Behavior of Untethered Horses during Vehicle Transport

Ryo KUSUNOSE[1] * and Kyoko TORIKAI[2]

[1]Equine Research Institute, Japan Racing Association, 27–7 Tsurumaki 5-chome, Setagaya-ku, Tokyo 154 and [2]Laboratory of Anatomy and Physiology, College of Agriculture and Veterinary Medicine, Nihon University, 1866 Kameino, Fujisawa-shi 252, Japan

J. Equine Sci.
Vol. 7, No. 2
pp. 21–26, 1996

To determine the reasonable direction for loading horses during transportation, we loaded 12 yearling Thoroughbred horses in pairs into a horse-carrying vehicle, and without tethering them, drove with either minimal acceleration and deceleration (normal travel group) or repeated sudden stops (abrupt stop travel group). As we investigated how these horses behaved and postured inside the vehicle throughout repeating trials, we observed the following: 1) While the vehicle was on the road, the horses exhibited significantly less feeding behavior ($P<0.01$) and significantly more standing ($P<0.01$) than while the vehicle was parked. 2) In the normal travel group, the frequency with which the horses changed direction inside the vehicle decreased significantly ($P<0.01$) with repeated trials. Moreover, the horses' behavior of facing away from the direction of travel increased significantly ($P<0.01$). 3) In the abrupt stop travel group, the number of direction changes made by the horses inside the vehicle did not decrease, and no tendency was observed in the direction the horses preferred to face during the repeated trials. Consequently, it was suggested that transporting restrained horses with their heads facing backward is a rational way.

Key words: *horse, behavior, transport*

Transportation can be a significant stressor to horses [2, 4, 5]. Therefore, reducing the stress is considered necessary for the prevention of diseases and from the aspect of animal welfare, as well as for ensuring the capability of the horses. Usually horses are transported restrained with their heads facing in the direction of travel. This forward-facing direction is thought to be selected for the sake of convenience at their loading. Recently, some researchers reported that transporting horses with restraining their facing away from the direction of travel was more advantageous because of the horses' body structure [1, 3, 6]. In the study of Clark *et al.* [1], horses were transported facing in the direction of travel or facing in the opposite direction. They found rear-facing horses had fewer losses of balance and fewer impacts against the sides and ends of the trailer. From these results, they concluded that having horses face away from the direction of travel was the most advantageous transport position.

In considering the direction in which horses should be transported, the horses' voluntary choice during travel in the vehicle thought to be effective as an index. Smith *et al.* [6] transported horses on a trailer without tethering them and compared their voluntary orientation during travel to that when the trailer was parked. They found that horses faced away from the direction of travel with greater frequency during travel than when the trailer was parked. In their study of the direction of horses during travel, they did not consider the changes with time until the horses' orientation was fixed. Since horses may continue to learn with repeated trial and error as to which direction is comfortable for them during travel, it is important to examine the time course until the horses' orientation is fixed.

In this study, we transported horses on a vehicle without tethering them, drove the vehicle intermittently, and observed the behaviors and postures of the animals inside the vehicle throughout many trials. We intended to examine the reasonable direction for loading horse during transportation by observing the direction that horses come to choose voluntarily during travel from repetitive trials. We set up two groups: one for which the vehicle maintained smooth travel (the normal travel

This article was submitted November 15, 1995 and was accepted May 30, 1996.
*corresponding author.

group) and one for which the vehicle provided intermittent abrupt stops during travel (the abrupt stop travel group). We hypothesized that repetitive abrupt stops during travel promotes the learning speed of the horses, thus clarifying the horses' preference.

Materials and Methods

1) Horses and vehicle

Six male and six female Thoroughbred horses at the age of 14–16 months were used as subjects. These horses had been raised, grazing in two groups separated by sex, at Hidaka Yearling Training Farm in Hidaka region, Hokkaido, since 6 months before the study. Each animal had been transported in a six-horse vehicle when it was about nine months old.

The vehicle used in this study was a six-horse vehicle. For this study, all of the existing stalls inside the vehicle were removed and a partition wall was installed across the center (Fig. 1). The room close to the front of the truck was used as an observation room and the room close to the rear of the truck was used as a loading room. The loading room was 3.5 m in length and 2.1 m in width, and its floor was covered with rice straw. Timothy hay was hung in hay nets at the four corners. A observer recorded the horses' behavior through a horizontal slit low in the partition wall. In addition, two video cameras (Victor, GR-AW1) were installed high on the partition wall to record the horses' behavior.

