

## Handling and training of primates for health examination and experimentation

- o Terminology
- o Positive Reinforcement
- o How to train desired behaviours
  - ✓ Target training and shaping
- o Cues
- o The training game
- o Negative Reinforcement and Punishment
  - ✓ What are the pitfalls of these techniques?
- o Getting rid of unwanted behaviour
  - ✓ Extinction, time outs, training an incompatible behaviour
- o How to get started
- o Problem solving
- o Writing your own training protocols

## Why know learning theory?

- o Training equals learning for the animal
- o In order to be a good trainer, you have to know learning theory
- o By knowing learning theory, you can solve problems and be flexible

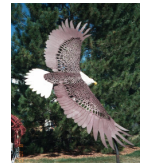
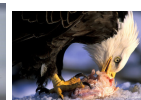
## Consequences of behaviour

- o Something nice happens  
*Positive reinforcement*
- o Something not nice happens  
*Positive punishment*
- o Something not nice stops  
*Negative reinforcement*
- o Something nice stops  
*Negative punishment*
- o Nothing happens  
*Extinction*



## Reinforcement

- o Anything that happens in conjunction with an action that increases the likelihood that the action will occur again.



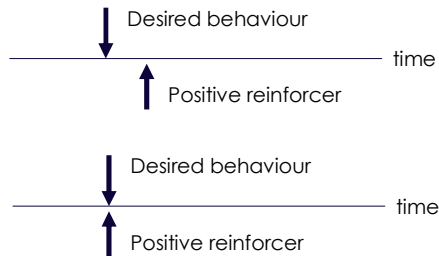
## Reinforcement

- o Reinforcers can be either positive (nice) or negative (aversive)
- o "Reward" is almost, but not exactly, the same as reinforcer
  - ✓ Not all rewards reinforce behaviour
  - ✓ Not all reinforcers are rewards

## Positive reinforcement

- o When the desired behaviour is shown, the subject is given something that he / she wants.
- o A reinforcer is anything the animal will work for.
  - ✓ Primary reinforcers: naturally reinforcing without learning
  - ✓ Individual preferences – variability!

## Positive reinforcement



## The importance of timing

- o Clear message: what exactly is desired behaviour
  - o Short interval response – reinforcer is more reinforcing (higher likelihood of learning)
  - o Reinforcer should give message: "you did the right thing NOW"
    - ✓ Problem with positive reinforcers: they take time to deliver!
    - ✓ Optimal interval is  $<1/2$  a second for many animals
- Use BRIDGE

## Bridge; secondary reinforcer; conditioned reinforcer



Helps animal understand which behaviour is the desired behaviour even before primary reinforcer is delivered

Learned by association, not naturally reinforcing.

The sound is a marker that usually ends the behaviour. "What you click is what you get". Animal remembers what it was doing when it heard the click.

*Timing is crucial!*

## Primary vs secondary reinforcers

- o Primary reinforcers
  - ✓ Naturally reinforcing without learning
  - Food, social company, sex, shelter, attention etc*
- o Secondary reinforcers
  - ✓ Acquires reinforcing properties through association with a primary reinforcer
  - The clicking sound, money etc*
  - ✓ Loses reinforcing properties if connection with primary reinforcer is lost
  - Italian Lire*

*If the animal is not willing to work for access to it, it's not a positive reinforcer!*

## What are the uses of targets?

## Target training

- o Moving animals
  - ✓ No need to wave arms, shout
  - ✓ Quicker than luring with food
  - ✓ If moving an animal to a scary place, target training is a lot faster because it gives the animal something to do
- o "Parking" and positioning animals
  - ✓ Gives trainer chance to interact with others
  - ✓ Cooperative training
  - ✓ Veterinary purposes

## Target training

- Getting rid of undesirable behaviour
  - ✓ Giving opportunity of an alternative, desirable behaviour
- Training animals to learn
  - ✓ Learning with prop is good for beginners – no begging
  - ✓ Target training involves learning about cues

## Recommendation: start with targets!

- Training is new for trainer
  - ✓ Easy to do the right thing
    - Evident when you have to click*
  - ✓ The behaviour is quickly trained
  - ✓ Useful
- Training is new for animal
  - ✓ Easy to do the right thing
    - Evident what you need to do*
  - ✓ Helps animal learn about training

## Target training helps animal to "get it"

- After 2-3 behaviours, the animal learns that:
  - ✓ A particular CUE means she should perform a certain BEHAVIOUR
  - ✓ When BEHAVIOUR is shown, she expects a CLICK
  - ✓ She expects every CLICK to be immediately followed by a TREAT

## Target training your monkeys?

- Who to start with?
  - ✓ The dominant animal?
  - ✓ The subordinate animal?
- Monkeys who approach you
  - ✓ If the animal doesn't look at the target?
  - ✓ If the animal doesn't touch the target?
  - ✓ If the animal doesn't let go of the target?
- Monkeys who don't approach you
  - ✓ Angry animals?
  - ✓ Frightened animals?

