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¹Department of Horse Breeding and Use, Faculty of Biology and Animal Breeding
University of Life Sciences, Akademicka 13, 20-950 Lublin

²Department of Small Ruminants Breeding and Agriculture Advisory, Faculty of Biology
and Animal Breeding, University of Life Sciences in Lublin, Akademicka 13, 20-950 Lublin
e-mail: anna.stachurska@up.lublin.pl

ANNA STACHURSKA¹, MIROŚLAW PIĘTA², AGNIESZKA KLOC¹,
KRZYSZTOF BOCIAN¹, MARZENA CEBERA¹

**Behavioural response to the toy in adult horses
of various breeds, sexes and ages**

Odpowiedź behawioralna koni różnych ras, płci i wieku na zabawkę

Summary. The aim of the study was to analyse the behavioural response in adult horses of various breeds, sexes and ages, to the toy hung in the box. 29 warmblood horses of Małopolski, Wielkopolski, Polish Warmblood and German breeds were studied. The horses were 4–14 years old. A plastic bottle was used as a toy. Each horse was tested and filmed for 15 minutes on two successive days. The following parameters were determined: (A) total length of play time excluding breaks, (B) number of breaks in playing, (C) total length of breaks in the play, (D) the time left to the period of 15 minutes when a horse was indifferent to the toy. Least square analysis of variance was performed considering factors of the breed, sex and age of the horses, as well as the day of the test. Correlations of parameters between the two days of the test were determined. The breed and age factors did not significantly influence the parameters. Stallions stopped playing long before geldings. The total length of play time was higher on the first day compared to the second day of the test (24.8% and 14.9% of the test time, respectively). The correlation of the total length of the play time between two days of the experiment was significant ($r = 0.38$). The results allow the conclusion that the toy hung in the box has a weak effect on improving the horse's welfare.

Key words: behaviour, play, welfare, horse

INTRODUCTION

Naturally, the horse lived in a herd and migrated over wide land areas. Domestication resulted among others in enclosing the horse in the stable. This artificial environ-

ment is usually associated with isolation from the herd. The horse spends most of the time alone in the box. The closing-off limits both the horse's movement activity and social needs [Mal *et al.* 1991]. In most riding centres, it is not possible to ensure the horse a long stay outside. Some elite athletes are not led to paddock or pasture at all because of owners' anxiety the horses might be injured. Studies documented strong effect of keeping horses in boxes on the horse behavior [Lee *et al.* 2011]. According to many authors, such closure often causes boredom, which in turn may lead to stereotypies [Luescher *et al.* 1998].

The best way to counteract the negative effects of isolation and to optimize the welfare, is to keep the horse outdoor, possibly together with other horses [Kiley-Worthington 1990]. However, circumstances of the riding centres, and also the harsh climate, often do not enable such solution. An important factor is the fibre content in the diet. In nature, grazing occupies up to 16 h a day, whereas a stabled horse consumes its daily ration in one or two hours [Winskill *et al.* 1996]. The human strives for compensating the loss of natural conditions by improving the stable arrangement. One way is to enable the horse to observe the yard or to contact visually or physically other horses inside the stable [Bagshaw *et al.* 1994, Kiley-Worthington 1990]. The horse can be also provided with entertainment, for instance a mirror or a sheep, a goat or a pony introduced into the box [Kay and Hall 2000]. A cat coming from time to time may be also a great attraction.

Play consists of activities having no immediate use or function to the animal, involving a sense of pleasure and elements of surprise [McDonnell and Poulin 2002]. There are many commercial toys for horses, which are claimed to reduce the horse's boredom in the monotonous conditions. For instance, special licks with a limited access to the sweet inside, require swiveling or escaping. On the other hand, simple objects are used, such as chains, plastic bottles and swedes hanging from the ceiling [Morel 2003, Winskill *et al.* 1996]. The issue is whether the horses play with such toys and if so, how long they are interested in the novel object. We assumed that because of genetic differences and changes occurring during the organism growth and development, horses of various breeds, sexes or ages might show differentiation with regard to the will to play. The aim of the study was to analyse whether introducing the toy to the box may improve the horse's welfare and whether the behavioural response in adult horses of various breeds, sexes and ages to the toy, is differentiated.

MATERIAL AND METHOD

We examined 29 warmblood horses of Małopolski (9), Wielkopolski (3), Polish Warmblood (12) and German breeds (5): 2 Holstein horses and 3 Oldenburg horses in the latter. The horses were 4–14 years old. They were divided into three age groups: 11 horses 4–5 years old, 12 horses 6–10 years old and 6 horses 11–14 years old. Seven of them were mares, eight were stallions and 14 were geldings. All of the horses were stabled, turned out on a paddock for approximately two hours a day, and used under saddle in leisure or sport for an hour a day.

In order to determine whether the horses were not highly differentiated with regard to their behaviour and so whether they were appropriate for the play testing, firstly they were tested with Brzeski's abbreviated method [Brzeski 1966]. The behavior of each horse towards human, towards horses, during cleaning, hoof cleaning, feeding as well as during bridling and saddling was judged on a 1–5-point scale. We assumed that horses which scored a mean lower than 3, would be excluded from the play test. However, each horse gained a mean of 3.2 to 5.0, hence all of them were qualified to the play test. Two horses were affected by crib-biting. According to the owners, the horses did not know any hanging toys before.

During the play test the horses were in the boxes. Each horse was individually tested on two successive days in the period between one o'clock to four o'clock p.m., that is at least one hour after midday feeding and at least one hour before evening feeding. A plastic bottle half filled with water was used as a toy. The bottle was given to the horse to be sniffed and then hanged on a 0.5 m line at the upper railings of the door to the box. During each day the experiment lasted 15 minutes. Immediately after the test the bottle was taken off the box. The experiment was filmed with camera placed on a stand. The behavioural response was measured with the time when the horse expressed interest in the toy. On the basis of the film, the following parameters were determined for each horse: (A) total length of play time (s) excluding breaks, (B) number of breaks in the play when a horse stopped playing, (C) total length (s) of breaks in the play, (D) remaining time (s) to 15 minutes when a horse was indifferent to the toy.

Least square analysis of variance of the behavioural parameters was performed with the use of SAS program [SAS 2003] considering constant factors of the breed, sex and age of the horses, the day of the test, as well as the random effect of error. Because of the two days of the test, the number of data in the analysis of variance was doubled. The significance of differences was determined by T-Tukey's test. Pearson's correlations in particular parameters between the two days of the test were found.

RESULTS

All of the horses were interested in the bottle hanged in the box except for one individual. At the beginning of the test, mainly on the first day, some horses were mistrustful towards the novel object. The horses played pushing and swinging the bottle, trying to bite it or to put it on the head. Two crib-biting horses made breaks in the play (parameter B) to come back to biting the crib edge.

The results of the play test are presented in Table 1. The breed, sex and age factors did not significantly influence the parameters apart from the sex effect on the remaining time to 15 minutes when a horse was indifferent to the toy (D): stallions stopped playing long before geldings (359.2 ± 70.3 s and 82.4 ± 29.0 s, respectively). The total length of play time (A) was significantly higher on the first day (223.1 ± 35.7 s) compared to the second day (133.8 ± 27.3 s).

However, some insignificant tendencies occurred with the age of the horse: higher total length of play time (A) in Małopolski horses and lowering total length of play time

(A), less frequent and longer breaks of playing (B, C) as well as stopping the play later (D). The significantly shorter time of playing (A) on the second day of the test was associated with insignificantly higher length of breaks (C).

Table 1. Results of the play test performed in two days
Tabela 1. Wyniki testu zabawy przeprowadzonego w ciągu dwu dni

Horse group Grupa koni	N	A. Total length of play time (s) Całkowity czas zabawy (s)		B. Numer of breaks Liczba przerw		C. Total length of breaks (s) Całkowity czas przerw (s)		D. Remaining time to 15 min (s) Pozostały czas do 15 min (s)	
		LSM	SE	LSM	SE	LSM	SE	LSM	SE
Breed groups/Grupy rasowe									
Małopolski	18	236.7	45.3	17.0	2.3	40.2	10.0	182.7	35.4
Wielkopolski	6	143.9	45.9	16.8	5.2	38.7	6.6	274.3	42.5
Polish Warmblood Polski Koń Szlachetny Półkrwi	24	138.6	35.7	12.4	2.5	59.5	7.7	256.7	62.3
German breeds Niemieckie rasy	10	194.6	38.4	19.4	3.9	61.1	40.8	217.7	82.2
Age groups/Grupy wiekowe									
4–5 year old 4–5-latki	22	216.8	45.7	18.9	2.9	33.5	8.6	263.1	62.9
6–10 year old 6–10-latki	24	193.5	32.5	19.6	2.3	32.3	6.9	273.8	40.7
11–14 year old 11–14-latki	12	125.1	21.5	10.8	1.4	83.8	33.5	161.7	71.6
Sex groups/Grupy płci									
Mares/Klaczce	14	129.4	29.8	14.8	2.1	50.9	9.4	256.9	77.1
Stallions/Ogiery	16	135.2	21.8	13.5	1.9	44.4	26.1	359.2 b	70.3
Geldings/Wałachy	28	270.5	36.2	20.9	2.4	54.3	7.4	82.4 b	29.0
Day of test/Dzień testu									
First day Pierwszy dzień	29	223.1 a	35.7	18.6	2.3	36.1	5.3	231.5	45.3
Second day Drugi dzień	29	133.8 a	27.3	14.2	2.0	63.6	15.6	234.3	46.7

N – number of observations – liczba obserwacji

a, b – LSMs marked in columns with same letters differ at $P < 0.05$ – Wartości LSM zaznaczone w kolumnach tymi samymi literami różnią się przy $P < 0,05$.

Table 2. Correlations of parameters between the first day and second day of the test (n = 29)
Tabela 2. Korelacje parametrów między pierwszym i drugim dniem testu (n = 29)

Parameter/Parametr	Correlation/Korelacja
A. Total length of play time/A. Całkowity czas zabawy	0.38*
B. Number of breaks/B. Liczba przerw	0.26
C. Total length of breaks/C. Całkowity czas przerw	0.06
D. Remaining time to 15 min/Pozostały czas do 15 min	-0.07

* correlation significant at $P < 0.05$ – korelacja istotna przy $P < 0,05$

The correlation of the total length of play (A) between the first day and second day of the test was significant (0.38, $P < 0.05$; Tab. 2). The number of breaks (B) during the two days of the test was correlated on a low level (0.26, $P > 0.05$). The correlations of the total length of breaks (C) and remaining time to 15 min (D) on the two days equaled to approx. 0.

DISCUSSION

According to Lee *et al.* [2011], the horse's need to stay in a group is stronger than to exercise. That means the horse is a typical sociable species. Opinions on the boredom of horses closed in the stable, sometimes isolated, and the horse's need for play are commonly formulated among others by animal rights activists and, on the other hand, by firms producing horse equipment. In the latest two decades the need for play in horses was broadly studied [e.g. Cameron *et al.* 2008, McCallum and Dumbell 2009, Winskill *et al.* 1996]. The horses play both staying in a group, particularly foals [McCallum and Dumbell 2009], and individually, in the box or outside. According to McDonnell and Poulin [2002], a novel object usually stimulates the horse to play. Our study was to verify those findings in the view of the breed, sex and age horse variability. Because of genetic and environmental differences between horses, the will to play may be differentiated.

The differences between breeds turned out to be statistically insignificant presumably because of the great individual differences in the horse behaviour resulting in the high standard error. Similarly, the age differences were not significant. However the tendency to play for a shorter time observed in older horses, and to make fewer but longer breaks may show that with age the horses lose the need for playing but focus on the toy for a longer time without break. It is interesting to note that the geldings returned to the bottle for a much longer time, i.e. the remaining time to 15 minutes was shorter than in the stallions. Probably the stallions often displayed reproductive behaviour and that is why they earlier stopped their interest in the toy.

The horses were more interested in the bottle on the first day of the test. On the second day the bottle was not the novel object, that is the horses already became accustomed to it. The mean percentage of playing time during the 15 minutes of the experiment during the two days (24.8% and 14.9%, respectively) shows that the time of playing was short and crucially decreased on the second day. The experiment could last only 15 minutes on both two days because our earlier observations made on other horses (not published) showed that after that time the horses usually stopped their interest in the novel object placed in the box. The medium significant correlation in the total length of play time between the two days of the test shows that there is a tendency of longer or shorter playing by a particular horse. Studies by McDonnell and Poulin [2002] showed the equid play ethogram was rather constant.

CONCLUSIONS

The results demonstrate that the toy affects the horse's behaviour for a very short time. During the 15-minute test the bottle did not cause interrupting the crib-biting in the

horses affected by the habit. The adult horse's response to the toy was not significantly differentiated with regard to the breed and age, whereas geldings were interested in the toy longer than stallions. On the basis of the present study it may be suggested that the horses' usual psychical activity is low or the artificial toy is not an interesting object for the horse. It is also possible that the opinions on the boredom of a stabled horse are exaggerated. The results allow to conclude that the toy hanged in the box has a weak effect on improving the horse's welfare.

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Streszczenie. Celem badań było przeanalizowanie odpowiedzi behawioralnej koni różnych ras, płci i wieku na zabawkę zawieszoną w boksie. Zbadano 29 koni półkrwi – małopolskich, wielkopolskich, polskich koni szlacheckich półkrwi oraz ras niemieckich. Konie były w wieku 4–14 lat. Jako zabawki użyto plastikowej butelki. Każdy koń był testowany i filmowany przez 15 min w ciągu dwu kolejnych dni. Ustalono następujące parametry: całkowity czas zabawy po odjęciu przerw (A), liczba przerw w zabawie (B), całkowita długość przerw w zabawie (C), czas pozostający do 15 min, kiedy koń był obojętny na zabawkę (D). Przeprowadzono analizę wariancji według najmniejszych kwadratów, biorąc pod uwagę czynnik rasy konia, płci i wieku, a także dnia testu.

Określono korelacje między parametrami w obu dniach testu. Rasa i wiek nie wpływały istotnie na badane parametry. Ogiery przestały się bawić długo przed wałachami. Całkowity czas zabawy był dłuższy pierwszego dnia niż drugiego (odpowiednio 24,8% i 14,9% czasu testu). Korelacja całkowitego czasu zabawy między dwoma dniami eksperymentu była istotna ($r = 0,38$). Rezultaty pozwalają wnioskować, że zabawka zawieszona w boksie odnosi słaby efekt w doskonaleniu dobrostanu konia.

Słowa kluczowe: zachowanie, zabawa, dobrostan, koń