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BEDDING MATERIAL PREFERENCES OF PONIES¹

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ABSTRACT

The bedding preferences of ponies were determined using video recordings of nighttime (1900 to 0700) behavior of individually housed ponies. The ponies' behavior each minute was recorded to determine time budgets. In Exp. I, preference for bedding was determined using three mares, three stallions and two geldings given access to bedded and unbedded areas in a box stall. The ponies spent more time (66%) on the bedded area and were never observed lying on the unbedded areas. In Exp. II, three mares and six stallions were given access to a box stall, one side of which was bedded with wood shavings and the other with straw. Although some individual animals preferred one bedding over the other, neither form of bedding was preferred consistently. Time budgets in Exp. II were similar on both bedding materials. The ponies spent 12% of their nighttime lying, 2% walking, 35% eating and 50% standing inactively. Some ponies had a relatively strong preference for bedding, but the type of bedding preferred varied with the individual animal. Some individual ponies had no clear preference, but instead had a side or position preference. (Key Words: Behavior, Horses, Floor Types, Bedding, Animal Welfare.)

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Introduction

In their natural environment, herds of horses and ponies spent most of their time grazing and walking (Duncan, 1979; Keiper and Keenan, 1980). This is in contrast to domestic horses, many of which live in individual stalls eating diets of hay and grain and spending much of their time standing on straw, wood shavings or some other type of bedding material. The type of bedding material used by horse owners is determined largely by the price, availability and owner preference. The bedding preferences of dairy cattle (Natzke et al., 1982) and of pigs (Fraser, 1985) have been studied, as have the flooring

preferences of chickens (Hughes and Black, 1973) and piglets (Farmer and Christison, 1982), but the bedding preferences of horses have not been studied.

The objectives of the present study were to determine 1) whether ponies preferred bedded to unbedded surfaces, 2) whether one type of bedding, wood shavings, was preferred over another, straw, and 3) whether the ponies exhibited different behavior on one bedding (or unbedded surface) than on the other.

Materials and Methods

General Methods

Eleven grade, Shetland-type ponies ranging in age from 2 to 20 yr were used in the study. These included six stallions, two geldings and three mares. Each pony was tested individually and no other animal was present in the barn during the experiment. Ponies were kept in a stall measuring 3.4 × 2.7 m. The stall was divided in half by a wooden board (366 cm long × 5 cm high × 2 cm wide) to prevent mixing of the two types of bedding. An automatic waterer was located in the middle of

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the front of the stall so that water could be obtained while the horse was standing on either side of the stall. There also was a manger and a salt block on each side of the stall. Each pony was fed 2.5 kg hay and .5 kg grain at 0900 and again at 1700. Half was placed in each manger to ensure that the pony sampled each side of the stall. Lights were on over the stall 24 h/d (approximately 400 lux) to permit video taping.

The activity of each pony was recorded using a video camera⁴ and time-lapse recorder⁵ set at 1/6 normal speed. Recordings were made only at night, between 1900 and 0700 for Exp. 1 and between 1800 and 0900 for Exp. 2. Video tapes were played back at normal speed, and scan samples of the pony's behavior were made every 60 s (Altmann, 1974). Both the side of the stall occupied and the pony's activity were recorded. The activities were mutually exclusive, in that if the pony were engaged in one activity, it could not be engaged in another simultaneously (i.e., if a pony were standing and eating, its activity would be recorded as eating and not as standing). The list of activities summarized included standing (not engaged in another behavior), walking, lying (lying sternally or lying laterally), eating (eating hay, grain, bedding, feces, or salt, or drinking), and other miscellaneous behaviors that included eliminating (urinating or defecating), grooming (rubbing or rolling), masturbating and exhibiting the flehmen lip curl.

