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

Melissa L. Cox, Ph.D.

EAAP 2018

Session 28: Welfare and behaviour in animal training

CAG
Center for Animal Genetics

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

- Meta reviews: dogs and punishment-based training methods(Ziv 2017, Fernandes et al., 2017)
  - 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.

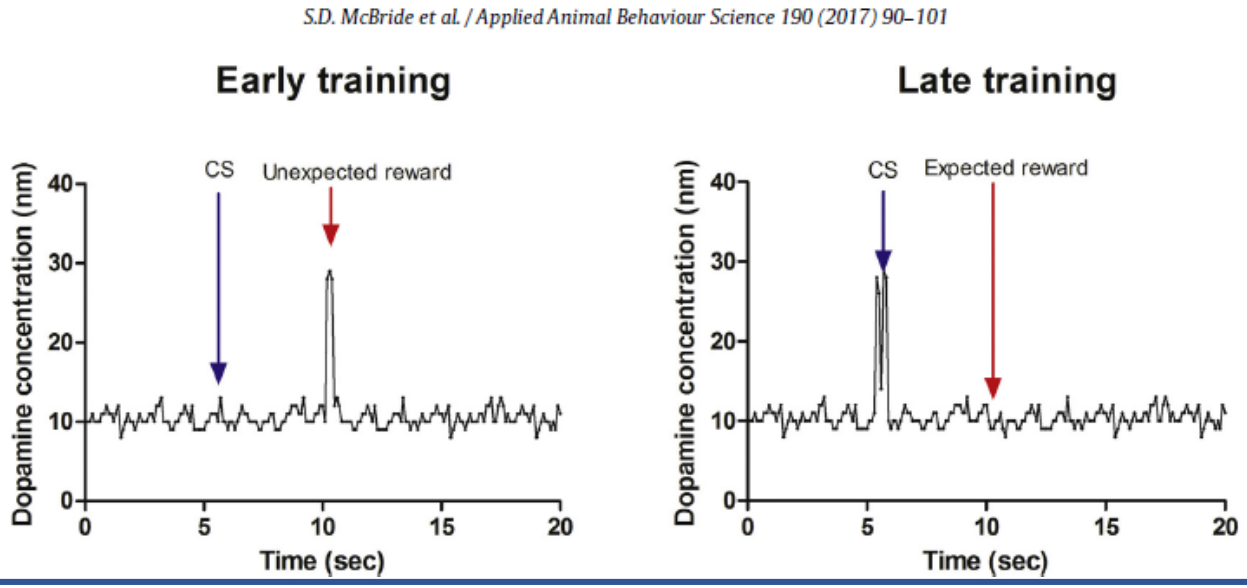
- Reinforcing the behaviour increases its frequency; ignoring an unwanted behaviour makes it happen less often
- Not species specific
- We don't have to "speak" the animal's language, just understand its body language and responses

