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Effect of novel visual item on behavioral distress in foals separated from their mothers

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Summary

The present study involved the observation and recording of behavior (vocalizing, defecating, moving about, charging door) in 12 pre-weaned Arab foals when the mare was isolated for a short period. The aim of the study was to determine whether the behavioral signs of distress exhibited were reduced if a novel item appeared in the foal's stall during the period of separation. The behavior of the foals was observed during two 3 min test sessions of dam's isolation from foal (mare out of stable; no contact with foal): session 1 – without environmental modification and session 2 – with environmental modification (the foal's stall enriched by a visual item: a plastic multicolored ball). Separated foals vocalized significantly (P = 0.004) more and charged the door significantly (P = 0.02) more times than "environmentally enriched" foals. When exposed to multicoloured ball, the foals showed item directed behaviours. Therefore, the presence of an enriching item in the stall with a pre-weaned Arab foal while its dam was taken for a short period reduced some behavioral signs of distress displayed and could eliminate the risk of injuring itself.

Keywords: foal, behavior, separation, environmental enrichment

The domestic horse (*Equus caballus*) represents a 'follower-type' species and the mare becomes bonded to the foal shortly after parturition (4, 9, 23). Maternal behavior supporting the bonding process includes attention to the fetal fluids, nuzzling, sniffing and licking. These reactions are most intense in the first hours and continue with decreasing frequency through the first 3 days until the selective bond (specific mare to specific foal) appears to be well-established (5). The critical period of attachment is longer for the foal. The neonate begins to develop a bond towards the mare more latterly within 2-3 days of birth and begins to be largely responsible for maintaining physical proximity to the mare after 1 week of age (3, 4, 25). Some foals may follow any moving animal or human for the first 24 hours and after this period they normally follow only the dam (5). The degree to which the young interacts with the mare declines with the age of the foal (from 2 to 3 months of age) and the percentage of time spent with other foals increases (3).

Reactivity or emotionality in a horse is a heightened state of arousal, which may influence a horse's manageability and usefulness for specific tasks (14). Stressful events may increase the reactivity level and reduce animal welfare. They can cause emotional disturbances in mental processes and stereotypies can occur as a result of environmental discomfort (12). Environmental modifications are aimed at increasing welfare by reducing negative emotional stimuli and improving physical health (17). Attempts of environmental changes (including methods of environmental enrichment) concern occupying animals in harmless behavior instead of aggression toward pen mates (6, 19), reducing escape responses during handling to decrease the risk of injury (20), providing enriching objects to reduce level of social frustration (13) and promoting a wide range of movement to improve animal's fitness (17).

Breeding practice at many horse farms includes taking mares for covering or other farm procedures when the foal is left alone in its stall for a brief period. Even short-term separation from a dam may be a very distressing experience for the pre-weaned foal (15). In testing the mare-foal bond (9), it was found that both mares and foals demonstrated higher levels of motor activity and vocalization when the pair was short-term (5 min) separated. Some authors assumed that a foal distressed at being separated from its mother for short but frequent periods in its first few weeks of life might

develop problem behavior (stereotypies), but other authors hypothesized that this treatment might help foals to cope with weaning stress (15, 16, 18).

The present experiment investigated the effects of short-term maternal separation on the distress responses of pre-weaned foals. The aim of this study was to determine whether the behavioral signs of distress exhibited were reduced if novel items appeared in the foal's stall during the period of separation.

Material and methods

The study included 12 pre-weaned purebred Arab foals (5 colts, 7 fillies, aged 124 ± 39 days). The mare-foal pairs were housed in stalls. Foals had free access to rolled oat grains, hay and water. Breeding practice at the farm was in accordance with the technology of brood mares' keeping and foals' rearing typical for state studs. Since the first weeks of the offspring's life the mare-foal pairs were submitted to short-term isolation events in order to take mares for mating or other farm procedures. This intervention in dam-offspring bond has always caused intensive response in pre-weaned foals.

