

Analysis of the weaned piglets reaction on the handling material with coloured balls and possibility of exploration and chewing

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Abstract: *Analysis of the weaned piglets reaction on the handling material with coloured balls and possibility of exploration and chewing.* Maintaining proper pig welfare levels in intensive production systems requires the use of appropriate handling materials. At present, there are many elements commonly referred to as toys in breeding and production, but not all of them meet safety and functional requirements. The purpose of the study was to analyze the reaction of weaned piglets on a toy pen – an “abacus” with coloured balls (test version). Direct observations were made on the behaviour of piglets of the Pulawska and Polish Large White (PLW) breeds using the ethogram, taking into account motor activity with elements of interest in an “abacus”, including: climbing on an “abacus”, shifting balls (interest in yellow, blue, red), rest, excretory behaviour, nutritional behaviour. It was found that piglets of the Pulawska breed climbed on an “abacus” for more time (15.2 min, i.e. 3.6 min longer than the PLW breed), and the PLW breed moved balls longer (26.2 min, i.e. 9.6 min longer than the Pulawska breed). Piglets of the two breeds had the least interest for red balls. Piglets of the Pulawska breed preferred the most blue and then yellow balls. Polish Large White piglets were more likely to choose yellow and blue balls. Eating time and water intake were higher in Pulawska breed, respectively 10.8 and 5.4 min compared to 6.6 and 3.0 min in PLW breed.

Key words: piglets, weaning, behaviour, toys

INTRODUCTION

Behaviour of pigs manifested in a specific ontology and production environment is an important element used in the shaping of modern breeding and production principles of this species of livestock. Age-appropriate behaviours are in addition to the production and health indicators, the most determinant criterion for assessing well-being (Marć-Pieńkowska et al. 2014, Adamczyk et al. 2015). The intensive rearing system exposes the individual pig production groups to a number of stressors. These factors affect their vital functions, they change the pattern of behaviour (Frindt et al. 2006), which often leads to behavioural disorders such as stereotypes or aggression (Kondracki et al. 2014). Based on the results of observing the behaviour of particular groups of pigs, also post-weaning piglets, it is possible to modify the breeding environment, e.g. by enriching them with manipulative materials (Nowicki et al. 2015). Straw is best material, but also in this case it is possible to apply materials of the marginal interest. These elements are used to distract pigs, which is especially useful in the post-weaning period. Materials of this type should arouse interest in exploration e.g. easy access, colour

variability and enable oral manipulation, e.g. biting, chewing (Council Directive 2008/120/EC, Commission Recommendation (EU) 2016/336).

The aim of the study was to analyze the reaction of piglets to a handling material – an “abacus” with coloured balls, towards the possibility of its use as an element of improving well-being by limiting the influence of stress factors in post-weaning period.

MATERIAL AND METHODS

Animals

The study was performed in the Lublin region (East-Central Poland) with two groups of piglets: Pulawska breed and Polish Large White (PLW) breed. Piglets were kept in two farms. Piglets were weaned at 35th day of age. Each research group was two litters. The size of the group was in the range: for the Pulawska breed 18–22 pcs, for the PLW breed 20–24 pcs. The sex share in the groups was close to even. Observations were conducted for five groups of the Pulawska breed (100 piglets) and five groups of the PLW breed (110 piglets). Piglets were maintained on traditional straw and they were kept in pens in which the average area for 1 pc was 0.25 m². The construction of pens and welfare conditions (temperature, humidity, air movement, lighting) in farms were comparable and consistent with the requirements (2010 Minister of Agriculture and Rural Development Regulation). Piglets were fed *ad libitum*. Permanent access to water was provided by nipple drinkers. Litters were subjected to preventive measures, standardized for this age group.

