



(RESEARCH ARTICLE)



How frequently do and what time Thoroughbred and Haflinger breeding horses perform particular behaviors in paddock areas?

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Abstract

The purpose of this study was to evaluate the frequency and time of specific behaviors in Thoroughbred and Haflinger horses reared in outdoor paddock environments. Therefore, 2 Thoroughbred and 2 Haflinger horses were used in the study, and the data were collected by video recording (112 hours in total) between 09:00 and 16:00 (7 h/day) for 16 days. Some behaviors examined during this period; eating from the hay rack, drinking water, grazing on the pasture, walking, running, standing, being next to the other horse and other activities (Rolling, lie down, etc.).

Considering the total number of behaviors performed in both horse breeds, it was observed that Thoroughbred horses (154.82 times - 7 h/day) made more daily movements than Haflingers (134.63 times - 7 h/day). When the behavior of the horses in the paddock is assessed based on breed, Thoroughbreds were seen to repeat eating from the hay rack, drinking water activities significantly ($P < 0.05$) more frequently than the other breed, as were Haflingers when grazing on the pasture.

There was no statistically significant difference in breeds among hours ($P > 0.05$), but when the repetition or intensity results of the movements were examined according to the study hours, it was discovered that the hours with the largest total number of movements were between 11:00 and 15:00.

As a result, it has been determined that the behavior activities of Thoroughbred horses is more in an outdoor paddock area during the 09:00-16:00 hours of the day compared to Haflinger horses.

Keywords: Behavior; Breed; Horse; Paddock; Times

1. Introduction

It is advised that horses spend at least a portion of the day in close proximity to one another in a paddock, pasture, or group shelter. While this facilitates socializing, it also helps young horses learn to interpret other horses' signals and establish some basic social behavior patterns. For this reason, paddock spaces are favored for horse breeding [1].

In general, the term "paddock" refers to outdoor spaces where horses are allowed to graze freely. In these places, horses can move around, walk, feed, and take part in various activities. In contrast to their shelters, these spaces allow horses to move about more freely and enjoy themselves [2].

A general rule is that each horse should have a minimum of 330 m² of paddock, and no paddock should be less than 800 m² when used primarily for turnout. Larger pastures are required to provide adequate grass [1]. There isn't much proof, though, that these specific paddock sizes are big enough for exercise and other activities [3].

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The welfare of animals may suffer if certain physical areas are restricted [4,5]. According to current research, individual housing of horses in their stalls has a detrimental impact on their welfare and as a result, horses need a specific amount of time to wander about freely [6].

It may be assumed that the time spent in the eating and drinking areas in these areas makes up the majority of the daytime when prior research [7,8] are taken into consideration. The horses in the paddock areas spend the majority of their day time feeding. According to a research by Harris et al. [9], horses on pasture spend significantly more time chewing their food than horses given hay and grain.

Horses should spend at least a portion of the day in complete physical contact with one another in a paddock, pasture, or group shelter. This enables young horses to interact with one other, learn how to read other horses' signals, and establish some basic social behavior patterns [1,10].

For feral horses, feeding takes up around half of their daily time budget and typically involves grazing. Resting takes up roughly 25–35% of a person's day, which is the second-largest portion of their daily time budget. Locomotion (jumping, trotting, walking, galloping, cantering, swimming, etc.) takes up the third-largest amount of time in the daily time budget of feral horses. Grooming activity, which takes up a minor fraction of the daily time budget of feral horses, is frequently seen as rolling [11].

Studying more fundamental behavioral studies for horses is advised since it might be challenging to create an ethogram from hundreds of behavioral patterns [11]. Although several individuals have described how horses behave, those made by McDonnell [12] rank among the best. More in-depth information may be found in Waring's [13] ethogram resource on horse behavior.

In this study, it is aimed to determine how many times and what time a day some behaviors of horses (Thoroughbred and Haflinger bred) in the paddock area (eating from the hay rack, drinking water, grazing on the pasture, walking, running, standing, being next to the other horse and other activities) are repeated. And another aim, it is to determine the number of behavioral movements in the examined time intervals during the day.

