

What impact does stall architecture have on horses' behaviour?



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Abstract

Box housing remains predominant in horse industry despite of the spatial and social restrictions it causes to the horse, leading to the emergence of abnormal behaviours such as stereotypies, which can arise very soon after the first box housing. In the present study, we have investigated the impact of openings in the boxes, in terms of possibilities of vision, on the normal and abnormal behaviours of box housed horses. Two complementary studies were performed: one observational study on 32 sport horses, all living in the same place, being of the same breed and sex, which aim was to compare the behaviours of horses maintained for a long time in two types of boxes that differed mostly in the possibilities of contact with close neighbours versus watching outdoor activities; the second experimental study consisted in moving purebred Arab broodmares from one to another type of box randomly every day for 66 days, the two types of boxes differing only by the possibility or not to put the head outside above the open top half door. The results show a clear statistical relation between box architecture and horses' behaviour, especially stereotypic behaviours. Their prevalence and type differed according to the type of box in both studies. Overall the access to outdoor vision, and its degree (head out or not) had a major effect on the horses' behaviours, which was the same in both studies, despite of the differences between populations in terms of breed, sex, occupation. The experimental study reveals that changes in behaviours can be rapid after a change of housing.

Keywords : stereotypies, time budget, housing, welfare, horse

Introduction

Single box housing is predominant in sport horses but remains also very frequent in riding schools. Such housing imposes different types of restrictions on horses, mostly spatial (hence locomotory) and social. Single box housing has thus been associated with the prevalence of abnormal behaviours such as stereotypies in questionnaire based epidemiological studies (e.g. [1]). The lack of close social contact seems to be one major problem as the presence of side windows enabling at least visual or naso nasal contact enables the reduction of abnormal repetitive behaviours, and especially weaving [2]. Visser et al ([3]) found that young warmblood horses developed stereotypies in the two first weeks after their first box housing if they were in single boxes while pair housed animals did not. Benhajali et al ([4]) showed that broodmares with foals were less stereotypic than their non foaling neighbours housed in the same conditions, the foal being a source of social interactions. In fact, being at least able to see closely a neighbor seems crucial as the presence of a horse picture or of a mirror reduces considerably the expression of such behaviours, even in horses that had been known to be stereotypic for several years ([2], [5]).

In the present study, we have investigated the impact of boxes' architecture, and especially the opportunity for social visual contact on the behaviour of adult horses housed in single boxes, with a special emphasis on stereotypic behaviours. Two complementary studies were performed: one based on the observation of 32 horses of same breed (SF), sex (geldings) and discipline (dressage) living on a same site (hence under the same management conditions) in two different types of boxes : (1) front half door open on outside and small side window with grid, (2) internal boxes with 2 side windows with grid and a front (corridor) half door closed with a grid, enabling to see close neighbours but no outside view; the second based on an experimentation performed on 42 Arab

purebred broodmares (non pregnant) housed in the site for more than three weeks in single boxes, the experimentation consisted in changing their housing randomly everyday between two types of boxes: type 1: front half door open on the courtyard and small opening near the ceiling enabling mostly olfactory contact with neighbor, type 2 boxes were similar but a grid on the door prevented the horse to have the head outside.

I. Study 1 (Hausberger *et al*, *subm*)

A. Material and methods

Subjects and housing conditions

Thirty-two horses (French Saddlebred) were observed at the "Ecole Nationale d'Equitation" (ENE) at Saumur in August 1994. They were all kept under the same conditions (housing and feeding practices): straw bedded single boxes, they were fed pellets (3 times a day) and hay (only once, in the morning), had water ad-libitum, and were ridden for one hour every day. Their type of work was dressage (competition and high school). They were all geldings and were 6 to 19 years old ($\mu = 10.03 \pm 3.8$).

Thus, all horses shared the same living conditions, were of the same sex and breed but differed only in the type of box they were living in (Fig 1a): 17 horses were housed in type 1 (surface: 9.75 m²; openings: 3.32m²) boxes consisting in two full walls, a side window with grid that allowed to see one neighbour and the front half door was open, enabling the horse to have the head outside. This opening gave a view over the riding arena and horses being led from their box to the working areas and back; 15 lived in the internal stable in boxes of type 2 (Fig. 1b) where they had no window or opening on the outside but had side windows with grids on each side wall, enabling sight and nose to nose contact with their neighbours as well as a grid above their door, enabling sight of neighbours across the corridor: they could see therefore more than 5 neighbours (1 on each side and 3 in front at least). Type 2 boxes were 9 m² and had 11.76 m² openings. Type 1 boxes favoured a vision of the outside world while type 2 boxes favoured social visual contact at close range only. Horses were kept in the same box for longer periods and all of them had been in this same type of box for more than 6 months.