Statistical Analysis

A Wilcoxon signed ranked test was used to determine whether the percentage of time spent on wood shavings was significantly different from 50%, that is, whether more time was spent on wood shavings than on the other types of surfaces (concrete or straw). Further Wilcoxon signed ranked tests were performed to determine whether the time spent in each behavior was spent equally on each surface type. For example, if ponies spent 10% of their time lying down, was 5% spent on wood shavings and 5% on concrete? In order to test for significance of these subdivisions, the

Bonferroni criterion was used (Fleiss, 1986). Each individual contrast was set at a significance level equal to the overall significance level (in this case, $P < .05$) divided by the number of contrasts (in this case, three for standing, lying and eating).

Experiment 1. Bedding vs No Bedding. Wood shavings were put on one side of the stall and the other side was left bare with a concrete floor. Three pony stallions, three mares and two geldings were used in Exp. 1 to test for preferences between bedded (wood shavings) and unbedded (concrete floor) areas. The animals were observed sequentially from September 1987 to March 1988. Each pony was observed for 6 d. In order to control for side preferences, after 3 d the concrete on one side of the stall was covered with wood shavings and the wood shavings on the other side of the stall were removed, leaving a bare concrete floor.

Experiment 2. Straw vs Wood Shavings. Six stallions and three mares were tested for bedding preferences between wood shavings and straw. These animals included the stallions and mares used in the first experiment plus three additional stallions. Wood shavings were used for bedding on one side of the stall and straw was used on the other side. The six pony stallions were observed sequentially from June 1986 to July 1986. Each stallion was allowed 2 h of exercise in a small corral 6 d per week. The three mares were observed from January 1987 to March 1988 and were not exercised. Each pony was observed for 6 d. To control for side preferences, the bedding was reversed after 3 d (i.e., the straw bedding on one side of the stall was replaced with wood shavings, and the wood shavings on the other side were replaced with straw.)

Results

Experiment 1. Bedding vs No Bedding. Each pony was observed for an average of 80 ± 2.5 h of observations. The mean percent time spent on a bedding material was $66.8 \pm 4.5\%$ on wood shavings vs $33.2 \pm 4.5\%$ on concrete (Figure 1). The amount of time spent on bedding was higher ($P < .01$) than the amount of time spent on concrete. The percent of time spent lying on the bedded side also was greater ($P = .05$) than that spent on the concrete. None of the ponies, however, was observed to lie down on the unbedded side of the stall. Table 1 gives the hourly behavior

⁴RCA TC-1501 videocamera, Univisions, Syracuse, NY.

⁵Panasonic NV-8050, Univisions, Syracuse, NY.

