

A QUANTITATIVE ETHOGRAM OF PLAY BEHAVIORS IN GROUPED PIGS: CONTROL VS ENRICHMENT ROPE

Kandis R. Cazenave, Kerbey Jacobs, Stephanie Soto, and Rachel Wyant

PRE-STUDY OUTLINE

Questions:

- 1) Does the control rope induce the same interest as the treatment rope?
- 2) Does the presence of the enrichment change other behaviors?
- 3) What are the control gilts doing when the others are chewing the rope?
- 4) About how much time do the gilts spend touching the rope?

Subjects:

- (4) PIC Camborough line Gilts
- a) Age? ~5 months
 - b) Weight?

Set-up:

Solid wood board w/ 4 ropes attached

- a) Ropes are 100% cotton
- b) Length of ropes from ground?

3 pens, with 4 gilts in each (not marked)

- 1) No Rope
- 2) Rope w/ placebo; blue buffer
- 3) Rope with BSA (Boar Saliva Analog)
 - a) Boar Better
 - i) 40µg/mL Androstenone
 - ii) 40µg/mL Quinoline
 - iii) 40µg/mL Androstenol

Brief Methods:

- 1) Pens with rope are sprayed in the morning
 - a) Each rope is sprayed with ~5ml
- 2) Behavior of gilts is recorded for 24 hour period
- 3) Behavior is recorded via Scan-sampling
 - a) Every minute of every hour for 24 hours
 - i) Total: 1,440 samples of data
 - b) Analyze for:
 - i) Stand
 - ii) Feed
 - iii) Drink
 - iv) Move
 - v) Lay
 - vi) Play with rope
 - vii) Play with other

Notes:

Scan Sampling: 8am-12pm

Sequential Analysis: choose playing bout, watch 2 behaviors for before and after

7e: Video 4 - Video 8

9w: Video 5 - Video 9

13w: Video 4 - Video 8

Video Assignment for Scan Sampling

Stephanie-

7e: Video 4-7

Kerby-

7e: Video 8

9w: Video 5-7

Rachel-

9w: Video 8-9

13w: Video 4-5

Kandis-

13w: Video 6-8

Pig Assignment

R: Stripe across rump

S: Stripe across withers

K: Double stripe

C: No stripe

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ABSTRACT

12 5-month-old PIC Camborough pigs were mixed in groups of four. One group was recorded without any enrichment devices (ropes), as a control. One group was provided with enrichment ropes which were sprayed with a placebo solution. A third group was provided with enrichment ropes treated with a pheromone ("Boar Better") solution. Their behaviors were recorded on video tape for 24 h, and a detailed behavioral analysis was performed. Play behavior in each of the 3 groups of four pigs was observed. Seven distinct behavioral categories were identified in the total data set, which contained 2433 behaviors. On average, pigs in the the control group spent 3.13% of their time playing with objects/others compared to only 0.75% in the placebo and 0.13% in the treatment groups. Pigs in the control group also spent 82.63% of their time laying and only 6.88% of time feeding compared with 47.50% of time laying and 17.38% feeding in the placebo group and 49.00% laying and 11.13% feeding in the treatment group. Additionally, the placebo and treatment groups, which were provided with enrichment ropes, spent 31-35% of their time manipulating the ropes. Although no correlations between play and rope manipulation in the control vs. enrichment groups were found to be statistically significant using a P value of $< .05$, results regarding play, rope manipulation, and feeding behaviors were found to be significant using a P value of < 0.20 . These results suggest that, in a larger study with a higher volume of data, the providence of enrichment ropes may increase both constructive (rather than destructive) play and feeding volume in market gilts, resulting in lower repair cost to producers and higher slaughter weight of gilts, increasing profit. Secondly, pheromone did not significantly increase or decrease rope play.

INTRODUCTION

According to McGlone 1985, an ethogram is defined as "a catalog of behaviors, vocalizations, and odors of single or socially interacting animals." He goes on to suggest that "a detailed, quantitative ethogram is an essential component for a full understanding of animal behavior." Wild and feral pigs are free to express instinctual behaviors, such as rooting, grazing, and exploring using their snouts. However, domestic pigs, especially when confined in commercial production environments, may express these instinctual behaviors inappropriately when their natural impulses are blocked by artificial means (i.e. concrete or grate floors, lack of nesting substrate, commercial feed diet) (Kittawornrat & Zimmerman 2011). According to studies published by Van Putten and Dammers (1976) and Wood-Gush and Vestergaard (1991), pigs continue to express instinctual exploratory behaviors even when housed in artificial production environments. Specifically production-housed pigs will preferentially select pens with novel objects available for investigation, and will employ chewing behavior to explore these objects. A number of research studies exist exploring different types of enrichment objects for pigs (i.e. tires, chains, rubber hoses, dog toys), properties of these objects (i.e. ingestible, destructible, chewable, odorous), along with various modes of presentation (suspended vs floor) and material (rope, wood, chain, metal pipe). Objects were found to be more attractive to pigs if they

could be altered by chewing (i.e. flexible, destructible) (Kittawornrat & Zimmerman 2011). A small amount of literature exists examining the effects of odor (Morrow-Tesch and McGlone 1990, Machado et al 2017) and pheromones (McGlone and Morrow 1988, McGlone and Anderson 2002) on pig behavior, however, no existing research could be found which employed ethogram design to examine the relationship between enrichment items, pheromones, and their potential influence on pig play (as well as laying, feeding, and drinking behaviors).

Improved management of pig play behavior may enhance production efficiency. By decreasing destructive play behavior (tail and ear biting, belly nosing, fighting, etc.) and increasing enrichment play behavior (providence of ropes, toys, etc.), producers may decrease repair costs and increase slaughter weight of market gilts.

RESEARCH QUESTIONS

1. Does the control rope induce the same interest as the treatment rope?
 - a. Yes
2. Does the presence of the enrichment change other behaviors?
 - a. Yes
3. What are the control gilts doing when the others are chewing the rope?
 - a. Laying more, playing more with chain/others
4. About how much time do the gilts spend touching the rope?
 - a. From 10%-50% of the time

MATERIALS AND METHODS

12 5-month-old PIC Camborough pigs (all female) were housed four/home pen. Pens measured 7x12 ft and had one feeder and one waterer for the group. 3 groups of four pigs were observed and behavior recorded for 24 h. One video camera and recorder at each of the three home pens filmed pig behavior continuously. The camera was placed at an overhead side view of the pen and recorded in real time.

Rope enrichment toys were introduced to two of the home pens, one sprayed with ~5mL blue BSA (Boar Saliva Analog), one sprayed with ~5mL blue placebo buffer, and one remaining devoid of toys as a control. Toys consisted of a solid wood board with 4 100% cotton ropes attached, hanging perpendicularly to the ground. Pens with ropes were sprayed with placebo and BSA each morning before 8:00 AM central standard time. BSA consisted of "Boar Better" solution--a mixture of 40 μ g/mL Androstenone, 40 μ g/mL Quinoline, and 40 μ g/mL Androstenol.

Behavioral data were collected from overhead side view using a single camera--pigs could not escape from view. Behaviors of gilts in each pen were recorded for a 24 hour period via scan sampling. Intervals of data collection took place at each minute for 50 minutes of every hour between the hours of 8am and 12pm (8:00-8:49, 9:00-9:49, 10:00-10:49, 11:00-11:49) during the 24-hour recording period, resulting in a total of 200 samples of data.

VALIDATION OF RESEARCHERS

4 graduate-level students watched 50 minutes of video from each of the 3 pens, recording gilt behaviors at each 1-minute interval, for a total of 153 samples of data. Recording took place at a time period of high activity, from 8-8:50 AM. Researchers independently coded behavior of gilts at each 1-minute interval--behaviors included: standing, feeding, drinking, moving, laying, playing, and rope manipulation. Each researcher's coding results were compared to the most experienced of the student group, and validation was repeated until all researchers' coding results reached a statistical significance level of $r^2 \geq 0.90$.

ETHOGRAM OF BEHAVIORS

Stand: All four feet are on the ground, belly off the ground

Feed: Head down, inside feeder

Drink: Head elevated at water spout level

Move: 1 second before or after interval at least 1 foot in motion, or elevated off ground

Lay: At least two legs touching ground, includes sitting

Rope Manipulation: any manipulation or contact with rope, with mouth or body

Play: any contact with other pigs or objects that are not the rope

RESULTS AND DISCUSSION

Statistical analysis conducted using SAS (Statistical Analysis System) software:

- Chi-square to determine statistical significance
- Univariate procedure (descriptive statistics)--skewness (non-normal distribution), kurtosis (non-normal tail)
- Mean and median--further they are apart, less normally distributed data is
- Student's t-test, signed rank test--is data significantly different than 0
- General linear model procedure

A total of 2,433 behaviors from 4 total hours of video, with each behavior belonging to 1 of 7 behavioral categories, were observed. Preliminary observations were used to identify the 7 behavioral categories. No other distinct behaviors were selected for identification during the course of the study.