The present study involved recording behavior in foals during mare's isolation test according to the authors' own modified method (1). The test was conducted once in every foal. It was organized in two isolation sessions, each lasting 3 min that were conducted on two consecutive days at the same time (10 a.m.). Session 1 involved the dam's isolation from the foal (no contact between foal and mare) – a mare was led out of the stable (for distance 15-20 m from the stable) and a foal stayed alone in the stall without any enriching item. On the consecutive day, session 2 was tested by the same procedure as during the isolation on the first day but when the mare was led out of the stable, the foal's stall was enriched by a novel visual item: a plastic multicolored ball (41 cm in diameter), fixed at the front corner in the stall, close to the stall's door, at the height of foal's head (at eye level). The following behavioral indicators: foal's vocalization frequency – the number of the foal's neighs, defecation frequency – the number of times a foal defecated, locomotor response: moving about (in sec) – the time spent moving around the stall, and charging door frequency – the number of times the foal charged into the door, were recorded by direct observation during both test sessions. The item directed behavior (frequency of watching and frequency of approaching and sniffing the ball) during foal's separation with enrichment was also recorded. After every session (when the mare was back in the stall) the mare-foal pair behavior was recorded for 3 min in order to observe the foal's first reaction after the pair reunion.

All examined variables had no normal distribution and were subjected to non-parametric analyses (22). Wilcoxon pair-matched test, ANOVA Kruskal-Wallis test and Mann-Whitney test were applied and Spearman correlations were estimated (Statistica 6.0). The values of behavioral indicators were expressed as means ($\bar{x}$) and standard deviations (SD). Differences were considered as significant at $P < 0.01$ and $P < 0.05$ (Wilcoxon test). In the present study, correlations were considered as statistically significant when $P < 0.01$ and $P < 0.05$ or tending to be significant when $P < 0.1$. This is in accordance with an earlier study (1) on horses where significance-tending correlations ($P < 0.1$) were considered to identify trends of some behavioral traits.

Results and discussion

This study, in which foals were separated from their mares for short periods, strongly suggests that novel visual items can influence the foals' behavior. Age (Kruskal-Wallis test, $0.09 < P < 0.69$) and gender (Mann-Whitney test, $0.15 < P < 0.88$) were found to be not significantly related to any of the behaviors recorded. Behavioral observations during the mare-foal reunion after both sessions of isolation showed that all foals began to suckle the dam.

Assessing individual differences in reactivity by observing behavioral responses may not always be satisfactory in that it can limit our ability to use behavioral indicators of stress (8). However, McGee and Smith (15) pointed out that although some behaviors may be difficult to interpret, a dramatic or prolonged change in behavior occurring at a time of an unusual event can reasonably be considered as a sign that the individual is experiencing some kind of distress. The young animals' distress can be measured by vocaliza-

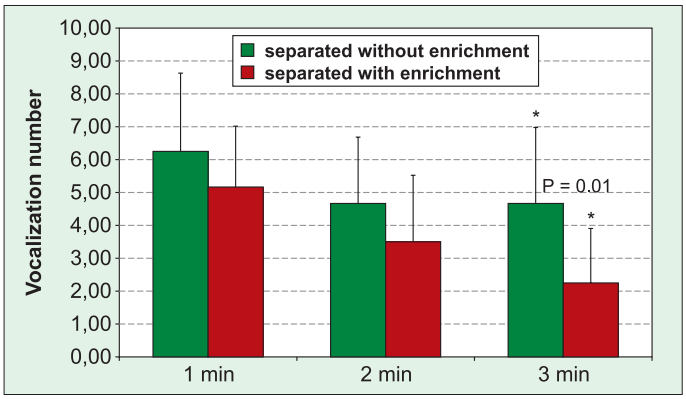

Fig. 1. Influence of visual item on vocalization frequency ($\bar{x}$ ± SD) in foals during separation from mares
Explanations: * significant differences (Wilcoxon test)

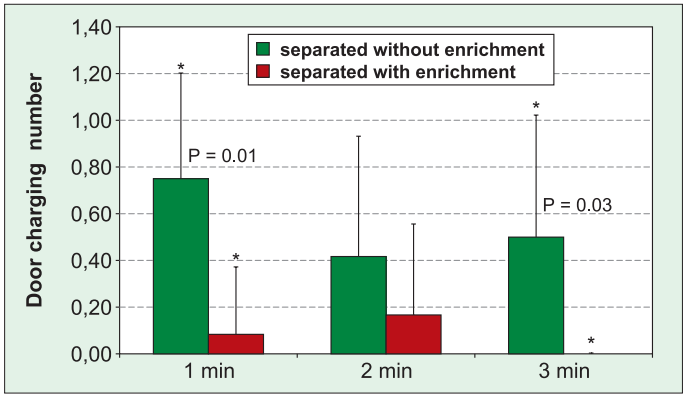

Fig. 2. Influence of visual item on door charging frequency ($\bar{x}$ ± SD) in foals during separation from mares
Explanations: * significant differences (Wilcoxon test)

tions and locomotory behavior as it was shown in studies on calves (2, 10), foals (1, 9, 15) and piglets (24).

