



Measuring and investigating factors which affect performance

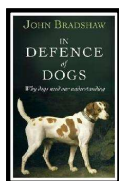
of working dogs, their handlers
& dog-handler teams



Dr Nicola Rooney
Anthrozoology Institute



Dog Behaviour and Welfare



✶ Value of measuring performance



✶ Value of measuring performance

- Confirm ideas on best practice
 - e.g. training methods
- Determine factors which affect performance
 - e.g. ideal frequency of training
- Measure the effect of changes in procedure
 - e.g. procurement sources, different breeds



✶ Could argue - not needed

- Decisions regarding procedure already made
- Have no choice due to
 - Practicalities
 - Financial constraints
- But you need to know the risks associated

✶ We wouldn't make important decisions without evidence



- Decide which car to buy without knowing fuel efficiency and what affects this
- Buy a equipment for \$50,000 and assume it works in all conditions



- Change the way children are taught without measuring the effect on their learning



Need **EVIDENCE-BASED** data
if we are to **IMPROVE** performance
and **PROTECT** welfare

✶ Could argue - not needed

- Our training and procedures are all optimal
 - Based on expert opinion

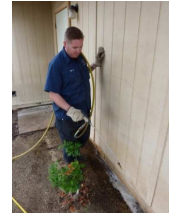


✶ Donaldson (2009) says

"Dog training is a divided profession.

We are not like plumbers, orthodontists or termite exterminators who, if you put six in a room, will pretty much agree on how to do their jobs.

Dog training camps are more like Republicans and Democrats, all agreeing that the job needs to be done but wildly differing on how to do it."



✶ You can only truly improve if you quantify your performance

- Measure trends in performance
- Explore factors associated with poor and good performance
- Need to ensure your measures are consistent
- Otherwise it is simply one opinion over another

✶ Could simply monitor pass/ fail

- 0/1 - will give you a success rate
- Allow you to maintain capacity
- But is 90% pass out this year the same as 90% last year?
- And can it really help you to improve?

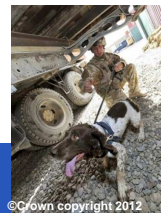
More value to measuring performance

✦ Two scenarios when measuring performance is valuable

- Research and Development / Controlled trials
 - Test effects of specific factors on performance
 - Example of our rearing study
- Day to day – during normal operations and training
 - Methods devised during trials can be adapted for this

✦ Examples of using performance measures

- Ability of AES search dogs in training
- Handler ability and team performance
- Search dog performance during daily operations
- Diabetes alert dogs



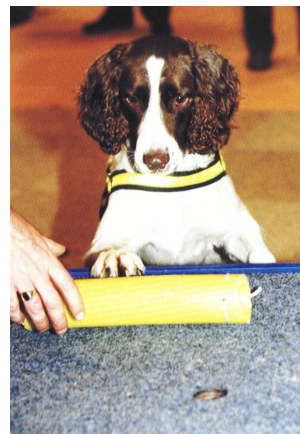
Which factors affect the working ability of dogs?

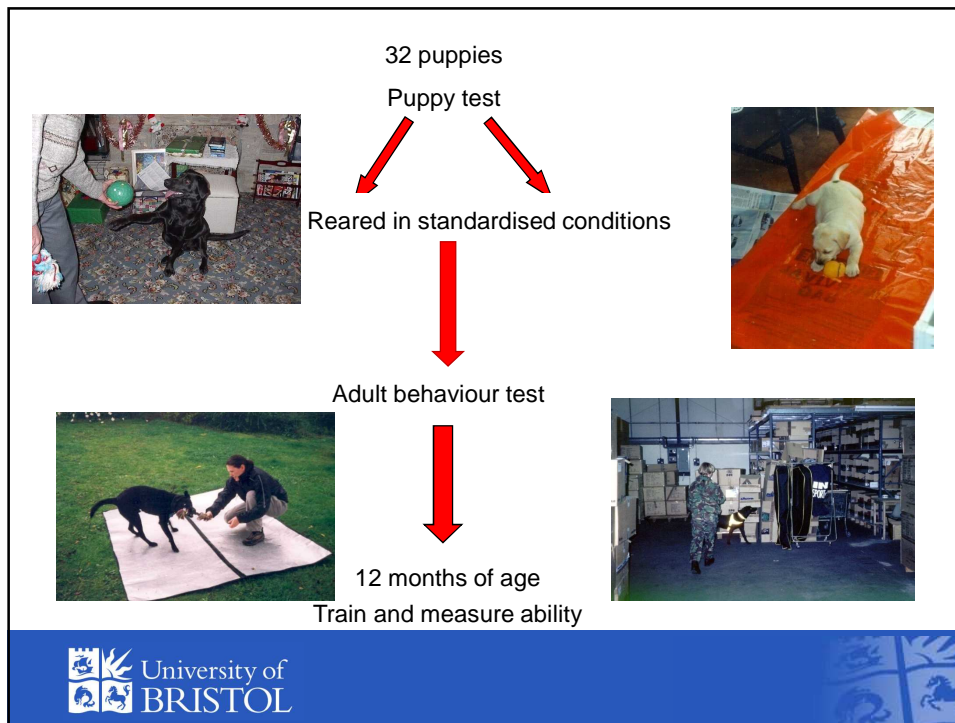


What produces the best search dog?



Routine procurement does not permit investigation





🔥 Challenge – how do we measure performance?

- What to measure?
 - Performance is not a single trait
 - There are numerous dimensions to performance
- How to measure it?

- Greyhound – winning race



Search dog – ability to find

Performance is not a single trait

By measuring multiple traits

- Detect early signs before overall performance decreases
- Examine different aspects of performance affected differentially
- E.g. rearing in outdoor pens
 - » Increase fitness
 - » Increase fearfulness



🔥 What makes a good search dog?



37 experts - 100 characteristics!



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- 1 Health
- 2 Acuity of sense of smell
- 3 Incentive to find an object which is out of sight
- 4 Ability to learn from being rewarded
- 5 Stamina
- 6 Intelligence – ability to act on own initiative
- 7 Tendency to hunt by smell alone
- 8 Motivation to chase an object
- 9 Agility
- 10 Obedience to human command
- 11 Independence – ability to work on own initiative
- 12 Consistency of behaviour from day to day
- 13 Tendency to be distracted when searching
- 14 Interest in toys or objects
- 15 Travel ability
- 16 Motivation to retain possession of an object
- 17 Boldness
- 18 Playfulness
- 19 Fear of specific things
- 20 Level of aggression towards humans
- 21 Excitability
- 22 Ease of adaptation to kennel environment
- 23 Friendliness to people
- 24 Willingness to bring an object back to a person
- 25 Reaction to sudden loud noises
- 26 Body sensitivity - reactivity to touch and contact with objects
- 27 Ease of adaptation to new handler
- 28 Level of aggression towards other dogs
- 29 Size
- 30 Motivation to obtain food



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VERY HIGH

Health

Acuity of sense of smell

Incentive to find an object which is out of sight

Ability to learn from being rewarded

Stamina



Rooney, Bradshaw & Almey, 2004.

Journal of Forensic Science 49 (2) 300-306.

Rooney & Bradshaw 2004

Applied Animal Behaviour Science 86 123-135**LOW**

Motivation to obtain food

Reaction to sudden loud noises

Level of aggression towards humans

Level of aggression towards other dogs

VERY LOW

Tendency to be distracted when searching

Fear of specific things

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Motivation or enthusiasm to search
Thoroughness / coverage of search area
Control (responsiveness to commands)
Ability to follow search pattern
Strength of indication
Stamina
Boldness / confidence in the environment
Tendency to falsely indicate finds
Distraction when searching

Vehicle

Motivation or enthusiasm to search
Strength of indication
Ability to follow search pattern
Thoroughness / coverage of search area
Stamina
Control (responsiveness to commands)
Agility
Boldness / confidence in the environment
Consistency from day to day

Arms and Explosives

Stamina
Control (responsiveness to commands)
Motivation or enthusiasm to search
Boldness or confidence in the environment
Tendency to falsely indicate finds
Strength of indication
Independence
Stress during transit
Tolerance to work around other dogs

Rooney and Clark (submitted)University of
BRISTOL

Pictures © Crown copyright 2012

🔥 How to measure performance?

Longitudinal assessments

- Expert opinion
- Consider longer time period

Are they consistent between raters?