## Another way of getting behaviour: shaping

## Shaping behaviour - differentiation

- Changing and raising criteria in response to shown behaviours
  - ✓ Complex behaviours
  - ✓ Series of behaviours; chains
- Know what you want
- Know what you don't want

## Shaping behaviour

- o Brake down behaviour into small enough steps (responses) to allow the animal success. Step within steps. Be specific.
- o Train responses, not behaviour
- o Stop reinforcing old versions of responses
  - ✓ Final behaviour achieved by gradually raising criteria
- o Train individual responses or in combination
- o Shaping plan
  - ✓ trainer must be prepared for huge success – and handle regression.

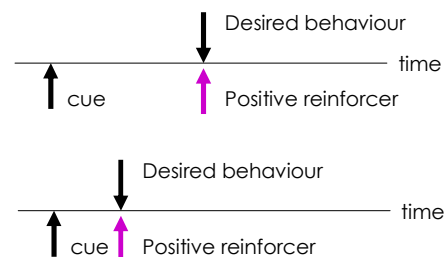
## Shaping behaviour

- o When to push on, when to stay put?
  - ✓ Staying – get consistency
  - ✓ Raise criteria when 80% correct responses
  - ✓ Too far, too fast, animal gets uneasy
  - ✓ Bounce back and forth between what the animal knows and is comfortable with, and what is new and challenging
    - Ex. Duration training: 1-3-2-5-3-7-6-9-5-8-11-7 seconds
  - ✓ Be prepared for anything!
    - Some animals don't get uneasy and are eager to learn more
  - ✓ Be careful; don't reinforce "trying" rather than "doing"

## Cues

When and how to apply them

## Positive reinforcement and cue



*The cue per se becomes reinforcing because it raises expectations...*

## Decided to add cue?

- o Choosing a cue
  - ✓ Maximum information, minimum interpretation
  - ✓ No yelling – an aversive
  - ✓ No risk confusing with bridge
  - ✓ Clear and simple (one word)

## How to add the cue

- o Train the response
- o Start adding cue on each response
  - ✓ Reinforcing generously
  - ✓ At first, cue each response as it is happening
- o Give cue slightly before responses
  - ✓ Anticipate that response will occur
- o Don't reinforce non-cued responses
  - ✓ Once discrimination has started, be consistent
    - If cue given, click and treat responses
    - If cue not given, ignore responses
- o Shape discrimination and get stimulus control

## Stimulus control

- o The animal waits for the cue before offering the behaviour
- o The animal shows the behaviour immediately on cue
- o No other behaviour is shown on that cue
- o The behaviour is not shown on any other cue

## Exercise: car driving

- o Work in pairs
- o Cars and instructions
- o One person – trainer
- o One person – animal
- o Trainer trains animal to show behaviour (with cars) according to instructions
- o Change roles!
- o 30 minutes

## Negative reinforcement and punishment

What are the pitfalls of these techniques?

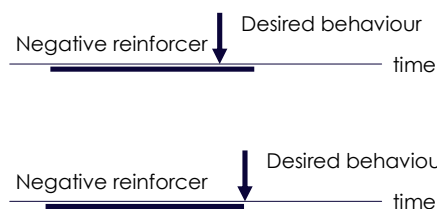
## Negative reinforcement

- o The animal is subjected to an unpleasant event, no matter how mild, that he / she wants to avoid, until the desired behaviour is shown.

*A loud sound  
Water spray  
The side of a restraint chute moving forward  
Someone waving a broom in your face*

*Note: Aversives are defined by the animal, just like primary reinforcers!*

## Negative reinforcement

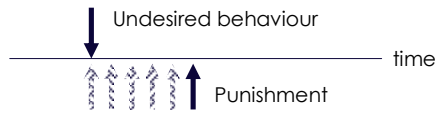


*Note that the negative reinforcer is an aversive, and contains a punisher!*

## Don't use negative reinforcement unless you have to

- o Motivation to train – and learn – is very different from positive reinforcement
  - ✓ Performance level is only high enough to avoid aversive if negative reinforcement is used
  - ✓ When using positive reinforcement, animal will work hard
- o Animals get desensitized to aversives
  - ✓ If used seldom, in an emergency using aversives (hosing fighting animals) is extremely efficient

## Punishment



unpleasant consequences should lead to reduction of undesired behaviour, but often, this is not the case...