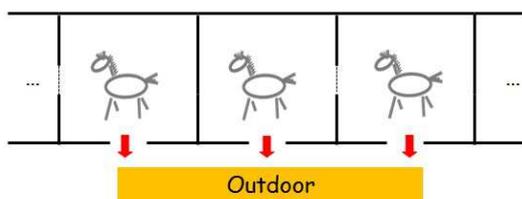


Figure 1a : Type 1 boxes

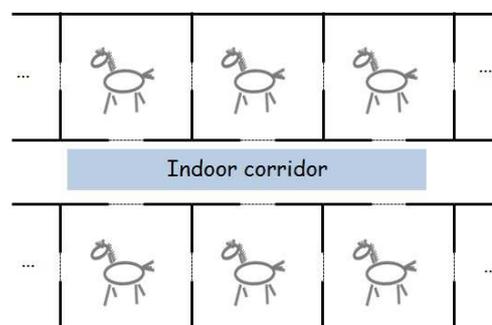


Figure 1b : Type 2 boxes

Data collection and statistical analyses

Each horse was observed during 10 to 11 5min sessions distributed in the morning (8 to 11 a.m), in the afternoon (1 to 4 p.m. and 5 to 7 p.m) and before meals, yielding 50 to 55 minute observation per horse (mean: 54.22 ± 1.84 min per horse). The same observer (EG) recorded all the observations through a voice recorder. The time of observation of a given horse changed every day following a rotation schedule (thus if one horse was observed from 05:00 p.m. to 05:05 p.m. on day 1, it was observed between 05:05 p.m. to 05:10 p.m. on day 2, etc).

All behaviours were noted. Abnormal repetitive behaviours were identified according to Mills ([6]) (see Appendix 1).

Non parametric statistics were used: Chi square tests to compare the number of horses performing a behaviour or activity according to the type of box; Mann Whitney U tests to compare the frequency of occurrences of behaviours between horses living in different types of boxes.

B. Results

Overall, the horses living in type 1 boxes spent less time sleeping ($U=197$, $p=0.007$) while no difference was found in activities such as eating (type 1: 0.703 ± 0.276 ; type 2: 0.732 ± 0.268 ; $U=133$, $p=0.85$) or drinking (type 1: 0.027 ± 0.029 ; type 2: 0.022 ± 0.028 ; $U=114$, $p=0.606$). All horses performed at least one type of abnormal repetitive behavior (ARB including stereotypies) during the observation period. However the type of ARB performed depended on housing (type of box).

Thus, weaving was observed in almost half of the horses with external view and less than 10% of the horses living indoors ($X^2= 8.07$, $p<0.005$) (Fig.2). while about 80 % of the horses living indoors performed repetitive grid licking for less than 10% of the horses with external opening ($X^2= 12.5$, $p<0.001$).

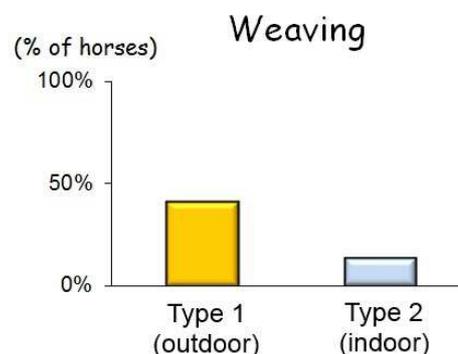


Figure 2 : Proportion of horses performing weaving according to the type of box.

II. Study 2: experimental approach (Benhajali et al subm)

A. Material and methods

Subjects and housing conditions

Forty two purebred Arab broodmares aged 4–22 years ($\mu = 9.23 \pm 5.37$) were observed at the national stallion breeding facility of Sidi Thabet, located 20km from Tunis. They were housed in individual stalls where they received barley grains (4 kg/day) and hay every morning. Roughage was therefore available most of the day time. They were released every day from 9 a.m. to 3 p.m. in a paddock where free access to water and limited shelter (5 trees) were provided. No food was available then but some freshly cut grass was left on the ground around 12 a.m. every day. None of the mares was pregnant at that time. Mares came from 75 breeding farms ($x = 1.48 \pm 0$, 89 mares/stud) and had been in the facility for at least 3 weeks before the start of observations. Thus, all horses were of the same sex, breed and overall living conditions.

Two types of straw bedded boxes (all 5x 3 m) were available: type 1 with 3 almost full walls and an opening on the top half door enabling to have the head outside ; type 2 which were similar except that a grid on the top half door prevented the horse to have the head outside, limiting the visual horizon. In both cases, very small openings near the ceiling (above the horses' head) at the upper level of the side walls could provide a minimal contact (naso nasal mostly, not visual) between neighbours.

