousy, boredom, or fear").

Differences within demographic categories on responses regarding belief in horses' emotions were tested using Kruskal-Wallis (Agricolae package, R Core Team, 2017). Data were transformed assuming total capacity = 5, some capacity = 4, intermediate = 3, little capacity = 2, no capacity =1. Significance was declared at $P < 0.05$. Open-ended responses were categorized according to "context" or "behavior" described by participants, and frequencies were calculated.

Results

Demographic data of the survey participants (n = 687) are presented in Table 1. Participants identified themselves as owners (81%), horse riding instructors (8%), horse centers' administrators (5%), veterinarians, or animal scientists, including students and professionals (6%). The majority (63%) identified themselves as experienced in the equestrian world, 39% as intermediate, and 15% as beginners.

The proportion of participants that attributed different emotions to horses is presented in Table 2. More women believed that horses feel pain, anxiety, sadness, jealousy, and boredom than men; more participants who identified themselves as "horse owners" believed that horses are able to feel jealousy than other participants (Table 3). Age, place of origin (rural/urban), and participants' schooling or self attributed experience with horses did not influence responses ($P > 0.05$).

Fifty participants (7.3%) did not complete the two open questions, which were optional; 637 participants answered the first question, describing examples of situations that elicited pain in their horses; 474 also answered the second question, describing other emotions (Table 4). In total, 326 participants described one or more behaviors that, in their perception, indicate emotional states in their horses (Table 5); of these, 36 described horse facial expressions.

Table 1
Demographic data of participants (n = 687)

Variable	Category	Participants (%)
Gender	Female	40
	Male	60
Residency	Rural	50.9
	Urban	43.7
	Both	6.9
Age (years)	Up to 25	36.6
	26–35	29
	36–45	15.8
	46–55	12.2
	56 or more	6.4
Schooling	Graduate	74.3
	Technical (Postsecondary)	7.9
	High school	16.7
	Elementary school	1

Table 2
Percentage of horse owners and caretakers (n = 687) reporting emotional states in horses

Emotion	Total capacity	Some capacity	Intermediate	Little capacity	No capacity
Pain	93.6	3.4	1.3	0.9	0.8
Fear	91.5	4.6	2.7	0.8	0.5
Joy	76.6	15.5	5.2	2.2	0.5
Anxiety	75.7	13.6	7.6	2.2	0.9
Sadness	68.2	19.6	7.8	3.3	1.2
Boredom	65.4	17.2	11.0	4.5	1.9
Jealousy	41.0	27.5	19.1	9.1	3.3

Examples of descriptions of contexts and behaviors that indicate emotions

Descriptions of behaviors that, in the perception of participants, indicated pain in their horses were “he did not let me touch the spot” (Participant 266); “… I was riding when he suddenly began to slow down and even stopped; when I checked there was a pebble in his hoof” (Participant 366); “… when he injured his limb he kept looking at it” (Participant 90). Some descriptions suggest that horse owners perceived that horses were aware of their pain: “The halter hurt him because of the friction caused by the knots and he came up to me and 'showed' that he was injured, tilting his head” (Participant 395); “…for some reason the horse was startled, slipped and immediately began to limp, remained motionless, lowered his head as if saying: what did you do to me?” (Participant 643); “… equine colic: “they express pain by pointing the muzzle to the abdomen” (Participant 253). Participants also referred to the pain observed on the horse describing postures: “… muscle contraction, limping, low head…” (Participant 86).

Twelve participants described body and facial expressions as a signs of pain, for example, “After jumping an obstacle he twisted his tail, and his ears withered” (Participant 597); “When his limb was bruised: his eyes were closed and his lips were drawn together” (Participant 464); "… in moments of crisis, his breathing is forced, the nose becomes wrinkled, the eyes express discomfort, the ears change position…” (Participant 307).