Behavioural observations

The handling material was placed in the pen on the first day after weaning – the experimental period. Direct observations were performed in three phases during the experimental phases: 7:00–8:00, 12:00–13:00, 16:00–17:00, which was associated with the activity of piglets resulting from the length of daylight. The record was made by the service staff, which eliminated the impact of additional novelty in the piglets environment. The animals showed no interest in the service staff. The ethogram included: motor activity with elements of interest an “abacus”, including: climbing on an “abacus”, moving balls (interest in yellow, blue, red), rest, excretory behaviour, nutritional behaviour. Behavioural observations included: frequency of each behaviour in three periods, duration of each behaviour per hour of observation in the experimental period. Observations were also made on behavioural anomalies, i.e. stereotypies acute aggression beyond normal behaviour in terms of group hierarchies, tails and/or ears biting.

Construction of handling material

The proposed manipulation element to maintain optimum piglet behaviour, as well as to reduce stress, was an “abacus” with coloured balls (Fig.), mounted in a pen. The counter frame has been made of rectangular tubes that are fit with steel bars (stainless steel) with movable coloured balls. The rods were secured with locking elements. The balls were used in three colours: yellow, blue, red, all made of material harmless to the health

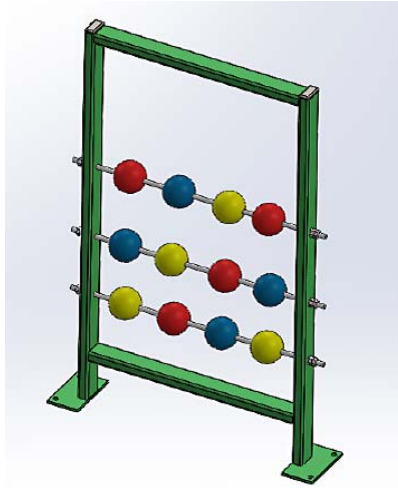


FIGURE. Design of an “abacus” with coloured balls

and life of piglets while easy to clean and disinfect. The base of the counters allows them to be attached to the floor in the pen by screws. Dimensions of the toy were adjusted to the size of piglets aged 5–6 weeks. The height of the counter was 65 cm and the width was 40 cm. With the increase in piglets, it is possible to adjust the height of the counter by moving the bars to the higher levels. The construction and assembly of the toy made it possible to exchange the balls and to disinfect the construction at any time. The toy was mounted in a pen on the border of the feeding and storage areas.

All data were statistically analysed by calculating the arithmetic means and standard deviations (*SD*) for each type of behaviour. Normal distribution of data was confirmed by the Shapiro–Wilk test. The results were statistically analysed by significance of differences between means was determined by Student’s *t*-test, using Statistica software ver. 6.0.

RESULTS AND DISCUSSION

Exploration is one of the most important components of the behaviour of pigs. Basic exploratory behaviour of pigs includes, among others, touching, chewing and sniffing (Olsen et al. 2000, Pisula 2003, Studnitz et al. 2007). Intrinsic instinct is particularly manifested by young individuals who are acquainted with the environment (Empel 2005). In no group of piglets it was found any behaviour different from the standard behaviour for age and hierarchy in the newly formed group (Grudniewska 1998). The highest motor activity of litters occurred in the morning and the lowest in the afternoon. In both breeds, it was similar in the individual observation intervals (Table 1). Although the motor activity of the piglets with interest in an “abacus” remained at a similar level, statistically significant differences ($P < 0.05$) were observed for the individual behaviour of an “abacus”.

