

Effects of feeding management and group composition on agonistic behaviour of group-housed horses



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ABSTRACT

Under natural conditions, horses spend 12–18 h of a day with synchronous grazing, but for stabled horses, the amount of forage and thus duration of feed intake usually are restricted. In group-housed horses, therefore, feeding times are often situations with increased levels of agonistic behaviour. Our aim was to evaluate how forage provision, feeding duration and group composition influence agonistic behaviour. The study was conducted on 50 groups of 4–21 adult horses ($n = 390$) housed in group housing systems. Each group was observed for 30 min before and for the first 30 min after a hay feeding. Feeding systems were 'floor', 'fodder rack', 'feed fence', 'net', 'feed stall with contact', 'feed stall no contact' or a 'combination' of these. Hay was provided mostly 2–3 times per day but the duration of hay availability varied from 1.5–24 h per day, whereas straw was mostly available *ad libitum*. Results showed that the proportion of horses showing agonistic behaviour was generally higher before than during feeding. Aggressive behaviour – bearing the risk of injuries by physical contact – was highest in 'floor' and lowest in 'net' ($\chi^2_6 = 13.0, p = 0.043$). Aggressive behaviour decreased substantially during feeding with an increasing duration of hay availability ($\chi^2_1 = 7.1, p = 0.008$). Threatening behaviour was highest in 'floor', 'fodder rack' and 'feed fence' and lowest in 'feed stalls' ($\chi^2_6 = 25.4, p < 0.001$). Threatening behaviour increased with an increasing proportion of mares in the group ($\chi^2_1 = 5.0, p = 0.025$). Displacements occurred most in 'floor' and least in 'feed stalls' ($\chi^2_6 = 37.37, p < 0.001$). Additionally, displacements decreased substantially during feeding with an increasing duration of straw availability ($\chi^2_1 = 4.4, p = 0.035$). Furthermore, horses fed at time-bound feeding times tended to show more locomotor activity before feeding than horses with no time-bound feeding times, whereas no difference was found during feeding ($F_{1,321} = 3.62, p = 0.058$). In conclusion, feeding places that are either individually separated by partitions or distant from each other lead to a reduced occurrence of agonistic behaviour, most likely because horses in such systems are able to maintain their perceived individual distances. Furthermore, it is highly recommended – from an ethological point of view – to provide not only straw but also hay over an unlimited period, regardless of the feeding system.

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1. Introduction

The potential risk of injuries during social interactions is a major concern of horse owners regarding group housing (Flauger and Krueger, 2013; Hartmann et al., 2012) although levels of agonistic behaviour are generally low in free-ranging horses (Fureix

et al., 2012). Under natural conditions, horses are highly social steppe inhabitants which live in groups of 2–35 individuals (Boyd and Keiper, 2005), which sometimes assemble into larger herds. Social behaviour is pronounced strongly and contributes to building and maintaining a hierarchy, which is crucial for stability within a group. Once a dominance hierarchy is established, the frequency of agonistic behaviour decreases and only moderate agonistic behaviour is needed to maintain it (McDonnell, 2003; Zeitler-Feicht, 2008). In general, horses show only the minimum amount of agonistic behaviour required in a situation, wherefore most conflicts are ritualised substantially (Briefer Freymond et al., 2013; Waring, 2003).

Horses are not territorial (Boyd and Keiper, 2005), and activities like locomotion, resting and feeding are synchronised highly

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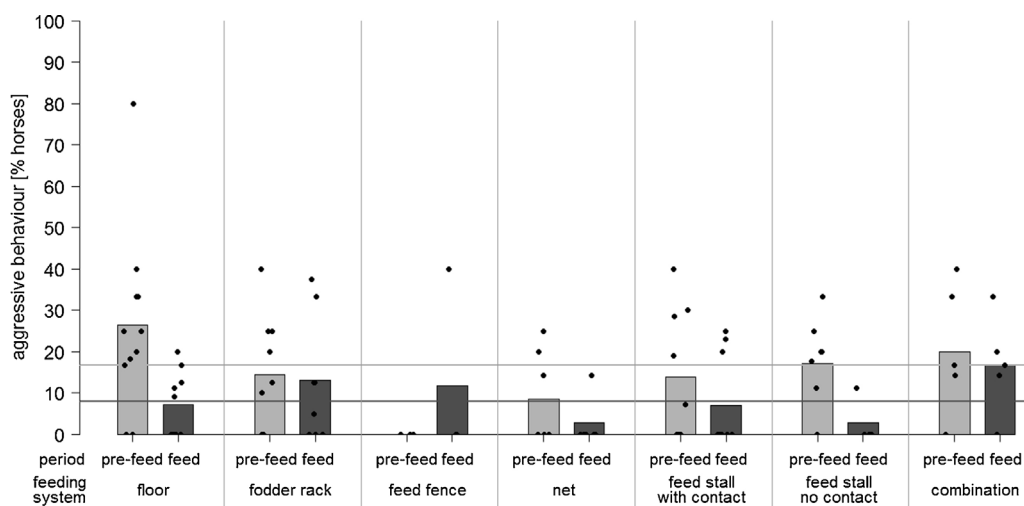


