Applied Animal Behaviour Science 129 (2011) 92–99

Contents lists available at ScienceDirect

Applied Animal Behaviour Science

journal homepage: www.elsevier.com/locate/applanim

Housing conditions and breed are associated with emotionality and cognitive abilities in riding school horses

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ARTICLE INFO

Article history:
Accepted 2 November 2010
Available online 8 December 2010

Keywords:
Horses
Riding schools
Management
Emotionality

ABSTRACT

Horses' emotional reactivity is of a major importance in riding schools where a variety of more or less experienced riders are present. Horses' learning abilities may also be important for work. Previous studies have shown that different intrinsic or extrinsic factors, such as breed, housing conditions, sire, and work may have an influence, and that different facilities present horses with different characteristics. In this study, we tested the reactions of 184 horses from 22 riding schools, all practicing the same type of work, but differing in particular in terms of housing conditions, to 3 emotionality tests and to one instrumental learning task, in order to (1) try and characterize riding schools, and (2) determine how general management could explain some of the potential differences observed between sites.

Multivariate analysis conducted on the whole set of data showed that riding schools could be classified into four categories from those where horses showed low emotionality levels and good learning abilities to those where horses showed high emotionality levels and poor learning abilities. Breed, in accordance to previous studies, had an impact on the time to cross a novel obstacle in hand ("Bridge Test") (Kruskall–Wallis, H (14, $N = 184$) = 27.08, $p < 0.05$) while housing conditions (e.g. box housing) influenced emotionality (emotionality index, MW: $p < 0.05$), when horses were released in the arena. Box housing was associated with more active locomotion patterns (including trot, canter and passage) (MW: $p < 0.005$). These results underline the importance for riding schools to take into account both the individual characteristics of the horse, and in particular the breed, and to consider the impact of general management including housing conditions, on horses' reactivity, and its consequences in terms of human security.

1. Introduction

Domestic animals frequently interact with humans, and the quality of these interactions is, amongst other factors, dependent on the animal's emotional state. In southern Alberta (Canada), horseback riding has been identified as a higher risk activity than automobile racing, motorcycle riding, football, and skiing, and at least as dangerous as rugby (Buckley et al., 1993; Macnab and Cadman, 1996; Norwood et al., 2000; Sorli, 2005). In another study conducted in southern Alberta, 48% of the riders victim of equestrian accidents experienced head injuries, and 45% needed surgical intervention (Ball et al., 2007). In the United States, horseback riding injuries are responsible for 2300 hospital admission annually amongst persons younger than 25 years old (Christey et al., 1994). Horses used in riding schools are in direct touch with a wide array of people, from caretakers, to riders or teachers. Users' and professionals' security is widely dependent on horses' behaviour and reactions,

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doi:10.1016/j.applanim.2010.11.005

and different studies showed that environmental factors can induce undesirable behavioural responses (e.g. Rivera et al., 2002). In horses, several of these environmental factors (such as housing conditions, feeding, and type of work) have been shown to influence emotionality or welfare (Cooper et al., 2005; Hausberger et al., 2004, 2009; Heleski et al., 2002; McGreevy and McLean, 2005), and therefore also the risks of accidents or aggression (Fureix et al., 2010). A large study conducted on different types of facilities (e.g. breeding farms, national studs, riding schools) showed that horses' cognitive and behavioural responses to challenges can be modulated by the interplay of different intrinsic (e.g. breed and paternal origin) and extrinsic (e.g. site and type of work) factors (Hausberger et al., 2004). These factors do impact horses' emotionality (Lloyd et al., 2008; von Borstel et al., 2009) and learning abilities (Hausberger et al., 2007; Wolff and Hausberger, 1996), which are reported by riders and teachers to be important in riding school horses. Thus, riding teachers, in a former study (LeScolan et al., 1997) estimated 40% of their horses as very nervous when handled and 56% as very nervous when ridden. Moreover 61% of the horses were rated as difficult to separate from conspecifics and 18% were considered as "poor learners". Additive effects have been found leading to differences between facilities that relate to both genetic and environmental factors (Hausberger et al., 2004).

In the present study, we hypothesized that riding school management may have an influence on horses' personality traits, through both choice of breed and housing. Higher emotionality may lead horses to express undesirable and dangerous reactions for the rider, such as flight behaviours (e.g. fast canter). Horses from 22 riding schools ($N = 184$) were thus submitted to 4 standardized behavioural tests, in order to (1) characterize riding schools and (2) try to understand whether management practices and/or choice of breeds could explain some of the potential differences between schools.

2. Methods

2.1. Animals

Behavioural tests were performed on 184 horses from 22 riding schools (4–29 horses housed at each school, $\bar{X} = 8.4 \pm 1.4$) in different regions of France, all involved in the same general activity (teaching, from beginners to moderate riders). Horses were of different ages (3–23 years old, $\bar{X} = 9.5 \pm 4.3$), sexes (51 mares, 127 geldings and 6 stallions), breeds (15 breeds represented, with a majority of French saddlebreds, $\bar{X} = 2.64 \pm 0.36$ breed per school), and sires ($N = 124$) (Table 1). The 6 stallions were in 6 different schools. Housing conditions were mostly single box housing, but riding schools differed in the time spent additionally in paddocks (0 to more than 12 h). In the further analysis, we separated riding schools into 2 categories: box (13–24 h per day in box) and paddock housing (13–24 h per day in paddock). In the paddock housing sites, horses were kept in group when released in the paddocks, but singly when left in box (0–11 h per day).

Table 1
Detailed list of the factors implicated in the analysis. Horses were distributed into box or paddock when they spent at least 13 h in the condition.

	No. of horses
Breed	
Anglo-Arab	8
Camargue	10
Saddle Horse	8
Connemara	11
Fjord	2
French Pony	3
Hafkinger	6
Iberian	4
Merens	32
New-Forest	3
Unregistered Pony	3
Thoroughbred	10
French Saddlebred	59
French Trotter	17
Welsh	8
Housing	
Box	130
Paddock	54
Sex	
Females	51
Geldings	127
Stallions	6

2.2. Experimental tests

In each riding school, the emotionality tests were performed in the same order: first the arena test, then the novel object test and lastly the bridge test. The chest test was performed independently.

All the tests were performed in calm weather only, in the arena for the emotionality tests and in the box for the chest test (under artificial light). All horses from a given school were not necessarily tested on the same day.

2.2.1. Tests used to measure emotional reactions

Three different tests, regularly used in studies on temperament (Hausberger and Richard-Yris, 2005) were used to assess horses' emotionality. They were chosen as they were shown to correlate with evaluations of horses given by riding teachers (LeScolan et al., 1997).

A unique experimenter handled the horses and performed the tests and observations in all the riding schools, including the bridge test. All the observations were recorded directly, using a digital audio recorder.

- *Arena test (AT)*: The horse is released in an indoor familiar arena and its behaviour is measured (Anderson et al., 1999; Seaman et al., 2002), here for 10 min. Reactions in this test correlated with "gregariousness" (difficulty to separate from other horses) evaluated by riding teachers (LeScolan et al., 1997).
- *Novel object test (NO)*: The horse is released in the same arena, faced with a novel object for 5 min (Visser et al., 2001, 2002). Reactions in this test correlated with "nervousness" when handled or ridden by teachers (LeScolan et al., 1997).
- *Bridge test (BT)*: The horse is led, using a halter and a rope, by a non-familiar experimenter over an unknown obstacle (foam mattress: LeScolan et al., 1997, planks: