

A note on the habituation to novelty in horses: handler effect

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The intensity with which the horse reacts to novelty is crucial for safety of both horse and human. The aim of the study was to examine: (1) whether horses' fear reactions to a startling novel object diminish with successive test days and (2) whether the active human handling leads to the decrease of the fear-related responses of the horse.

Eight adult horses were submitted daily to 5-minutes exposition to a novel object (NO) – open umbrella – for 5 consecutive days when released (Trial 1) and for 5 consecutive days when held by the handler (Trial 2), with 2-days break between Trials. Startle reaction score (SR), latency to touch the novel object (LNO), mean heart rate (HR) during 6 minutes of the tests, the percentage of time the horse spent standing, on locomotor activity (walk, trot, gallop) or on vigilance (vigilant standing, sustained walk) were analysed.

The SR and LNO during Trial 1 did not change in consecutive test days. The NO provoked higher HR ($P<0.05$) and intense vigilant standing at the beginning of the study ($P<0.01$). Per cent of time of sustained walking, standing, trotting and galloping did not differ between days during Trial 1.

The SR during Trial 2 differed neither within nor between Trials. The horses approached NO when handled as compared to almost no approach when not held by the handler ($P<0.05$). With each day of the Trial 2 the horses approached quicker the umbrella ($P<0.05$). The HR was lower than in the

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Trial 1 ($P<0.05$) but did not differ within the Trial 2. This study revealed that horses habituated to a startling event as expressed by a decrease in HR and vigilant behaviour. Gentle and repeated handling facilitates habituation to a novel situation and/or stimuli.

KEY WORDS: behaviour / habituation / heart rate / horse / human-animal relationship

The horse is an animal species that evolved in open-space areas and it is naturally predisposed for flight response when exposed to unexpected situations. The intensity with which the horse reacts to novelty is crucial for safety of both horse and human during work, daily care, veterinary examinations and treatment [Jaggin *et al.* 2005, Jagodzinski and deMuri 2005].

As other species, the horse can learn and memorize objects and situations that initially evoked startle reactions, but later proved not to be dangerous and can be tolerated with no fear (habituation). A number of studies have been made to explore the problem of fearfulness of horses when exposed to a new object (neophobia) including reactivity [Wolff *et al.* 1997, LeScolan *et al.* 1997, Minero *et al.* 2006] and explorative abilities [LeScolan *et al.* 1997, Momozawa *et al.* 2003], but the research on habituation to novelty in horses is limited [Christensen *et al.* 2006].

A decrease in escape response improves manageability of the horse and enables a successful training and work. Usually the habituation is achieved by repeated exposure of the horse to fear-evoking objects or situations until its escape reactions disappear. However, some horses repeatedly demonstrate flight reactions in some specific places or situations whereas others, even being afraid, would not escape when held or ridden, as they are trained not to run away [Visser *et al.* 2001]. It is known that high quality human-animal relationship (HAR) may reduce the perceived aversiveness of traumatic events, like isolation [Søndergaard and Halekoh 2003, McGee and Smith 2004], restraint [Waiblinger *et al.* 2006] and handling [Jezierski *et al.* 1999]. The impact of human handling on horses' behaviour has been examined prevalently in foals and young horses [Jezierski *et al.* 1999, Søndergaard and Halekoh 2003, McGee and Smith 2004]. As suggested by Waiblinger *et al.* [2006], novelty and isolation are experimental factors which can be used to test reassuring effects of human presence on animals' behaviour. In the present report the authors focused on active interactions of humans with adult horses, as many problems with frightening and flight reactions concern adult animals and involve serious accidents during riding and handling [Jagodzinski and deMuri 2005, Thomas *et al.* 2006].

In order to assess habituation effects, behavioural and physiological (heart rate) responses to an unknown object were studied in the situation when the horse could react freely (no human intervention) or was gently handled, during experimental exposition to a novelty.

Material and methods

General

All applied procedures were approved by the 3rd Local Ethics Commission in Animal Experimentation, Warsaw, Poland.

Used were six Hutzul mares, one halfbred mare and one halfbred gelding, all belonging to the Institute of Genetics and Animal Breeding, Jastrzębiec. Animals were kept in individual boxes, fed with oat grain and hay (water *ad libitum*) and allowed to graze in one group for 8 hours daily. The horses were 4-10 years old and had previous experience with handling, but were naïve for the novel object.

Each horse was submitted to a 5 min exposition to a novel object (open umbrella) for 5 consecutive days in two replications: when released (Trial 1) and when held on the leading rope by the handler (Trial 2), totalling in 10 days of exposition to novelty, with 2-days break between experiments. On day 2 of Trial 2 one mare had to be excluded from the experiment, showing signs of sensitization to the test paddock, which is normally used as a riding arena, to avoid future dangerous reactions of the horse during riding. The rest of the study was made on 7 horses.

Prior to the tests the horses were accustomed to the test paddock (15 x 30 m) and to social separation from the stable-mates to minimize effects other than of the novel object.

Trial 1

Prior to the test, the heart rate (HR) monitor (Polar 810i, Oy Electro, Finland) was put on the cardiac area of the horse when in the box. Next, the horse was led into the test paddock, situated approximately 30 m from the stable. After the horse entered the paddock, the handler started the HR measurement. Next, the horse was released from the leading rope and the handler left the paddock. After one minute the experimenter entered the paddock, opened a yellow umbrella (novel object – NO) and remained in a stationary posture for the next 5 min. The horse had the opportunity to react freely, including exhibiting a startle reaction and escape response. The horse was given 5 min from the umbrella presentation to approach it voluntarily, to sniff and/or touch the umbrella and after this time the horse was taken back to the stable. The test was repeated once daily between 3.00 and 6.00 pm over the following four days. The behaviour of the horse was videotaped for further analysis. The score for the startle reaction to the novel object (SR) was applied according to a decreasing reactivity exhibited by the horse (Tab. 1). Signs of general arousal (*i.e.* posture, head, neck and tail positions), as well as gait speed, were considered as creating the SR score. The latency to touch the novel object (LNO) was measured in seconds. In case the horse did not touch the umbrella at all, it was given 300 s. The percentage of time the horse spent standing on locomotor activity (walk, trot, gallop) and on the vigilance (vigilant standing, sustained walk) were calculated.

Table 1. The score for the behavioural startle reaction (SR) during the novel object test

Score	Description	
	Trial 1	Trial 2
5	no reaction to the novel object	
4	minimal reaction, head elevated/turned towards the novel object	
3	short distance escape (up to 5 m)	the horse can easily be stopped
2	medium distance escape (5-15 m)	the horse is difficult to handle
1	long distance escape (more than 15 m)	the horse cannot be managed and shows dangerous reactions

Trial 2

The procedure in Trial 2 was similar to that applied in Trial 1, except for that after entering the test paddock the horse remained on the leading rope, held by the handler. During umbrella presentation the horse was able to exhibit a startle reaction and/or short-distance escape within the length of the leading rope (5 m). If the horse was not willing to approach the NO voluntarily, it was led towards the umbrella and gently encouraged by the handler by light pulling the rope, speaking and stroking when the horse was approaching and exploring the umbrella. The test was repeated for the following four days. The SR, LNO and HR were assessed.

The SR, NO, mean HR during 6 minutes of the test, the percentage of time the horse spent standing, on locomotor activity (walk, trot, gallop) and on the vigilance (vigilant standing, sustained walk) were analysed within and between trials. All examined variables had no normal distribution and were subjected to non-parametric analyses. Friedman test and Wilcoxon pair-matched sign-rank test were applied.

Results and discussion**Trial 1**

During the first five days the SR ranged from 3.38 to 4.00 and did not show any clear tendency (Tab. 2). The horses were generally not willing to approach the umbrella voluntarily, although on Day 3 and Day 4 one of them approached it on its own (LNO<300 s, Tab. 2). The highest HR was recorded on Day 1 of the Trial 1 (88.6 bpm) and decreased during the following two days, reaching the lowest value (64.5 bpm) on Day 4 ($P<0.05$) – Table 2.

The novel object evoked intense vigilant standing at the beginning of the Trial 1 (18.5%) which dropped to 3.9% on Day 4 ($P<0.01$) – Figure 1-A. Percent of time spent on sustained walking did not differ between days during the Trial 1 (Fig 1-A). During the 5-min. exposure to NO, the horses mainly remained standing (41.5-69.5%

Table 2. Startle response (SR), latency to touch the novel object (LNO) and heart rate (HR) in horses tested when released (Trial 1) and handled (Trial 2)

Variable	n	SR (points)		LNO (s)		HR (bpm)	
		mean	SD	mean	SD	mean	SD
Day of the test							
Trial 1							
1	8	3.63	1.06	300.0	0.0	88.6 ^a	28.6
2	8	3.62	0.92	300.0	0.0	73.3	23.3
3	8	3.75	1.04	286.9	37.1	70.1	29.2
4	8	3.38	1.06	283.5	46.7	64.5 ^b	15.7
5	8	4.00	0.93	300.0	0.0	65.3	12.7
mean		3.68	0.97	294.1^a	26.3	72.4^a	23.3
Trial 2							
6	8	4.0	0.92	104.5 ^a	102.1	64.3	14.0
7	7	3.87	0.83	58.1 ^{bc}	98.1	66.0	17.0
8	7	4.57	0.79	37.3 ^{bc}	45.1	61.3	16.6
9	7	4.14	0.89	23.9 ^b	17.6	65.6	14.3
10	7	4.14	0.98	35.1 ^c	38.1	63.7	9.5
mean		4.14	0.85	53.5^b	73.4	64.2^b	13.90

^{ab}Within each trial means for days bearing different superscripts differ significantly at $P < 0.05$.

^{ab}Means for trials bearing different superscripts differ significantly at $P < 0.05$.

of time), with several walking bouts (13.5-19.4% of time) – Fig. 1-B. The percentages of trotting and galloping were not affected by the day of the Trial 1 (Fig.1-C).

Trial 2

During the Trial 2 the mean SR values for days were not significantly affected by the day of the test (days 6-10, Tab. 2). Moreover, the mean value in Trial 2 did not differ significantly from that in Trial 1 (4.14 and 3.68 points, respectively) – Table 2. The horses were more willing to approach the umbrella (LNO) when handled (53.5 s) than when loose (294.1 s, $P < 0.05$) – Table 2. With each day of the Trial 2 the horses approached the umbrella quicker ($P < 0.05$). The HR (mean amounting to 64.2 bpm) ranged from 61.3 to 66.0 bpm and was significantly lower than in the Trial 1 (72.4 bpm, $P < 0.05$), but did not differ between particular days of Trial 2 (Tab. 2).

Startle reaction. During days 1-5 (Trial 1), no changes in startle reaction to novelty were found, as expressed by the SR score. During the test, before the umbrella was open, typical behaviour of the horses involved sniffing the ground, remaining motionless or slow walking. After opening the umbrella the horses reacted mostly with a short distance escape. Strong individual differences were observed.