2. Material and methods

Each paddock had 16 tests on each breed (2 horses x 8 days) during the course of the 16-day research, totaling 32 tests on two breeds. Each paddock was given a group of horses and one horse, either a Thoroughbred or a Haflinger.

The investigation was conducted in two fenced-in outdoor paddock areas between the hours of 09:00 and 16:00. The animals spent seven hours each day (09:00–16:00 h) in the paddock before returning to their stalls. The paddocks had an approximate 20 x 40 m² space and were unprotected from the sun or other bad weather. Equivalent environmental elements were supplied for the examination of horses of two different breeds when they were placed side by side in the paddock areas, making the rate of exposure to those environmental factors comparable.

No permissions or ethics committee approval were required to conduct the study because the horses weren't trained for any exercise during the examination.

2.1. Horses

Two Thoroughbred horses (two geldings) and two Haflinger horses (two mares), with a mean age of 10 years (range: 6-18 years), were observed. The Haflingers' and Thoroughbred horses' average body weights were determined to be 485.62 ± 20 kg and 493.36 ± 20 kg, respectively. The health and condition of the horses were evaluated by observers and equestrians. The horses were given a daily diet of 0.5-1 kg of concentrated feed and 1-2 kg of roughage per 100 kg of body weight, and they were free to graze in the paddock. Throughout the trial, the horses had the same daily diet, no extra food was given, and no activity was required of them. Both of the horse breeds employed in the study (Thoroughbred and Haflinger) belong to the group of warm-blooded horse breeds known as cultural breeds and have unique temperaments [14]. For this reason, while planning the research material and method, the evaluation was more meaningful since both breeds were warm-blooded.

2.2. Camera and recording system

A video camera (Haikon, Copyright Hikvision Digital Technology Co., Ltd., Hangzhou, China) was used to capture images of the horses in the paddocks at a distance of roughly 24 meters. During the experiment, a digital video recorder

(Hikvision, Copyright Hikvision Digital Technology Co., Ltd., Hangzhou, China) was linked to the video camera and programmed to record for 7 hours between 9:00 and 16:00 h. (16 days).

2.3. Observations

In July–August month of 2019 year, the horses' behavior was tracked for 16 days, and seven hours were allotted for one observation day (total 112 h). The descriptions of the behaviors recorded during the observations of the horses are shown in Table 1. Also, in order for the behaviors not to interfere with each other, a period of about 5 seconds or longer [15] was waited between the two behaviors and then the other behavior was started. Thus, the transition between the behaviors was determined more clearly.

Table 1 Definition of behaviors recorded during observations (for 5 s or longer)

Behavior	Observation
Being next to the other horse	Time spent with the other horse area
Eating from the hay rack	Mouth and/or chew hay or leaves on the hay rack
Grazing on the pasture	With head lowered to ground, take grass into mouth and chew on pasture
Drinking water	Water drinking from a bucket
Standing	Standing, standing alert, sniffing, resting, huddling (no feeding, locomotion)
Walking	Move forward with a slow
Running	Move forward with a trotting or canter and gallop
Other activities	Rolling, Lying down, etc.

2.4. Statistical analysis

The research data watched from the camera recordings were taken as numbers (times 7 h/day). In other words, certain behaviors of horses (*Equus caballus*) in open air paddock areas were determined according to the numerical number of movements during the day (7 h/day), in other words, the frequency of movements. In addition, the number of behavioral movements made in the time budgets (09:00-10:00, 10:00-11:00, 11:00-12:00, 12:00-13:00, 13:00-14:00, 14:00-15:00, 15:00-16:00) determined in the research was examined numerically.

The results of this study are presented as estimated marginal means and standard error of the mean (SE), also standard deviation of the mean (SD). In the case of an analysis (general linear model) revealing a significant difference, differences were considered significant at $P < 0.05$. Data were analysed by using IBM SPSS Statistics for Windows (Version 25, IBM Corp., Armonk, NY, USA).