Standardised task

- Point sample
- Can video so compare raters
- Can use objective measures

🔥 Trainers' assessments

Weeks 1, 4, 7 and 10

Overall Ability

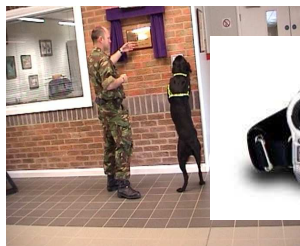
11 behavioural traits



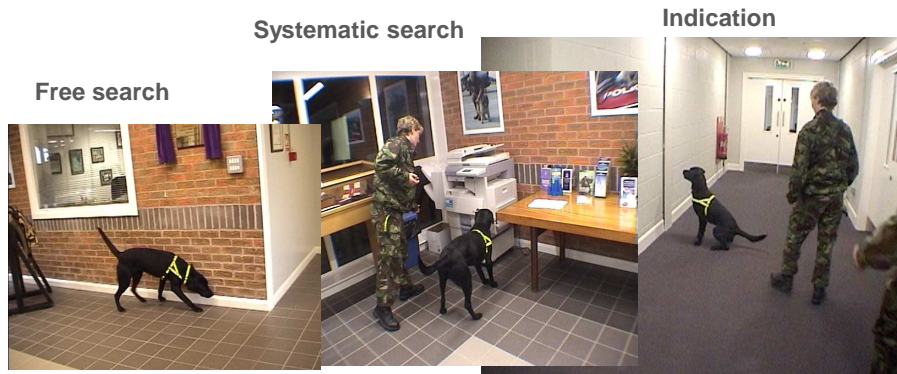
Week 10 - Final Rating

- 1) should be rejected
- 5) definitely ready to progress onto further training

Standardised task



Standardised assessment



Rooney et al. (2007) Validation of a method for assessing the ability of trainee search dogs
Applied Animal Behaviour Science

Standardised search task



✶ Rate search

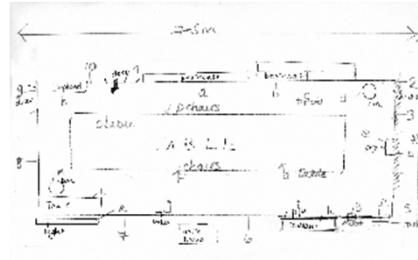


Subjective ratings



2 underlying traits

General search ability
Ability to work without false indications



Objective ratings

4 measurable traits

Free search thoroughness
Location ability
Systematic search ability
Mean number of false indications

✶ How did trainers' ratings compare to the standard search task?

	Standardised search task	Trainer ranking
Subjective	General search ability	***
	Ability to work without false indications	NS
Objective measures	Free search thoroughness	***
	Location ability	**
	Systematic search ability	*
	Mean number of false indications	NS