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

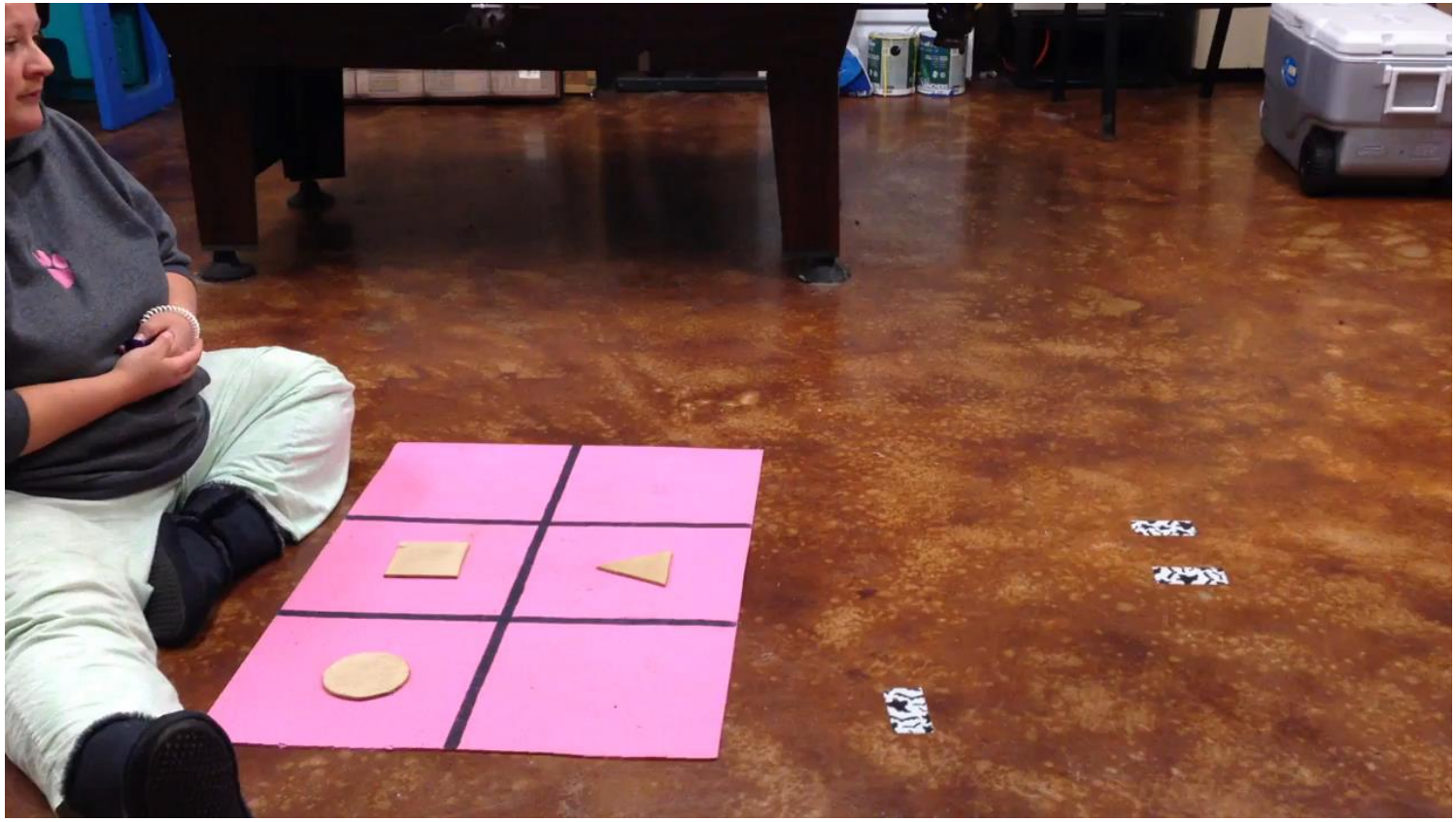
- Determine what your animal considers a reward
- Animal learns a new way to manipulate its environment