Others described different types of vocalizations that they interpreted as an expression of pain in their horses: “…the vet was trying to give him stitches, he was whinnying loudly and not letting her move. The veterinarian only managed after more anesthesia” (Participant 154); “... long whinnies and moans, like howls, until she was medicated" (referring to a horse that was bitten by a snake)

Table 3
Percentage of horse owners and caretakers (n = 687) reporting emotional states in horses according to gender and relationship with horses (owner or other)

Emotion	Variable		Total capacity	Some capacity	Intermediate	Little capacity	No capacity	Likert mean[a]
Pain	Gender[b]	Female	95.7	2.2	0.7	0.4	1.1	4.9
		Male	91.5	4.4	2.2	1.2	0.7	4.8
	Relationship	Owner	93.3	3.5	1.5	0.9	0.7	4.9
		Other	92.6	3.4	2.0	0.7	1.4	4.8
Fear	Gender	Female	93.1	2.9	2.2	1.1	0.7	4.9
		Male	90.1	6.1	2.9	0.5	0.5	4.8
	Relationship	Owner	91.0	4.3	2.4	0.7	0.7	4.9
		Other	89.2	6.8	3.4	0.7	0.0	4.8
Joy	Gender	Female	79.7	12.0	6.2	1.8	0.4	4.7
		Male	74.3	17.7	5.1	2.4	0.5	4.6
	Relationship	Owner	76.3	15.7	5.5	1.8	0.6	4.7
		Other	77.0	14.2	5.4	3.4	0.0	4.6
Anxiety	Gender[b]	Female	81.5	8.3	7.2	2.2	0.7	4.7
		Male	70.9	18.4	7.5	2.2	1.0	4.6
	Relationship	Owner	75.0	14.6	7.8	2.0	0.6	4.6
		Other	75.7	13.5	6.1	2.7	2.0	4.6
Sadness	Gender[b]	Female	75.0	15.6	6.5	1.8	1.1	4.6
		Male	63.4	22.0	9.2	4.1	1.2	4.4
	Relationship	Owner	67.3	20.0	7.6	3.1	1.1	4.5
		Other	70.9	14.2	10.1	3.4	1.4	4.5
Boredom	Gender[b]	Female	72.8	14.1	7.6	3.3	2.2	4.7
		Male	59.6	19.4	13.3	5.8	1.9	4.3
	Relationship	Owner	64.1	17.0	11.8	4.3	2.4	4.4
		Other	67.6	16.9	8.1	6.8	0.7	4.4
Jealousy	Gender[b]	Female	46.0	29.3	14.1	7.6	2.9	4.1
		Male	37.0	27.1	22.0	10.2	3.6	3.8
	Relationship[c]	Owner	44.0	27.2	17.2	8.9	2.8	4.0
		Other	28.4	31.1	25.0	10.1	5.4	3.7

[a] Mean Likert was calculated assuming total capacity = 5, some capacity = 4, intermediate = 3, little capacity = 2, no capacity = 1.
[b] Difference between female and male, $P < 0.05$.
[c] Difference between horse owner and other relationship with horse, $P < 0.05$.

Table 4
Contexts that, according to horse owners and caretakers (n = 474), elicit horse emotions

Emotion	Contexts in which participant observed the emotion (n = number of participants that mentioned a given context[a])
Pain	Colic (n = 154); injuries (n = 31); inadequate use of saddles, spurs and bits (n = 29); contusions (n = 29); presence of a foreign body in the sole or hoof (n = 26); application of injections (n = 24); being kicked (n = 22) or bitten (n = 9) by other horse; lameness (n = 21); problems arising from hoof trimming or farrier work (n = 19); excessive exercise (n = 17); trauma (n = 16); bone fracture (n = 14); bruises (n = 13); taming (n = 9); castration (n = 8); marking (n = 7).
Fear	Presentation of novel or unexpected objects (n = 24), noises (n = 8), novel or unexpected objects situations (n = 12), novel environments (n = 5), or sudden movements (n = 5); loading for transport (n = 15); mistreatment (n = 10); plastic bag (n = 7); fire (n = 7); taming (n = 6); dogs (n = 5); storms (n = 5).
Joy	Being released in a paddock (n = 93); greeting owner (n = 40); anticipating or receiving a food reward (n = 30); being reunited with other horse (n = 18); being stroked (n = 5).
Sadness or Boredom[b]	Social isolation (n = 32); social loss (death of foal, separation from mother, companion, caretaker, or owner) (n = 27); illness (n = 11); abandonment or neglect (n = 7).
Jealousy	Owner/caregiver directs attention to a human (n = 40), other horse (n = 45), or other animal (n = 7).

