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A Preliminary Study on the Investigation of Learning Ability of Arabian Horses Through

Arap Atlarının Öğrenme Yeteneklerinin Araştırılması Üzerine Bir Ön Çalışma

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ABSTRACT

Knowing the behavioural responses of horses while planning the training processes is crucial in constituting the appropriate training program. The purpose of the study was to examine some behavioural and physiological responses of Arabian horses participating in flat races against the reactivity to human and fear tests. Within the scope of this study, 15 female Arabian horses aged between 2 and 8 years were subjected to reactivity to passive human test, reactivity to active human test, and handling tests from reactivity to human tests and the novel surface test, the static novel object test, and the startling novel object tests from fear tests. Significant relationships ($P < .05$) were detected between the agonistic behaviours of horses and maximum heart rate values in the passive human test, active human test, static novel object test, and startling novel object test. Active human test, it was determined that as the agonistic behaviours of horses increased, the distance to approach humans increased ($P < .05$). The novel surface test observed that as the horses' agonistic behaviours increased, the number of attempts to cross the surface successfully also increased ($P < .01$). In the handling test, increased agonistic behaviours caused the test time to prolong ($P < .01$). As a result, it was determined that various processes in training were prolonged in horses with high agonistic behaviours during the tests. It has also been determined that the trainability of horses may differ within the same breed and sex. For this reason, it is recommended to determine behavioural responses and to plan horse training individually. By understanding the trainability of horses, it is possible to achieve maximum efficiency for their benefit.

Keywords: Behavioural tests, equid ethogram, horse, learning theory, welfare.

ÖZ

Atların eğitim süreçleri planlanırken davranışsal tepkilerinin bilinmesi, uygun eğitim programının oluşturulması açısından önemlidir. Bu amaçla davranışsal testlerden yararlanılmaktadır. Araştırmaya 2-8 yaş arası, on beş dişi Arap atı katılmıştır. Davranışsal Testler kapsamında İnsana Karşı Tepki ve Korku Testleri uygulanmıştır. Pasif İnsana Karşı Reaksiyon Testi, Aktif İnsana Karşı Reaksiyon Testi, Sabit Alışılmamış Nesne Testi ve Ürkütücü Alışılmamış Nesne Testi'nde atların agonistik davranışları ile maksimum kalp atım hızı değerleri arasında anlamlı ilişkiler ($P < ,05$) tespit edilmiştir. Aktif İnsana Karşı Reaksiyon Testi'nde atların agonistik davranışları arttıkça insanlara yaklaşma mesafesinin de arttığı tespit edilmiştir ($P < ,05$). Alışılmamış Yüzey Testi'nde, atların agonistik davranışları arttıkça, yüzeyi başarılı bir şekilde geçme girişimlerinin sayısının da arttığı gözlemlenmiştir ($P < ,01$). Etki-Tepki Testinde, agonistik davranışların artmasının test süresinin uzamasına neden olduğu tespit edilmiştir ($P < ,01$). Sonuç olarak, testler sırasında agonistik davranışları yüksek olan atlarda eğitimdeki çeşitli süreçlerin uzadığı tespit edilmiştir. Atların eğitilebilirliğinin aynı ırk ve cinsiyet içerisinde farklılık gösterebileceği belirlenmiştir. Sonuç olarak, atların davranışsal tepkilerinin belirlenmesi ve at eğitiminin bireysel olarak planlanması önerilmektedir. Atların eğitilebilirliğinin anlaşılması yoluyla, onların yararına maksimum verim elde etmek mümkün olabilecektir.

Anahtar Kelimeler: At, at etogramı, davranişsal testler, öğrenme teorisi, refah

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INTRODUCTION

Recently there have been different views in the scientific evaluation of animal welfare. Welfare is arguably the result of the animal's attempt to adapt to its environment.[1] Some physiological stress signs and behavioural responses happen during the adaptation of animals to different environmental conditions.[2, 3] An animal's ability to effectively cope with environmental conditions is viewed as a measure of its robust biological functioning. Conversely, its inability to adapt adequately is seen as an indication of welfare issues.[4] Horse training requires understanding the adaptations horses undergo during the process to ensure their welfare and reduce accident risks. Behavioural tests help tailor training programs accordingly, enhancing horse well-being and safety.