TABLE 1. Mean ($\pm SD$) number of events in individual behaviours of piglets

Type of behaviour	Observation 7:00–8:00		Observation 12:00–13:00		Observation 16:00–17:00	
	Pulawska	PLW	Pulawska	PLW	Pulawska	PLW
	<i>SD</i>		<i>SD</i>		<i>SD</i>	
Motor activity with elements of interest in an “abacus”	14.8 \pm 6.1	14.4 \pm 6.9	9.7 \pm 4.5	10.1 \pm 4.4	8.9 \pm 3.6	7.9 \pm 3.1
climbing on an “abacus”	6.5 ^a \pm 2.9	4.6 ^a \pm 1.8	4.7 \pm 1.9	3.8 \pm 1.1	3.9 \pm 1.4	2.8 \pm 1.0
moving and biting balls	7.2 ^a \pm 3.1	9.5 ^a \pm 3.2	4.8 ^a \pm 1.2	6.7 ^a \pm 2.2	4.7 \pm 1.8	4.8 \pm 1.8
– interest in yellow	1.8 ^a \pm 0.7	4.7 ^a \pm 1.9	1.0 ^a \pm 0.3	3.6 ^a \pm 1.1	1.0 ^a \pm 0.3	3.7 ^a \pm 1.2
– interest in blue	4.6 \pm 1.7	2.9 \pm 0.9	3.6 \pm 1.2	1.9 \pm 0.4	2.9 ^a \pm 1.1	1.0 ^b \pm 0.7
– interest in red	1.1 \pm 0.3	1.8 \pm 0.5	0.0	1.1 \pm 0.4	1.0 \pm 0.5	0.0
Eating	3.4 \pm 1.4	1.8 \pm 0.5	1.8 \pm 0.4	1.9 \pm 0.6	2.7 \pm 1.0	1.9 \pm 0.7
Drinking	1.9 \pm 0.5	1.1 \pm 0.3	1.7 \pm 0.5	1.1 \pm 0.5	1.1 \pm 0.3	1.0 \pm 0.2
Excretion behaviour	1.0 \pm 0.2	0.9 \pm 0.4	1.1 \pm 0.3	1.0 \pm 0.3	1.0 \pm 0.4	0.9 \pm 0.1
Rest	0.9 \pm 0.3	1.0 \pm 0.3	0.9 \pm 0.2	1.1 \pm 0.3	0.9 \pm 0.3	1.1 \pm 0.5
Behavioural anomalies	lack					

Means with the same letters differ significantly between groups in a observation, $P \leq 0.05$.

Climbing on an “abacus” took the Pulawska breed 15.2 min, e.g. 3.6 min longer than the PLW breed. On the other hand, in the case of piglets of the PLW breed, the time spent on ball handling was increased by 5.6 min (Table 2). Such a distribution of values may mean that individuals of the Pulawska breed prefer active exploration of new objects, while the PLW breed selects stable exploration.

TABLE 2. Mean ($\pm SD$) time spent of individual behaviours per 1 hour of observation

Type of behaviour	Duration (min)	
	Pulawska	PLW
	<i>SD</i>	
Motor activity with elements of interest in an “abacus”	31.8 \pm 18.8	37.8 \pm 22.3
climbing on an “abacus”	15.2 ^a \pm 7.9	11.6 ^a \pm 5.6
moving and biting balls	16.6 ^a \pm 9.6	26.2 ^a \pm 12.1
Eating	10.8 \pm 6.6	6.6 \pm 3.9
Drinking	5.4 \pm 2.9	3.0 \pm 1.6
Excretion behaviour	3.9 \pm 2.1	2.9 \pm 1.3
Rest	8.1 \pm 4.7	9.7 \pm 4.3

Means with the same letters differ significantly between groups, $P \leq 0.05$.

tion, which may be due to the genetic characteristics of the breed (Pastwa et al. 2016).

Using knowledge of pig behaviour, the characteristics of the exploratory material should be defined, e.g. the possibility of chewing, shape and colour, contact, edibility and safety (Santen and Donselaar 2014). An important asset of the exploratory material for pigs is the maintenance of the so-called novelty effect (Tynes 2015). The more introduced to the pen the element stands out against the background of the environment, e.g. colour, the greater the interest of the animal.

Pulawska breed were more likely to climb on an “abacus”, and the PLW breed was more likely to move the balls (Table 1).

As a result of observations of pig behaviour, it has been shown that these animals have the ability to distinguish basic colours (Herbut et al. 2006, Stelios et al. 2006, Kittawornrat and Zimmerman 2010, Klocek et al. 2010, Klocek et al. 2016) and piglets prefer blue and red.

In our own studies it was shown that piglets of the two breeds had the least interest for red balls. Piglets of the Pulawska breed preferred the most blue and then yellow. Polish Large White piglets, on the other hand, were more likely to choose yellow and blue (Table 1). The information obtained is an important element in the application of the appropriate colour to piglets. Thanks to the use of preferential colours in an “abacus” it stands out against the background of the living environment of piglets, which increases their interest in handling material.

