

Difference in exploration and use of PET bottle and horseshoe for environment enrichment in piglets

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Attractivity of two different enrichment objects was investigated in paper. Eight piglets were housed in pen with slatted floor. Pen environment was enriched with two hanging objects – PET bottle and horseshoe. Interactions with enrichment objects were evaluated during two consecutive days. PET bottle was more attractive, total number of interactions was 600 on day 1 and 451 on day 2. Horseshoe has very low attractiveness, number of interactions on day 1 was only 64 and 74 on day 2. Exploration of more attractive object was decreasing between days. Exploration of less attractive object was increasing. We recommend use of different enrichment objects for prolonged duration of exploration and occupation by manipulation, but both objects should be attractive for piglets.

Keywords: environment, enrichment, piglets, keyword, keyword

1 Introduction

Environmental enrichment is a key factor of animal welfare as well as farm animal production. The lack of stimuli in animal environment can lead to boredom which may results in development of abnormal behaviors or aggressive behavior (Wood-Gush and Beilharz, 1983; Bolt and George, 2019; Chen et al., 2020). Housing systems for farm animals differs from natural environment but enrichment stimulate and allow animals show normal behavior. In most of modern housing systems for pigs are animals kept in pens without straw, because of economic and hygienic reasons. Exploration and rooting are naturally important behaviors and if allowed pigs spent large amount of time by these patterns. According to the Council Directive 2008/120/EC “pigs must have permanent access to a sufficient quantity of material to enable proper investigation and manipulation activities” (Jensen, 2002; Elkmann and Hoy, 2009; Buijs and Muns, 2019).

Environmental enrichment motivates the expression of natural behavior in pigs, e.g. exploration, rooting, etc. (Averós et al., 2010). There are five main categories of enrichment: nutritional; occupational; sensory; physical; and social (Young, 2003). Enrichment for farm animals should be cost effective, safe and successfully exploited by animals in farm (Bolt and George, 2019). Several types of non-straw enrichment are in use with considerable effect on undesired behavior as tail biting. Enrichment objects should be changed regularly for permanent attractiveness and occupation by manipulation in prevention of abnormal behavior (Averós et al., 2010; Ernst et al., 2018; Buijs and Muns, 2019). Godyń et al. (2019) in wide review on environmental enrichment reported materials considered to be of marginal interest by EU legislation (plastic objects) have desired effect on pigs` behavior.

Aim of the present study was to evaluate the differences in exploration and use of two different type of physical enrichment. Two hanging objects – a PET bottle and a horseshoe were used as enrichment objects. PET bottle

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and horseshoe are made from different materials and senses perceive difference in contacts. We expected that the interaction with the PET bottle would be more pleasant and the piglets would use it more frequently and for a longer time, but with a decreasing interest in time.

In study we tested hypothesis that the number of interactions with PET bottle will be higher than interactions with the horseshoe.

2 Material and methods

2.1 Animals, housing and enrichment

A total of 8 piglets (6 barrows and 2 gilts) were included in study, crossbreds of the Mangalitsa and the Large White. Piglets were 12 weeks old, the average weight was 19.56 kg, *s.d.* = 1.92 kg. The piglets were housed in pen with dimensions 1,820 × 2,350 mm (length × width). The pen has slatted floor, 700 mm height plastic walls, it was equipped with a feeding rack, a watering point (one nipple drinker) and a nest with heating lamp for piglets. Feeding was *ad libitum*, feed was offered once a day at 8.00 AM.

The environment of the pen was enriched with two external accessories – one hanging PET bottle and one hanging horseshoe. PET bottle was filled with water, but not full and was slightly compressible. The PET bottle was not destroyed by the piglets and same was used on both days. Enrichment objects were in pen simultaneously, 1000 mm apart, free accessible from all directions and piglets can freely manipulate with objects (see Figure 1).