Understanding horses' habituation and sensitization abilities is crucial for tailoring effective training methods. Positive horse training seeks to enhance learning by diminishing horses' fear of humans, which can be assessed by the quality of horse-human interaction [5,6] Behavioural tests offer a means to evaluate horses' habituation and sensitization abilities.

In this study, Reactivity to human tests and fear tests are applied. The purpose of the study was to examine some behavioural and physiological responses of Arabian horses participating in flat races against the Reactivity to human and fear tests.

MATERIALS AND METHODS

Horses and Management

Fifteen female Arabian horses, aged 2-8 years, from a private horse farm were part of the study. In their daily routine, horses receive forage in the stable and then freely access the pasture from their boxes without human guidance. They undergo regular veterinary checks and hoof care but have limited interaction with humans beyond these practices.

Water and hay were ad libitum in both the stable and the paddock. Each box had an area of about 3 x 3 m (Table 2. The Test Arena and Behavioural Tests) and paddock had an area of about 40 x 60 m. Horses were given forage in their boxes twice a day, according to the routine in the stud.

The tests were always administered between 9:00 am and 3:00 pm on horses. The horses were in the paddock during the hours outside the test (07:30-18:30). During the research, they were released in the paddock after being tested.

Experimental Design

Behavioural tests, such as reactivity to human tests and fear tests, are used to evaluate horses' responses. Reactivity to human tests includes passive human test, active human test, and handling test, assessing horses' reactions to humans. Fear tests involve the novel surface test, static novel object test, and startling novel object test, evaluating horses' habituation-sensitization abilities.

In the study, reactivity to human tests was conducted in standardized 3 x 3 meter boxes where all horses were tested individually. Fear tests were carried out in the stable, with a 3-meter wide service road serving as the testing area for all horses (Table 2. The Test Arena and Behavioural Tests). The same groom and trainer/researcher participated in all tests, with the trainer/researcher consistently wearing a red vest. The term "trainer/researcher" denoted an unfamiliar person, while "groom" referred to a familiar person. Distances were measured using a Leica Geosystems DISTO Laser meter.

Heart rates and behavioural responses were assessed during the tests. The Polar Equine M400 Heart Rate Monitor was used to measure heart rate, while behavioural responses were recorded via camera and scored using the "Equine Agonistic Ethogram," comprising 12 agonistic behaviours presented in Table 1.[7] A higher ethogram score indicates increased agonistic behaviours during the habituation-sensitization process.

Statistical Analysis

One-way ANOVA was applied for approach distances and average heart rates in the Reactivity to human and Fear tests, and the Duncan test was used to compare groups with differences. Correlation analysis was performed to determine the relationships between the values obtained from the Reactivity to human and Fear tests. SPSS version 24 (IBM SPSS Corp., Armonk, NY, USA) package program was used to conduct the analyses.

Table 1. Ethogram of Agonistic Horse Behaviour during the Behavioural Tests

Horse Behaviour* (McDonnell and Haviland, 1995)[7]	Description
Alert	Rigid stance with the neck elevated and the head oriented toward the object or animal of focus. The ears are held stiffly upright and forward and the nostrils may be slightly dilated.
Approach	Forward movement in a straight or curving path. The approach can be at any gait or speed. The head may be elevated and ears forward or the head may be lowered and ears pinned back.
Avoidance/retreat	Movement that maintains or increases an individual's distance from an approaching animal. The head is usually held low and ears turned hack. The retreat can be at any gait but typically occurs at the trot.
Balk	Abrupt halt or reversal of direction with movement of the head and neck in a rapid sweeping dorsolateral motion away from an apparent threat while the hind legs remain stationary. The forelegs may simuhaneously lift off the ground.
Bite Threat	The ears are pinned and lips retracted. Similar to a bite (Opening and rapid closing of the jaws with the teeth grasping the flesh of another animal) except that no contact is made. The neck is stretched and ears pinned back as the head swings toward the target stallion.
Head Bump	A rapid lateral toss of the head. Usually the eyes remain closed and the ears forward.
Head bowing	Head bowing is a repeated, exaggerated, rhythmic flexing of the neck such that the muzzle is brought toward the point of the breast.
Kick	One or both hind legs lift off the ground and rapidly extend backwards, with apparent intent to make contact. The forelegs support the weight of the body and the neck is often lowered.
Kick retreat	Similar to a kick, but without sufficient extension or force to make. The hind leg(s) lifts slightly off the ground and under the body in tense "readiness", usually with no subsequent backward extension of the hind leg(s). This action is often indistinguishable from the preparation for an actual kick.
Nip	Similar to a bite, but with the mouth less widely opened and the teeth closing on only a small piece of flesh.
Push	Pressing of the head, neck, shoulder, chest, body or rump against another in an apparent attempt to displace or pin
Stomp	One foreleg is raised and lowered, sharply and firmly striking the ground, usually repeatedly.