During observation it was also shown that piglets from Pulawska breed were

more likely to eat than PLW breed. An analogous trend was observed with respect to water intake (Table 1). Feeding time and water intake were higher in Pulawska breed, respectively 10.8 and 5.4 min compared to 6.6 and 3.0 min in PLW breed (Table 2). On the other hand, the multiplicity of excretory and resting behaviours remained similar in both breeds (Table 1). Piglets of the Pulawska breed spent 3.9 and 8.1 min respectively, while 2.9 and 9.7 min were used in PLW breed (Table 2). However, the differences noted were statistically insignificant.

CONCLUSION

The perineal period is considered to be one of the critical stages in the rearing of piglets. Therefore, measures should be taken to limit the effects of stressors on animals, e.g. by using properly selected handling material. The test version of an “abacus” with coloured ball has been shown to meet the requirements as an environmental enrichment factor for piglets. This is indicated by the number of approaches and time spent with an “abacus”. The ability to regularly clean and periodically change the colour of the balls in an “abacus” is a solution that allows the pigs to be more interested in the subject when their natural curiosity about the dirty or damaged element is noticeable.

REFERENCES

- ADAMCZYK K., GÓRECKA-BRUZDA A., NOWICKI J., GUMUŁKA M., MOLIĆ E., SCHWARZ T., EARLEY B., KŁOCEK C. 2015: Perception of environment in farm animals – A review. *Ann. Anim. Sci.* 15 (3): 565–589.

- Commission Recommendation (EU) 2016/336 of 8 March 2016 on the application of Council Directive 2008/120/EC laying down minimum standards for the protection of pigs as regards measures to reduce the need for tail-docking. Official Journal of the European Union L 62/20 from 09.03.2016.
- Council Directive 2008/120/EC of 18 December 2008 laying down minimum standards for the protection of pigs. Official Journal of the European Union L 47/5 from 18.02.2009.
- EMPEL W. 2005: Portret psychologiczny świnii. *Życie Wet.* 7: 369–399.
- GRUDNIEWSKA B. 1998: Hodowla i użytkowanie świń. Wydawnictwo A-RT, Olsztyn.
- FRINDT A., ZOŃ A., BIELAŃSKI P. 2006: Stres jako forma zachowania się zwierzęcia. *Wiad. Zoot.* 44 (1): 15–18.
- HERBUT E., SOSNÓWKA-CZAJKA E., WALCZAK J. 2006: Colour vision in pigs and poultry. *Ann. Anim. Sci.* 6 (2): 187–194.
- KITTAWORNRAT A., ZIMMERMAN J. 2011: Toward a better understanding of pig behaviour and pig welfare. *Anim. Health Res. Rev.* 12 (1): 25–32.
- KLOCEK Cz., NOWICKI J., BRUDZISZ B., PABIAŃCZYK M. 2016: Colour preferences in pigs. *Scient. Ann. Polish Soc. Anim. Prod.* 12 (4): 123–129.
- KLOCEK Cz., NOWICKI J., KOCZANOWSKI J., JURCZAK M. 2010: Obserwacje nad zastosowanie kolorowych piłek jako wzbogacenia środowiska chowu warchlaków. *Rocz. Nauk. PTZ* 6 (3): 167–172.
- KONDRACKI S., REKIEL A., GÓRSKI K. 2014: Dobrostan trzody chlewnej. PWRiL, Warszawa.
- MARĆ-PIEŃKOWSKA J., TOPOLIŃSKA P., MITURA K. 2014: Poziom stresu wskaźnikiem dobrostanu zwierząt. *Wiad. Zoot.* 52 (2): 36–42.
- NOWICKI J., SCHWARZ T., OLCZAK K., ŚWIERKOSZ S., TUZ R. 2015: Wzbogacenie środowiska chowu świń a zachowania związane z gryzieniem ogonów w kontekście Dyrektywy 2008/120/WE. *Wiad. Zoot.* 53 (2): 103–111.
- OLSEN A.W., VESTERGAARD E.M., DYBKJÆR L. 2000: Roughage as additional footing substrates for pigs. *Anim. Sci.* 70: 451–456.
- PASTWA M., SKRZYPCZAK E., BURDZANOWSKI J. 2016: Ocena struktury genetycznej świń rasy puławskiej. Świnie gołębskie – puławskie. 90 lat hodowli (1926–2016). Wydawnictwo UP w Lublinie, Lublin, 43–50.
- PISULA W. 2003: Psychologia zachowań eksploacyjnych zwierząt. Gdańskie Wydawnictwo Psychologiczne, Gdańsk.
- Rozporządzenie Ministra Rolnictwa i Rozwoju Wsi z dnia 15 lutego 2010 r. w sprawie wymagań i sposobu postępowania przy utrzymywaniu gatunków zwierząt gospodarskich, dla których normy ochrony zostały określone w przepisach Unii Europejskiej [Minister of Agriculture and Rural Development Regulation of 15 February 2010 on the requirements and conduct of behaviour in keeping species of farm animals for which protection standards have been defined in the European Union legislation]. *Dz.U.* 2010 nr 56, poz. 344 z późn. zm.
- SANTEN L., DONSELAAR J. 2014: Pig toys gain popularity on European pig farms. *Pig Internat.* 11–12: 12–24.
- STELIOS D., KOSTAS K., GEORGIOS K. 2006: The influence of drink location and colour of drinking behaviour and water intake of newborn pigs under hot environments. *App. Anim. Behav. Sci.* 3–4: 233–244.
- STUDNITZ M., JENSEN M.B., PENDERSEN L.J. 2007: Why do pigs root and in what will they root? A review on the exploatory behaviour of pigs in relation to environmental enrichment. *App. Anim. Behav. Sci.* 107: 3–4.
- TYNES V.V. 2015: Environmental Enrichment for the Miniature Pet Pig. *Clinician's Brief* 4: 61–63.