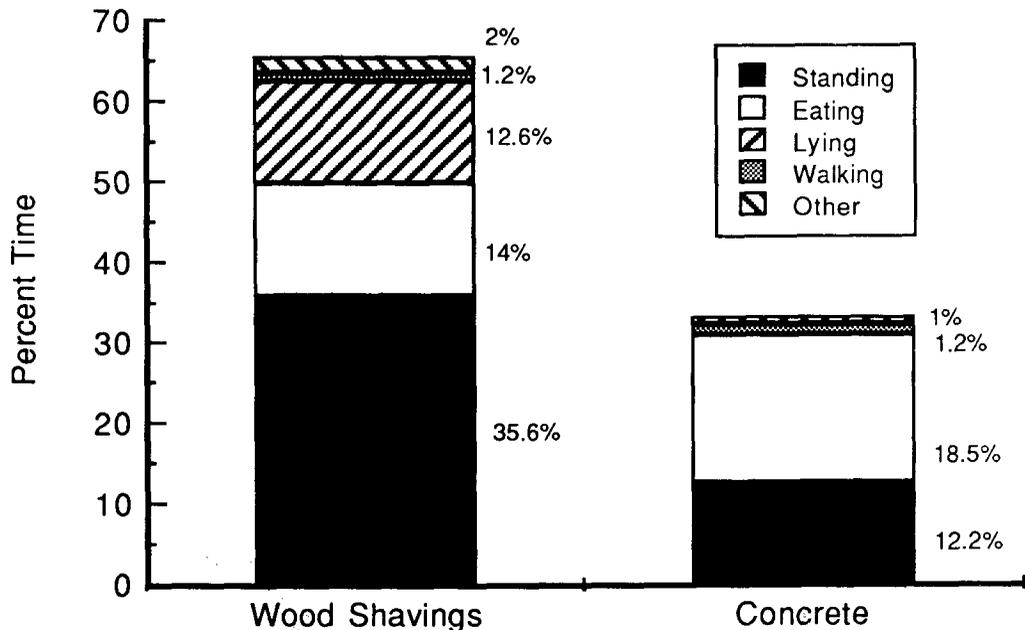


Figure 1. The percentage of time ponies spent on bedded (wood shavings) and unbedded (concrete) areas. A significantly greater percentage of time was spent on the bedded side ($P < .01$, Wilcoxon signed rank test). Note that no lying occurred on the unbedded (concrete) area. The total height of the two columns combined equals 100%.

patterns or time budgets for the time period 1900 to 0600. Overall, time budgets were $51.5 \pm 4.6\%$ SEM standing, $30.3 \pm 3.2\%$ eating, $12.6 \pm 2.7\%$ lying, $2.7 \pm .60\%$ walking, and $2.9 \pm .63\%$ in other activities.

Experiment 2. Straw vs Wood Shavings. Each pony was observed for an average of 66 ± 4 h of observation. The mean percent time spent on a bedding material was $52.5 \pm 6.4\%$ on wood shavings vs $47.6 \pm 6.4\%$ on straw ($P = .239$) (Figure 2). Neither the total time spent on each type of bedding nor the time spent eating, standing, lying, or eliminating was significantly different on each bedding material. The time budgets were $45.2 \pm 3.8\%$ standing, $37.9 \pm 3.4\%$ eating, $12.2 \pm 2.6\%$ lying, $2.5 \pm .56\%$ walking, and $2.24 \pm .33\%$ in other activities. If all the activities in which the ponies were standing (standing plus eating, grooming, etc.) are combined, the ponies spent 85% of their time standing.

There were individual differences in bedding preference and side (right vs left) preference. Three ponies spent $>59\%$ of their time on wood shaving bedding. These ponies included one mare and two stallions. Two other stallion spent $>74\%$ of their time on straw bedding. Four ponies spent roughly an equal amount of time on

both the woodchip and straw bedding. Three of these four ponies had a preference for the right side of the stall, and spent 65.5%, 76.1% and 60.2% of their time on the right side, respectively. One of the four ponies preferred the left side of the stall and spent 69.6% of the time on the left. The overall mean preference for a side of the stall was not significant ($P = .407$).

Discussion

The ponies in this experiment showed a clear preference for bedded over nonbedded area. These preferences are similar to those of dairy cattle (Natzke et al., 1982) and of pigs (Fraser, 1985). The choice an animal makes appears to depend on whether it is standing or lying, i.e., on its activity state. Horses spend most of their time standing (Ruckebusch, 1972). While standing or eating, the horse may choose a surface that is more resilient. When choosing a place to lie down, they may be influenced not only by the softness of the surface, but also by the texture and insulative properties. The ponies' choice was clearly evident; they did not lie down on the concrete at all. If the experiment had not included the

