The use of operant conditioning behavior analysis (OCBA) in animal training for husbandry and performance

Melissa L. Cox, Ph.D.
Methods of animal training

- Command performance – punishment based
  - Give command and add punishment until animal accomplishes exercise

- “Natural handling/whispering” – “understand” language of a species and interact using that language

Assumptions: Packs and herds are hierarchical - all behaviours are aimed at maintaining or increasing rank → Unwanted behavior is labeled as dominant
- Coercion and punishment are used to “correct” or prevent this “lack of respect”

Reality: Research shows that dog-dog and horse-horse interactions are complex and context-specific; no evidence that dogs or horses see humans as part of their social system in this way.

- Positive reinforcement – reward-based
  - Using a primary or conditioned reinforcer - “clicker training”
  - Species independent
Positive Punishment and Animal Welfare

  - negative effects, increased aggression
  - increased frequency of stress-related behaviours

- ESVCE (European Society of Clinical Animal Ethology)
  - Position statement strongly opposing use of e-collars and punitive training techniques based upon science and canine welfare. (Massone et al., 2018)

- Punishment-based training in horses
  - Increases stress-related behaviours, jeopardizes horse welfare and human safety (Hartmann et al., 2017)
Using the Theory of Learning

Classical conditioning can be used to elicit voluntary behaviours from animals.

- Reinforcing the behaviour increases its frequency; ignoring an unwanted behaviour makes it happen less often
  - Not species specific
  - We don’t have to “speak” the animal’s language, just understand its body language and responses

Operant conditioning puts the focus from the reward to the behavior – “click” happens at the exact moment animal does something we like

- Exchange of information
  - “What did I do to earn the click (food), and how do I make it happen again”?
- The animal volunteers a behaviour – modifying the behavior influences (operates on) its environment (elicits reward).
Conditioned Reinforcer

- The clicker is a precise event marker
- Takes the focus from the food to the behaviour
- When the animal performs the behaviour you want, reinforce it (click) as it happens
- Timing of dopamine release confirms that the marker becomes a conditioned reinforcer (McBride et al., 2017)
First Steps

▪ First step: “charging the clicker”: click = reward
▪ Second step: head turns – a specific body movement can result in a reward
Training Head turns

- Determine what your animal considers a reward
- Animal learns a new way to manipulate its environment
Training Head turns

- Increased criteria – deeper, longer
Complex behaviour

- Shape discrimination
Chain behaviours – one cue, multiple behaviours, one reward

Diabetic assistance dog
Chain Behaviour

Giving a border collie in the city a job to do

The Task: "Pen the Sheep"
Chain behaviour

Walk through gate, touch ball, return to handler “Go Play”
Chain behaviour - Moose

Head turn, lift foot, touch target
Pfizer Global Research and Development, Ann Arbor, MI

- Göttingen mini-pigs were used in Dermal Safety Studies
  - On study, animals had to be picked up, carried, and physically restrained in slings for procedures: Physicals, electrocardiograms, weighing, clipping, dosing, etc.
  - Dermal dosing - up to 10 minutes; studies can have twice daily dosing for up to 30 days
  - Up to 6 technicians were required to restrain and work with the animals for some routine procedures

Problem:
- Unhappy animals, unhappy staff
- Need to prioritize safety for animals and staff
Goals and starting points

▪ Train staff in theory and practice of OCBA
  ▪ Identify core group of enthusiastic trainers to be study leads
  ▪ Determine criteria be for staff competency

▪ Analyse current protocols and determine where changes are needed → Minimize stress/maximize safety

▪ Develop shaping plans
  ▪ Define protocol of “baby steps” to train a behaviour
  ▪ Track the behaviours
    ▪ Duration of training session
    ▪ Number of repetitions
    ▪ Animal’s “comfort level”
Set the Environment for Success – Consider arousal and affective state

Housing
- Group housing not possible, so moved panels so that animals can see staff and each other

Feeding
- Food for the day measured out in morning, all rewards came from that amount → No extra calories were added.

Desensitization
Smells
- Rubbing alcohol

Noise
- Clippers
- People speaking
Goals for study procedures

Pigs should:

- Approach handlers
- Walk onto scale
- Stand still for physicals and electrocardiograms
- Stand still for dosing
- Allow us to pick them up when necessary
- Freely offer these desired behaviours on cue
- Require minimal physical handling

Main behaviour required: stand still and ignore everything else
Training Protocols and Data Collection

Pre-study

- Standardized protocols allowed consistent training of all animals by any trainer.
- Data collected for each animal for each training session.

On study

- Only “maintenance” required.
- No extra time or documentation involved.

Behavior parsing
(Fry pan) Acclimate to fry pan/ladle:
- put several pellets in fry pan, put pan close to pig
- keep putting pellets into pan, slowly move pan closer to trainer
- continue until animal will confidently approach fry pan to eat
- move pan around to get animal to eat in different spots relative to the trainer

(C&T) “Charge clicker”
- click and put pellets in fry pan; repeat
- continue until animal is confident & is looking for click
- move pan around to get animal to eat in different spots relative to the trainer

(HT) Head turns
- click when pig looks or turns to its left, feed from fry pan
- click for the pig looking further and/or longer to its left

(TS) Target stick touching
- introduce target attached to plastic spoon
- C&T for interest
- C&T for proximity
- C&T for touching
- C&T for touching longer
Tools – be inventive!