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

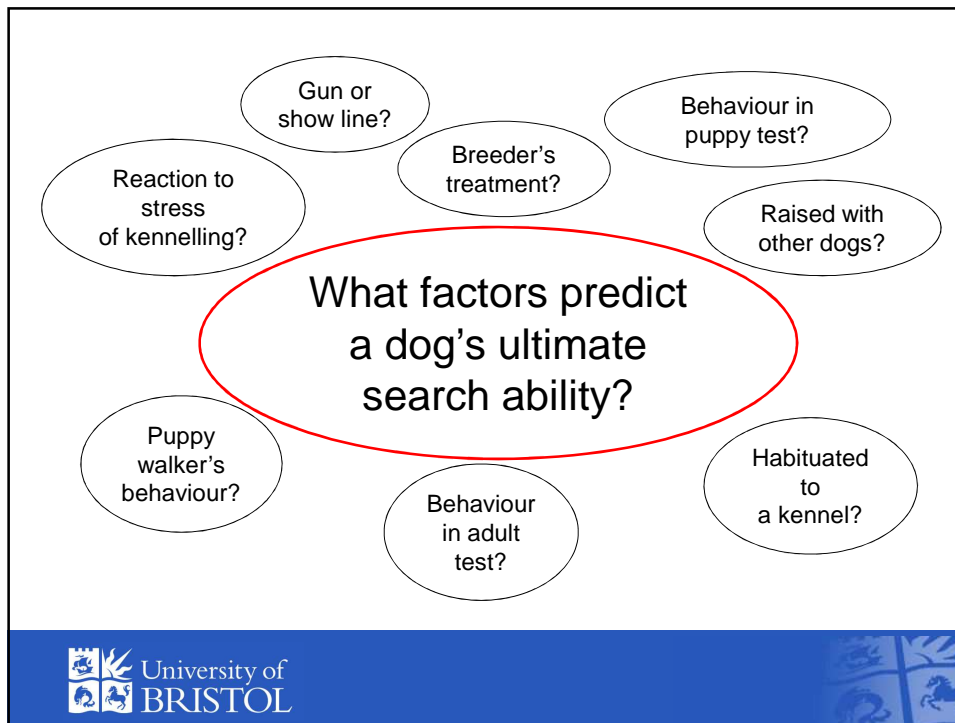
Summary of findings

- Subjective ratings by scientists were similar to experienced trainers
- Objective recordings correlate to trainers' ratings but can add information by breaking ability into more traits
- Trainers can reliably rate ability, but are less able to break the traits down
- Trainers refine their ratings as training progresses

Trainers' ratings in the first week were not perfect

- Trainers' ratings of Overall Ability were only 80% accurate after Week 7 of training
- Rejection of dogs should be delayed





🔥 Do dogs from gun-dog lines make better search dogs?

- Yes but only if properly socialised
- Still dependent on individual temperament
- Brothers were no more similar
- Gun-dog lines - used in preference
- Rearing environment vital



✦ Are dogs raised with other dogs more or less successful in training?



16 raised with other
dog(s)
maximum of 2 dogs



16 raised with no other dog

✦ Raising dogs with other dogs - did not affect their ability

- Past experience of puppy walker was not important
- When selecting puppy walkers compliance is more important



✦ Is working ability predictable from behaviour in the home or as a puppy?



✦ Behaviour in puppy test did not predict ultimate ability

- Very few links between puppy and adult behaviour
- may be useful to identify potential problems
- predictive value needs to be proven

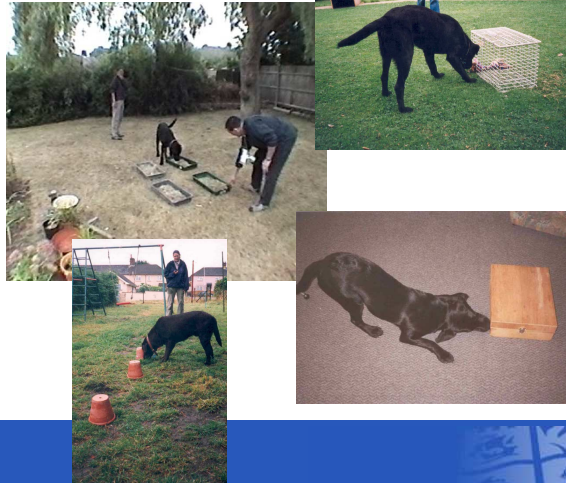


☀ Search-related behaviour in home did not predict success in training

Ability to locate hidden
food, find toys &
olfactory behaviour

not related to ability

Procurement
assessment methods
need to be evaluated



☀ Human-directed behaviour did predict ability



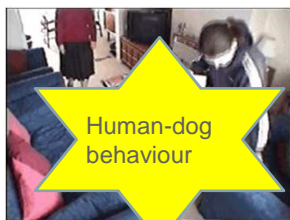
very interactive dogs did poorly during training