Streszczenie: *Analiza reakcji prosiąt odsadzonych na materiał manipulacyjny z kolorowymi piłkami i możliwością eksploracji oraz żucia. Utrzymanie właściwego poziomu dobrostanu świń w intensywnym systemie produkcji wymaga zastosowania odpowiednich materiałów manipulacyjnych. Obecnie w praktyce hodowlanej i produkcyjnej funkcjonuje wiele elementów określanych potocznie mianem zabawek, lecz nie każdy z nich spełnia wymagania odnośnie bezpieczeństwa i funkcjonalności. Celem pracy była analiza reakcji prosiąt odsadzonych na*

umieszczoną w kojcu zabawkę – „liczydło” z kolorowymi piłkami (wersja testowa). Wykonano obserwacje bezpośrednie behawioru prosiąt rasy puławskiej i wielkiej białej polskiej (wbp) z wykorzystaniem etogramu, uwzględniając aktywność motoryczną z elementami zainteresowania liczydłem, w tym: wspinanie się na „liczydło”, przesuwanie piłek (zainteresowanie kolorem żółtym, kolorem niebieskim, kolorem czerwonym), odpoczynek, zachowania wydalnicze, zachowania żywieniowe. Stwierdzono, że prosięta rasy puławskiej wspanały się na „liczydło” przez dłuższy czas (15,2 min, czyli o 3,6 min dłużej od rasy wbp), a rasa wbp dłużej zajmowała się przesuwaniem piłek (26,2 min, tj. o 9,6 min dłużej od rasy puławskiej). Prosięta obu ras najmniejsze zainteresowanie wykazywały piłkami w kolorze czerwonym. Osobniki rasy puławskiej najbardziej preferowały niebieskie, a następnie żółte piłki. Prosięta rasy wbp częściej wybierały żółte i niebieskie piłki. Czas pobierania paszy i wody

był dłuższy dla rasy puławskiej, odpowiednio 10,8 i 5,4 min w porównaniu z czasem rasy wbp (odpowiednio 6,6 i 3,0 min).

Słowa kluczowe: prosięta, odsadzanie, behawior, zabawki

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