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Short communication

A note on behaviour of stabled horses with foraging devices in mangers and buckets

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Abstract

Processed feed for stabled horses is usually presented in buckets or mangers, and is easily and rapidly consumed. Foraging devices based on the Edinburgh foodball can be used to provide part of the ration. Current designs are all placed on the floor, raising concerns regarding ingestion of foreign materials along with the dispensed food. Alternative devices were evaluated, when presented within suitable, clean containers to prolong food-handling times but avoid such issues.

In four Latin square designed replicated trials we investigated behaviour of 12 stabled horses with three foraging devices. These were separately presented for 5 min, varied in sensory complexity (round, square, polyhedral) and contained 500 g high fibre pellets. In Trials 1 and 2 six geldings were presented with devices in buckets then mangers. All individuals foraged successfully from at least one device and behaviour was compared. However, all individuals exhibited some frustration while using the devices (either pawing or biting them). Horses frequently removed the devices from the buckets in Trial 1 terminating these sessions. In Trial 2 mean device foraging duration was ranked polyhedral > round > square. Mean pawing rate in Trial 2 was calculated for horses (frequency of pawing per individual/summed duration manipulation and foraging) and was highest with square (0.11, $n_{\text{pawers}} = 6$). In Trial 3 six stabled mares were presented with the same foraging devices in mangers. Mean foraging duration with devices again ranked polyhedral > round > square. Mean pawing rate was highest with round device (0.08, $n_{\text{pawers}} = 4$). Trial 4 investigated behaviour of six horses when devices initially containing five high fibre pellets became empty. Mean foraging duration with devices ranked round > polyhedral > square. Mean pawing rate was highest with square device (0.11, $n_{\text{pawers}} = 4$).

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All horses foraged successfully from at least one foraging device in buckets and mangers. Devices met initial objectives but the unpredictability of reward suggests a source of frustration and warrants further investigation.
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1. Introduction

Feral and free-ranging horses forage for around 16 h per day (Tyler, 1972). Their foraging behaviour includes locomotion, selection, manipulation and ingestion of food (Goodwin et al., 2002). In contrast stabled horses are routinely housed singly in approximately 4 m × 3 m stables and provided with a single forage, a straw bed and concentrate rations (Goodwin et al., 2005; Harris, 1999). Processed feed is generally presented in buckets and mangers, so is easily and rapidly consumed, leaving much of the horses' time unoccupied.

Currently available commercial foraging devices are based on the Edinburgh foodball (Winskill et al., 1996). These aim to prolong food-handling time and are designed to be presented on the floor. However, this risks ingestion of foreign material along with the dispensed feed. Husted et al. (2005) and Walesby et al. (2004) provide evidence of sand colic associated with feeding from the ground and Boles and Kohn (1977) provide evidence of impaction colic caused by ingestion of other foreign materials. The aim of this study was therefore to evaluate three devices presented within suitable, clean containers that would prolong food-handling times but avoid issues of contamination.

2. Methods

In this series of four replicated trials we assessed three foraging devices presented in buckets and mangers. The devices were all approximately 20 cm wide and presented a range of sensory complexity, being round, square or polyhedral. Devices were separately presented to 12 stabled horses of competition breeds in four Latin square designed trials. Each device was presented on separate days and horses were only tested once per day. In all stables the front third of the floor was

Table 1
Ethogram

Behaviour	Description
States	
Away	Horse's head is more than 0.5 m away from foraging device
Close	Horse's head is within 0.5 m of foraging device
Investigate	Sniff and touch device without moving it
Manipulate	Move the device prior to releasing feed
Forage	Moving and feeding from the device after initial release of food
Events	
Paw	Pawing with front leg with or without contact with the floor
Bite	Bite the foraging device
Knock out	Knock the foraging device out of its container