*Aversives that do not diminish behaviour are abuse, not punishment*

## Why punishment often doesn't work

- o Occurs during or after (undesirable) behaviour is completed
  - ✓ Timing of punishment and behaviour is inaccurate – unclear which behaviour is undesirable
- o The animal receives no information of desired behaviour
  - ✓ Punishment stops behaviour rather than starts behaviour
- o Limited learning occurs
  - ✓ Unpredictable changes in behaviour
  - ✓ Behaviour occurs when trainer not present
- o Strains relationship
  - ✓ Risk of escalated aggression (frustration)
  - ✓ The risk of abuse instead of punishment

*Punishment is rewarding for punisher because it maintains dominance*

## Positive and negative punishment

- o Positive punishment
  - ✓ Trainer "adds" something when undesired behaviour is shown
  - ✓ Something negative occurs  
*Hitting; pulling ears; raising voice; scolding*
- o Negative punishment
  - ✓ Trainer "subtracts" something when undesired behaviour is shown
  - ✓ Something positive disappears  
*The chance to earn reinforcement is temporarily taken away; giving time outs; eating the candy oneself*

## More on positive punishment

- o Difficult to apply correctly
  - ✓ Generalizes easily
  - ✓ Causes fear and aggression
  - ✓ Timing critical
  - ✓ Severity critical
- o Easy to apply incorrectly
  - ✓ Over use
  - ✓ Ill timing

## Unwanted behaviour

How to get rid of them

## Losing undesirable behaviour? Time out

- o Negative punishment
  - ✓ Positive reinforcement withheld
  - ✓ Opportunity to interact with care-taker withheld
- o Should follow immediately on inappropriate response
- o Should not last more than a few minutes
- o When training is resumed, no hard feelings..!
- o Consider whether animal is at fault before use!
- o Some studies imply that animals react as severely physiologically from negative as positive punishment. Restrict it if possible:
  - ✓ Aggression towards trainer
  - ✓ Aggression towards cage-mates

## Losing undesirable behaviour?

### Extinction



- o A way to diminish unwanted behaviour
- o Stop reinforcing behaviour
  - ✓ Getting mad
  - ✓ Showing interest
  - ✓ Saying "it's OK" in soothing voice to growling dog

## Losing undesirable behaviour?

### Extinction

- o Most effective when paired with positive reinforcement of alternative behaviour
- o Some behaviours are self-reinforcing
  - ✓ Certain behaviour will not be affected by attempts of extinction, e.g. shoe chewing in dogs.
- o Remove source of reinforcement – look at environment
  - ✓ Not just yourself or your bag of goodies

## Extinction

### Some people think it doesn't work

- o Spontaneous recovery
  - ✓ Sudden appearance of previously extinguished behaviour
  - ✓ Usually at beginning of extinction session
  - ✓ May be your friend if you screw up
- o Extinction burst
  - ✓ A rapid series of the response being extinguished
  - ✓ May occur any time during an extinction session
  - ✓ Responses may be more vigorous
  - ✓ Skilled trainers may use this to shape behaviour quicker – beware!

## Losing undesirable behaviour?

### Train incompatible behaviour

- o Punishment doesn't work very well
- o Easier to train animal to do something than not to do something
- o Some things are impossible to do at the same time

*Ex: Aggression towards group mates at feeding  
Behaviour trained: sitting at target*

Some tips to start your training!

## Manipulating behaviour

### Consequences of behaviour

	Trainer adds something when behaviour is shown	Trainer takes away when behaviour is shown	Trainer does nothing
Effects on behaviour	positive reinforcement	negative reinforcement	
Behaviour shown more often			
Behaviour shown seldom	positive punishment	negative punishment	extinction

### Where? - Training environment

- o Establish pattern of training in "classroom" giving the animal the best chance of success
  - ✓ Few distractions
  - ✓ Predictable
  - ✓ Comfortable
  - ✓ Consistency in learning stages
  - ✓ Later distractions can be added and behaviour *generalized*
  - ✓ But beware novelty and neophobia in lab animals

### How long? – training sessions

- o Several short sessions better than one long
  - ✓ Attention span of animal
    - Training itself increases attention span!*
  - ✓ Progress made during session
  - ✓ How long reinforcements last
  - ✓ Don't consistently end session on failures

### Who to train? – your first try

- o The first animal you train, is also your trainer. Teaches you timing, planning, and flexibility.
  - ✓ Greedy
  - ✓ Active
  - ✓ If you work in a group, start with most dominant