Human-directed behaviour



Gun-dog lines better than show-dog lines

**Low
Attention-seeking
behaviour**



$\beta = -0.53$

$\beta = 0.50$



Rearing vs
breeding



**Reaction to
acute stress**



Amelioration
of stress in
kennels

$\beta = -0.32$

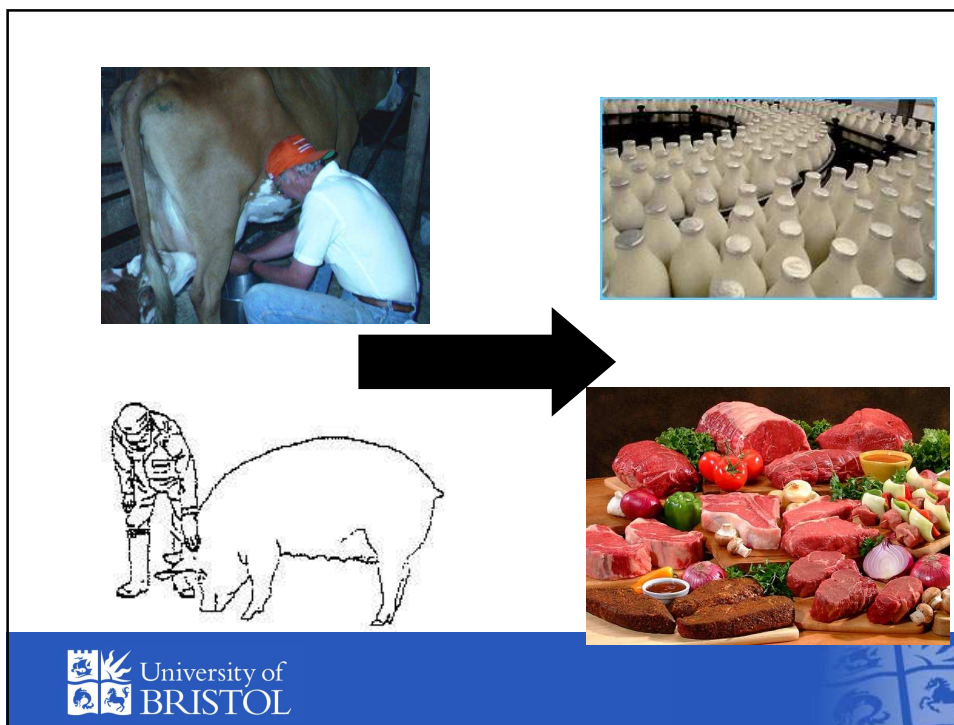
OVERALL ABILITY

✶ Take home messages

- Challenge your own and consensus beliefs
- Test your procedures are all necessary!
- Train some of your rejects!

✶ What makes a good handler?





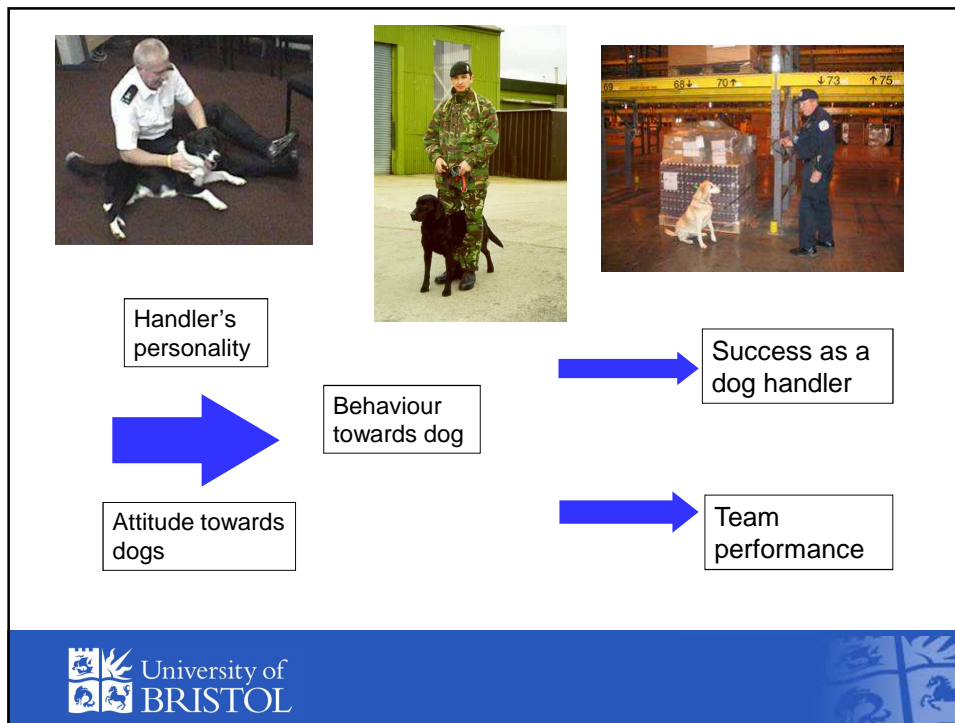
Established
AES handlers

Trainee AES
handlers

Established drugs
dogs handlers

**3
populations
150 handlers**

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🔥 Measuring handler or team ability

Longitudinal assessment

Ratings of supervisors / trainers



Point samples

Subjective - Ratings by assessors/ evaluators

Objective - Standardised search



Dog-oriented skills

- Empathy and affection for animals
- Ability to interpret the dog's behaviour
- Appropriate use of voice when training and working with dog
- Ability to control their dog
- Avoidance of excessive correction
- Knowledge of dogs and their behaviour
- Appropriate use of rewards
- Ability to search in an efficient way
- Building a relationship with their current dog
- Patience
- Commitment to dog handling

General skills

- Staying calm under pressure
- Physical coordination and agility during search
- Physical strength and stamina
- Following instructions
- Reacting to situations and adapt own behaviour quickly
- Learning new skills and concepts
- Self-confidence
- Working independently
- Working as a member of a team
- Multi-tasking
- Working safely



Standardised searches



Ability during the search



Searching style



Ability measures varied between searches



Style measures were more consistent:

Natural tendency to re-search
Presentation rate
Mean reward duration



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What makes a successful handler?

