Applied Animal Behaviour Science 153 (2014) 18–25

Contents lists available at ScienceDirect

Applied Animal Behaviour Science

journal homepage: www.elsevier.com/locate/applanim

Learning performance of gestating sows called to the feeder

Jasmin Kirchner[a], Christian Manteuffel[b], Gerhard Manteuffel[b], Lars Schrader[a,*]

[a] Friedrich-Loeffler-Institut, Institute of Animal Welfare and Animal Husbandry, Doernbergstrasse 25/27, 29223 Celle, Germany
[b] Leibniz Institute for Farm Animal Biology, Behavioural Physiology, Wilhelm-Stahl-Allee 2, 18196 Dummerstorf, Germany

ARTICLE INFO

Article history:
Received 24 September 2013
Received in revised form 8 January 2014
Accepted 21 January 2014
Available online 27 January 2014

Keywords:
Gestating sows
Learning
Cognitive enrichment
Animal welfare

ABSTRACT

A call feeding station in which sows learn to be allowed to enter a feeding station only after being called by an individual acoustic signal has been shown to reduce agonistic interactions in front of the feeding station. Here, we tested important prerequisites for integration of a call feeding station in common husbandry practice of group-housed sows. In particular we tested whether the learning task was accepted by the animals in a reasonable time, whether sows which already knew a feeding station would perform different from sows naive towards any feeding station, whether sows would remember their individual acoustic call after returning from farrowing and service period and whether feeding frequency in the gestation pen would affect learning performance. A total of 62 sows involved in this experiment. 22 of those sows did not have any practice with a feeding station before the experiments (NLS = new learning sows) and 40 sows were already accustomed to a conventional feeding station and had to adapt to the new task of the call feeding station (RLS = relearning sows). Subgroups of sows were trained in a learning pen for 19 days and then integrated into a larger group of sows in the gestation pen where they were fed either once or twice a day by a call feeding station. During training the proportion of correct responses in both groups increased (RLS: $r_s = 0.6247$; $p = 0.0169$; NLS: $r_s = 0.6169$; $p = 0.0188$). NLS sows showed a higher learning performance compared to RLS sows (median: 62.75% vs. 47.5% correct responses). In the gestation pen learning success of sows which had learned the call feeding task for the first time still increased throughout the gestating period of 80 days ($r_s = 0.5426$; $p < 0.0001$) but showed a steady course of correct responses of 100% in sows which returned into the gestation pen for a second time or even more often. After six weeks of farrowing and service period in which sows did not hear their individual call both NLS and RLS sows remembered it to 100% in median. Across the whole stay in the gestation pen, calling the animals to feed once a day resulted in a slightly better learning performance than twice a day ($N_1 = 80, N_2 = 80$; $Z = 3.6297$, $p < 0.0003$). Our results suggest that with respect to the learning ability of sows the prerequisites for implementation a call feeding station in the normal production process are given.

1. Introduction

Addressing the cognitive abilities of farm animals is a promising way to improve their housing conditions. Pigs in particular are known to be excellent learners; probably due to their marked explorative behavior. They are known

* Corresponding author. Tel.: +49 5141 3846101; fax: +49 5141 3846117.
E-mail address: lars.schrader@fli.bund.de (L. Schrader).

0168-1591/$ – see front matter © 2014 Elsevier B.V. All rights reserved.
http://dx.doi.org/10.1016/j.applanim.2014.01.008

to be able to discriminate and learn different cues in a food-rewarded learning system in which classical and operant conditioning techniques are combined (Ernst et al., 2005; Puppe et al., 2007; Manteuffel et al., 2009a; Manteuffel et al., 2010).

In commercial housing conditions pigs already have to learn different tasks such as how to deal with a feeding station, drinkers and other housing equipment. This remarkable learning ability of pigs could be used to promote behavioral activity and to enable the animals to control aspects of their environment (Manteuffel et al., 2009b). Furthermore, learning tasks included in commercial housing conditions can possibly form a kind of cognitive enrichment. In experiments it has been shown that fattening pigs which learned to receive food only when called by an individual acoustic signal were less fearful in an open field and novel object test (Puppe et al., 2007), showed an improved wound healing (Ernst et al., 2006) and reduced abnormal behavior (Mendl et al., 2010).