2) Experimental method

The horses were assigned to six same-sex pairs; then three pairs were randomly assigned to the normal travel group and the other three pairs were placed in the abrupt stop travel group. In the experiment, each pair experienced five consecutive sessions; each session consisted of a 20-minute parking period, a 20-minute idling period, and a 20-minute driving period. During travel, the vehicle carrying the normal travel group moderately stopped and started at each street corner only. The vehicle carrying the abrupt stop travel group stopped and started at each street corner in the same way as the vehicle carrying the normal travel group, but also stopped abruptly five times in one driving period. An abrupt stop was determined to be the braking applied at the speed of 65 km/hr that would stop the vehicle in approximately five seconds.

3) Experiment site

The experiment was conducted by driving on a paved public road with little traffic. The distance traveled in

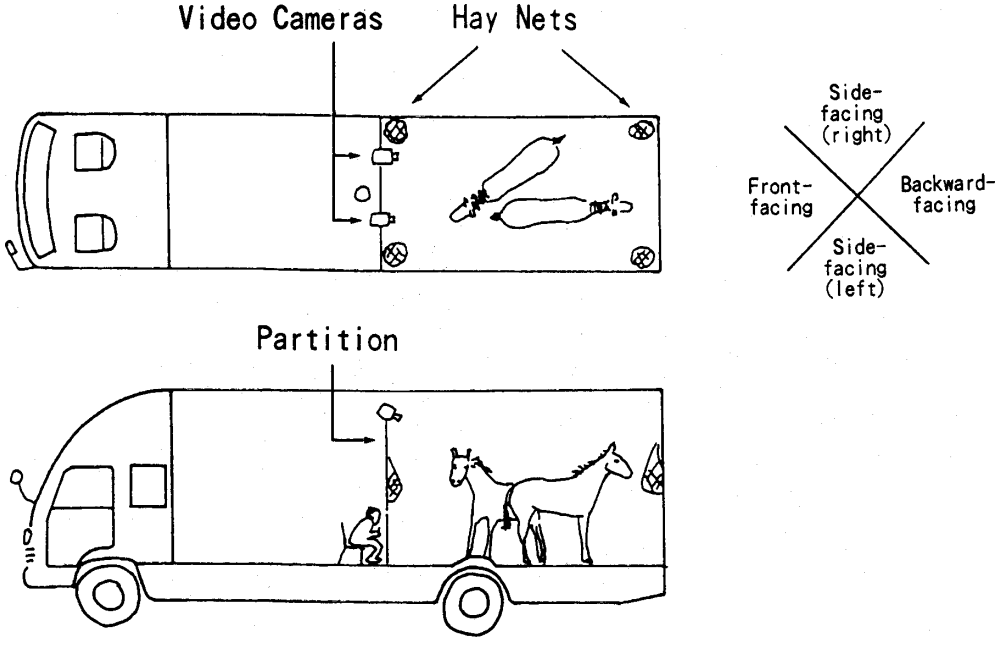

Fig. 1. A drawing of the vehicle used in this experiment and facing direction. The inside of the vehicle was divided with a partition wall: the area nearest the front of the truck was used as an observation room, and the area nearest the rear of the truck was used as a loading room. The horses' behavior was observed through a horizontal slit (15 cm × 2 cm) made in the lower part of the partition wall.

one session was about 19 km. Along the route, there were 8–12 corners which were almost right-angled. During the parking and idling periods, the vehicle was placed in a quiet parking area. The ambient temperature during the experiment remained within the range of 15–21°C.

4) Observation of the horses' behavior

The behavior and facing direction of the two horses were recorded at intervals of one minute.

Behavior was classified into five types: feeding (feeding hay or bedding), standing (resting or holding their balance), walking, and social interactions between peers, and other behavior which included grooming and excreting. Direction was noted as one of four possibilities: facing the front of the vehicle, facing left, facing right, or facing backward. When a horse changed its direction by more than 90 degrees in a minute, one change of direction was recorded. The horses' movement at abrupt stops was also examined from videotapes. The direction each horse was facing immediately before the brake was applied and the degree of loss of balance immediately after the brake was applied were recorded. The degree of loss of balance was determined as follows:

0: kept balance
1: less than three steps taken despite a slight loss of balance
2: more than three steps taken to keep balance or balance was lost, with a part of the horse's body hitting against some part of the interior.