3. Results and discussion

There is little information available to indicate how many movements the horses made during daylight hours in an outdoor paddock. For this reason, it is thought that very useful information is presented with the results of this research. Also, the basic needs of horses have been claimed to be social companionship, social contact, free movement and access to roughage [16]. In this research, horses were observed in the open paddock area and these needs were met.

3.1. Evaluation of behaviors according to breeds

During the 16-day trial, the daily average number (Means \pm SE times - 7 h/day) of behaviors of both breeds, which were monitored for 7 hours a day, are presented in Table 2. The behavior activities of horses in overall average times indicated that the time horse spent to standing, drinking water, grazing on the pasture, eating from the hay rack, being next to the other horse, walking, running, other activities (rolling, lie down, etc.) were about times - 7 h/day 37.84, 30.91, 30.50, 18.56, 13.53, 12.97, 0.28, 0.13, respectively.

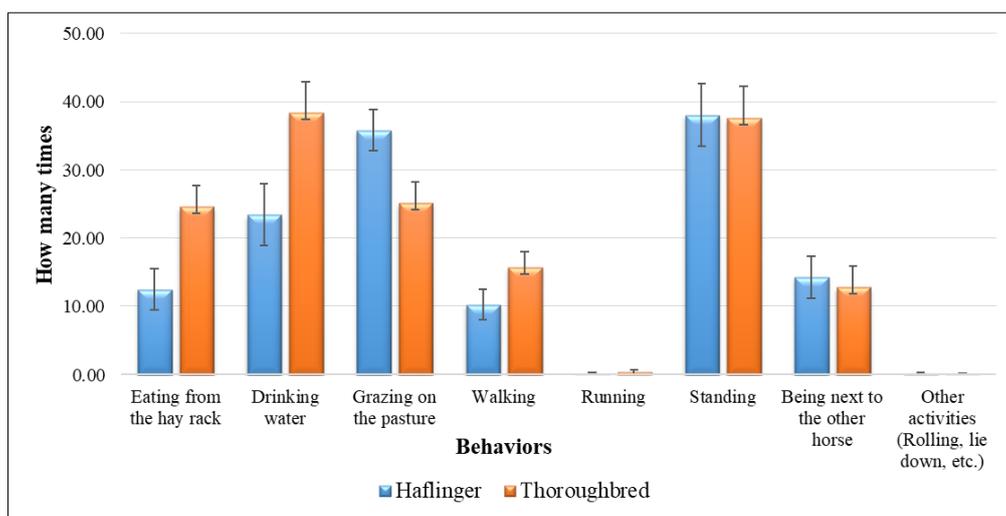
In a study in which daily activities were evaluated as a percentage, the most time-consuming activity was found to be standing [17]. In parallel with these findings, in this study, it was observed that the number of standing behaviors was repeated during the day more than other behaviors.

Table 2 Observations of the behavior of the horses of both breeds in the paddock area (Means \pm SE times - 7 h/day)

Behaviors	Means	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Eating from the hay rack	18.56	2.14	14.18	22.94
Drinking water	30.91	3.21	24.36	37.45
Grazing on the pasture	30.50	2.11	26.20	34.80
Walking	12.97	1.59	9.73	16.21
Running	0.28	0.14	-0.01	0.57
Standing	37.84	3.28	31.16	44.53
Being next to the other horse	13.53	2.22	9.01	18.06
Other activities (Rolling, lie down, etc.)	0.13	0.10	-0.08	0.33

Some researchers stated that, horses devote a large part of their daily activity to feeding [7,8,11,18,]. However, in the results of this research, when we look at the amount of time (times) per day, or in other words, when we look at the most repeated movement, it has been observed that the standing movement is repeated more by the horses.