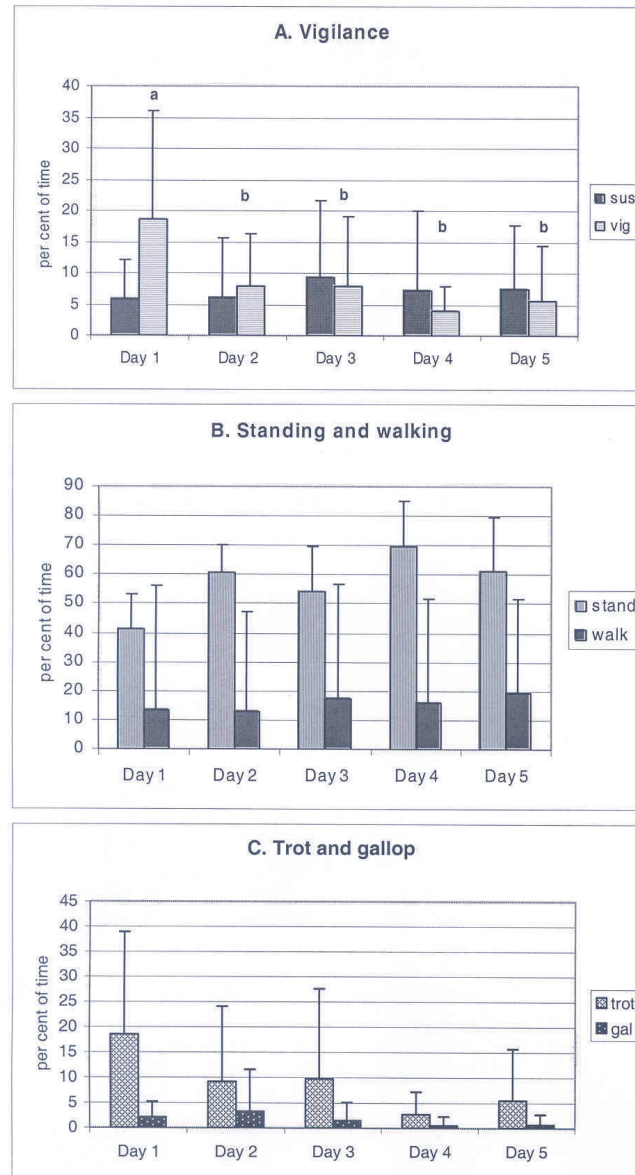


Fig. 1. Per cent of time spent on particular behaviours during Trial 1. Sust – per cent of time spent on sustained walking, vig – per cent of time spent on vigilant standing, stand – per cent of time spent on standing, walk – per cent of time spent on walking, trot – per cent of time spent on trotting, gal – per cent of time spent on galloping. a, b – values differ significantly at $P < 0.05$

Some horses showed no reaction to the stimulus, while some shied continuously when exposed to the novelty. One mare became unwilling to enter the test paddock, showing signs of sensitization and had to be excluded from the trial. This was also observed by Christensen *et al.* [2006], that some of horses of their study did not habituate to a test stimulus only by repetitive exposition. In the cited report individual variation in HR persisted even when behavioural responses had ceased, similarly to our observations of individual horses.

Heart rate. In a study involving a 10-days habituation to novel environment and social separation it was found that pigs' behavioural activity and heart rate also did not change consistently across repetition of exposures [Schrader and Ladewig 1999]. However, during the whole experiment the HR of pigs was higher than the basal value, while in the present study the mean HR of horses during both Trials, except for Day 1, did not differ from the average reference values for a calmly walking horse [Dietz and Wiesner 1982, Voss *et al.* 2002] indicating that in general the horses were not strongly aroused by the stimulus object, or less aroused than pigs.

The optimum duration of habituation to frightening stimulus in horses is unknown. As found in a study on comparison of different methods of ranking horses as related to their emotionality, there is a limit to how often a horse could be exposed to a specific novel stimulus before becoming habituated, as the response to the novel stimulus test decreased on the third day of the 3-days study [McCall *et al.* 2006]. In another study, the average number of required habituation sessions to achieve calm reactions of young stallions to a frightening stimulus was found to be 4.6 [Christensen *et al.* 2006].

Latency to touch NO. The horses in the present study were generally not willing to approach and to explore the umbrella on their own, except for one individual. Similar lack of interest in unknown humans shown by handled young horses was suggested to be an effect of previous handling and experience [Søndergaard and Halekoh 2003]. However, the response to novelty (startle and approach response) was successfully evoked in other studies [LeScolan *et al.* 1997, Wolff *et al.* 1997, Momozawa *et al.* 2003, McCall *et al.* 2006, Górecka *et al.* 2007]. It may also be supposed that our horses, although not very frightened, preferred not to approach unknown object on their own. In the study of McCall *et al.* [2006] about 82% of horses touched a novel stimulus (bright colours child's tricycle) within 15 min of the novel stimulus test, but only 39.5% touched a novel stimulus placed on the ground (plastic tarp) in a runaway test. When not forced or led down the runaway containing a novel stimulus, the horses could avoid passing the runaway and remain at a safe distance from the stimulus, similarly to our horses in Trial 1.

Particular behaviours. The most pronounced change in behavioural response to the novelty was observed in the vigilant behaviour. The horses were mostly vigilant and focused on the novel object on the first day, but on remaining sessions their interest decreased.

The horses were not aroused very much by the umbrella. For the reaction to the umbrella the first day of exposition was crucial. In adult horses, it may be due to their

previous experience with different potentially fearful situations they encountered in their lives. This is in agreement with previous studies on adult horses [Visser *et al.* 2003, Minero *et al.* 2006].

Handler effect. The positive effect of the handler presence was mostly expressed by a shortened latency to approach and touch the umbrella. As the horses were previously acquainted with umbrella during the Trial 1, but not willing to approach it, it may be supposed that during Trial 2 the horses were reassured by the presence of a human. This finding is supported by the study demonstrating that foals accompanied by a human showed less behavioural distress when transiently separated from their dams [McGee and Smith 2004]. It has also been shown that when in a novel environment the previously handled horses reacted less vigorously and seemed to find comfort in the presence of a human [Søndergaard and Halekoh 2003]. Although in the present study the horses showed high individual variation in the latency, on consecutive days they approached the umbrella quicker. It should be noted that all horses did touch the umbrella within the experimental time when held by the handler, except for one mare that refused being led to the umbrella and apparently became sensitized.

