

Independent Study 490A: Positive Reinforcement Training Piglets to Stand in a Container and Follow a Human

A.S. Leaflet R2914

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Summary and Implications

The Department of Animal Science within the biomedical research area is using the pig as a model for Duchenne and Becker muscular dystrophy. Duchenne muscular dystrophy is the leading, fatal, X-linked disease, affecting 1:3,500 male births worldwide. Two tests require the pigs afflicted with Duchenne and Becker muscular dystrophy is to stand still and walk in a controlled manner. To accomplish this pigs need to undergo Positive Reinforcement Training (PRT). Therefore, the objectives of this study was to use PRT on young pigs to 1) get them to recognize PRT during lactation 2) have them stand still one way for a 5-min period in a plastic storage container (to resemble the embedded force plate) and 3) follow a handler at a steady gait down an alley way and back (resemble the GaitFour Analysis). A total of 10 Landrace x Yorkshire barrows (4.64 ± 1.45 kg) were tested. Barrows were enrolled on trial when they were 15 days of age. Barrows were trained to stand still for 50-min and walk down an alleyway. On the first day of PRT in lactation, the average latency for the first barrow to approach the handler and receive a marshmallow was 32.2 min and by day 3 onwards the first barrow immediately approached the handler. By Day 11, 5 barrows completed the 1-minute standing test in the container but it took until day 22 before all barrows stood for 5-minutes. On Day 23, 7 barrows followed the handler down the alley but it took until day 27 for all pigs to follow the handler. Therefore the current PRT methodology worked to keep barrows still for a 5-minute consecutive period and all barrows followed the handler up and down the alley way.

Introduction

In laboratory settings, negative reinforcement has been used as a training methodology. The basic premise of negative reinforcement, is that an animal is given the choice of cooperating with the handler or experiences a negative response if the desired behavior was not performed. In turn, negative reinforcement may result in welfare challenges including stress, anxiety, and/or fear. Positive reinforcement training (PRT) has been successfully used for laboratory,

companion, marine, and zoo animals. The objective of PRT has been to reduce animal stress during human-animal interactions, to improve worker safety and to provide environmental enrichment. This type of operant conditioning uses a primary reinforcer (i.e. food) as a reward for a desired behavior that the animal has performed. A continuous reinforcer (i.e. a clicker) can be used as a “bridge” to pair the desired animal behavior and the primary reinforcer together. The Department of Animal Science within the biomedical research area is using the pig as a model for Duchenne and Becker muscular dystrophy. Duchenne muscular dystrophy is the leading, fatal, X-linked disease, affecting 1:3,500 male births worldwide. One test that the pig will be subjected to is weight bearing on four limbs using an embedded force plate system. The second test that the pig will be subjected to is walking over a GaitFour Analysis, a floor mat designed to measure a gait of an animal or human. Sows are very motivated to eat and using a trickle feeding approach sows have been kept still for 5-min when experiencing a transient induced lameness. In the dystrophinopathy model a pig from birth to 12 months will be used, and it is unknown how well this younger age pig will stand still on the embedded force plate and walk at a consistent gait over the GaitFour system. Therefore, the objectives of this study was to use PRT on young pigs to 1) get them to recognize PRT during lactation 2) have them stand still one way for a 5-min period in a plastic storage container (to resemble the embedded force plate) and 3) follow a handler at a steady gait down an alley way and back (resemble the GaitFour Analysis).

Materials and Methods

The protocol for this experiment was approved by the Iowa State University Institutional Animal Care and Use Committee. The trial was conducted between August and September 2013.

Animals and housing: Barrows were housed at the Swine Student Teaching Farm located near Ames, Iowa. A total of 10 Landrace x Yorkshire barrows (4.64 ± 1.45 kg) were tested. Sows and the barrows were housed in a farrowing stall for 20 d. Barrows were weaned and placed into the same nursery pen with an additional 7 gilts at 21-days of age.

General methodology: Barrows were enrolled on trial when they were 15 days of age. Barrows were numerically painted on trial days 0, 5, and 21 with blue Quik Shot spray paint for Livestock Marking for easy identification (Figure 1).

The handler conducting the PRT training was a female in her mid-20's. Throughout the trial the handler wore navy blue coveralls with black rubber boots, and her hair was pulled back into a ponytail.



Figure 1. Schematic of the individual identification of barrows enrolled within this study.

PRT for the embedded force plate

PRT in lactation: Days 1-3: The handler quietly entered the lactation room and approached the stall from behind the litter/sow, she knelt down on the floor immediately behind the stall and held a marshmallow between her fingers. Each time a barrow approached and took a marshmallow, the handler depressed the clicker within ~1 second. These sessions continued for 1 hour. Days 4-6: The handler entered the lactation room as previously described but, stepped quietly into the back of the stall and immediately sat down. Each time a barrow approached and took a marshmallow the handler depressed the clicker as previously mentioned.

PRT in the nursery: Days 7-10: The handler quietly entered the nursery room. The handler gently placed a plastic storage container (53 L x 37 W x 33 H cm Figure 2a) on its side in the pen and then immediately stepped into the pen and stood with the barrows. The barrows were able to interact with the plastic storage container during the one hour session, and the handler depressed the clicker when a marshmallow was taken from her hand. Days 11-14: The handler entered the nursery room as previously described. However, the plastic storage container was located on the alley floor next to the pen. The handler then gently picked up a barrow, supporting him under the belly and placed him inside the plastic storage container. The clicker was depressed and a marshmallow given when a barrow stood still, calm, and faced one direction for a consecutive 1-min period. At the conclusion of this 1-min. period, the barrow was transferred from the plastic storage container back to its nursery pen and a 2-min quiet period occurred between barrow testing (Figure 2b).

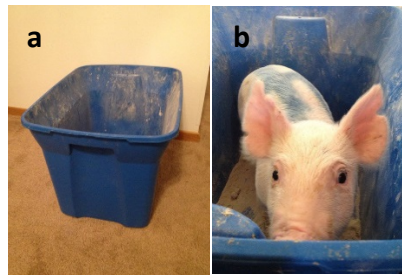


Figure 2. The plastic storage container (a) and a barrow placed inside the plastic storage container (b).

Days 15-18: The handler quietly entered the nursery room, placed the storage container in the same location and tested each barrow as previously described. However the barrow had to stand still for a 2.5-min period. Days 19-22: PRT was conducted as previously mentioned by the barrows had to stand still, calm, and in one direction for a 5-min. period.

PRT for the GaitFour Analysis

Days 23-28: The handler quietly entered the nursery room. The handler then gently picked up a barrow, supporting him under the belly and placed him on the alley way floor. The handler then would face the barrow and step backward a couple steps from the barrow. The clicker was depressed and a marshmallow given when a barrow would follow the handler down to the end of the alley and back to its nursery pen. At the conclusion of walking down the alley way the barrow was transferred back to its nursery pen and a 2-min quiet period occurred between barrow testing.

Measures: Latency to approach the handler in lactation was defined as the time (minutes) taken for the first barrow within a training session to approach and receive a marshmallow. In addition, live observations were collected by the handler every 5-min during the PRT sessions when barrows were in lactation (Table 1). In nursery, for each training session, when a barrow stood still, calm, and faced one direction for a consecutive 1-, 2.5, or 5-min period in the plastic storage container this was defined as a “success.” and the barrow identification was recorded. For, PRT in the alley this was defined that the barrow followed the handler down to the end of the alley way and back without stopping, turning around or running back to the nursery pen. Data will be presented descriptively.

Table 1. Definitions of behaviors and postures for 5-min scans in the lactation stall for barrows.

Behavior	Definition
Active	Standing or walking around pen
Inactive	Lying sternal, lateral, or sitting
Nursing	Attached to sow's teat
Human Contact	Physically touching the handler

Results and Discussion

On the first day of PRT in lactation, the average latency for the first barrow to approach the handler and receive a marshmallow was 32.2 min, on day 2 it had halved to 12.2 min and by day 3 onwards the first barrow immediately approached the handler. The behaviors and postures of barrows in lactation over PRT changed, with less time engaged in active postures (45 to 28%) but inactivity increased (27 to 44%) respectively. Nursing decreased to 12% on Day 6 but this may be related to barrows getting older and closer to weaning rather than from e PRT. However, the interest in, human contact increased over the lactation PRT from 7 (Day 1) to 16 % (Day 6; Figure 3).