Based on these findings we recently tested a call feeding station for group-housed sows (Kirchner et al., 2012). The sows were allowed to enter the feeding station only when they were called in by an individual acoustic signal. After the animals had learned the association between the individual signals and subsequently allowance into the station results showed a significant decrease of agonistic interactions in front of the feeding station. Thus, a call feeding station might be a possibility to integrate learning tasks even in commercial housing systems resulting in an improvement of animals' welfare.

However, a prerequisite for integration in common husbandry practice is that the task could be learned by the animals within a reasonable time, that sows accomplish the learning performance and that the whole procedure did not result in an additional effort for the farmer. We had already shown in a previous paper that the learning procedure could be automatized (Manteuffel et al., 2011).

Here we tested additional important requirements with respect to the learning ability of sows: (1) Once the learning phase had finished sows should show a stable learning performance in the gestation pen. This is important in order to guaranty a sufficient feed supply and to allow sows also in large groups to predict their access to food in a reliable manner. (2) The stability of learning performance in the gestation pen might increase with a higher number of feeding calls per day and thus, a higher number of food rewards to the acoustic signal. Hence, we tested whether learning performance would be steadier, if sows are called twice a day compared to just once a day. (3) The sows were not fed with the call feeding station for a period of six weeks during farrowing and service period. Therefore we tested the learning performance of sows after the return into the learning pen. (4) In order to introduce a call feeding station in practice it should be known whether sows which already know a feeding station will be able to learn the additional task of the call feeding station. This implies that sows have to be able to gather that waiting in front of the station is not sufficient to obtain food.

2. Material and method

2.1. Animal, housing and care

The study took place at the research station of the Friedrich-Loeffler-Institut in Mariensee, Germany, with a total of 62 sows (German Landrace) from the second to eleventh lactation. The herd was divided into 7 subgroups and managed following a three week production rhythm. Every three weeks the sows of one subgroup left the gestation pen and were brought into the farrowing pens where they stayed for five weeks from the calculated farrowing date until weaning of their four week old piglets. From farrowing pens sows were re-grouped in an arena for four days and penned in the service station for six days. Before the re-introduction into the gestation pen the sows were kept in a learning pen (see below) for 19 days. This resulted into four subgroups staying in the gestation pen at the same time and one subgroup in the learning pen.

2.1.1. Learning pen

The initial conditioning to an individual acoustic signal took place in a separated learning pen (Fig. 1). This pen had a size of 15 m × 5 m, an additional outside run (25 m^2) and a solid concrete floor. The bedding area (12 m^2) within the pen was covered daily with fresh straw. Sows were fed with a feeding station identical to the one in the gestation pen (see below). In addition, they had access to roughage (hay and straw) which was offered ad libitum in a rack. Water was offered ad libitum in two drinking bowls. In this pen young sows were also integrated in the herd in case of replacement of old sows was needed.

2.1.2. Gestation pen

The gestation pen (Fig. 2) was located in a free ventilated stable building approximately 80 m from the stable in which the learning pen was located. The gestation pen had a total of 207 m^2 and was equipped with a solid concrete floor and six lying boxes (2 m × 4 m each) bedded with straw. Sows had permanent access to an adjacent outside run (60 m^2). Food was delivered by a feeding station (see below) and sows were offered roughage (hay and straw) ad libitum in a rack (1.80 m × 0.70 m). Water was offered ad libitum by four drinking bowls.

2.1.3. Feeding station

The same feeding station (INTEC MAC, Pig Tec Europe GmbH, Schüttdorf, Germany) was used in both the learning pen and the gestation pen. The one-way-feeder alley measured 1.50 m × 0.60 m (length × width) and the trough space was 0.55 m × 0.45 m (length × width). All sows were equipped with an RFID ear tag transponder, type MAC Mannebeck Animal Control (PIGTEK Europe GmbH, Schüttorf, Germany), which was used to identify sows by an antenna at the entrance door of the station. When sows had the right to feed, the door opened and closed after they entered the station. At the passage sows were identified for a second time. In both the learning pen and the gestation pen the exit of the feeding station led to the outside run.

The modifications in the hard- and software of the call feeding station are described in detail by Manteuffel et al.