Considering the total number of behaviors performed in both horse breeds, it was observed that Thoroughbred horses (154.82 times - 7 h/day) made more daily movements than Haflingers (134.63 times - 7 h/day). In general, Haflingers make wonderful family horses because of their laid-back personalities. The breed is renowned for having a very gentle and friendly demeanor. Additionally, it is quiet, which indicates that it does not readily frighten or become overexcited. The Haflinger is a gentle horse that is appropriate for riders of all ages and skill levels because of its kindness and tranquility [19]. Thoroughbred horses are a smart, active breed with a strong work ethic. They may also be brash and energetic, therefore an equestrian with more experience would be more suited to ride them than a novice. Thoroughbreds excel at racing, but their disposition also makes them excellent all-arounders. You can find them on the trails and in dressage arenas. The temperament of a Thoroughbred horse also has a nurture component, as they may be more difficult to retrain for regular riding because of their long history of racing [20]. This temperament difference in Thoroughbred and Haflinger horses, in other words, Thoroughbred horses being more lively, more agile and more active than Haflinger horses were found in parallel with the findings of our research. For this reason, it is recommended to employ more professional breeders in the breeding of Thoroughbred horses.

**Figure 1** Daily averages of the behaviors of both breeds

When the data of the research is examined in Figure 1; It has been observed that Thoroughbred horses repeated the eating from the hay rack, drinking water, walking and running activities more than Haflinger horses. And so, it was determined that Haflinger horses repeated the grazing on the pasture, standing, being next to the other horse and other activities more than Thoroughbred horses. When we evaluate these results as statistical significance ($P < 0.05$); Thoroughbreds were seen to repeat eating from the hay rack, drinking water activities substantially more frequently than the other breed, as were Haflingers when grazing on the pasture (Table 3). Additionally, it was observed that the standing action was repeated more frequently than other movements when both breeds were analyzed together. Therefore, when the general results are evaluated, we can say that Thoroughbred horses are more active than Haflinger horses and this is due to genetic factors between breeds.

The behavior of Haflinger and Thoroughbred horses in the paddock area was analyzed separately in Table 3, and significant differences were found between the data of eating from the hay rack ($P = 0.008$), drinking water ($P = 0.027$) and grazing on the pasture ($P = 0.017$). However, differences in other behaviors (walking, running, standing, being next to the other horse and other activities) were insignificant. ($P > 0.05$). While the most performed behavior of Thoroughbred horses used in the research is drinking water (38.37 times - 7 h/day), the Haflinger horses' behavior is standing (37.63 times - 7 h/day).

Table 3 Observations of the behavior of the horses of Haflinger and Thoroughbred breed in the paddock area separately. (Means \pm SD how many times - 7 h/day)

Behaviors	Breeds	Mean	Std. Deviation	N	P
Eating from the hay rack	Haflinger	12.50	6.69	16	0.008
	Thoroughbred	24.63	15.79	16	
	Total	18.56	13.43	32	
Drinking water	Haflinger	23.44	13.51	16	0.027
	Thoroughbred	38.37	21.80	16	
	Total	30.91	19.39	32	
Grazing on the pasture	Haflinger	35.81	12.78	16	0.017
	Thoroughbred	25.19	10.97	16	
	Total	30.50	12.90	32	
Walking	Haflinger	10.25	8.36	16	0.097
	Thoroughbred	15.69	9.56	16	
	Total	12.97	9.26	32	
Running	Haflinger	0.13	0.34	16	0.284
	Thoroughbred	0.44	1.09	16	
	Total	0.28	0.81	32	
Standing	Haflinger	38.06	18.48	16	0.947
	Thoroughbred	37.63	18.57	16	
	Total	37.84	18.23	32	
Being next to the other horse	Haflinger	14.25	13.25	16	0.748
	Thoroughbred	12.81	11.77	16	
	Total	13.53	12.35	32	
Other activities (Rolling, lie down, etc.)	Haflinger	0.19	0.75	16	0.532
	Thoroughbred	0.06	0.25	16	
	Total	0.13	0.55	32	

Warm-blooded horse breeds are more active, that is, warm-blooded breeds show a cautious, active and sensitive temperament, while cold-blooded horse breeds show a slow, calm (docile), lymphatic temperament [14]. The two breeds used in this research are warm-blooded breeds. According to the total data obtained from the research results, we can say that Thoroughbred horses are more active than Haflinger horses in general. However, when the behaviors with statistically significant differences between breeds are examined; It has been determined that Thoroughbred horses have more eating from the hay rack and drinking water and Haflinger horses have more grazing on the pasture behavior.