*The study examined agonistic behaviours through horse-human interactions.

RESULTS

All horses (100%) in scope of the study were defined as good-tempered by their breeders. Also, has been reported that 26.67% of horses are skittish and 73.33% of them are calm.

The findings of the reactivity to human tests are given in Table 3. In the passive human test, it was determined that 46.60% of the horses contacted the familiar person and 53.30% of them contacted the unfamiliar person. While the average distance of horses approaching a familiar person was 70.67±22.33, the average distance they approached an unfamiliar person was 60.00±22.34. The ethogram score of horses against both familiar and unfamiliar person ranged from 0 to 2, with the highest rate being 0 (66.60%).

In the active human test, it was observed that 6.70% of the horses contacted an unfamiliar person. The average distance of horses approached an unfamiliar person was determined as 160.00±21.93. The ethogram score was between 0 and 5 during the test and the highest rate was observed in the 3 scores (33.33%).

In the handling test, the ethogram score during approach to the horse varied between 0 and 4 and the highest rate was 0 (60.00%), it changed between 0 and 5 during contact and when the lead rope was attached, and the highest rate was 0 (60.00%), it has been determined that it varies between 0 and 5 while being led and the highest rate was 1 (40.00%). During the behavioural tests, the average heart rate values of the horses were determined as 53.67±2.76 and 41.66±1.06 in the passive human test, against a familiar and an unfamiliar person, respectively, as 47.80±2.38 in the Active human test, and as 52.40±2.06 in the handling test.

The findings of the fear tests are given in Table 4. In the novel surface test, 53.30% of the horses were successful on the first trial, 80.00% on the second, and 86.60% on the third trial. It was determined that the ethogram score ranged from 0 to 8 during the horse's first pass over the novel/frightening surface, with the highest score being 0 (40.00%).

In the static novel object test, it was determined that 100% of the horses sniffed the object, 86.60% of them touched the object, 53.30% of the horses bit the object, and 6.60% of the horses did not show interest in the object. 93.30% of the horses passed by the object. Horses that "passing by the object" was defined as follows, the horse's passing without any resistance, without negative reinforcement with the help of a halter, without frightening behaviours, at most 25cm ahead of the object and in walk. When the behaviours of the horses while passing by the object were examined, it was determined that the ethogram score ranged between 0-5 and the highest value was 0 (73.30%).