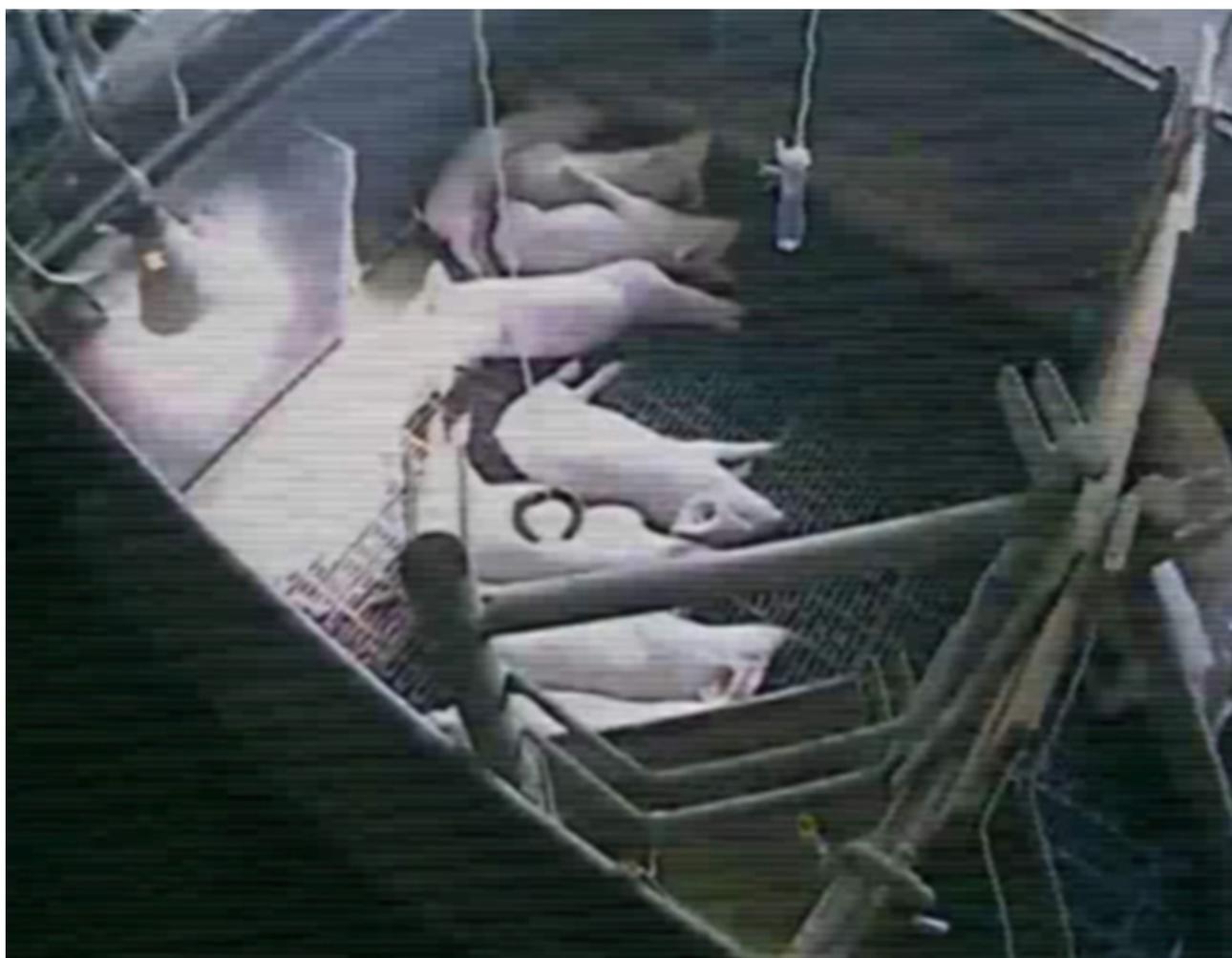


Figure 1 Pen with enrichment – hanging PET bottle and horseshoe

2.2 Data collection

Behavior of the piglets was observed, analysed and evaluated during two consecutive days. Piglets were observed as group. Piglets were housed in the enriched pen on first day of observation at 8.00 AM. Observation in both days was lasted 6 hours, from 9.00 AM to 15.00 PM. Behavior was recorded by means of video-surveillance CCTV system. One camera was mounted at ceiling. Behavior was analysed from videorecords by software for behavior analysis The Noldus Observer XT 11.5. Interactions with enrichment objects were coded by continuous sampling. Interaction was defined as touch of the enrichment object with snout. Some touches were followed by attempts to chew or few chews on the objects. Attempts to chew and chews on object was considered as one interaction together with initial touch.

