Applied Animal Behaviour Science 130 (2011) 91–100

Contents lists available at ScienceDirect

Applied Animal Behaviour Science

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

Preference and demand for exercise in stabled horses

Joyce Lee[a], Toby Floyd[b], Hollis Erb[b], Katherine Houpt[c,*]

[a] Animal Surgical and Emergency Center, 1535 South Sepulveda Boulevard, Los Angeles, CA 90025-3311, USA
[b] Department of Population Medicine and Diagnostic Services, College of Veterinary Medicine, Cornell University, Ithaca, NY 14853, USA
[c] Department of Clinical Sciences, College of Veterinary Medicine, Cornell University, Ithaca, NY 14853, USA

ARTICLE INFO

Article history:
Accepted 3 January 2011
Available online 2 February 2011

Keywords:
Horse
Welfare
Exercise
Operant conditioning
Two choice preference
Treadmill

ABSTRACT

Operant conditioning and two choice preference tests were used to assess the motivation of horses to be released from straight and from box stalls. The motivations for food, a companion, and release into a paddock were compared when the horses had to work for each commodity at increasing fixed ratios of responses (panel presses) to reward in an equine operant conditioning stall. The motivation for food (mean ± SEM = 258 ± 143) responses was much greater than that for either release (38 ± 32) from a straight stall into a large paddock alone or into a small paddock with another horse (95 ± 41) ($P = 0.04$). When given a two choice preference test between exercise on a treadmill for 20 min or returning to their box stalls, eight of nine horses chose to return to their stalls. In a two choice preference test six of eight horses in box stalls chose to be released into a paddock alone. Horses were given a series of two choice preference tests to determine how long they preferred to be in a paddock. After 15 min in the paddock the horses were re-tested, but all chose the paddock when released into a paddock with three other horses. They were retested every 15 min until they chose to return to their stalls. They chose to stay out for 35 ± 6 min when other horses were in the paddock but for only 17 ± 2 min when they would be alone. When deprived of stall release for 48 h the horses chose to remain in the paddock with other horses for 54 ± 6 min, but showed no compensatory behavior when they were alone (duration chosen = 16 ± 4 min). These findings indicate that horses are not strongly motivated to exercise alone and will choose not to endure forced exercise on a treadmill. The social context of voluntary exercise is important; horses are willing to stay out of their stalls longer if other horses are present and will show compensatory behavior only if other horses are present. These finding have implications for optimizing turnout time for stalled horses.

1. Introduction

Feral and wild horse live in bands and spend most of their time grazing or resting (Boyd and Bandi, 2002; Duncan, 1980; Salter and Hudson, 1979). Grazing consists of taking a few bites of grass before walking a few steps to a new feeding station. Walking comprises 3–10% of free ranging horses' time and trotting or cantering less than 1%. In contrast to the environment of free ranging horses, that of most recreational and performance horses is a stall with limited opportunity for exercise. Denial of freedom of movement (exercise) has been raised as a welfare issue by several authors (Cooper and Albentosa, 2005; Fraser and Broom, 1990; Goodwin, 2002).

Consideration of the exercise requirements of horses is important for several reasons: (1) controversies should be resolved scientifically. For example, the welfare of mares used in estrogen production who may be confined for 6 months of the year with access to a paddock only once every

* Corresponding author at: 3065 East Dixon Lake Road, Gaylord, MI 49735, USA. Tel.: +1 989 448 8083.
E-mail address: kah3@cornell.edu (K. Houpt).

0168-1591/$ – see front matter © 2011 Elsevier B.V. All rights reserved.
doi:10.1016/j.applanim.2011.01.001

two weeks was questioned; (2) formulation of recommendations by governmental and professional organizations should be based on objective criteria; (3) the welfare of horses owned by private individuals, the vast majority of horses, needs to be addressed. The objective of this study was to determine horses' motivation and preference for exercise – both spontaneous and forced exercise. Patterson et al. (2008) have noted that operant conditioning techniques have not been applied to equine welfare. We hoped to begin filling that experimental void in our knowledge of equine welfare.

We had four distinct questions: (1) whether the horse is motivated to obtain exercise; (2) whether it has a preference between exercise and stall rest; (3) how strong is its motivation to exercise, and (4) whether the preference for exercise is altered by deprivation or a change in the social environment.