Table 2. Test Arena and Behavioural Tests

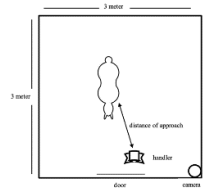
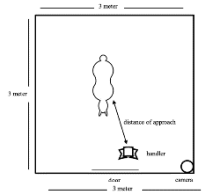
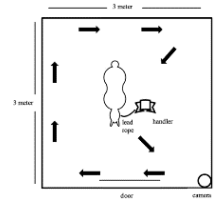
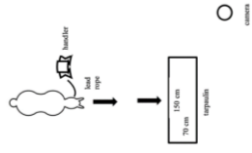
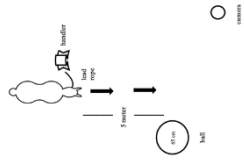
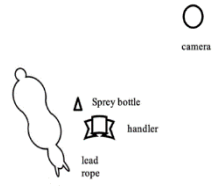
Reactivity to passive human test	In the reactivity to passive human test, the horse's approach time and distance to the passive person were assessed. The trainer/researcher entered the horse's box with passive body language, stood still by the door for 3 minutes without providing any stimulus to the horse.	
Reactivity to active human test	In the reactivity to active human test, the horse's approach time and distance to the moving person were assessed. The distance was measured between the horse's forefoot and the trainer/researcher's foot. During this test, the trainer/researcher provided auditory and tactile stimuli to the horse in the box for 3 minutes.	
Handling test	During the Handling Test, horses were led by the trainer in the box for three rounds. Behavioural responses of the horse during various management tasks, such as the trainer's approach, touching, attaching the lead rope, and leading, were evaluated.	
Novel surface test	In the novel surface test; horses were passed over a tarpaulin (70 x 150 cm, red) with led by the trainer. Passing through the novel surface with horses has been tried 3 times. Horses that crossed the surface with all their feet were defined as successful.	
Static novel object test	In the Static novel object test, a ball with a diameter of 65cm was placed at a point 5m from the horse and approach time of the horse to the object, distance of approach, and behavioural responses in this process were evaluated. At the same time, the reactions of the horses to the object (sniffed, touched, bit, lack of interest) were also examined during the test.	
Startling novel object test	In the Startling novel object test, water was sprayed towards the horse's shoulder using a spray bottle. The test involved two stages: initially spraying water on the ground and then on the horse's body. It aimed to assess horses' behavioural responses to objects with a gradual increase in stimulus intensity. Additionally, the horses' reactions to the object, such as sniffing, touching, biting, or showing lack of interest, were examined during the test.	

Table 3. Reactivity to human tests (N=15)

Tests	Reactivity to human Tests						
	Passive human test		Active human test	Handling Test			
	Familiar person	Unfamiliar person	Unfamiliar Person	Approaching	Touching	Attaching the lead rope	Leading
Contact (%)	46.60	53.30	6.70				
Approach Distance (cm) ($\bar{x} \pm S\bar{x}$)	70.67±22.33[b]	60.00±22.34[b]	160.00±21.93[a]** *				
Etogram Score (%)							
0	66.60	66.60	20.00	60.00	60.00	60.00	26.66
1	20.00	20.00	13.33	26.66	20.00	13.33	40.00
2	13.30	13.30	20.00	0.00	13.33	20.00	20.00
3	0.00	0.00	33.33	6.67	0.00	0.00	6.67
4	0.00	0.00	6.70	6.67	0.00	0.00	0.00
5	0.00	0.00	6.70	0.00	6.67	6.67	6.67
Heart Rate (pcs/minute)							
Maximum	38-100	36-50	42-103		51-88		
Average ($\bar{x} \pm S\bar{x}$)	53.67±2.76[a]	41.66±1.06[b]	47.80±2.38[a]		52.40±2.06[a]		**

**: $P < .01$. a, b: Differences between means with different letters in the same row are significant.

Table 4. Fear tests (N=15)

Tests	Fear tests			
	Novel Surface Test		Static novel object test	Startling novel object test
Success in the 1st trial (%)	53.50	Sniffed (%)	100.00	86.60
Success in the 2nd trial (%)	80.00	Touched (%)	86.60	33.30
Success in the 3rd trial (%)	86.60	Bit (%)	53.30	6.60
		Lack of interest (%)	6.60	6.60
Etogram Score (%)				
0	40.00		73.33	33.33
1	26.66		6.67	6.67
2	6.67		0.00	40.00
3	0.00		0.00	20.00
4	6.67		6.67	0.00
5	0.00		13.33	0.00
6	13.33		0.00	0.00
7	0.00		0.00	0.00
8	6.67		0.00	0.00
Heart Rate (pcs/minute)				
Maximum	62-156		48-103	44-98
Average ($\bar{x} \pm S\bar{x}$)	63.46±3.31[a]		53.46±2.41[b]	50.53±2.20[b] **

**: $P < .01$. a, b: Differences between means with different letters in the same row are significant.

In the startling novel object test, it was determined that 86.60% of the horses sniffed the object, 33.30% of them touched the object. 60% of them bit the object, and 20.00% of them did not show interest in the object. When the behaviours of the horses towards the frightening object (sprey bottle) were examined, it was determined that the ethogram score ranged between 0-3 and the highest value was 2 (40.00%). During the behavioural tests, the average heart rate values of the horses were determined as 63.46±3.31, 53.46±2.41 and 50.53±2.20 for the novel surface test, static novel object test and startling novel object test, respectively. Correlations between the data

obtained from the reactivity to human and fear tests are given in Table 5, Table 6, Table 7 and Table 8.