[a] The number of examples may be different from the number of total survey participants because participants referred to one or more emotions.
[b] Participants often reported boredom and sadness together.

(Participant 164); “During a crisis of colic. He groaned a lot …” (Participant 385).

Describing fear, participants said, for example, “…when we were loading him into a cart my horse refused to enter… after much resistance he embarked, but he was all trembling” (Participant 476); “When the horse shakes and looks sideways, breathing deeply and blowing, he is frightened” (Participant 560). Seven participants described facial expressions of their animals that in their opinion reflect fear, for example, “Ears forward and sudden stop; fast breathing, snorting” (Participant 236); “When one of the farm horses arrived he was afraid of ropes. Any abrupt movement with a rope in hand was enough for him to change the behavior. He would balk and snort a lot, his eyes would also look wide” (Participant 384); “… he stands still looking with bulging eyes, especially when lightning and thunder falls” (Participant 437); “Fear: low head, low ears” (Participant 91); “The breath is panting, the pupils are dilated, and they try to draw near to someone they trust” (Participant 652); “Whenever he sees needles he widens his eyes” (Participant 681).

Describing sadness, some said: “After a long time in the stall, a least my animals convey a sad look” (Participant 288); “Sadness is harder for me to understand, it may also be boredom. On one occasion I thought that the horse was sad, because he was turned away inside the stall, and did not come when we called” (Participant 236).; “… a 14-year-old stallion that was left for two whole months locked up in his stall, with no contact with anyone, no sunlight… he developed the habit of eating his feces. When they took him out the first time he was clearly a sad, depressed horse” (Participant 49). To describe boredom, one participant said, "Low head, inside the stall, for me this is boredom" (Participant 420). In reference to examples of boredom, several participants reported the development of stereotypical and abnormal behaviors in horses kept in stalls: “Boredom and sadness in the stall, developing some vices” (Participant 331); “Boredom is manifested in horses that do not work and are kept in the stall for long periods of time. In these cases, the appearance of vices is common” (Participant 97).

Participants mentioned joy around situations when their horses were released from the stall and moved to pasture or to a paddock: “Joy, when he’s released on pasture with his peers” (Participant 23); “When I set him free. He always runs away and seems very cheerful.” (Participant 633); “Some weeks ago I couldn’t ride my horse. After some days I released him and he was joyful and boastful: he ran around me pretending to hump and kick; all the time he walked with his head in my direction” (Participant 26). Some participants described horse behaviors when they met the owner or caretaker that in their opinion expressed joy: “When I arrive at the farm they always come to meet me … running, whinnying and kicking in the air” (Participant 641); “Joy at hearing my voice: digging or neighing” (Participant 36); "Joy, when I stayed for many days away and suddenly I called her, she would neigh and run” (Participant 455). Vocalizations were also cited by many: “When my mare lived with me, every day when she heard me coming and talking she would start to neigh, and when I approached, she would rub her head on my arm” (Participant 86). One participant described the response of a mare at getting help for her foal: "… when I arrived at the farm the mare ran to the edge of the fence and showing distress she screamed. When I went to see what was happening, the foal was wounded and hungry, I raised him and took care of him, she changed her demeanor and performed gestures of joy and gratitude" (Participant 348).

Referring to jealousy participants described behaviors like, “If I do not pay him attention, he often tries to get my attention pushing me” (Participant 40); “My horse is jealous of the other mare we have on the estate. When I am with him, if the mare comes near, he lowers his ears and drives her away” (Participant 338); “He tries to bite and kick people who are approaching me” (Participant 131); " If she is on the paddock and I go in to please other horses, she walks in circles around me, wanting to "drive" the intruders away. On one occasion I was petting another horse that was inside the paddock and she gave me a kick in the middle of the inner thigh…” (Participant 330).