HANDLER

Personality

Attitudes towards animals

Behaviour towards dogs

?

PERFORMANCE

Standardised search

Assessors' reports

Supervisors' reports



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✶ Which personality type makes the best handler?

- Neuroticism
- Extraversion
- Openness to experience
- Agreeableness
- Conscientiousness

✶ Personality dimensions affected ability of prison dog handlers

Overall ability measure predicable from:

- 1) high score for 'Conscientiousness', *tendency to be hard working, persistent, responsible and orderly*
- 2) a low score for 'Neuroticism'

The most able handlers

- scored high scores for Conscientiousness



🔥 Attitudes affected skill at handling

- Handlers who believed in much punishment
 - less confident dogs
 - less playful dogs (Agency 2 - $\rho = -0.288$, $p = 0.003$)
- Handlers more understanding of dog behaviour
 - more patient when training their dog ($t = -2.01$, $p = 0.05$)



🔥 Patience

while performing a simple training task was predictive of ability in two out of three agencies



Rooney and Cowan 2012

task might form the basis of a useful selection tool

🌳 What affects operational team performance day to day?



🌿 Tools for monitoring performance

[illegible]



🔥 Lone workers



can they use scales reliably and
can they rate their own dogs' ability?

🔥 Is there agreement in ratings?

9 AES handlers rated 9 videos of searches

Own dog and colleagues' dogs



🔥 No there isn't

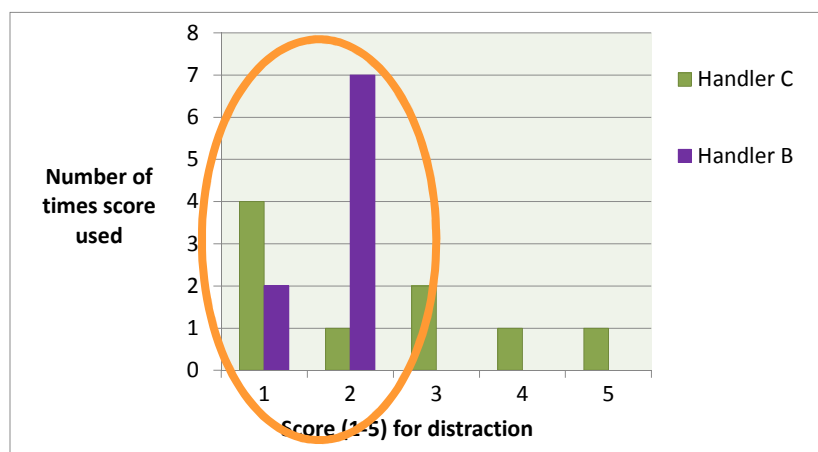
Characteristic	Agreement
Control	56%
Motivation	52%
Stamina	22%
Distraction	32%
Confidence	18%
Independence	51%
Indication strength	20%
False indications	46%
Overall rating	39%

✶ Important to look at single-rater reliability

- Compare overall agreement (ICC) may seem high
- Examine single raters – variable in their ability
 - to rate reliably
 - to discriminate between traits (discriminant validity)



✶ Differences between handlers in use of scales



🔥 Subtle aspects of presentation are important



Benchmarking can help handlers score certain traits

(Clark and Rooney submitted)

Control - response to your commands

1	Rarely responds to commands	Very Low
2	Often ignores, or responds slowly	Low
3	Sometimes ignores or responds slowly	Intermediate
4	Usually responds quickly	High
5	Always responds, responds and generally very quickly	Very High

✶ Handlers rated their own dogs differently to their colleagues'

	Handler									
	A	B	C	D	E	F	G	H	I	
Control					↑	↓		↑		
Motivation	↓	↑	↑	↑		↓	↑			
Stamina	↓					↓		↓		
Distraction		↑	↑		↑	↑			↓	
Confidence		↑	↑						↓	
Independence			↑	↓	↑					
Indication strength			↑		↑	↑	↑			
False indications			↓							
Overall rating	↓		↑	↑	↑	↑		↑		

