

# K9 TRAINING AID VALIDATION

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## INDEPENDENT VERIFICATION & VALIDATION (IV&V)

- Third-party evaluation to determine if the system (e.g., training aid):
  - Meets the needs of the end-users → validation
  - Fulfills its intended purposes (stated requirements) } verification
  - Matches the manufacturer's specifications } verification
- Very common in DoD
- Iterative process throughout the product development cycle
- Ensures highest quality outcomes for large-scale RDT&E projects

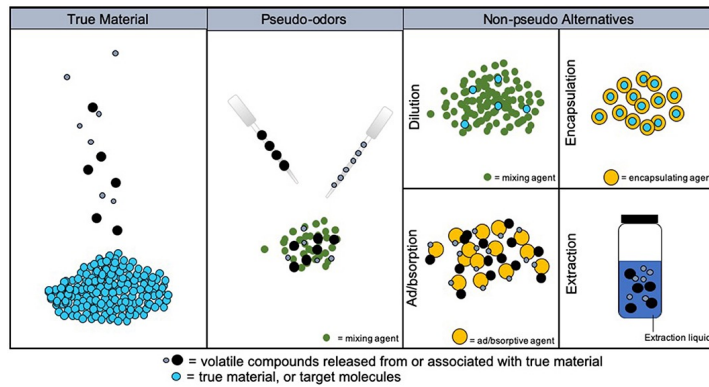


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## DEFINITIONS

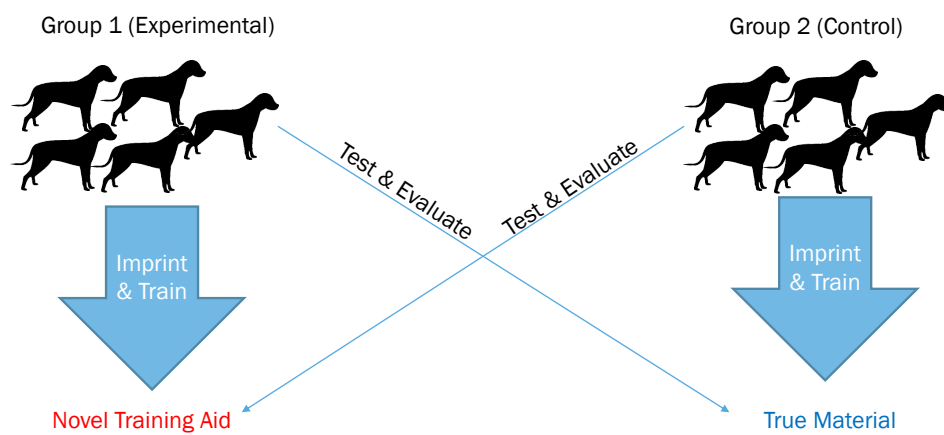
Simon *et al.* 2020 *Frontiers in Veterinary Science. A Review of the Types of Training Aids Used for Canine Detection Training*



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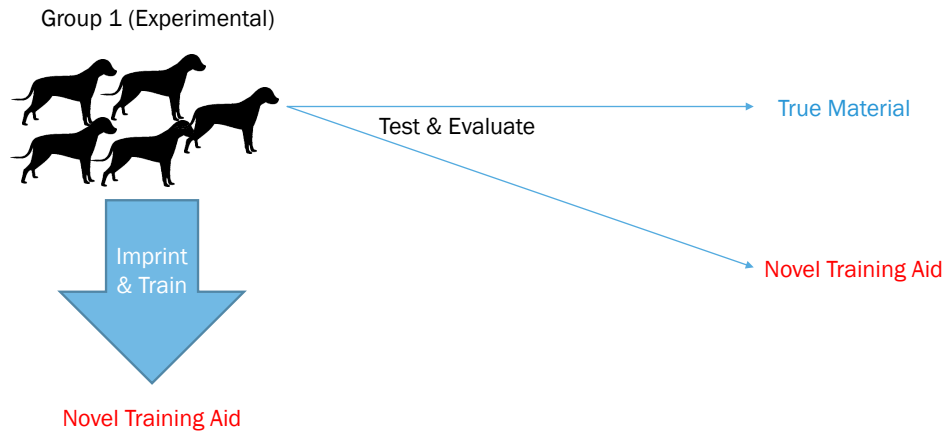
## CROSS-OVER STUDY DESIGN – GREEN DOGS



