Can models be used successfully to mimic the real thing to prevent canine predation of an endangered species?

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The use of models

Models are commonly used when training and assessing animals:

• canine temperament testing e.g. child-like doll & plastic dog (Bernard et al. 2012)

• predator awareness training e.g. wooden raptor models (Gaudioso et al. 2011)

• prey aversion training e.g. DoC Kiwi Aversion Training (Dale et al. 2013)
Despite the widespread use of models in animal training, there has been no systematic empirical evaluation about their effectiveness when presented with the ‘live species’.

The aim of this research is to investigate whether models do actually mimic the ‘real thing’.
One problem is….

Pig distribution in New Zealand
Pig and kiwi distribution

Dogs are the main predator of adult kiwi
Dogs are not all bad...

Operation Nest Egg
Kiwi Aversion Training

- Punishment based associative learning training technique using a range of kiwi ‘models’
- Electric collars as the aversive stimulus
- KAT is part of a range of methods to try and conserve kiwi against dogs

Management of dogs

- Live trapping & shooting
- Poisoning
- Regional Council initiatives
- KAT permitting for hunters
KAT permits

- Kiwi ‘models’ are used
- ‘Kiwi-safe’ permits given if aversion displayed towards the kiwi models
- Allows hunting of introduced species in kiwi habitat, criteria for hunting permit
- Use of dogs crucial with pigs, lesser degree deer
KAT permits

- Over 20 Conservancies/area offices and contractors train and permit dogs as kiwi safe (up to 1000 dogs busy weekends)
- Hauraki Area Office has over 1200 dogs on their books
- Annual permitting system
- One scale study investigating the effectiveness of the KAT (n=13; Jones, 2006)

What we already know

- Can dogs associate the KAT props with an electric shock?
  - YES – All dogs showed significant AVERSION to the KAT props (P <0.001)
Can dogs remember this association?

- YES over a one month period (P < 0.001)
- YES over a one year period (P < 0.001)
- KAT programme results in all dogs showing aversion to the KAT models during their initial training and one month later, and that most (87%) continue to show aversion after one year (Dale et al. 2013)

Did the behavioural response vary over time?

- NO - AVERSION responses were the same regardless of time passed since KAT training (1 month vs 1 year) (P=0.830)
Does location affect the behavioural response of the dogs to the KAT props?

• No – AVERSION responses were the same regardless of location both one month and one year later (P=0.536)
• Aversion generalizes successfully to locations other than that used during training & when not wearing the electric collar used in training (Dale et al. 2013)

KAT appears to be effective in dogs consistently displaying aversion towards the KAT props.
The KAT programme results in less aversion to the KAT models in:
• older dogs
• dogs from single-dog households
• dogs used to hunt pigs
• ‘non-sporting’ breed dogs
• with a three year or more gap between sessions

(Dale et al. *in prep*)
Do the models mimic the ‘real thing’? What is the ecological significance of these kiwi models?

- Almost 20 years with substantial political, financial & PR investment
- There is no empirical evidence that indicates that this programme is successful in reducing depredating of live kiwi

Need for live species presentation
Ecological significance of KAT model use

- Less ecologically valuable
- Easily obtainable
- AEC approval
- Used the DoC KAT standardised canine training protocol with chickens as a model, rather than kiwi

Methodology

- Sourced 84 owned dogs (no previous e-training)
- Trained using the Hauraki Area Office standardised KAT method by one DoC KAT trainer to avoid a chicken model
- Presented with a live chicken one month later at a novel location with novel dog handlers (eliminate potential site or person specific aversion)
- The training and testing sessions were filmed with 3 cameras to allow in-depth behavioural analysis using Observer
Methodology

• Ability to investigate the individual models
• DoC often have difficulty sourcing the kiwi models so it was useful to know if there are one or two models that were more ‘ecologically significant’ or work better...

Methodology

• There were 7 treatment groups:
  (1) dead chicken \( (n=13) \)
  (2) stuffed chicken \( (n=12) \)
  (3) chicken faecal material \( (n=13) \)
  (4) chicken nesting material \( (n=12) \)
  (5) wooden cut-out chicken \( (n=12) \)
  (6) ‘All models’ together (1-5 above) \( (n=12) \)
  (7) Live chicken (positive control) \( (n=10) \)
• The 84 dogs were randomly allocated to one of seven treatment groups.
Model choice

These models were selected for investigation because they are the training stimuli used by the New Zealand Department of Conservation’s Kiwi Aversion Training programme, but with kiwi equivalents (Groups 1-6 only)

Methodology - Training

• All dogs were health checked by a vet/vet nurse
• Good health
• Owner consent
• Attend initial & test session
• Randomly allocated to a model group
• Fitted with a Smart Aid 4 e-collar
• Walked 200 meters by a novel handler on a long line to where the models were located
Methodology - Training

- Walked past the model
- No verbal communication
- Shocked by DoC KAT trainer when interest displayed
- Walked past repeatedly (& shocked) until sufficient aversion was displayed
- Returned to owner
- Filmed on 3 cameras
- Standard DoC KAT protocol (handler amendment to KAT protocol)