2.3 Statistical analysis

Evaluation of the engagement of piglets with enrichment was quantified by the sum of interactions with enrichment objects during all observation and the arithmetic mean of interactions per 20 minutes (AMI_20) intervals (18 intervals). Comparison of the sum of activities between 1st and 2nd day was performed by paired *t*-test. Changes in interactions with enrichment objects during observation were tested by One-way ANOVA.

$$y_{i,j} = \mu_i + \varepsilon_{i,j}$$

where:

$y_{i,j}$ – observations; μ_i – arithmetic mean of *i*-th interval; $\varepsilon_{i,j}$ – random errors; $j = 1, \dots, 20$ minute; $i = 1, \dots, 18$ interval

Tested was the difference in arithmetic means of number of interactions per minute in 18 intervals.

Tendency in changes in interactions with enrichment objects during day was evaluated by linear regression model. Statistical analysis and calculation were performed with IBM SPSS Statistics 20.

3 Results and discussion

Analysis of the interactions with the enrichment objects by the pigs showed that PET bottle was more attractive. PET bottle was interacted 600 times per day 1 and 451 times per day 2. Horseshoe was interacted 64 times per day 1 and 74 times per day 2. Differences in attractiveness of various enrichment objects is suggested by many other authors (Elkman and Hoy, 2009; Averós et al., 2010; Buijs and Muns, 2019). Intensity of exploration is dependent on many factors like type of floor, bedding, space allowance (Averós et al., 2010). Number of interactions was relatively high, in contrary with decreasing exploration activity in no-bedding pens with similar space allowance reported by Averós et al. (2010). Distribution of interactions with enrichment objects during day was not-uniform (Figure 2, Figure 3). ANOVA procedure discovered significant differences ($P < 0.001$) among arithmetic mean of interactions per minute during intervals per day for both enrichment objects in both days. Explanation is simple, piglets during period of resting did not show any activity. Interactions with PET bottle on day 1 was recorded in 14 intervals, on day 2 in 12 intervals. Interactions with horseshoe on day 1 was recorded in 11 intervals, on day 2 in 9 intervals. The highest number of interactions per interval on 1st day (98 with PET bottle and 15 with horseshoe) was recorded in 1st interval of observation, probably because of effect of novelty. The highest number of interactions per interval with horseshoe was recorded on 2nd day (17 interactions) in 6th interval, after period of resting. The arithmetic mean of interactions per 20 minutes (AMI_20) with PET bottle during day 1 was 42.86 interactions ($s.d. = 36.87, n = 14$). The AMI_20 with PET bottle during day 2 was 37.58 interactions ($s.d. = 21.55, n = 12$). Difference in PET bottle interactions per interval between day 1 and 2 was not significant ($t = 1.13, P > 0.05$). The AMI_20 with horseshoe per day 1 was 5.82 ($s.d. = 4.29, n = 11$). The AMI_20 with horseshoe per day 2 was 8.22 ($s.d. = 5.52, n = 9$). Difference in horseshoe interactions per interval between day 1 and 2 was not significant ($t = -0.663, P > 0.05$). Linear regression of interactions with PET bottle during day discovered increasing number of interactions on day 1 and decreasing number of interactions on day 2 (Figure 2). In contrary, interactions with horseshoe during day 1 was decreasing and during day 2 was slightly increasing (Figure 3). Decreasing number of interactions with PET bottle between day 1 and day 2 suggests necessity of changes of enrichment objects (Ernst et al., 2018; Buijs and Muns, 2019; Godyń et al., 2019). Increased number of interactions with less attractive objects is in accordance with Averós et al. (2010) reported the provision of different enrichment objects increases the duration of exploration.