Data collection and statistical analysis

Observations were made by two observers everyday from the 21th March to the 26th of May 2011 (66 days) using instantaneous scan sampling (8 scans / mare / day). Twice a day (once in the morning before feeding and once in the evening after feeding), each observer walked throughout the stable 2 times and noted the behaviour of each of the mares at the instantaneous time of each passage. The total number of scans was 11684 (278.2 ± 79.3 per mare). The time budget for each behaviour was determined as the recorded numbers of each behaviour divided by the total recorded number of all behaviours in each horse.

The same mares were observed in the two different types of boxes and therefore the behaviours of the mares were compared according to the box in which they were when observed, using a Wilcoxon test.

B. Results (Fig 3)

Twenty seven percent of the mares were observed performing an abnormal repetitive behaviour. Those that did performed them more when they were in the type 1 boxes ($Z= 4.38$, $p<0.01$). This is

true for weaving that diminishes fourfold when the mares were in the type 2 boxes ($Z=3.41$, $p<0.01$) and crib biting ($Z=3.51$, $p<0.01$). Overall the horses were quieter in the type 2 boxes as compared to type 1 boxes with more resting ($Z=5.38$, $p<0.01$), lying down ($Z=2.02$, $p=0.04$) and feeding ($Z=5.59$, $p<0.01$) and less alert standing ($Z=5.57$, $p<0.01$).

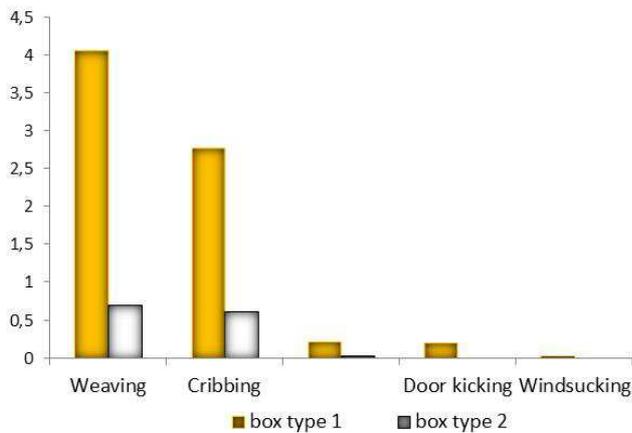


Figure 3 : Time spent (proportion of scans) performing the different types of stereotypies according to the type of box

III. Discussion

The results obtained through these two studies confirm of course the inappropriateness of single box housing for horses, especially when they have no opportunity of going out at some stage. Thus, the first population observed had a higher prevalence of stereotypic behaviours than the second: reasons are in particular that the mares were in paddocks part time, but also the differences in occupation (see also [7]).

Nevertheless even in this restricted type of housing, some conditions may be still less appropriate than others. Here we show that having close (visual/olfactory) contact with neighbours diminishes the risk of major stereotypies such as weaving (less when two side windows) (study 1) which just confirms earlier findings ([2], [5]) although increasing repetitive grid licking, which may reflect some frustration not to be able to have proper contact. We also show that changes in housing induce immediate behavioural changes (study 2). More intriguing and interesting however is the major finding that distant visual contact is an aggravating factor for stereotypic behaviours and especially weaving, considered as reflecting frustration of social contact [8].

Thus, in both studies, being able to have the head outside to watch distant neighbours and above all, horses that were led to the arena or to other activities, seem to increase the risk of weaving in both populations. This is especially remarkable in the broodmare population where it was the only difference between the two types of boxes: mares that had grids on the half door performed less weaving than those who could have the head outside and watch conspecifics and human walking around. As stereotypies are considered a sign of frustration ([9], [10]), this seems to reveal that horses experience more frustration in these conditions, due to either being unable to join the distant horses, or to being unable to move out of the box as do the other horses (ex in the riding arena or walking along the boxes). In monkeys, it has been shown that it is much more frustrating to watch a conspecific eating an (unreachable) appetitive food than seeing simply being denied access to the same visible food [11].

This is once more the demonstration that "only animals can tell". Humans would tend to think that being able to watch outside and see activities would reduce boredom and hence stereotypies while obviously this situation creates much more frustration as suggested also by Cooper et al ([8]) study.

Acknowledgments

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Appendix : terminology

The stereotypic behaviours noted corresponded to those described in a variety of studies and had the common feature of consisting of repetitive movements performed without any specific goal [6].

Weaving: obvious lateral swaying, movement of head, neck, forequarters and sometimes hindquarters [6].

Stall-walking: the pacing of a fixed route around the stall ([12]).

Head nodding: repetitive bobbing of the head up and down [6].

Door kicking: repetitive kicking of the door [13].

Wind-sucking: was defined as when a horse bends the neck, tenses the muscle on the underside of its neck while opening the mouth and with the neck muscles forces air in the oesophagus without supporting the teeth on any solid material [14].

Organisms

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