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## NOVEL TRAINING AID **VALIDATION** STUDY DESIGN – GREEN DOGS



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## ANALYSIS OF POTENTIAL OUTCOMES



- Experimental Group detects **True Material** → **VALIDATION** of **Novel Training Aid** for initial odor training (and probably maintenance training)
- Experimental Group does not detect **True Material** → **Novel Training Aid** is **NOT VALID** for initial odor training

Positive Control

Control Group detects **True Material** → Demonstrates efficacy of canine training

Negative Control

Control Group does not detect **True Material** → Demonstrates inefficacy of canine training → Entire Experiment is Invalid

- Control group detects **Novel Training Aid** → **Novel Training Aid** may be valid for maintenance training (further studies needed)
- Control group does not detect **Novel Training Aid** → **Novel Training Aid** is **NOT VALID** for maintenance training

Positive Control

Experimental Group detects **Novel Training Aid** → Demonstrates efficacy of canine training

Negative Control

Experimental Group does not detect **Novel Training Aid** → Demonstrates efficacy of canine training, however, may also point to issues inherent with the training aid (stability, durability of odor memory, etc.)

*\*Further research still needed to assess training aid shelf- service-life, consistency & robustness of detection over time and generalization.\**

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## REAL WORLD SCENARIOS

- Real World
  - ~~Control groups~~ Operational Dogs
  - CERTIFICATION
    - Operational dog detects **True Material** → Demonstrates efficacy of canine training
    - Operational dog does not detect **True Material** → you've got issues
- Testing on Operational Dogs
  - Operational dog detects **Novel Training Aid** → **Novel Training Aid** *may be* valid for maintenance training (further studies needed)
  - Operational dog does not detect **Novel Training Aid** → **Novel Training Aid** is **NOT VALID** for maintenance training
- Lack of experimental controls, sufficient subject numbers, etc.

## WHAT'S HAPPENING...

Certified Operational Dogs



N=1

Imprint  
& Train

True Material



"Test"

Novel Training Aid

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## WHAT ABOUT CHANGE OF BEHAVIOR (COB)?

- In a **PROPERLY** designed experiment, COB is absolutely meaningful and can be qualitatively and quantitatively assessed.
  - Scored COB 0 - 3, sniff time
- All the other reasons dogs demonstrate COB...
  - Novel odor in a familiar environment
  - Familiar odor in a novel environment
  - Human scent contamination
  - Canine scent cues
  - Handler (intentional and unintentional) cues
  - Blind, double-blind assessments
  - Visual, thermal, vibration cues
  - Fresh disturbance
  - Anomaly detection

"Oh! What's that new thing in my training area?!"

"Mmmm, smells like home"

"Mom? Dad? Is that you?"

"Oh, hey, Bingo! What happened here? Smells like you were pretty excited!"

"Every time I go near *this area* my handler shifts his weight or holds his breath"

"Someone here knows the answers!"

"Check out the HEAT left by my handler! She might as well just throw the training aid at my face!"

"Everything in this room is stale and smells like old library books, BUT NOT THIS DRAWER!"

"Which one of these scent boxes doesn't belong? I know! The one covered in dog slobber"

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## COST BENEFIT ANALYSIS OF PARTICIPATING IN “TESTING”

### Potential Benefits

- Be part of the scientific/discovery process
- Being first
- Perks
  - Free training?
  - Free training aid?
  - Publicity?

### Potential Costs

- What are you training your dog on?
  - Informed consent?
  - Toxicity of novel training aid?
    - Inhalational hazard, safety data sheet
- Potential ramifications
  - False alerts (nuisance) – requires remedial training
  - False alerts (detrimental) – cause dog to wash out
- What is your time worth to you?
- **What is your fully trained operational dog worth to you?**

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## WHAT REAL K9 R&D ENTAILS

- Animal Use Protocols (AUP)
- Review by an Institutional Animal Care and Use Committee (IACUC)
- Personnel trained in American Association for Laboratory Animal Science (AALAS) ethics, procedures, and 3 Rs
- Personnel trained in occupational health and safety
- Informed consent
- Participant enrollment by qualified individuals
- Responsible Principal Investigator (PI)
- Literature reviews for duplication
- Statistically valid design of experiment vetted by statisticians that conduct power analysis
- Data rights and management plan
- Documentation, oversight, peer review, and continuing review
- Justification of all procedures
- Third-party testing / IV&V

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