Table 5
Horse behaviors perceived to express emotional states according to horse owners and caregivers (n = 326)

Emotion	Behavior associated with emotion
Pain	Body postures; limping; gazing or pointing head to painful area of body; quietness; contact avoidance; facial expressions: ear position, eyes closed or showing eye white, lip curling, wrinkled nostrils; vocalizations
Fear	Body shaking; abnormal breathing; contact avoidance; head down; facial expressions: ear position, eyes showing white
Joy	Running; relentless; jumping; neighing and kicking in the air; seeking human contact; approaching human or other horse, seeking contact
Sadness	Turned away in the stall, unresponsive to calls from owner/caretaker; facial expression: “sad look”; low head
Boredom	Stereotypes and abnormal behaviors; withdrawn/unresponsive; apathy
Jealousy	Attempts to bite or kick human or other horse that approaches owner/caretaker; pushing owner/caretaker to beg attention; pushing other horses away from owner/caretaker; low ear position; aggression toward owner/caretaker after he/she directs attention to other horse; begging attention of owner/caretaker that contacts or caresses other horse by circling him/her; horse positions itself between owner/caretaker and another human

Discussion

Horse owners and caretakers participating in this survey in general attributed high ability to experience emotions to horses. Most participants believed that horses can experience primary emotions such as pain, fear, and joy, and many also believed that horses are capable of jealousy, a secondary emotion (i.e., an emotion that involves some degree of self-consciousness or self-evaluation, Morris et al., 2008). As in this survey, other studies assessing human attribution of emotions to horses (Morris et al., 2008), dogs (Konok et al., 2015), and rabbits (Edgar and Mullan, 2011) also found that people tend to attribute more primary than secondary emotions to animals. In addition, some of the behaviors described as examples of expression of pain, joy, and jealously suggest that at least part of the participants believed that horses are aware of their emotions.

Women attributed greater ability to horses to express pain, sadness, anxiety, boredom, and jealousy than men, in accordance with several studies that show that women express greater empathy for animals than men and more positive attitudes toward animal welfare (Walker et al., 2014b) and horses' welfare in particular (Ikinger et al., 2016). Participants that identified themselves as horse owners attributed greater capacity of jealousy to horses than other respondents. It has been shown that people that live or have lived in the past with a given species tend to attribute a greater ability to experience emotions to animals and a larger range of them (Morris et al., 2012; Walker et al., 2014a). Animal ownership in particular has been associated with greater attribution of cognitive and emotional states (Kendall et al., 2006; Morris et al., 2012; Walker et al., 2014a). One study reported that gaining awareness of chicken capacity to learn increases belief in chickens' capacity to experience affective states such as joy, boredom, and frustration (Hazel et al., 2015). In that context, it may be argued that the opportunity to learn about their horses' cognitive abilities through routine contact with horses may have influenced participants' beliefs and attitudes toward horses' emotions. Furthermore, it has been argued that people's assessment of animal emotional capacities may be influenced by their emotional attachment to the animals (Arahori et al., 2017; Martens et al., 2016; Morris et al., 2012; Thibault et al., 2006). Thus, the relatively high attribution of emotions to horses in this survey may be related to the fact that most participants were either horse owners or caretakers, and more than half self-identified as experienced horse enthusiasts. Age, place of origin, and schooling of participants did not influence responses. It must be noted that the sample was predominantly young and well educated; although the questionnaire was aimed at horse owners and caretakers, for which there is no demographic census data to compare with, these demographic characteristics of the sample may be considered as a limitation to the generalizability of the results.