The fact that the feeding behaviors of Thoroughbreds in eating from the hay rack and Haflingers in grazing on the pasture are significantly different may be due to the difference in temperament between the two breeds [19,20].

The amount of water required by horses may vary depending on a number of factors [21]. The horse should always have access to water for drinking. Some horse owners choose to fill the stall with water in the morning in the afternoon to water the horse, also make sure the horse gets the necessary amount of water each day [22]. In this study, water was constantly found in front of both breeds of horses and it was observed that Thoroughbred horses were more likely to drink water.

The two horse breeds (Thoroughbred and Haflinger) used in the research are warm-blooded horse breeds [14]. When we look at the number of movements in other behaviors (walking, running, standing, being next to the other horse and other activities), it can be said that there is no significant difference between the two breeds because of the warm-blooded breed in both breeds.

3.2. Evaluation of behaviors according to time budgets

When the review study of Krueger et al. [16] was examined, no study was found that examined the behavior of the horses in the paddock in terms of numbers (times-how many times) at any time of the day. Generally, the expressions of morning, noon, afternoon, evening or night were used as time intervals in the evaluation of behaviors in studies on horses in the outer paddock area, and also evaluated as a percentage. In this study, behaviors were examined separately for one hour (09:00-16:00) and 7 hours apart, also, the data has been given as times (pieces).

In this study, a statistically significant ($P = 0.002$) difference was determined between the data of the behaviors between the hours in the general total including both breeds (Table 4). When the hours examined in the study were evaluated, it was determined that the highest total number of movements occurred especially between 11:00 and 15:00 hours. When the research results of some researchers are examined, it has been determined that feeding is more intense in the morning hours than in the afternoon [8]. This nutritional state may be the explanation for the decrease in the movements of the animals in the morning hours. Because horses are busy with feeding and do not tend to other movements.

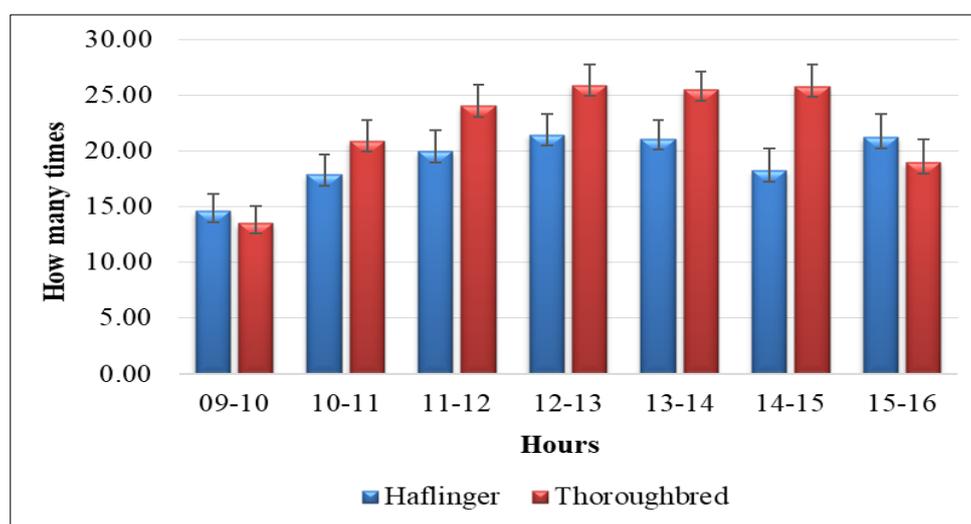
Table 4 Observations of the behavior of total data (both breeds together) in time budgets