Operant conditioning can measure and rank the strength of preferences, whereas choice tests allow comparison of situations, but not quantification of rank. In order to measure motivation we applied operant conditioning and progressive ratios of reinforcement to evaluate the strength of the preference for food, companionship, and release from a straight stall (Hodos, 1961). Several studies have found that horses readily solve simple two choice mazes (Haag et al., 1980; Kratzer et al., 1977), so we used that method of determining preferences. Horses housed in box stalls were used to test their preference for forced (treadmill) exercise over returning to their stall. Repeated two choice preference tests were used to determine how long a horse preferred to be in a paddock either alone or in a small group. Finally, the issue of whether the motivation for exercise in a paddock increases with deprivation – compensatory or rebound behavior – was addressed by comparing the duration horses chose to be in a paddock following 48 h of confinement to their stalls.

This study was approved by the Institutional Animal Care and Use Committee of Cornell University.

2. Materials and methods

2.1. Motivation for release from stall

2.1.1. Animals, housing, and management

Nine mares (six thoroughbreds and one each quarter horse, Arabian, and Arabian-quarter horse cross) of median age 14 years (range 10–19) were used. They were housed in a barn that was arranged with one pipe rail straight stall (2.3 m × 1.0 m). A box stall (3.6 m × 3.6 m) was located in the barn to house the companion horse. Pine shavings were used for bedding in the straight and box stall and both were cleaned out at 07:00 and 17:00 h. The horses were fed *ad libitum* non-legume hay. In addition, 0.7 kg of a 15% protein textured horse feed (Legends® Agway Inc., Syracuse, NY, USA) was also provided twice a day. A salt block was available. Water was available at all times, via buckets in the straight stall and an automatic waterer in the box stall.

2.1.2. Apparatus

The operant conditioning arrangement consisted of a 10 cm × 10 cm metal plate attached by a hinge to an electrical junction box that was affixed to the upper left hand corner of the inside of the front door of the straight stall. When pushed by the horse, a small switch with a spring lever located in the box beneath the push plate was closed, completing a 24 V circuit to an electronic counter (Biomedical Electronics, Cornell University, Ithaca, NY, USA). This counter could be preset to a specific number.

Repeated pushes by the horse were counted down from the preset number until zero was reached, and then a relay was automatically closed that completed a circuit to the solenoid of the latch mechanism of the door. At that time, the door latch unlocked with an audible click and the door swung open, allowing access to a small paddock (100 m^2) (used for food and companionship) that adjoined a larger paddock. The total area available to the horses in both paddocks was 917 m^2 (used for release).

Except for the 30-min test period, a wooden chest guard made from a 0.51 cm × 1.02 cm piece of wood with a hasp locking mechanism that attached to the pipe railing was placed across the straight stall in front of the panel so that the horse could not reach it and exit the stall when not in testing condition. There were two horses that required restraint while they were housed in the straight stall. They were restrained with an elastic, quick release tie rope so they would not be able to escape under the rails. Both horses had enough slack on the rope to be able to eat, but not enough to escape by ducking under the side rails.

A metal gate and a garage door separated the barn from the paddock. When the garage door was open the horse was able to look out into the small paddock.

2.1.3. Operant training

Each horse was familiarized with exiting the experimental stall by walking through it and into the paddock two or three times. The next step was to shape the behavior of pressing the panel with the nose. To accomplish this, clicker training was employed, although recently Williams et al. (2004) have found no advantage in speed of learning using this method. While the horse was in the straight stall, a clicker would be clicked a few times and the horse would receive a small grain reward with each click. This was done so the horse associated the sound of the clicker (secondary reinforcer) with a reward (primary reinforcer). Once the horse paired the sound of a click with food, the investigator would then click and reward only if the horse's nose was within a 15 cm radius of the panel. Through successive approximation, the horse would only be rewarded when she touched the panel. Once she associated pushing the panel with her nose with a reward, the next step was to chain the whole set of behaviors together (pushing the panel then walking out into the paddock for a reward). To start chaining the behaviors together, the electronic counter was set to FR (fixed ratio) = 1. The horse was rewarded only when she pushed once on the panel and then walked out into the paddock. This was repeated several times at FR = 1. Then, the FR would be set at 2, and again, the horse would be rewarded only when she completed two pushes and walked out into the paddock. The time in the paddock was the same as the time used as a reward