In the present study, as Figure 1 illustrates, the separated (without stall's enrichment) foals vocalized significantly (3rd min of separation: P = 0.01) more than animals separated in enriched stalls. Separated foals (without stall's enrichment) charged the door significantly (1st min of separation: P = 0.01, 3rd min of separation: P = 0.03) more times than foals separated with stall's enrichment (Fig. 2). A positive trend (R_s = 0.361, P < 0.09) between vocalization and door charging frequency was shown: the more they vocalized, the more they tended to charge the door. The obtained results are in accordance with the data for pre-weaned Thoroughbred foals (15), providing clear evidence that a human handler accompanying a separated foal reduces vocalizations' rate and eliminates door charging. These authors also found that the mare's isolated foals that were accompanied by a handler spent a smaller proportion of the separation time moving about the stall than those in the isolated group without a human presence but it was not statistically significant. In the present study, the foals isolated in enriched stalls spent less time moving about and their defecation frequency was lower, but these differences were also not statistically significant (Tab. 1). Another study on short-term maternal separation (21) revealed a significant decrease in the frequency of restless behaviors in the foals treated with synthetic Equine Appeasing Pheromone (EAP).

Tab. 1. Level ($\bar{x}$ ± SD) of some behavioural indicators assessed in foals during 3 min. separation from mare

Behavioural indicator	Separated without enrichment (n = 12)	Separated with enrichment (n = 12)	P-level (Wilcoxon test)
Vocalizations number	15.58 ± 5.96	10.92 ± 4.03	0.004
Defecations number	0.50 ± 0.52	0.25 ± 0.62	n.s.
Moving about (s)	65.83 ± 64.87	47.50 ± 46.93	n.s.
Door charging number	1.67 ± 1.15	0.25 ± 0.62	0.02
Watching the ball number	–	0.75 ± 0.45	–
Approaching and sniffing the ball number	–	0.42 ± 0.51	–

Explanation: n.s. – non significant

When exposed to a multicolored ball, most of the studied foals showed item directed behaviors (Tab. 1). A total of 9 (75%) of the 12 'enriched' foals were interested in the novel visual item and watched it (Fig. 3). Of the 9 foals that showed item directed behavior, five (56%) approached and sniffed the ball. Only three 'enriched' foals were not interested in novel, visual item and showed intensive vocalizing and locomotor activity (Fig. 4). The frequency of item directed behavior was negatively correlated with total score of moving about (R_s = –0.631, P < 0.05 between watching the ball and moving about, R_s = –0.831, P < 0.01 between approaching, sniffing the ball and moving about). Moreover, a negative trend (R_s = –0.519, P < 0.08) between frequency of approaching and sniffing the item and vocalization frequency was shown: the more interested the foals were, the less they tended to vocalize. The results of Jorgensen et al. (11) showed that horses kept in individual paddocks and in groups performed more item-directed behaviors when given access to edible items like straw and a ball filled with concentrates. However, the horses kept individually paid more attention to non-edible items like a pole compared to horses in group paddock.

In conclusion, the presence of an enriching item in the stall with a pre-weaned Arab foal while its dam was taken for a short period reduced the incidence of

Fig. 3. Item (multicolored ball) directed behavior during foal's separation from dam

Fig. 4. Behavioral distress (door charging) and no interest in novel visual item (multicolored ball) during foal's separation from dam

distress displayed and could decrease the risk of injuring itself. Moreover, the earlier study by McGee and Smith (15) underlined that such procedures may have longer-term benefits by reducing the chance of later developing locomotory stereotypies. The multi-colored ball provides visual stimuli and provokes an orienting reflex to novelty or distraction to alter the foals' perception of the stall. It appears to be a successful method of environmental modification to reduce the consequences of the social frustration and improve the foals' welfare by reducing negative emotional states expressed by intensive vocalizing and locomotor activity. The present study suggests that this method may be used to reduce stress during horse rearing, farm and veterinary procedures. However, this method needs more investigation to elucidate the underlying mechanisms.

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