Tukey HSD a,b			
Hours	N	Subset	
		1	2
9-10	16	28.19	
10-11	16	38.81	38.81
15-16	16	40.25	40.25
11-12	16		44.06
14-15	16		44.06
13-14	16		46.63
12-13	16		47.44
Sig.		.165	.553

Means for groups in homogeneous subsets are displayed. Based on observed means. The error term is Mean Square (Error) = 184.357; a. Uses Harmonic Mean Sample Size = 16.000; b. Alpha = .05.

Table 5 Observations of the behavior of Haflinger and Thoroughbred horses in the paddock area at time budgets

Time Budgets (Hours)	Breeds	Mean	Std. Deviation	N	P
9-10	Haflinger	14.63	8.08	16	0.728
	Thoroughbred	13.56	9.01		
	Total	14.09	8.44	32	
10-11	Haflinger	17.88	8.82	16	0.399
	Thoroughbred	20.94	11.26		
	Total	19.41	10.07	32	
11-12	Haflinger	20.00	10.41	16	0.291
	Thoroughbred	24.06	10.95		
	Total	22.03	10.71	32	
12-13	Haflinger	21.50	8.62	16	0.228
	Thoroughbred	25.94	11.58		
	Total	23.72	10.29	32	
13-14	Haflinger	21.12	7.54	16	0.185
	Thoroughbred	25.50	10.45		
	Total	23.31	9.24	32	
14-15	Haflinger	18.25	8.81	16	0.060
	Thoroughbred	25.81	12.76		
	Total	22.03	11.45	32	
15-16	Haflinger	21.25	12.57	16	0.586
	Thoroughbred	19.00	10.42		
	Total	20.12	11.42	32	

**Figure 2** The distribution of the number of behaviors during the research hours examined in both breeds

The observations of the behavior of Haflinger and Thoroughbred horses in the paddock on time budgets are shown in Table 5. When these data were evaluated during the hours of the day, no statistically significant difference was found between the breeds ($P > 0.05$). Both of the horse breeds employed in the study (Thoroughbred and Haflinger) belong to known as cultural breeds [14], so there may not be a difference in the time intervals observed.

However, when we examine the number of movements in the hour budgets on the basis of breed; While there was a statistically significant difference among Thoroughbred horses themselves ($P = 0.014$), no difference was found among Haflinger horses themselves ($P = 0.350$). In Thoroughbred horses, the maximum number of movements between 12:00 and 15:00 h and the least number of movements between 09:00 and 10:00 h were determined (Figure 2). When the time budgets examined in both breeds were evaluated, it was observed that they made at least 17.88 ± 8.82 movements in the remaining hours, except for the 09:00-10:00 hours in the morning. When the hour budgets with the most movement were examined, it was determined that there were 25.94 ± 11.58 hours between 12:00-13:00 hours.

4. Conclusion

When the behavior of the horses in the paddock is evaluated on the basis of breed; the eating from the hay-rack and drinking water of Thoroughbreds, and in grazing on the pasture of Haflingers were observed to repeat significantly more often than the other breed. But, the differences were founded in other behaviors (walking, running, standing, being next to the other horse, and other activities) were insignificant. In addition, when both breeds were evaluated together, it was seen that the standing movement was repeated more than other movements.

When the repetition or intensity results of the movements were evaluated according to the research hours, it was determined that the hours with the highest total number of movements were between 11:00 and 15:00, although there was no statistically significant difference in breeds within hours.

In conclusion, according to the overall average results of the study, it was observed that the behavior activities of Thoroughbred horses is more in an outdoor paddock area during the 09:00-16:00 hours of the day compared to Haflinger horses.

Compliance with ethical standards

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Disclosure of conflict of interest

There is no conflict of interest.

Statement of ethical approval

The present research work does not contain any studies performed on animals/humans subjects by any of the authors.

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