5) Statistical analysis

Data were analyzed using a nonparametric method. To study the frequency of each behavior type, data from each of the five sessions were pooled, and the Friedman rank test was performed for each behavior type between the normal travel group and the abrupt stop travel group. In cases where a significant difference was found by this test, multiple comparisons were made by the sign test. In analyzing the number of direction changes and transition of horses' direction, the page test was performed to examine the significance of any trends. Regarding the relation between balance and horse's direction, significance was tested using the χ^2 test. Difference were considered significant if $P<0.05$.

Results

1) Behavior

There was no significant difference between the normal travel group and the abrupt stop travel group in the appearance rate of five types of behavior in each period of parking, idling, and driving. Then, data from the normal travel group and the abrupt stop travel group were combined and the average appearance rate of each type of behavior was calculated, with the results shown in Fig. 2. The appearance rate of feeding behavior was the highest in the parking period (67.0%), followed by the idling period (64.0%) and the driving period (10.5%). There were significant differences between both the parking and driving periods ($P<0.01$), and the idling and driving periods ($P<0.01$).

The appearance rate of the standing state was highest in the driving period (75.3%), followed by the idling period (24.8%) and the parking period (17.9%). There were significant differences between both the parking and driving periods ($P<0.01$) and the idling and driving periods ($P<0.01$). Regarding the appearance rates of other three types of behaviors, there was no significant difference among the three periods.

2) Head direction during driving

The direction of the horse's head during the driving period was recorded as being either front-facing, side-facing (including facing left and facing right), or backward-facing for each session, and a test for any trends was performed. As a result, in the normal travel group, there were no significant trends of increase or decrease in the frequencies of front-facing and side-facing, but the frequency of backward-facing significantly increased with the number of trials (Fig. 3, $P<0.01$). In the abrupt stop travel group, there was no statistically significant changes in any orientation (Fig. 4).

3) Change of direction

The number of direction changes in the normal travel

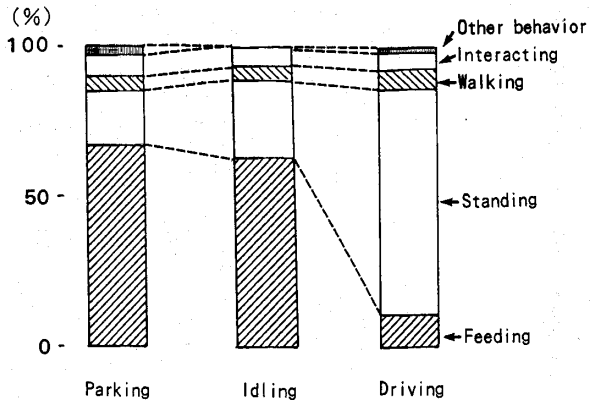

Fig. 2. Appearance rate of each type of behavior.

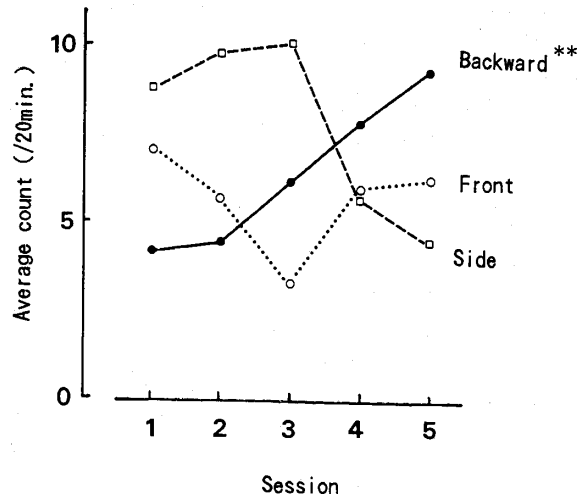

Fig. 3. Change in head direction of horses in the normal travel group during the driving period by trial number. **: indicates a statistically significant increase ($P<0.01$).