### What to train? – the first behaviours

- o Train behaviour involving prop
  - ✓ Target training
  - ✓ In absence of prop, the animal does not offer behaviour
  - ✓ Until under *stimulus control*, the animal offers the behaviour "constantly" if prop is present
  - ✓ It's hard to train other behaviours as long as the animal is offering first behaviour
  - ✓ Once the animal gets the idea, non-prop behaviours can be trained

### Who's training whom?

- o Dog barks until you open the door and let him out
- o Child nags until you buy ice-cream
  - ✓ Dog / child uses negative reinforcement until you show desired behaviour. You are "positively reinforced" by silence.
  - ✓ Through positive reinforcement, you are reinforcing undesirable behaviour (barking, nagging).
    - Variable ratio – makes behaviour resistant to extinction*
    - Extinction possible – but beware of extinction burst!*

### Training – what?

- o Trainer wants two things
  - ✓ Increase the frequency / duration of desirable behaviours
  - ✓ Decrease the frequency / duration of undesirable behaviours
- o Animal wants two things
  - ✓ Pleasant things to happen
  - ✓ Unpleasant things not to happen

## Some possible training objectives

- Research procedures
  - ✓ Obtaining blood samples
  - ✓ Giving injections
  - ✓ Urine samples
  - ✓ Operant tasks
- Veterinary procedures
  - ✓ Tooth examinations
  - ✓ Gross body exams
- Husbandry procedures
  - ✓ Moving animals
  - ✓ Cooperative behaviour

## Limitations

- Time consuming
- Training education needed
- Not all animals respond well – and fast - to training
  - ✓ Variability
  - ✓ Temperament
  - ✓ Housing
- Difficulties with group-housed animals
  - ✓ Cooperation training

## Objectives – Behaviour Master List

- Target training
  - ✓ Stationing – sit/stay
  - ✓ Gating/enter transport box
  - ✓ Sit on scales
  - ✓ Cooperative training
- Cooperate during handling
  - ✓ Hands/arm/feet/legs/chest/ears/open mouth etc
  - ✓ Vaginal swab / thermometer
- Tolerate painful events
  - ✓ Present for injection / blood draw
- Avoid unnessecary handling
  - ✓ Urine collection

## Cancer perception

- Breast and lung cancer
- 90% precision
- Breath analysis



## Demining

- The rats are so light so they don't set off the mines

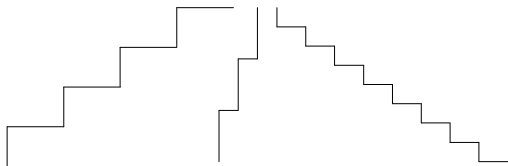


## Write your own shaping protocol

- Work in pairs
- Choose one of the following behaviours
  - ✓ Sitting on a scale
  - ✓ Voluntary presentation for an intramuscular injection
  - ✓ Moving calmly into a transport box and allowing door closed

## Write your own shaping protocol

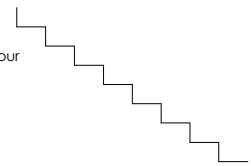
- o Imagine the finished behaviour as a series of small steps.



## Write your own shaping protocol

- o Imagine the finished behaviour as a series of small steps.

- ✓ Etc, etc
- ✓ Another person cueing behaviour
- ✓ Tolerating painful events
- ✓ Adding scary objects
- ✓ Duration of behaviour
- ✓ Location in cage
- ✓ Behaviour



## Write your own shaping protocol

- o Example of Target Training Protocol
  - ✓ M1 – classical conditioning
  - ✓ M2 – touched target once
  - ✓ M3 – touches target within 5 seconds
  - ✓ M4 – target generalized to whole cage
  - ✓ M5 – transfer to other trainer
  - ✓ M6 – stimulus control
  - ✓ M7 – fluency

## Write your own shaping protocol

- o Write an overhead with the basic training steps outlined.
- o 20 minutes (?)

## Interested in knowing more?

- o EUPRIM-nets outreach program
  - ✓ Training video
  - ✓ Shaping protocols
  - ✓ Introductory lecture
    - Inspiration, how to get started*
  - ✓ Intermediate lecture
    - Problem solving, record keeping, how to achieve training results*
  - ✓ Advanced lecture
    - Theoretical focus, how to become an independent trainer*

## Resources

- o "clickertraining" on the web
  - ✓ <http://www.wagntrain.com/OC/>
- o Karen Pryor: Don't shoot the dog
- o Ken Ramirez: Animal Training
- o PTEW (Primate Training Enrichment Workshop)
  - ✓ 4-day workshop
  - ✓ Ask for contact details