TABLE 1. NIGHTTIME BEHAVIORS OF STALLED PONIES^a

Behavior	Time budgets by hours											
	1900	2000	2100	2200	2300	2400	0100	0200	0300	0400	0500	0600
Other	3.31 ± .50	2.48 ± .75	2.93 ± .58	3.40 ± .89	2.50 ± .59	2.99 ± .88	2.34 ± .54	2.78 ± .54	3.41 ± .59	3.11 ± .91	2.89 ± .75	3.39 ± .94
Lying	6.51 ± 2.73	7.20 ± 2.02	5.10 ± 2.31	10.94 ± 4.52	12.49 ± 4.48	14.05 ± 3.50	21.19 ± 6.13	15.00 ± 3.30	18.64 ± 3.75	16.33 ± 4.03	15.28 ± 5.13	7.60 ± 2.77
Walking	2.49 ± .56	1.91 ± .54	2.44 ± .57	1.85 ± .42	2.30 ± .74	2.21 ± .70	1.89 ± .37	1.84 ± .48	1.91 ± .51	3.09 ± 1.41	5.03 ± 2.95	5.40 ± 2.35
Standing	45.75 ± 6.61	54.66 ± 4.58	45.76 ± 4.86	50.26 ± 5.44	45.41 ± 7.65	54.50 ± 3.06	47.66 ± 5.67	54.28 ± 5.41	55.98 ± 5.37	49.6 ± 6.50	53.10 ± 6.65	55.41 ± 4.97
Eating	41.48 ± 6.88	33.94 ± 5.13	43.74 ± 5.90	32.83 ± 4.59	37.3 ± 5.57	26.53 ± 2.55	26.91 ± 4.93	26.14 ± 3.74	20.05 ± 4.34	27.90 ± 5.31	23.15 ± 3.87	28.21 ± 4.19

^aN = 8 (2 geldings, 3 stallions and 3 mares).

^bMean ± SEM % total time budget. Each hour adds up to 100%.

^cOther behavior includes eliminating, grooming, masturbating and flehmen.

horse's normal sleeping hours of 0200 to 0500, the main effect may not have been observed, because daytime observations of the horses might not have revealed the preference for a bedded area and certainly would not have included much lying time.

Lying occupied a small part of the ponies' time budget, but that time is particularly important because, although horses can experience slow wave sleep while standing, they must lie down in order to undergo REM or paradoxical sleep (Dallaire and Ruckebusch, 1974; Hale and Huggins, 1979). The time at which most lying (and REM sleep) occurs is between midnight and 0500, as shown in Table 1 and in other studies of nocturnal behavior of horses (Keiper and Keenan, 1980). In the absence of suitable bedding, for example when they are housed on concrete or in a muddy paddock, horses may remain standing and become deprived of sleep.

The experiment evaluating the preference for bedding over no bedding was performed in the winter; different results might have been obtained in the summer. For example, Fraser (1985) found that, when straw was used as the bedding material and a bare concrete floor represented the unbedded area, the pigs' choice depended on the environmental temperature. At warmer temperatures they chose to rest on the concrete side, whereas at cooler temperatures they chose to rest on the straw. Evidently, the concrete provided a cool surface for relief from the heat, whereas the straw provided a means of conserving body heat at cooler temperatures. Horses may act similarly, but it should be noted that pigs lie down more often than horses do, and pigs, unlike horses, do not sweat, and therefore must regulate their body temperature by other means. Thus, pigs would be more apt than horses to use bedding to conserve body heat and concrete to reduce body heat.

There was not a marked preference for wood shavings, the material most familiar to the animals, suggesting that previous exposure was not a major factor. The two geldings had extensive exposure (years) to wood shaving bedding as well as to bare concrete. The other ponies had been on pasture with some exposure to wood shavings (run-in shed during winter months). There was no consistent preference in bedding type with regard to age or gender.

In the experiment in which two different beddings were tested, the ponies had individual