Powering & controlling cameras
Methodology - Testing

• One month later (previously established timeframe for 100% recognition of KAT models)
• Novel site (site specific aversion)
• Novel handlers (handler specific aversion)
• No electric collar (collar specific aversion)
• Bags of dog food, free micro-chipping, petrol vouchers, pet shop vouchers etc etc
• Dogs walked long line 100m away, corner 8m chicken
• Chicken in very large wire mesh cage with 5 times use before changing (2 x 3 x 2m)

Responses of the dogs to the live chicken were rated on the following scale: Modification of Dale et al. 2013

(1)'Strong aversion' of the live chicken: won't approach vicinity of the chicken, refuses to walk past the chicken, runs away; at least two stress behaviours such as licking lips, cringing, slinking (walking hesitantly crouched low to the ground), ears back, and panting;

(2)'Moderate aversion' of the live chicken: reluctant to approach vicinity of the chicken, gives the chicken a wide berth when walking past, avoids looking at the chicken, does not sniff the chicken, and displays at least one stress behaviour(s);

(3)'Indifferent' to the live chicken: Shows no interest or aversion of the chicken, walks past the chicken, does not sniff the chicken, is not reluctant to stay in vicinity of the chicken, no stress behaviours displayed, any other behaviour not related to the props;

(4)'Moderate interest' in the live chicken: air sniffs in direction of the chicken, slowly approaches the chicken, sniffs close to the chicken, no physical contact made with the chicken cage;

(5)'Strong interest' in the live chicken: quickly approaches the chicken, sniffs the chicken, makes physical contact with the chicken cage.
Other measurements of live chicken recognition recorded

- The zone of detection of the live chicken (measured in meters)
- The time taken to detect the presence of the chicken (measured in seconds)

Behavioural response to the live chicken in the test session

The model that was used for training had a significant effect on the behavioural response of the dogs in the presence of the chicken ($H(6)20.868, p=.001$)
Live chicken training

Resulted in significantly higher levels of aversion behaviours being displayed when presented with a novel live chicken (90%)

All models together

Resulted in the next highest level of aversion behaviours observed when presented with a live chicken (67%)
Dead chicken model

3rd highest model in producing aversion (62%)

The remaining four models resulted in lower levels of aversion behaviours being displayed when presented with a live chicken

‘Faecal material’ model (33%)  ‘Stuffed chicken’ model (25%)
The model that was used for training had a significant effect on the time taken to detect the presence of the chicken ($H(6)14.502, p=.021$)

Dogs that were a trained using the live chicken having significantly shorter periods of time to detect the presence of the chicken.
Distance to detect the presence of the live chicken

The model that was used for training had a significant effect on the distance that the dog detected the presence of the chicken \((H(6)=12.74, p=.04)\).

Dogs trained using all of the props together detected the live chicken from a significantly shorter distance.

Effect of gender

- 48% male & 52% were female (reproductive status on graph)
- No significant effect on the time taken to detect the chicken \((H(3)=2.907, p=.416)\)
- No significant effect on the distance the chicken was detected from \((H(3)=1.779, p=.629)\)
- No significant effect on the behavioural response to the live chicken in the test session \((H(3)=4.316, p=.224)\)
Effect of age

- No significant effect on the time taken to detect the chicken \((H(3)=6.897, \ p=.075)\)

- No significant effect on the distance the chicken was detected from \((H(3)=3.972, \ p=.265)\)

- No significant effect on the behavioural response to the live chicken \((H(3)=1.612, \ p=.664)\)

Effect of breed type (NZKC)

- There was no significant effect on the time taken to detect the chicken \((H(6)=4.841, \ p=.564)\)

- There was no significant effect on the distance the chicken was detected from \((H(6)=5.153, \ p=.524)\)

- There was no significant effect on the behavioural response to the live chicken \((H(6)=5.275, \ p=.522)\)
Chicken model to live chickens

- The results indicate that 35% of the test dogs displayed aversion towards live chicken with 65% not
- The majority of test dogs did not appear to generalise from the chicken models to the live chicken

What does this mean for Kiwi & the KAT program?
**Chickens are not kiwi**

- Chicken respond to the presence of dogs with movement, noise and attempts to flee
- Kiwi may freeze (or not) – contradiction between published literature & hunter reports
- Smell different with kiwi having a strong distinctive odour
- Easier to kill

**What does this mean for the KAT program?**

- Educational function - provides information about the dangers of dogs to kiwi
- PR
- Part of hunting permit approval process to hunt on DoC land & lots of privately owned forestry blocks
- Suggest review of methodology
What do these results mean for kiwi?

Not conclusive but potentially indicative

Conclusion

• It is possible that the use of models in animal training is questionable, and needs further investigation.

• Ethical & practical difficulties, use of live kiwi should be explored.

• The success of any aversion training programme needs to be weighed up with the possible associated welfare compromise.
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