Some accounts suggested anthropomorphic projections, but others have some support in scientific research. Participants reported cases of horses "begging for help", "pointing" at the body region where they feel pain or "showing off", which in some participants' descriptions seemed to imply the belief that horses are somewhat aware of their emotions. However, these behaviors could correspond to behaviors conditioned by the owners that possibly greet their horses back or help them when identify them in pain or distress. For example, most people attribute guilt and jealousy to dogs (Morris et al., 2008; Konok et al., 2015); however, some of the behaviors shown by dogs and interpreted by humans as guilt or jealousy may be conditioned by their owners or may simply reflect frustration or excitement (Hecht et al., 2012; Horowitz, 2009, 2012). Yet, many examples of behaviors the participants described to justify their attribution of emotional states to horses, and some contexts in which these occurred have some support in scientific research. Contemporary scientific knowledge of the evolutionary continuity between animal species and of the behavior, anatomy, physiology, and genetics of human and nonhuman animals (Desire et al., 2002; Kendrick, 2007) give support to the lay understanding that animal behavior can be an expression of their emotions. For example, participants described a variety of facial expressions as signs of pain, including ear position, strained nostrils and lips, eye tightening or opening, or exposing the eye white. Facial expressions have been validated as indicators of pain in the horse (Dalla Costa et al., 2014) and in other species (Descovich et al., 2017; Guesgen et al., 2016; Keating et al., 2012; Langford et al., 2010; McLennan et al., 2016; Viscardi et al., 2017). Participants also described facial expressions, especially ear positions and eye expressions as indicators of fear and jealously. In horses, eye expression may indicate emotions of positive or negative valence (Hintze et al., 2016); ear positions have been associated with emotions of different valences in sheep (Reefmann et al., 2009) and pigs (Reimert et al., 2013). Participants also cited vocalizations that they perceived to indicate emotions of positive (joy) and negative (pain) valence, as discussed by Briefer et al. (2015). Behavioral responses described by participants as indicative of fear in horses, as well as examples of situations that elicit fear in horses (e.g., the unexpectedly presentation of objects or loud sounds), also match those described and validated in the literature (Boissy, 1995; Forkman et al., 2007).

Some participants described horses' responses to social loss, including weaning, death of a foal or of an adult companion, or separation from a human or a horse companion, in terms of pain (McMillan, 2016; Panksepp, 2003), whereas other participants described it as sadness. Known responses to breaking social bonds in domestic animals that support participants' interpretations include behavioral, physiological (Newberry and Swanson, 2008), and mood changes (Daros et al., 2014; Löckener et al., 2016). Indeed, mood changes, which participants described in horses stabled for prolonged periods of time, have been described in related situations in dogs and horses. For example, horses that were released on pasture with other horses after 6 months of individual housing in stables showed positive bias in a spatial discrimination task (Löckener et al., 2016); dogs showing anxiety-like behaviors after being left alone for long time showed a negative mood in a cognitive bias test (Mendl et al., 2010a). In addition, some behaviors and postures participants described to explain a depressive state or apathy in horses also correspond to reports in the scientific literature (Fureix et al., 2012, 2015; Rochais et al., 2016).

Owners' and caretakers' attribution of emotions to animals may result in compassionate attitudes that positively affect their welfare (Butterfield et al., 2012; Edgar and Mullan, 2011; Hazel et al., 2015; Hecht et al., 2012); one example is that recognition of behaviors associated with pain in horses may increase the likelihood of owners or caretakers calling a veterinarian (Scantlebury et al., 2014). However, it has also been shown that attribution of complex emotional abilities may lead to anthropomorphic views of animals and motivate management choices and behaviors toward these animals that can in fact reduce welfare, for example, punishing their animals for behaviors interpreted as "guilt," or choosing inadequate diets (Bradshaw and Casey, 2007; Edgar and Mullan, 2011; Rooney and Bradshaw, 2014; White et al., 2016). Exploring this relationship among horse caretakers may shed some light into the paradoxical fact that people that profess love for their horses often use feeding, housing, and exercise practices that reduce their welfare (Horseman et al., 2016; Leme et al., 2014; Vieira, 2015).

The examples of behaviors and contexts associated with different emotions described in this survey, based on horse owners' and caretakers' experiences in a variety of environments, management styles, and observation of the horses in their environment

may contribute to further studies into horse emotions. They may also be used to develop programs to change owners' and caretakers' practices to enhance horse welfare. The education of those involved in the daily management of horses may positively influence their behavior, by avoiding or minimizing events that cause negative affective sates such as pain, fear, and boredom, and facilitating those that cause positive affective states. Our findings suggest that there is a lay knowledge base to work this theme with horse owners, users, and caregivers.

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Conflict of interest

The authors declare no conflicts of interest.

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