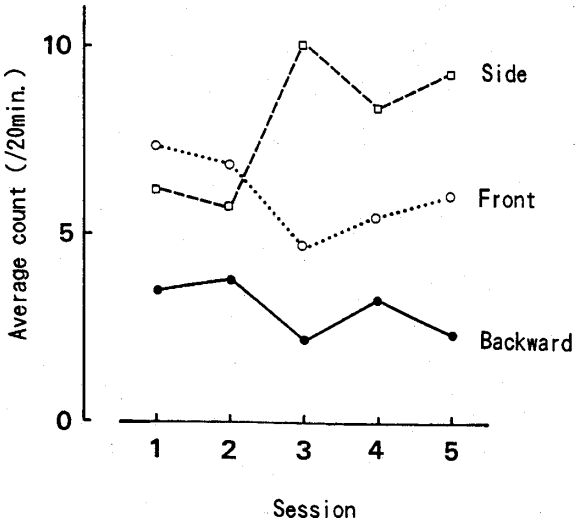

Fig. 4. Change in head direction of horses in the abrupt stop travel group during the driving period by trial number.

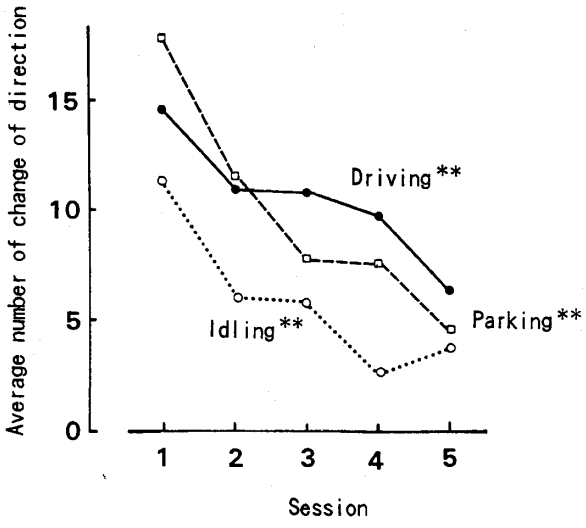

Fig. 5. Change in the number of direction changes in the normal travel group by trial number. **: indicates a statistically significant decrease ($P<0.01$).

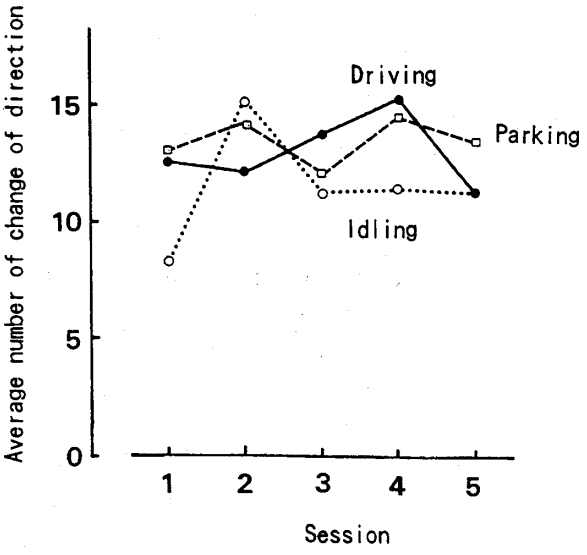

Fig. 6. Change in the number of change of direction of horses in the abrupt stop travel group by trial number.

group significantly decreased as the trials were repeated in any period of driving, parking, and idling (Fig. 5, $P<0.01$). On the other hand, in the abrupt stop travel group, there was no significant change in the number of direction changes in any period (Fig. 6).

4) Orientation and balance

In the abrupt stop travel group, the degree of loss of balance at the abrupt stop was classified based on the head direction of horses just before the abrupt stop and the resulting scores were totaled (Table 1). The rate of 0-degree was highest when the horses were backward-facing (17.1%) and the rate of 2-degree was highest when the horses were side-facing (32.9%), while there were no statistically significant differences among orientations.