Training Head turns

- Increased criteria – deeper, longer

Complex behaviour

- Shape discrimination

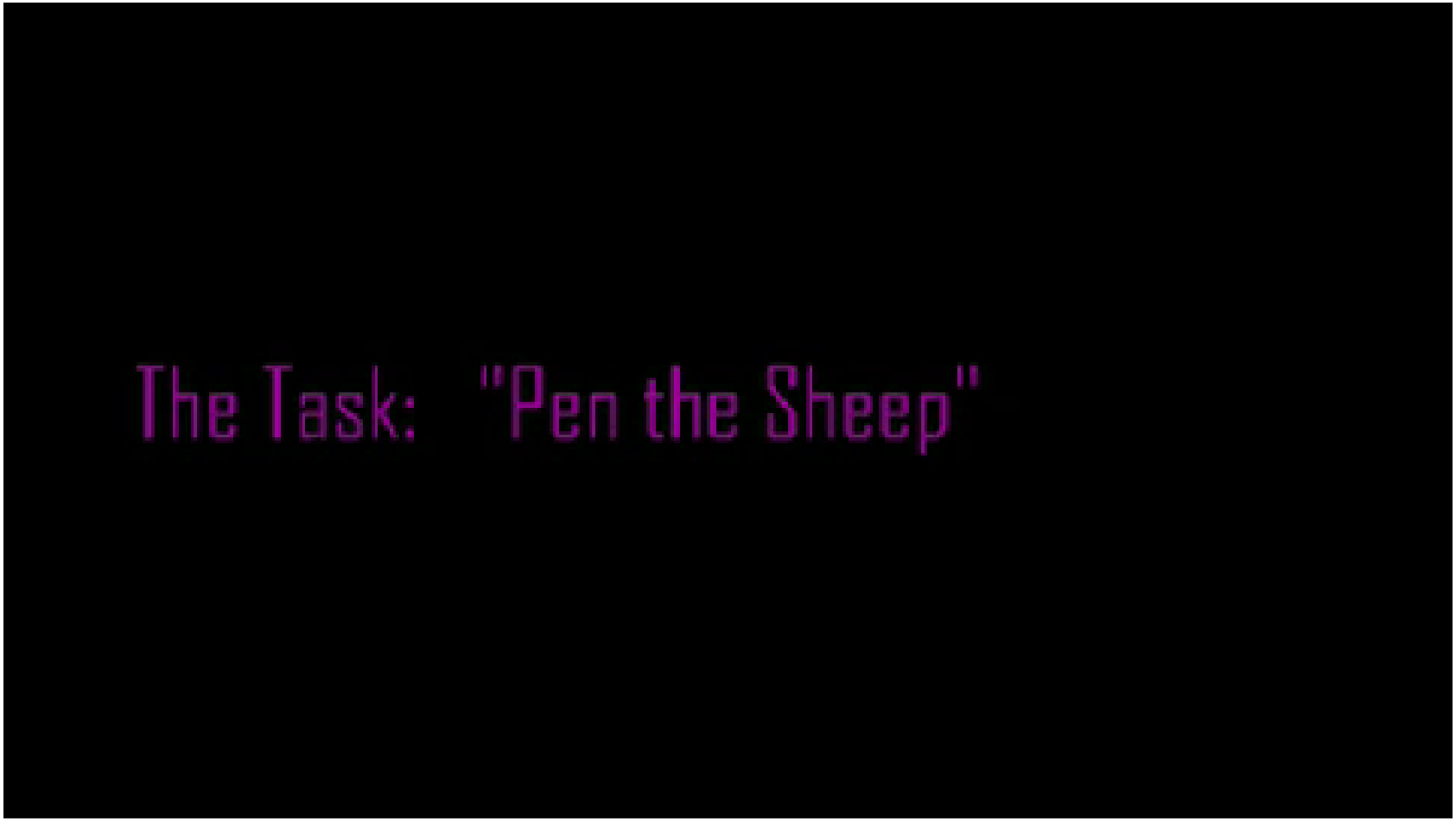


Chain behaviours – one cue, multiple behaviours, one reward

Diabetic assistance dog

Chain Behaviour

Giving a border collie in the city a job to do



Chain behaviour

Walk through gate, touch ball, return to handler “Go Play”

Chain behaviour - Moose

Head turn, lift foot, touch target

Case Study – Application in industry

Pfizer Global Research and Development, Ann Arbor, MI

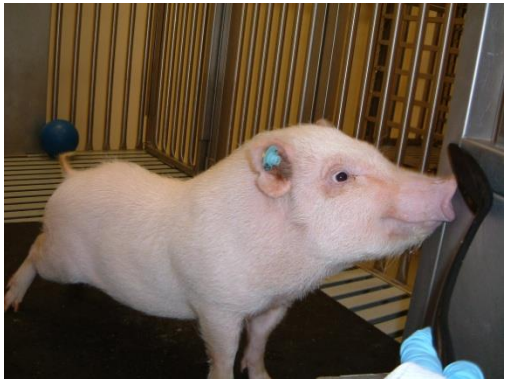
- Göttingen mini-pigs were used in Dermal Safety Studies
- On study, animals had to be picked up, carried, and physically restrained in slings for procedures: Physicals, electrocardiograms, weighing, clipping, dosing, etc.
  - Dermal dosing- up to 10 minutes; studies can have twice daily dosing for up 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.