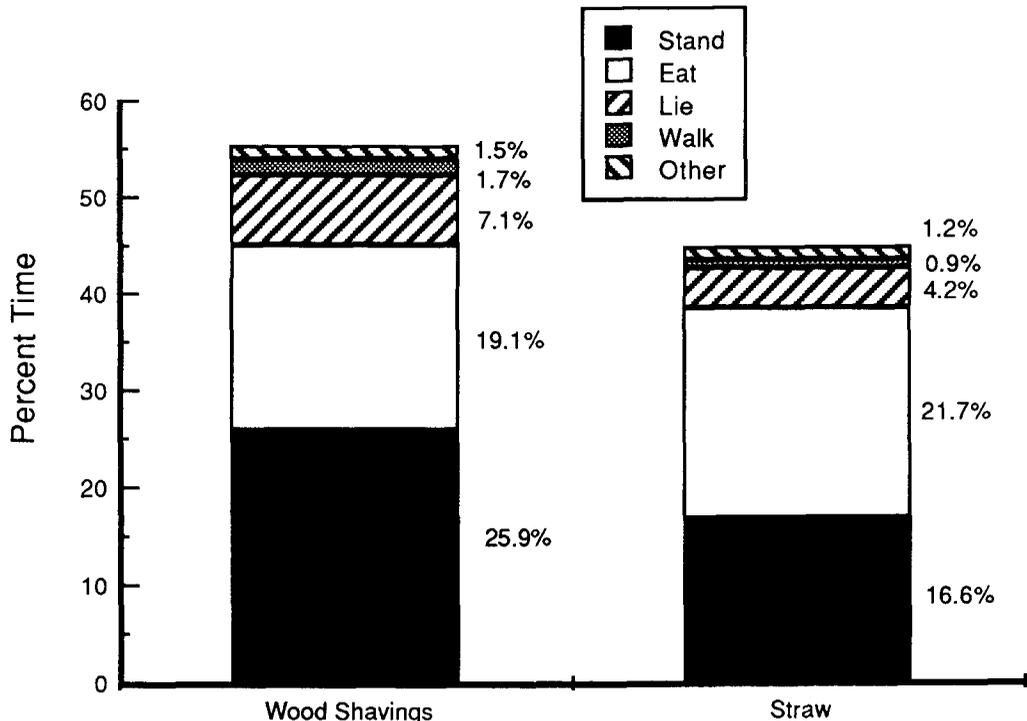


Figure 2. The percentage of time ponies spent on areas bedded with wood shaving and with straw. There was no significant difference between the time spent in each area. The total height of the two columns combined equals 100%.

preferences: three ponies preferred wood shavings and two preferred straw. The ponies that preferred straw had a stronger preference and spent >75% of their time on straw, whereas those that preferred wood shavings spent >59% of their time on wood shavings. Three ponies spent equal amounts of time on both bedding materials and had a preference for the right side of the stall. Only one pony, which did not show a definite bedding preference, had a preference for the left side of the stall.

Weather and temperature also may have influenced the bedding preferences. The six stallions in the second experiment were tested during the summer months of June and July, whereas the mares were tested during the winter months of January to March. The insulation value of straw (.6 R/cm) is greater than that for wood shavings (.4 R/cm). Straw is less able to conduct heat than are wood shavings, and therefore, it is a better insulating material. Thus, the mares, tested in cooler weather, would be expected to prefer straw over wood shavings. However, none of the mares preferred straw. Yet, two of the stal-

lions, although tested in the summer, did. Apparently, the difference in insulation values was not great enough to influence their preference. As in the first experiment, such factors as the texture, smell and dustiness of the bedding, the depth of the bedding, and the age and gender of the ponies could have influenced the results of the experiment.

In the second experiment, the time budgets for the ponies on the different bedding materials were not significantly different. That is, their activities on both beddings were quite similar; most of their time was spent standing and eating, and less time was spent lying, walking and engaging in other activities. This is another indication that the ponies did not consistently perform a behavior on one particular bedding.

In conclusion, this study showed that ponies strongly prefer bedding for lying. When given a choice of two beddings, all ponies do not have the same bedding preferences, but instead they have individual preferences for bedding material. Also, some ponies may be indifferent about their bedding material or they may have

a side preference. There was no significant overall preference for either wood shavings or straw. Further experimentation might be directed toward establishing preferences for some of the more exotic bedding, such as shredded paper or stall mats. Preferences for dirt or wooden floors in comparison to concrete floors (with and without added bedding) also should be evaluated. The effect of various flooring materials on the horses' limbs also should be investigated because flooring affects other ungulates such as swine (Newton et al., 1980).

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