As a result of the correlation analysis conducted to determine the relationships between the values obtained from the reactivity to human and fear tests; Significant positive relationships ($P < .05$) were detected between agonistic ethograms of horses and maximum heart rate values in the reactivity to passive human test (against a familiar person), reactivity to active human test, static novel object test and startling novel object test. In the reactivity to active human test, it was determined that as the ethogram value of horses increased, the approach distance also increased ($P < .05$). In the novel surface test, it was observed that as the ethogram values of the horses increased, the number of attempts to successfully pass over the surface also increased ($P < .01$). In the handling test, the increase in the ethogram value caused the test time to extend.

Table 5. Correlation values of variables in reactivity to passive-familiar human test, passive-unfamiliar human test, active-unfamiliar human test

Reactivity to Passive-Familiar Human Test				
	Approach distance	Etogram	Maximum heart rate	Average heart rate
Approach distance	-			
Etogram	0.339	-		
Maximum heart rate	0.315	0.682**	-	
Average heart rate	0.250	0.371	0.737**	-
Reactivity to Passive-Unfamiliar Human Test				
Approach distance	-			
Etogram	-0.133	-		
Maximum heart rate	0.025	0.047	-	
Average heart rate	0.012	-0.180	0.908**	-
Reactivity to Active-Unfamiliar Human Test				
Approach distance	-			
Etogram	0.519*	-		
Maximum heart rate	0.187	0.652**	-	
Average heart rate	0.326	0.619*	0.920**	-

*: $P < .05$, **: $P < .01$

Table 6. Correlation values of variables in reactivity to Handling Test

	Etogram at approaching	Etogram at touching	Etogram at leading	Maximum Heart rate	Average Heart rate	Test times
Etogram at approaching	-					
Etogram at touching	0.179	-				
Etogram at leading	0.058	0.851**	-			
Maximum heart rate	0.126	0.408	0.404	-		
Average heart rate	0.078	0.184	0.452	0.731**	-	
Test times	0.311	0.836**	0.755**	0.199	0.121	-

**: $P < .01$

Table 7. Correlation values of variables in reactivity to novel surface test

	Number of tries	Etogram	Maximum Heart rate	Average Heart rate	Test times
Number of tries	-				
Etogram	0.741**	-			
Maximum heart rate	0.513	0.498	-		
Average heart rate	0.424	0.427	0.965**	-	
Test times	0.349	0.205	0.143	0.039	-

**: $P < .01$

Table 8. Correlation values of variables in reactivity to static novel object test, startling novel object test

Static novel object test					
	Cruosity score	Etogram	Maximum Heart rate	Average Heart rate	Test times
Cruosity score	-				
Etogram	-0.402	-			
Maximum heart rate	-0.375	0.589*	-		
Average heart rate	-0.340	0.630*	0.975**	-	
Test times	0.398	0.161	-0.359	-0.384	-
Startling novel object test					
	Cruosity score	Etogram	Maximum Heart rate	Average Heart rate	Test times
Cruosity score	-				
Etogram	-0.377	-			
Maximum heart rate	-0.282	0.442	-		
Average heart rate	-0.025	0.672**	0.839**	-	

*: $P < .05$, **: $P < .01$

DISCUSSION

Passive and active human tests were found to produce consistent results in the studies of Hausberger and Muller[8], Jezierski et al.[9] and Lansade and Bouissou.[10] Similarly, handling tests produced repeatable results in several studies. [11,12] Consistency of fear reaction in three different situations: novel surface, novel static and startling object tests, was also confirmed.[10,12,13] Therefore, the above-listed tests were employed in our study to be evaluated for their practical usefulness.