Fig. 1. Proportion of horses showing aggressive behaviour with respect to feeding system and observation period. Mean proportions in individual groups are displayed as dots, horizontal lines represent the mean proportion of all horses showing aggressive behaviour in the pre-feed (light grey) and feed periods (dark grey).

within a group (Boyd and Bandi, 2002; Rifá, 1990). As horses are grazers, their natural diet is poor in energy and rich in fibre. Therefore, feral horses spend 12–18 h per day foraging (Boyd et al., 1988; Mayes and Duncan, 1986; Salter and Hudson, 1979; Waring, 2003) and meanwhile cover large distances in slow locomotion (Hampson et al., 2010a). Free-ranging Przewalski horses in a steppe habitat were found to consume 6.7–10.9 kg phytomass (dry weight) per day (Pozdnyakova et al., 2011), resulting in a dry matter intake of approximately 2.0–3.5 kg per 100 kg body weight; variations depended on season and nutrient content (Negi et al., 1993; Pozdnyakova et al., 2011). The digestive system is adapted to continuous feed intake (Janis, 1976; Zeitler-Feicht, 2005), and the feeling of satiety is not achieved as in most mammals by stimulation of the stretch receptors with a filled stomach but by fatigue of the masticatory muscles by biting and chewing (Meyer and Coenen, 2014; Zeitler-Feicht, 2008) and other oropharyngeal factors like prehension, salivation and swallowing (Ralston, 1984). Horses avoid fasting for longer than 3–4 h and perform about ten feeding periods distributed over 24 h (Harris, 2005; Ralston, 1984; Zeitler-Feicht, 2008).

Although domesticated horses have similar behavioural and physiological needs (Goodwin, 2007; Zeitler-Feicht, 2008), the feeding regime for stabled horses usually differs distinctly from natural feeding behaviour. Under stabled conditions, forage is generally higher in energy and thus often rationed in order to prevent overweight. Also the duration of feed intake is restricted. In most stables, daily rations are fed in two or three batches (Bachmann and Stauffacher, 2002; Henderson, 2007) with intermissions between feeding times frequently longer than 4 h. Given these discrepancies to natural feeding behaviour, the common feeding management for stabled horses is under increasing suspicion to cause not only disturbances in the digestive system (e.g. gastric ulcers (Flores et al., 2011; Murray and Eichorn, 1996), colic (Cohen et al., 1999; Hudson et al., 2001)) but also stereotypies (e.g. wood chewing, crib biting), predominantly in single-housed horses (Bachmann et al., 2003; Cooper and Mason, 1998; Hothersall and Nicol, 2009), and high levels of agonistic behaviour in group-housed horses. Principally, agonistic behaviour results from competition over limited resources and its frequency and intensity often depends on restriction of space and/or feed availability (Hartmann et al., 2012).

Table 1
Definitions of observed agonistic behaviours.

Agonistic behaviour	Description
Displacement	Approach of one horse with ears pointing forward or laterally is followed by another horse moving away ^{a,b}
Push	Pressing head, neck, shoulder, body or rump against another horse ^c
Threatening behaviour	
Threat	Extension of the head and neck towards another horse with ears laid back ^d
Bite threat	Bite movement, performed by fast opening and closing of the jaw, with extended neck and ears laid back but with no physical contact ^e
Kick threat	Kick movement, performed by swinging rump or backing up, and waving or stamping hind leg towards another horse, without making physical contact ^e
Aggressive behaviour	
Bite	Fast opening and closing of the jaws with physical contact to another horse's body; ears are laid back and lips retracted ^e
Kick	One or both hind legs lift off the ground and rapidly extend backwards towards another horse ^e
Attack	Sudden forward movement against another horse, with ears laid back, extended neck and muscles of the muzzle contracted ^f
Chase	One horse pursues another (trotting or galloping) with ears laid back ^e

^a Heitor et al. (2006).
^b Zharkikh and Andersen (2009).
^c McDonnell and Haviland (1995).
^d Weeks et al. (2000).
^e Jørgensen et al. (2011).
^f Glatthaar (2009).

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