On average, pigs in the the control group spent 3.13% of their time playing with objects/others compared to only 0.75% in the placebo and 0.13% in the treatment groups. Pigs in the control group also spent 82.63% of their time laying and only 6.88% of time feeding compared with 47.50% of time laying and 17.38% feeding in the placebo group and 49.00% laying and 11.13% feeding in the treatment group. Additionally, the placebo and treatment groups, which were provided with enrichment ropes, spent 31-35% of their time manipulating the ropes.

Although no correlations between play and rope manipulation in the control vs. enrichment groups were found to be statistically significant using a P value of $< .05$, results regarding play, rope manipulation, and feeding behaviors were found to be significant using a P value of < 0.20 . These results suggest that, in a larger study with a higher volume of data, the providence of

enrichment ropes may increase both constructive (rather than destructive) play and feeding volume in market gilts, resulting in lower repair cost to producers and higher slaughter weight of gilts, increasing profit. Secondly, pheromone did not significantly increase or decrease rope play.

DATA TABLES

Figure 1. Frequencies of behaviors shown by gilts in treatment, placebo, and control group.

Pen	Treatment	Time	Stand	Feed	Drink	Move	Lay	Play	Rope Manipulation
7E	Treatment	8	18	31	2	4	26	1	118
7E	Treatment	9	5	10	3	1	104	0	74
7E	Treatment	10	1	41	3	1	88	0	66
7E	Treatment	11	1	7	0	0	174	0	18
		AVG	6.25	22.25	2	1.5	98	0.25	69
		% AVG	3.13%	11.13%	1.00%	0.75%	49.00%	0.13%	34.50%
13W	Placebo	8	8	49	0	2	39	0	102
13W	Placebo	9	3	54	2	3	76	0	62
13W	Placebo	10	0	6	1	1	168	1	23
13W	Placebo	11	0	30	0	4	97	5	64
		AVG	2.75	34.75	0.75	2.5	95	1.5	62.75
		% AVG	1.38%	17.38%	0.38%	1.25%	47.50%	0.75%	31.38%
9W	Control	8	14	25	1	4	150	6	.
9W	Control	9	1	4	0	1	193	1	.
9W	Control	10	5	10	4	1	178	0	.
9W	Control	11	19	16	1	6	140	18	.
		AVG	9.75	13.75	1.5	3	165.25	6.25	.
		% AVG	4.88%	6.88%	0.75%	1.50%	82.63%	3.13%	.

Figure 2. Total time (minutes, percentage) spent exhibiting behavior immediately (1 behavior) before and after rope manipulation.

1 Behavior Before	Frequency of Behavior	% Time Spent
Move	47	63.51%
Lay	16	21.62%
Feed	7	9.46%
Stand	2	2.70%
Drink	2	2.70%

1 Behavior After	Frequency of Behavior	% Time Spent
Move	47	63.51%
Lay	16	21.62%
Feed	8	10.81%
Stand	8	4.05%

Figure 3. Total time (minutes, percentage) spent exhibiting 2 behaviors before and after rope manipulation.

2 Behaviors Before	Frequency of Behavior	% Time Spent
Lay	27	35.06%
Stand	6	7.79%
Feed	21	27.27%
Drink	11	14.29%
Play	4	5.19%
Rope Manipulation	3	3.9%
Move	5	6.49%

2 Behaviors After	Frequency of Behavior	% Time Spent
Lay	11	17.19%
Stand	10	15.63%
Feed	19	29.69%
Drink	13	20.31%
Play	3	4.69%
Rope Manipulation	8	12.5%