- Clicker and food (Measure the food!)
- Target stick
- Airline crate
- Stop watch
- Counter
- Etc.

Start with head turns!
Target training

- Mini-pig is taught to touch the wide part of the spoon

- Shaping plan:

  Click & Treat for:
  1. Approaching the target stick
  2. Touching the stick anywhere
  3. Touching just the wide part of the spoon
  4. Following the target stick

Generalize to a stationary target attached to an object
Target Training

Confidently touch target to earn click.

Ignore distractions
Training for weighing and EKG

Goal: Have mini-pig walk out of pen onto scale and stand still for weighing or EKG

Shaping plan:

Click and Treat for:

1. Following target stick
2. Walking onto crate
3. Standing and targeting
4. Walking back into pen
Clipping: 12 days (2 hours total) training time
First dose training after being clipped

Shaping Plan:

Click and Treat for:

1. Standing and targeting
2. Ignoring alcohol wipe
3. Ignoring water dripping onto back
4. Ignoring being rubbed with glass rod
<table>
<thead>
<tr>
<th>Pre-Study</th>
<th>Traditional Acclimation</th>
<th>Operant Conditioning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pig arrival time required pre-study</td>
<td>4 weeks (20 acclimation days)</td>
<td>2.5 weeks (12 training days)</td>
</tr>
<tr>
<td>Total average acclimation/training time required (per pig)</td>
<td>5 hours (15 min / day)</td>
<td>2 hours (10 min / day)</td>
</tr>
<tr>
<td>Average prep time for a 24 pig study</td>
<td>120 technician hours</td>
<td>48 technician hours</td>
</tr>
</tbody>
</table>
### On Study

<table>
<thead>
<tr>
<th>On Study</th>
<th>Traditional Acclimation</th>
<th>Operant Conditioning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staff required per pig for dermal dosing</td>
<td>Minimum of 3 technicians</td>
<td>2 technicians</td>
</tr>
<tr>
<td>7 day, 24 pig study, once daily, 10 min dosing</td>
<td>84 technician hours</td>
<td>56 technician hours</td>
</tr>
</tbody>
</table>

**Overall**

<table>
<thead>
<tr>
<th>Total time required</th>
<th>204 technician hours</th>
<th>104 technician hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time savings on one study*</td>
<td>100 technician hours</td>
<td></td>
</tr>
</tbody>
</table>
Final Results

• Greatly reduced stress / increased positive interactions for humans and mini-pigs

• Increased safety in study procedures, increased accuracy in dosing

• More reliable electrocardiograms, more thorough physicals

• Lower levels of stress hormones

• Quantifiable savings in time and staff hours

• Very happy Institutional Animal Care and Use Committee (IACUC)
Service, Companion, and Performance Animals

What is the difference?
General husbandry of livestock and other animals

Alpaca shearing

Foot care
Applications: Research

Functional MRI in awake unrestrained dogs. (Berns et al., 2012)

Training to allow voluntary blood collection
Our responsibility

▪ How can we use OCBA in our research?
  ▪ General husbandry
  ▪ Improved study designs with standardized handing protocols
  ▪ Training for specific study behaviours

▪ How can we encourage animal handlers, trainers, and others in the industry to improve the welfare of animals in their care using these techniques?

▪ What kinds of research can we do to show them a) what is possible and b) that it is feasible?
Thank you!

CAG GmbH
Paul-Ehrlich-Str. 23
D-72076 Tuebingen
Germany

Tel: +49 7071 / 565 44 850
Fax: +49 7071 / 565 44 56
www.centerforanimalgenetics.com
info@centerforanimalgenetics.com
Training Methods and types of reinforcements

- **Clicker training**
  - *Increase the likelihood of the behaviour*
  - *Positive reinforcement*
    - The horse stands quietly without being tied and receives a food reward.
  - *Decrease the likelihood of the behaviour*
    - *Positive punishment*
    - The horse resists moving forward off the leg and is tapped with the crop.

- **“Natural horsemanship”**
  - *Take away a stimulus*
  - *Negative reinforcement*
    - Leg pressure is applied to the horse’s sides; he moves forward and the pressure is released.
  - *Negative punishment*
    - The horse mugs for treats and the attention he is seeking is withdrawn.

Henderson, Horse-Canada.com
Dermal Dosing Training

Shaping Plan:
Click and Treat for:

1. Standing and targeting
2. Ignoring alcohol being wiped on back
3. Ignoring water dripping onto back
4. Ignoring being rubbed with glass rod
Lure

▪ Entice the animal to perform the behaviour

Capture

▪ Click as the behaviour happens naturally
Complex behaviour

- Object discrimination
Shaping

Sit
Lift a Hoof
Shake a Hoof
- Normal husbandry
- Basic care
Veterinary care

Wound care

Physical therapy
Shaping complex behaviours
Chain behaviours

Helpful behaviours “Lights Out”