bare concrete and the rest of the floor was covered with straw bedding. A haynet and water was also available. Behaviour in each 5 min session was observed from video recordings using the Observer 3 package according to the ethogram shown in Table 1. Each device contained 500 g high fibre pellets and had one dispensing aperture. In Trial 1 six geldings were presented with the devices in a shallow rubber feed bucket at the front of the stable on the bare concrete stable floor. In Trial 2 the same horses were presented with the devices in the stable's 50 cm × 30 cm ceramic corner mangers. In Trial 3 six mares were observed with the devices in mangers, and in Trial 4 we observed the behaviour of the mares when the devices initially containing five pellets (i.e. containing 1% by weight or 0.8% by pellets compared to Trials 1–3) became empty, or failed to deliver the remaining pellets.

3. Results

Trial 1. Horses frequently removed the devices from buckets terminating the sessions. Table 2 shows Trial 1 mean behaviour data for all sessions and includes data to termination of the sessions when devices were removed from buckets.

Trial 2. In Trials 1 and 2 all geldings foraged successfully from at least one of the devices and only the square device was removed from the manger by one individual. Table 2 shows Trial 2 mean data for all sessions including data to termination of sessions. Mean duration of foraging in Trial 2 was ranked polyhedral > round > square. However, all horses exhibited some frustration in Trials 1 and 2 by pawing or biting the devices. In Trial 2 mean pawing rate was calculated as frequency pawing/(manipulation + foraging duration) and was greatest for the square device (0.11, $n_{\text{pawers}} = 6$).

Trial 3. Six stabled mares were presented with the same devices in mangers. All mares foraged successfully from at least one of the devices and employed a range of manipulation techniques. Table 3 shows Trial 3 mean data for all sessions including data to termination of sessions. Their mean foraging duration was greatest with the polyhedral device and again ranked polyhedral > round > square. Mean pawing rate for those individuals that pawed was greatest with the round device (0.08, $n_{\text{pawers}} = 4$). Three mares knocked the round device out of the manger on one or two occasions, two mares removed the square device from the manger on one or two occasions, and three mares removed the polyhedral device from the manger on one occasion.

Trial 4. Mean foraging duration ranked round > polyhedral > square and again mean pawing rate was greatest with the round device (0.11, devices $n_{\text{pawers}} = 4$). Table 3 shows Trial 4 mean data for all sessions including data to termination of sessions.

4. Discussion

All horses foraged successfully from at least one foraging device in buckets and mangers, and employed a range of manipulation techniques including the muzzles, lips, teeth and side of the head. The polyhedral device had the greatest surface sensory complexity and had the highest mean foraging duration in Trials 1–3. In terms of times spent foraging the polyhedral device was second to the round device by 0.2 s in Trial 4. Whereas the geldings rolled the round device, the mares spun it on its axis and so were less successful at dispensing food and the highest mean frequency of biting a device was recorded ($\bar{x} = 31.2$, $n = 6$).

In all trials individual variation was observed in behaviour towards the devices, and accounts for the range of standard deviations reported in Tables 2 and 3. Total session times were 300 s, in Trials 1, 2 and 3 horses were close to, investigating, manipulating or successfully foraging from

Table 2
Trials 1–2: mean durations (s) of behavioural states and frequencies (*f*) of events for all horses in both replicates

	Away	Close	Invest.	Manip.	Forage	Paw (*f*)	Paw rate	Bite (*f*)	Knock out (*f*)
Trial 1									
Round	88.4 (137)	26.5 (72)	2.9 (6)	13.5 (19)	97.7 (115)	5.3 (9)	0.07 ($N = 5$) (0.1)	1.6 (5)	0.4 (0.5)
Square	178.0 (116)	16.6 (38)	4.0 (7)	40.0 (41)	19.3 (23)	1.4 (3)	0.02 ($N = 5$) (0.03)	0.1 (0.3)	0.3 (0.5)
Polyh'drl	36.1 (93)	1.4 (1)	2.0 (2)	19.0 (11)	202.0 (104)	9.1 (10)	0.04 ($N = 6$) (0.06)	0 (0)	0.3 (0.5)
Trial 2									
Round	88.1 (120)	7.6 (10)	3.6 (14)	11.0 (14)	200.7 (122)	11.9 (14)	0.06 ($N = 5$) (0.05)	1.5 (2)	0 (0)
Square	104.3 (131)	12.5 (9)	2.9 (2)	47.4 (38)	141.6 (123)	22.7 (32)	0.11 ($N = 6$) (0.1)	0.9 (2)	0.2 (0.4)
Polyh'drl	14.0 (35)	7.2 (13)	4.3 (7)	21.5 (19)	274.5 (43	19.8 (20)	0.07 ($N = 6$) (0.07)	0.6 (2)	0 (0)