In this study, it can be seen that the percentage of contact with unfamiliar person (53.30%) of horses is higher than the familiar person (46.60%) in the passive human test. When the approach distances of the horses were examined, it was seen that the distance between horses with familiar person (caretaker) (70.67±22.33cm) is similar to unfamiliar person (trainer/researcher) (60.00±22.34cm). The results of the research suggest that people's body language and behaviour are important in the approach distance of horses to people, rather than whether the person is familiar or not. Lundberg et al.[14] revealed in their research that horses' heart rates decreased upon reunion with both the owner and stranger. Therefore, they stated that whether the person is known or not by the horse does not make a difference in mitigating the effect of the stressful event. Ijichi et al.[15] examined the stress responses of horses during new handling procedures while being guided by their owners and a stranger, they found no difference in horses' performance (crossing time), behaviour or in physiological responses (heart rate, eye temperature) in terms of caregiver familiarity. Similar to our research results, Ijichi et al.[15] concluded that an unknown handler may be as effective as the owner in influencing horses' responses when exposed to potentially stressful situations. Also, Hartmann et al.[16] and Liehrmann et al.[17] deduced that they did not find any effect of the familiarity of the handler in novel object and novel surface tests.

Within the scope of the research, it was observed that although familiar and unfamiliar people used the same body language, the approach distance was similar. Similar to this finding, Lansade and Bouissou[10], in a study they conducted on the reactivity of horses to humans, reported that this indicates the horse's personality rather than the familiar or unfamiliar of the person and the active or passive body language. Górecka-Bruzda et al.[18], also stated in their research that there is a correlation between the timidity of horses and their reactions to humans. In addition to this in the study, the fact that the horse's percentage of contact with the unfamiliar person of horses is higher than the familiar person's contact, although not statistically significant, suggests that the horse has become habituated to repetitive practices. Larssen and Roth[19] investigated the effects of positive reinforcement on the contact-seeking behaviour of horses, they revealed that having the same person perform the tests and therefore increasing physical contact may be an indication that the experimenter is not seen as an unfamiliar in the second test. Similar to our research results, they also stated that it was possible for the horses to habituated to the testing area and to focus more easily on the experimenter in the case of repeated testing. According to the results, it was seen that the approach distance to the unfamiliar person in the reactivity to active human test (160.00±21.93 cm) was significantly ($P < .01$) higher than the results of the reactivity to passive human test (70.67±22.33 and

60.00±22.34cm). At the same time, when the ethogram score in both tests was compared, it was determined that the active human test was higher. This result reveals that horses are more sensitive to human active body language than passive body language and it could cause more stress and horses show more agonistic behaviours. Similarly, Birke et al.[20], examined the reactions of horses to human approach, and it was revealed that approaching horses quickly increased both the tendency to horse move quickly and the distance travelled significantly.

In the reactivity to passive human test, the maximum heart rate of horses was 38-100 pcs/min when they saw a familiar person, while it was 36-50 pcs/min when they saw an unfamiliar person. In the reactivity to active human test, the heart rate of the horses was 42-103 pcs/min. It has been determined that in the reactivity to passive human test, the average heart rate value for the reaction to an unfamiliar person (41.66±1.06) was significantly ($P < .01$) lower than the other tests (53.67±2.76 and 47.80±2.38). In the research, in the reactivity to passive human test, the processes of approaching a familiar person and then an unfamiliar were applied. Therefore, the research results reveal that horses become habituated to human passive body language with repeated applications. It is thought that these results are due to the habituation of the situation of humans in the test (waiting with passive body language), regardless of whether the horse recognizes the person or not. In addition, in the reactivity to human tests determined a positive significant ($P < .05$) relationship between the agonistic behaviour of horses and their heart rate. This suggests that horses with more agonistic behaviour during the tests had higher physiological stress levels.

In the handling test, a positive significant ($P < .01$) relationship was found between the agonistic behaviours of the horses during handling the horse to the test duration. Therefore, it was seen that the increase in the ethogram level of horses caused the test period to extend. This reveals that an increase in the agonistic behaviours of horses prolongs the duration of the handling process. At the same time, it is seen that the heart rate of horses is the highest in the handling test among human reaction tests. It is thought that a longer duration of training and increased stress may increase the risk of accidents and injuries. For this reason, it is thought to be important to evaluate horses' responses to behavioural tests. A study by Christensen et al.[21], on horse training, draws attention to the importance of knowing the habituation and sensitization abilities of horses in reducing the response related to frightening behaviours.