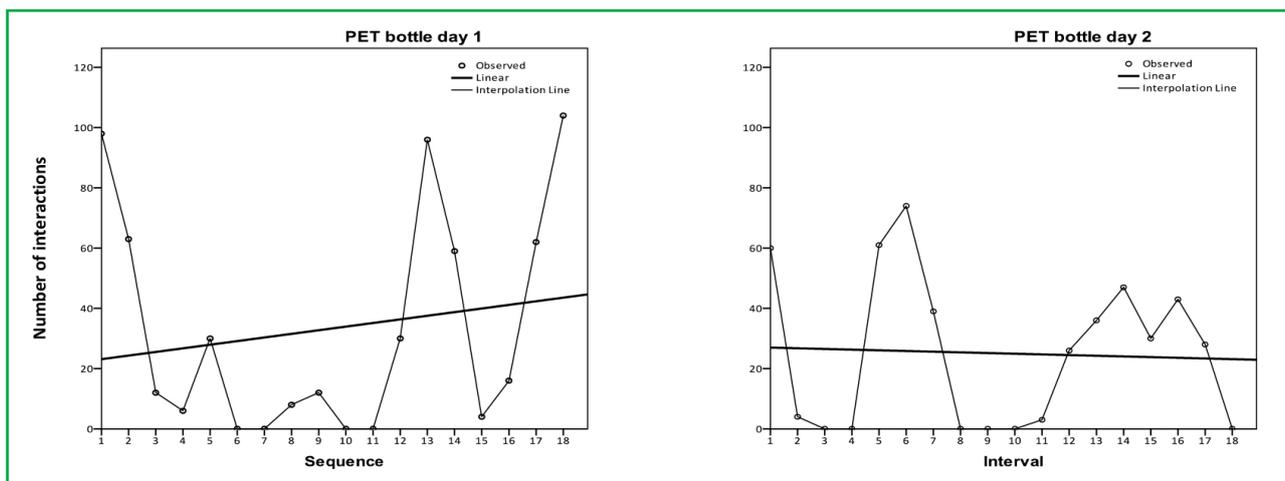


Figure 2 Number of interactions with PET bottle on day 1 and day 2 ($n = 8$)

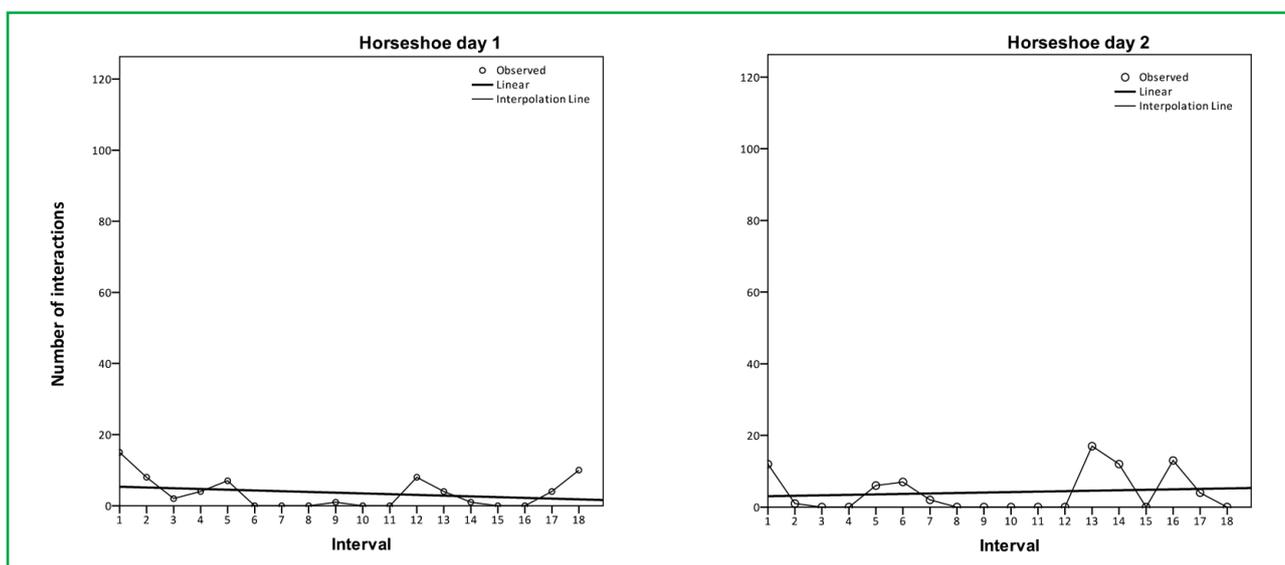


Figure 3 Number of interactions with horseshoe on day 1 and day 2 ($n = 8$)

4 Conclusions

The results of the experiment show the difference in the attractiveness of PET bottle and horseshoe for interactions in piglets. However, the use of different enrichment objects prolongs the duration of exploration. Because of low attractiveness of the hard object – horseshoe and small total number of interactions we recommend the use of different enrichment objects, but more attractive for pigs.

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