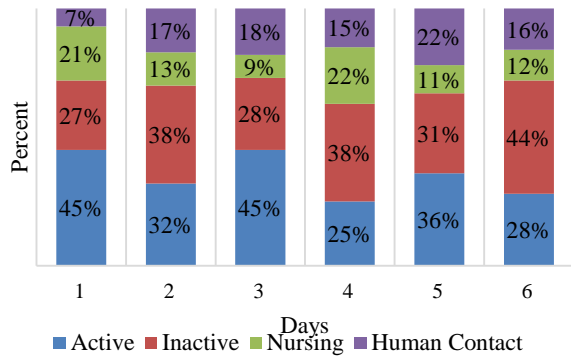


Figure 3. Behaviors and postures of barrows in lactation room during the 1-hour training session.

By Day 11, 5 barrows completed the 1-minute standing test in the container but it took until day 22 before all barrows stood for 5-minutes (Figure 4).

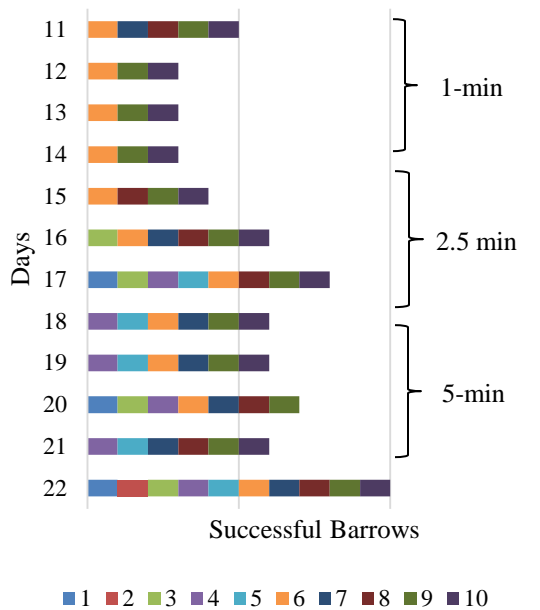


Figure 4: Days when barrows stood still, calm, and faced one direction for a consecutive 1-, 2.5-, or 5-min period

Note Days 7-10 barrows interacted with the container in their home pen but were not subjected to being placed inside the container.

On Day 23, 7 barrows followed the handler down the alley but it took until day 27 for all pigs to follow the handler (Figure 5).

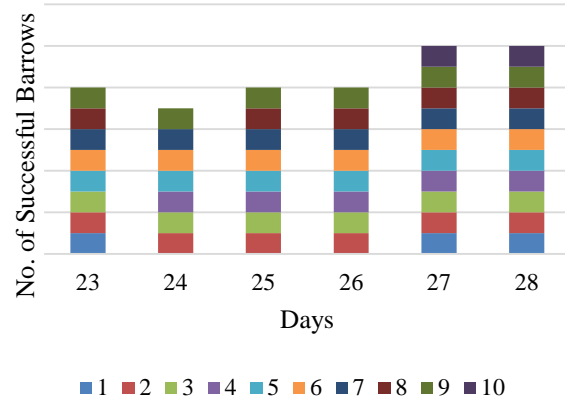


Figure 5. Successful days when barrows had navigated down the alley and back to the home pen.

On the first day of PRT in lactation, the barrows were hesitant to approach the handler. Instead, the methodology was reworked so that the handler tossed a couple of marshmallows into the stall for the barrows to first learn that the marshmallows were a treat. When barrows became accustomed to the handler stepping into the stall, barrows became aggressive towards the handler and other barrows. Therefore, the handler only gave a marshmallow to a barrow that was standing/sitting calmly and waiting for a treat. Over the course of the PRT barrows became less aggressive. A recommendation to future PRT in the nursery would be to leave the container in their home pen for a few days. When the handler began placing the barrows into the storage container, barrows became distressed at being picked up and conversely did not wish to be placed into the plastic storage container. The handler also went back into the nursery pen and reinforced approach-marshmallow and click after the container work had been completed. Future considerations for methodology modification could include the handler touching the barrows early in the PRT sessions to accustom them to human touch. Therefore the current PRT methodology worked to keep barrows still for a 5-minute consecutive period and all barrows followed the handler up and down the alley way.

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