In the novel surface test, as horses made more attempts to pass over the surface across trials (1st Trial- 2nd Trial- 3rd Trial), the rate of successful passage also increased. This indicates habituation to the novel surface. Additionally, it was noted that the habituation process varies individually among horses. The results show that the trainability of horses may differ even if they are of the same breed and sex. The ethogram score of all horses passing the novel surface in the first trial was between 0-1. It was determined that the scores of the horses that did not pass the surface on the third attempt were above 5. In the data obtained from the novel surface test, a positive and significant relationship was determined between the number of surface crossings and the agonistic behaviours. This shows that the increase in agonistic behaviour in horses may reduce their success in crossing novel surfaces in behavioural tests and prolong the test durations.

Also, it was determined that the maximum heart rate of the horses that did not pass the novel surface on the first attempt was higher (85 pcs/min) than the other horses. The maximum heart rate of the horses which could not pass the surface at all was the highest (over 100 pcs/min). This suggests that frightening surfaces might cause more stress in horses with lower habituation ability than horses with higher habituation ability. Forkman et al.[22] drew attention to the importance of the fear test in examining the emotional states of animals and stated the importance of standardization of these tests in the development of applied ethology. Pierard et al. (2017)[23] pointed out that the existence of personality in animals is widely accepted in their studies, but it is necessary to develop valid and reliable methods to measure and interpret it.

According to the static and startling novel object tests, the rates of the horses' responses to the object were sniffing (86.60-100.00%), touching (33.30-86.60%), and biting (6.60-53.30%), respectively. In this test, almost all horses (93.40%) showed interest in the object. Although it was not statistically significant in the static and startling novel object tests, a negative relationship is observed between curiosity behaviour and agonistic behaviours and heart rates. This situation reveals the importance of benefiting from the curiosity behaviours of horses in training. Thus, there are many studies on the positive effect of the clicker method, which is based on curiosity behaviour and supports the training of horses by following the target stick, on the habituation processes of horses [24,25,26,27,28] and was reported to be a popular technique used in pet training today.[29] In the startling novel object test, the rate of interest toward the object was lower (80.00%). It was also

observed that the ethogram score was higher in the static novel object test compared to the startling novel object test. In this case, it can be said that horses show higher curiosity behaviour towards objects that cause less startle response. This situation also coincides with the way the target stick is used in the clicker method.

Researchers have measured fearfullness in horses in many studies.[30-32] Vidament et al.[33] stated that they developed experimental methods in their laboratories to determine the personalities of horses and that these simplified tests measured the reactions of horses in fear situations. When the heart rate values in the fear tests were examined in this study, the average heart rate values of the novel surface test (63.46±3.31) were found to be significantly ($P < .01$) higher than the other tests (53.46±2.41 and 50.53±2.20). This situation is also compatible with the higher ethogram values. These results show that startling stimuli in behavioural tests increase the occurrence of agonistic behaviours in horses and also increase heart rate levels. Additionally, there is a positive significant ($P < .05$) relationship between ethogram and heart rate during the tests. This reveals that the physiological and behavioural stress levels of horses during their habituation process could be determined with the help of behavioural tests. In Olczak et al.'s[34] study examining the link between horses' learning ability and fear across various tests, heart rate was measured before and after the fear test. The findings showed a significant increase in heart rate during the fear test compared to the pre-test level, aligning with our study's results. The research also revealed that fear can impact performance on certain types of learning tests.

In conclusion, the results of behavioural tests indicate that the trainability of horses may vary, even among those of the same breed and sex. It has been observed that increased agonistic behaviours during tests prolong training processes. Such behaviours and prolonged training periods can heighten the risks of accidents and injuries. Therefore, it's crucial to assess horses' behavioural responses through tests and plan their training individually. Utilizing learning theory in horse training is vital for both horse welfare and human safety. Additionally, standardized and reliable behavioural tests in applied ethology research can optimize efficiency by understanding horses' training tendencies, potentially reducing losses in the sector.

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