Invest. = investigate; Manip. = manipulate; paw rate = [paw(*f*)/(Manip. + forage)]; Plyh'drl = polyhedral; S.D. = standard deviation given in parentheses.

Table 3
Trials 3–4: mean durations (s) of behavioural states and frequencies (*f*) of events for all horses in both replicates

	Away	Close	Invest.	Manip.	Forage	Paw (*f*)	Paw rate	Bite (*f*)	Knock out (*f*)
Trial 3									
Round	51.1 (101)	5.7 (5)	1.3 (1)	19.4 (23)	164.6 (119)	10.8 (18)	0.08[a] (*N* = 4) (0.1)	31.2 (64)	0.3 (0.5)
Square	121.6 (116)	19.2 (34)	2.7 (3)	27.2 (23)	63.7 (86)	2.1 (4)	0.05[a] (*N* = 3) (0.1)	25.7 (48)	0.3 (0.5)
Polyh'drl	47.4 (105)	2.4 (4)	1.0 (0.9)	13.8 (18)	183.7 (132)	7.5 (19)	0.05[a] (*N* = 2) (0.06)	0.4 (2)	0.3 (0.5)
Trial 4									
Round	118.8 (106)	8.8 (14)	1.5 (2)	70.6 (59)	19.0 (20)	12.3 (22)	0.11[a] (*N* = 4) (0.2)	0.8 (2)	0.3 (0.5)
Square	215.7 (104)	6.0 (4)	1.5 (1)	31.3 (49)	3.9 (11)	3 (7)	0.05[a] (*N* = 3) (0.1)	0.0 (0)	0.2 (0.4)
Polyh'drl	77.7 (111)	14.8 (27)	1.3 (3)	115.5 (93)	18.8 (22)	14.2 (21)	0.07[a] (*N* = 2) (0.1)	1.6 (3)	0.3 (0.5)

Invest. = investigate; Manip. = manipulate; paw rate = [paw(*f*)/(Manip. + forage)]; Plyh'drl = polyhedral; S.D. = standard deviation given in parentheses.

[a] A mean calculated for mares which either manipulated or foraged from the device, the frequency of pawing per individual was divided by its summed duration of those two behaviour patterns.

the round and polyhedral devices for more than 200 s. Mares were away from the polyhedral device in Trial 2 for only 14 s. However, 5 min was not long enough for the horses to empty the devices in any of these trials and so Trial 4 investigated effects on behaviour when horses were presented with devices that were almost or became empty. In Trial 4, some mares continued to manipulate the device when it became empty, some continued if there was a single pellet remaining while others quickly ignored the device when the delivery rate was lower than in previous trials.

Horses removed the devices from their containers most frequently when presented in buckets. Horses who manipulated the devices most vigorously in the mangers could also remove them, so some modification of the containers is required in future. There was evidence of some behaviour indicative of frustration, e.g. biting or pawing the devices (Ödberg, 1973). While the devices presented in the mangers met the initial objectives of delivery into a clean receptacle, the unpredictability of reward suggests a source of frustration and warrants further investigation.

These devices could represent a useful short-term distracter for stabled horses but, as for the Equiball (Henderson and Waran, 2001), we consider that they should be removed when empty.

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