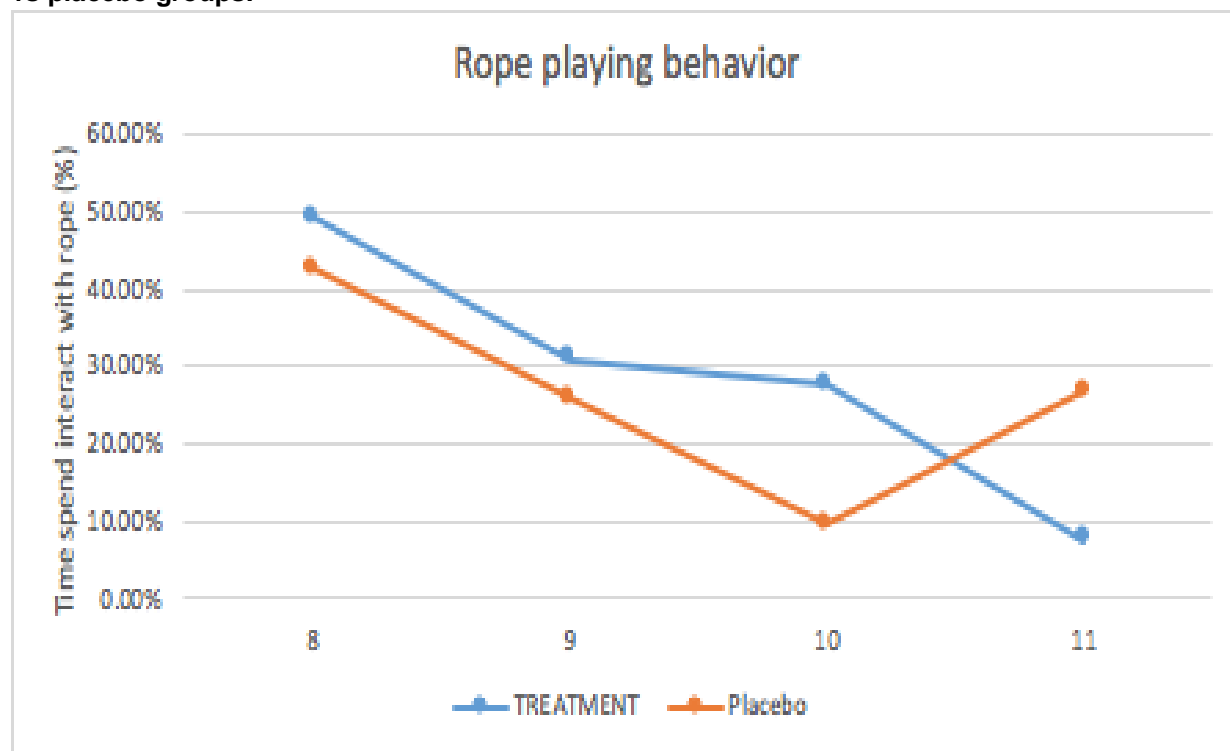
Figure 4. Total time spent exhibiting behaviors overall in treatment, placebo, and control groups.