✶ Training of observers is vital



Guided training on use of scales



Interactive teaching device - Turning Point

Control

- response to your commands

Includes verbal and physical commands

- **Proportion of commands to which dog responds**
- **Speed at which dog obeys**

Control / response to handler commands

Always responds and generally very quickly

5



Control / response to handler commands

Rarely responds to commands



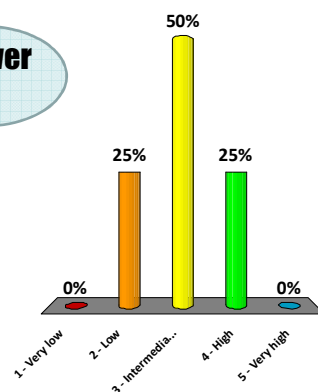
1

How would you rate this search for
Control?


- 1- Very low
- 2 - Low
- 3 - Intermediate
- 4 - High
- 5 - Very high

0 of 3

Answer
Now



Characteristic	Agreement
Control	56%
Motivation	52%
Stamina	22%
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 Clark, Sibbald and Rooney submitted


People have trouble recognising signs of fear

(Tami and Gallagher 2009), (Correia et al. 2007) (Mariti et al. 2012).

Avoiding eye contact



Repeated yawning



Tense facial expression



Ears held low



Whimpering/whining



Tense body posture



Lifting one paw

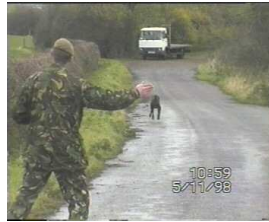


Rolling on back




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✦ Working dogs - in environments including aversive and unexpected stimuli



✦ Fear behaviours can simply reduce ability to perform the task



Fear also associated with

- Changes in immune function
(e.g. Terlouw et al 1997)
- Reduced life span – associated with extreme social fear (Dreschel 2010)
- Altered ability to learn new tasks
(e.g. Blackwell et al 2010)
- Frequent cause of aggression
- Cause compromised welfare



Handler training is vital

Recognising Fear and Anxiety in Dogs

Dogs have a unique way of communicating with each other, and with us, through using a whole range of body language, facial expressions, tail and ear position, and vocalisations. By reading these 'behavioural signs' or 'signals', we can find out a lot about how a dog is feeling, and often predict how it is likely to behave.

When dogs feel scared or anxious they show it, but it's easy to miss or misinterpret these signs. If early signs are not responded to properly, the dog may develop behaviour problems such as aggression, fear of noises, or of other situations. These can severely affect the dog's quality of life and can cause stress for those owning, or working with dogs. So it's important to learn to read the signs.

This is a training resource that will help you, and others, recognise the early signs of fear and anxiety shown by dogs, so that action can be taken to prevent the development of fear-based behaviour problems.

This resource is aimed at anyone who interacts with dogs, from dog owners to shelter staff, as well as professional dog handlers and trainers.

How to use the resource:

1. Read the information on the [interpreting behavioural signs](#) page, and look at the pictures and videos on the behavioural signs pages. These are split into the following categories:
 - Facial expressions
 - Body posture
 - Movements (descriptions of the dogs movements)
 - Vocalisations (the noises that dogs make)
 - Other reactions
2. Practise identifying the behavioural signs that you have learnt about by watching the videos on the [Test your knowledge](#) page.

Loftus , Casey
Rooney 2013



<http://www.bristol.ac.uk/vetscience/services/behaviour-clinic/dogbehaviouralsigns/index.html>

☀ Benefits of rater training

- Reduced missing data
 - trained handlers - no missing data
 - untrained = 6% forms missing information
- Use full scale
- Better agreement between observers
- Helps raters understand the value of data