During handling, the horses reacted with no changes in heart rate, indicating no arousal during approaching the umbrella. This could be caused by both habituation and reassuring presence of the handler, but regarding the fact that in Trial 1 the horses almost totally refused to approach umbrella by themselves, and that the latency decreased with each day of the Trial 2, gentle handling could facilitate the horses the approach with no stress response of cardiovascular system. Although it has been reported that a novel stimulus test appeared to be a better predictor of nervousness of horses during riding than a novel stimulus test in which a horse was handled [Wolff *et al.* 1997, LeScolan *et al.* 1997], the horses' approach to a novel object was achieved by gentle interaction with a handler, as shown also in the present report. Moreover, the HR was significantly lower during gentle handling than when alone and this is an important finding, showing that even in adult horses, the initial reluctance may be successfully overcome with time. As in the cited report of LeScolan *et al.* [1997], where the handler led the horse, but was not allowed to encourage it, the horse might not be reassured by human behaviour, but only experienced handler's expectation to perform the task (passing the "bridge"). However, the case of the problematic mare in the present study shows that some horses are so reactive that they would rather sensitize than habituate to a novel stimuli and the increased reaction to novelty may jeopardize the safety of the rider or handler. The results of previous studies on horses and other species [Waiblinger *et al.* 2006] as well as the present findings support the idea that a high quality of human-animal relationship can improve welfare and performance of animals and the safety for humans.

In conclusion, this study shows that horses habituated to a startling event by a decrease in vigilance and that gentle and repeated handling facilitates the habituation process.

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Habituacja koni do nowej sytuacji: wpływ człowieka

Streszczenie

Intensywność, z jaką konie reagują na nieznane bodźce, stanowi o bezpieczeństwie konia i człowieka. Celem badań było ustalenie (1) czy nasilenie reakcji konia na zaskoczenie nowym obiektem spada z każdym dniem prowadzonego codziennie testu oraz (2) czy aktywne, łagodne postępowanie z koniem zmniejsza jego reakcje lękowe.

Ośmiu dorosłym koniom eksponowano raz dziennie przez 5 minut w ciągu 5 kolejnych dni nowy (nieznany dotąd) obiekt (NO), z możliwością swobodnego ruchu konia (doświadczenie 1) bądź podczas trzymania go na lonży (doświadczenie 2). Dało to łącznie 10 dni ekspozycji z dwudniową przerwą między doświadczeniami. Analizie statystycznej poddano skalę reakcji wzdrygnięcia (SR), latencję dotknięcia nowego obiektu (LNO), średnie tętno (HR), oraz procent czasu, jaki koń poświęcił na stanie, aktywność lokomotoryczną (stępn, kłus, galop) i zachowanie wyrażające zaniepokojenie (czujność oraz sprężysty, energiczny stępn).

SR i LNO nie uległy zmianie podczas doświadczenia 1. NO spowodował, że na początku badań koń miał szybsze tętno ($P<0,05$) i dłużej pozostawał czujny ($P<0,01$). Procent czasu, jaki koń poświęcił na stanie, aktywność lokomotoryczną (stępn, kłus, galop) i zachowanie wyrażające zaniepokojenie (sprężysty, energiczny stępn) nie był istotnie różny w kolejnych dniach doświadczenia 1. Poziom SR nie różnił się tak w trakcie doświadczenia 2, jak i między doświadczeniami. W odróżnieniu od doświadczenia 1, w doświadczeniu 2 konie podchodziły do NO ($P<0,05$). Z każdym dniem doświadczenia 2 konie podchodziły do NO szybciej ($P<0,05$). Podczas doświadczenia 2 tętno koni było niższe niż w doświadczeniu 1, ale nie stwierdzono w tym względzie różnic między dniami. Badania wykazały, że wystąpiło przywykanie do nowego przedmiotu (habituacja) wyrażająca się zmniejszeniem czujności i że łagodne postępowanie z końmi ułatwia habituację do nowej sytuacji lub nowego bodźca.