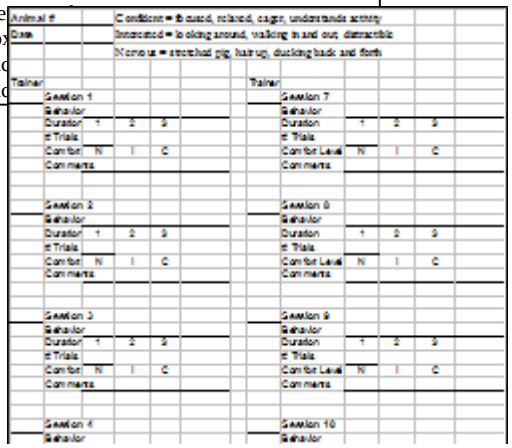
Behavior parsing

(Fry pan) Acclimate to fry pan/ladle:
-put several pellets in fry pan, put pan close to pig
-keep putting pellets into pan, slowly more 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 inte
-C&T for pro
-C&T for touc
-C&T for touc



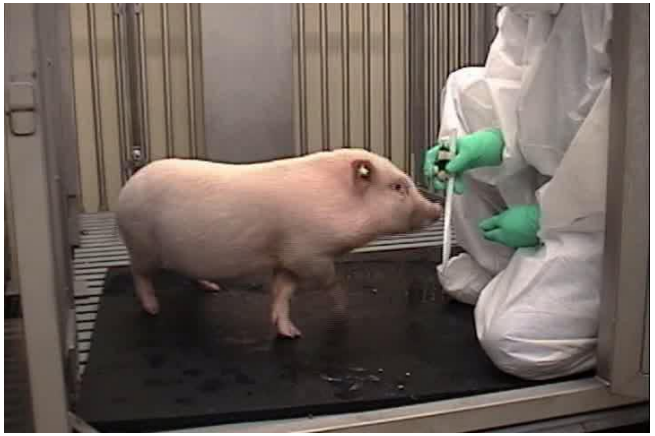
Tools – be inventive!

- 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

Pre-Study

Pre-Study	Traditional Acclimation	Operant Conditioning
Pig arrival time required pre-study	4 weeks (20 acclimation days)	2.5 weeks (12 training days)
Total average acclimation/ training time required (per pig)	5 hours (15 min / day)	2 hours (10 min / day)
Average prep time for a 24 pig study	**120** technician hours	**48** technician hours

On Study

On Study	Traditional Acclimation	Operant Conditioning
Staff required per pig for dermal dosing	Minimum of 3 technicians	2 technicians
7 day, 24 pig study, once daily, 10 min dosing	**84** technician hours	**56** technician hours

Overall		
Total time required	204 technician hours	104 technician hours
Time savings on one study*	**100 technician hours**	

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

CAG
Center for Animal Genetics

Training Methods and types of reinforcements

Clicker training

"Natural horsemanship"

Command performance

	INCREASES THE LIKELIHOOD OF THE BEHAVIOUR	DECREASES THE LIKELIHOOD OF THE BEHAVIOUR
+ Add a stimulus	 **POSITIVE REINFORCEMENT** The horse stands quietly without being tied and receives a food reward.	 **POSITIVE PUNISHMENT** The horse resists moving forward off the leg and is tapped with the crop.
– 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

Capture

- **Entice the animal to perform the behaviour**

- **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”