Hypoglycaemia alert dogs



How a dog can save your life:
Pets trained to detect diabetes in
amazing study



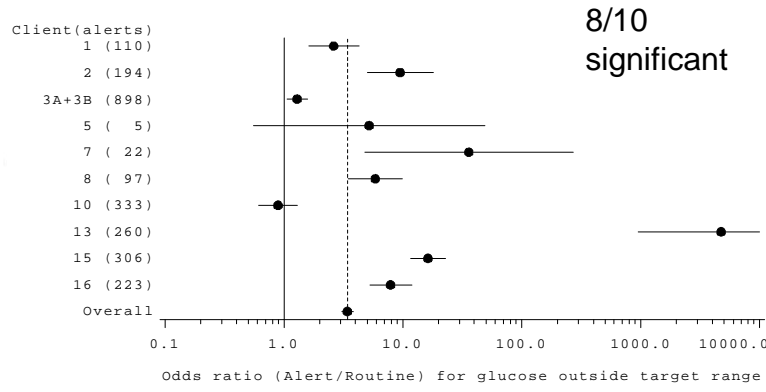
Rooney. Morant &
Guest, (2013). *PLoS*
ONE, **8**:



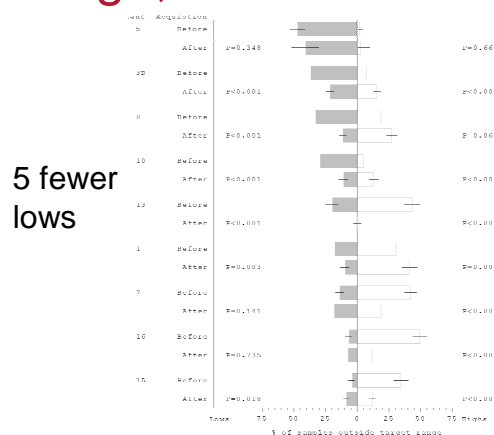
CLIENT	low blood sugar	unconscious episodes	paramedic call outs
1		NEVER SINCE GETTING DOG	
2			DECREASED SINCE DOG
3a			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			



🔥 Odds of “alert” being outside target



🔥 Proportion of routine tests in target range, before and after dog

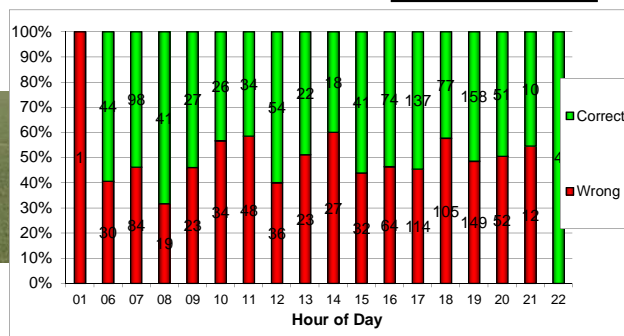


✶ Clients saw the value in data collection

- first demonstration
 - trained dogs perform above chance level,
 - dogs afford improvements to client well-being
- points to the potential value for
 - increasing glycaemic control,
 - client independence, quality of life,
 - reducing the costs of long-term health care.



✶ Rolling analysis



blind, owner-independent trials now needed

Two scenarios

- Research and Development / Controlled trials
 - Test effects of specific factors on performance
 - Example of our rearing study
- Day to day – during normal operations and training
 - Methods devised during trials can be adapted for this

Conclusions

- Value in trials and in long-term recording of performance
- Performance traits to be measured need to be specific to the role and task in hand
- Measuring tools take investment in time and refining to be meaningful, valid and reliable
- No simple “off-the-shelf” tool
- Analysis is vital
- Stakeholder consultation and training is critical

✶ Value of monitoring performance

- Confirm ideas on best practice
 - e.g. puppy tests, lines used
- Determine factors which affect performance
 - e.g. handler training
- Measure the effect of changes in procedure
 - e.g. time of rejection

✶ Collecting good data can...



- Improve future working dog capability
- Confirm and refute ideas about best practice
- Ensure all procedures are necessary and effective

Good data = honest, reliable, repeatable and validated

🔥 Acknowledgements

Collaborators:

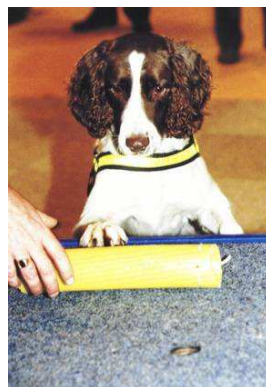
- Corinna Clark
- John Bradshaw,
- Nicola Sibbald,
- Liz Paul,
- Sam Gaines



All agencies who have taken part in these studies:
1st Military Working Dog Regiment , Defence Animal Centre,
HMP, TSA, UK Army & RAF, Medical Detection Dogs



🔥 Thank you for your attention!



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