Discussion

Since yearling horses were used in this study, they may

Table 1. Relation between facing direction and degree of loss of balance at the time of abrupt stops

	Degree of loss of balance			
Facing direction	0	1	2	n
Front	10.5%	68.4%	21.1%	38
Side	9.6%	57.5%	32.9%	73
Backward	17.1%	65.7%	17.1%	35

change their behavior greatly when they are kept alone. Therefore, we performed this experiment using pairs to eliminate the effect of isolation. Also, to vary the appearance of the behaviors that are the indices of assessment, the environment inside the horse-hauling vehicle was created stable conditions where the horses are usually fed. As a result, the appearance rates of the feeding behavior and the standing state were clearly different between the parking and driving periods and between the idling and driving periods. The reduced rate of feeding behavior and the increased rate of the standing state during the driving period is thought to be the result of the horses' efforts to keep their balance against the tremor of the driving motion during travel and the forces of acceleration and deceleration. In the idling period, there was a trend of a slightly lower rate of the feeding behavior and a higher rate of the standing state as compared with the parking period, though it was not statistically significant. This suggests that the slight tremor of the vehicle or the noise of the engine during the idling period may affect the horses' behavior.

In the early stage of experiment, the horses in both the normal travel group and the abrupt stop travel group frequently faced in the direction of travel. Although the loading room was remodeled so that the interior conditions of the front and the back are almost the same, the existence of an observer inside the observation room in the front, though blocked from the horses' view, may have affected the facing direction of the horses in the early stage of the experiment.

In the normal travel group, the horses' movement decreased and the frequency of facing backward increased with the repetition of trials. These results suggest that horses in the normal travel group learned that facing backward is advantageous for them during transport. Smith *et al.* [6] also found that there was a significantly higher frequency of horses facing backward during the driving period than during the parked period when the horses were loaded onto trailers without being tethered.

On the other hand, in the abrupt stop travel group, no significant change was observed regarding either the head direction or the number of direction changes with the repetition of trials. This suggests that due to the strong impact of the abrupt stops, the horses could not accommodate themselves to the environment until the end of the experiment and then repeated a random change of direction. In particular, since the number of direction changes did not decrease with the number of trials either in the parking or idling periods, it appears that the abrupt stops created constant and tremendous stress for the horses.

Clark *et al.* [1] transported horses, restraining them facing forward and backward, and observed the various phenomena that arose under the circumstances. As a result, they reported that backward-facing horses were better able to maintain their balance and had evidently fewer impacts against the inside walls of the vehicle. Although statistical significance was not observed in our study, a horse's body was most stable against abrupt stops when the horse was facing backward rather than forward. Further results suggest that it is most difficult for side-facing horses to maintain their balance when the vehicle stops abruptly.

Consequently, it was suggested that transporting restrained horses with their heads facing backward is a rational way, because the frequency of facing backward increased with the repetition of trials in the normal travel group. More detailed experiments have to be conducted in order to examine why horses choose voluntarily facing backward during vehicle transport.

Acknowledgments

The authors extend warm thanks to Mr. Masao Takaya, Equine Research Institute and the staff of the Hidaka Yearling Training Farm for their great cooperation in implementing this study. We are also grateful to Dr. Shigeyoshi Takagi, Dr. Masa-aki Oikawa, Equine Research Institute and Professor Takao Nishida, Nihon University for their valuable advice.

References

1. Clark, D.K., Friend, T.H., and Dellmieier, G. 1993. The effect of orientation during trailer transport on heart rate, cortisol and balance in horses. *Appl. Anim. Behav. Sci.* 38: 179–189.
2. Codazza, D., Maffeo, G., and Redaelli, G. 1974. Serum enzyme changes and haemato-chemical levels in Thoroughbreds after transport and

exercise. *J. S. Afr. Vet. Assoc.* 45: 331–334.
3. Cregier, S. 1982. Reducing equine hauling stress. A review. *J. Equine Vet. Sci.* 2: 186–198.
4. Leadon, D., Frank, C., and Backhouse, W. 1989. A preliminary report on studies on equine transit stress. *J. Equine Vet. Sci.* 9: 200–202.
5. Owen, R.R., Fullerton, J., and Barunum, D.A. 1983. Effects of transportation, surgery, and antibiotic therapy in ponies infected with salmonella. *Am. J. Vet. Res.* 44: 46–50.
6. Smith, B.L., Jones, J.H., Carlson, G.P., and Pascoe, J.R. 1994. Body position and direction preferences in horses during road transport. *Equine Vet. J.* 26: 374–377.