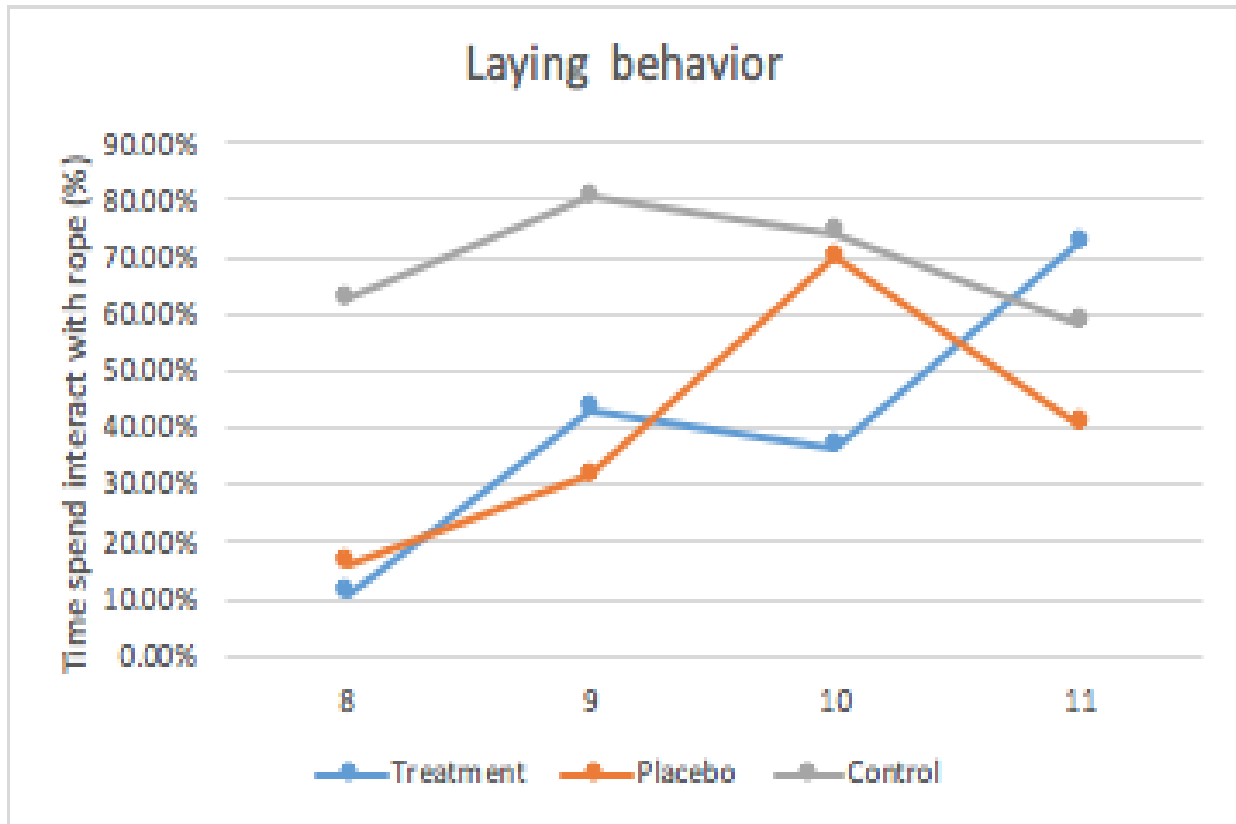
BSA	Overall													
	Stand	Stan%	Feed	Feed%	Drink	drink%	Move	Move%	Lay	Lay%	Play	play%	Rope Manipulation	Rope manipulation %
TRT	6.25	2.60%	22.25	9.27%	2	0.83%	1.5	0.63%	98	40.83%	0.25	0.10%	69	28.75%
Placebo	2.75	1.15%	34.75	14.48%	0.75	0.31%	2.5	1.04%	95	39.58%	1.5	0.63%	62.75	26.15%
Control	9.75	4.06%	13.75	5.73%	1.5	0.63%	3	1.25%	165.25	68.85%	6.25	2.60%	.	.
P value	0.52%		0.31		0.42		0.6		0.12		0.24		0.56	

Figure 5. Total time spent exhibiting behaviors by hour in treatment, placebo, and control groups.

Treatment	Time	Stand	Stand %	Feed	Feed %	Drink	Drink %	Move	Move %	Lay	Lay %	Play	Play%	Rope	Rope %
Treatment	8	18	7.50%	31	12.92%	2	0.83%	4	1.67%	26	10.83%	1	0.42%	118	49.17 %
Treatment	9	5	2.08%	10	4.17%	3	1.25%	1	0.42%	104	43.33%	0	0.00%	74	30.83 %
Treatment	10	1	0.42%	41	17.08%	3	1.25%	1	0.42%	88	36.67%	0	0.00%	66	27.50 %
Treatment	11	1	0.42%	7	2.92%	0	0.00%	0	0.00%	174	72.50%	0	0.00%	18	7.50%
Placebo	8	8	3.33%	49	20.42%	0	0.00%	2	0.83%	39	16.25%	0	0.00%	102	42.50 %
Placebo	9	3	1.25%	54	22.50%	2	0.83%	3	1.25%	76	31.67%	0	0.00%	62	25.83 %
Placebo	10	0	0.00%	6	2.50%	1	0.42%	1	0.42%	168	70.00%	1	0.42%	23	9.58%
Placebo	11	0	0.00%	30	12.50%	0	0.00%	4	1.67%	97	40.42%	5	2.08%	64	26.67 %
Control	8	14	5.83%	25	10.42%	1	0.42%	4	1.67%	150	62.50%	6	2.50%	.	.
Control	9	1	0.42%	4	1.67%	0	0.00%	1	0.42%	193	80.42%	1	0.42%	.	.
Control	10	5	2.08%	10	4.17%	4	1.67%	1	0.42%	178	74.17%	0	0.00%	.	.
Control	11	19	7.92%	16	6.67%	1	0.42%	6	2.50%	140	58.33%	18	7.50%	.	.

Figure 6. Percentage of total time spent exhibiting rope playing and laying behaviors in treatment vs placebo groups.





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