

Reliability, validity and feasibility of existing tests of canine behaviour

Authors: Kate Mornement, Samia Toukhsati, Grahame Coleman and Pauleen Bennett, Anthrozoology Research Group, Animal Welfare Science Centre, Monash University

Presenter: Kate Mornement

Email: kate.mornement@med.monash.edu.au

Abstract

Domestic dogs play a large number of important roles in modern societies. Thousands work as police dogs, detector dogs or assistance dogs and up to 3.75 million dogs are kept as companion animals in Australia alone. The success of dogs in these various roles depends critically on their behavior, leading to the development of a wide range of behavioural tests, sometimes also erroneously called temperament tests or personality tests. Welfare shelters regularly administer behavioural tests to inform decisions about whether individual dogs are suitable for rehoming; service organizations administer them to predict which dogs are most likely to succeed in specific roles; breeders administer similar tests to puppies in order to match puppies with suitable prospective owners. While such objectives are admirable, scientists who have recently begun to comprehensively review available tests of canine behavior have concluded that they are generally inadequate. Few have been tested for reliability and validity. Those that have either fared very poorly or are not feasible within the constraints of normal workplace practices. This clearly presents a significant problem for those wanting to assess canine behaviour. The use of invalid tests may result in dogs being incorrectly classified as safe or unsafe, with potentially devastating consequences. The objective in this paper is to review current scientific information about available testing practices, particularly tests used to measure aggressive or fearful tendencies. The need for caution in using these existing tests and interpreting the results will be stressed.

Existing behavioural assessment protocols

Studies on canine behaviour and temperament are extremely varied and occur within a wide variety of disciplines, including animal behaviour, biology, psychology, animal welfare and veterinary medicine (Jones & Gosling 2005). These studies also have varied purposes, including assessing temperament in specific breeds (Reuterwall & Ryman 1973), evaluating the dog as a general model of animal personality (Svartberg & Forkman 2002) and assessing a dog's suitability for a service role (Lucidi et al., 2005). Over the past 15 years, interest has increased in the development of tests to establish the suitability of dogs as companions for people (van der Borg et al., 1991; Lucidi et al., 2005; Taylor & Mills 2006). Most of these have been developed in or by shelters, seeking to ensure that the dogs they adopt to members of the public are safe. Several tests developed overseas are of interest here because they attempt to evaluate how safe a dog may be in 'normal' circumstances. These include the following:

Ethotest

Ethotest was developed for the purpose of identifying dogs from welfare shelters suitable as service animals and adoptable pets (Lucidi et al., 2005). Step A is a test to assess aggression and temperament and selection occurs based on a binary criterion (yes or no). Step B is a test comprising three items and selects dogs able to interact with people (Lucidi et al., 2005). Table 1 describes the sub tests of steps A and B of the Ethotest protocol.

Table 1: Sub tests of tests A and B of the Ethotest protocol*

Test	Description
A ₁ : <i>Aggressiveness</i>	An unknown dog approaches the enclosure for 5 minutes
a) Between dogs	The instructor walks into the enclosure
b) Towards people	
A ₂ : <i>Temperament</i>	Instructor approaches dog in a friendly way and touches it all over (body, legs, ears, teeth etc)
a) Stroking	
b) Harsher manipulation	The instructor dominates the dog by restraining it with their arms on its back and pushes it to the ground or handles it roughly
B ₁ : <i>Initiative</i>	The instructor approaches the enclosure and stays close to the fence for 5 minutes
a) People approach the dog's environment	The instructor then opens a gate to another area
b) Attempts of the dog to go out once a gate is open	

Test	Description
B₂: Sociability/diffidence	
a) Dog's behaviour when known people enter its environment without calling the dog	The instructor goes into the enclosure and approaches the dog without calling it
b) Dog's behaviour when known people enter its environment and call the dog	The instructor calls the dog
c) Dog's tendency to jump on people	The instructor approaches the dog directly and invites it to come near with open arms
d) Dog's aptitude to meet other dogs	While the instructor is in the dog's test area, another dog is brought close to the fence
e) Dog's behaviour when unknown people enter the premises without calling the dog	An unknown person goes into the enclosure and goes near the dog without calling it
f) Dog's behaviour when unknown people enter the premises and call the dog	An unknown person goes into the enclosure and goes near the dog calling it
g) Dog's tendency to jump on unknown people	An unknown person approaches the dog directly and invites it to come near with open arms
h) Dog's aptitude to meet other dogs II	While the unknown person is in the dog's test area, another dogs is brought near the fence
B₃: Fearfulness	
Introduction of a strong stimulus	The instructor throws an object which falls noisily to the ground

*Lucidi et al., 2005

The S.A.F.E.R. test

S.A.F.E.R. stands for Safety Assessment for Evaluating Re-homing (Craats, 2004). This test was developed by Weiss as a tool for assessing the behaviour of dogs in shelters. In each part of the test, the dog is given a score of A, B, C, D, E or F. For example, during a sensitivity test, in which the handler kneads and squeezes handfuls of skin from the dog's head to its tail, if the dog accepts the touch,

it receives an A; if the dog turns quickly towards the handler's hand and mouths with slight to moderate pressure, it scores a C; if it growls and attempts to bite, an F. Weiss recommends that her evaluation be conducted by two people (a handler and observer) and video-taped if possible.

Table 2: Sub tests of the SAFER assessment*

Test	Description
<i>NB: Before test commences</i>	
1: Stare test	The handler gently holds both sides of the dogs head, staring directly into the eyes.
2: Sensitivity test	The handler kneads the dog's skin all over its body to simulate stronger than average touch with no pain.
3: Tag test	Play is initiated by the handler by tagging the dog on the rump and quickly moving away.
4: Pinch test	The command "pinch" is given. The handler then holds one of the dog's front paws and pinches between two toes. The pressure is increased until the dog reacts. The test is then repeated.
5: Food aggression test	A combination of wet and dry food is placed in a bowl. The handler places the bowl on the floor and attempts to pull the bowl away (using Sternberg's assess-a-hand) while saying "give me your food".
6: Dog-dog aggression test (optional)	The handler walks to the past a 'helper' dog (either tied to an anchor or handled by another person).

Sue Sternberg's Assess-a-pet

Developed by Sternberg, Assess-a-pet takes approximately 15 minutes to conduct. The test begins with hands off observation in which the tester looks for the presence and absence of sociable and non-sociable behaviour, and progresses to assessment of play, arousal levels, resource guarding, behaviour with cats and other dogs and mental sensitivity. Sternberg (2004) advises shelters to test dogs two to four days after admission (as dogs need time to acclimate) and to have two trained staff members perform the assessment. For safety reasons, an artificial hand and a toddler doll are used to assess resource guarding (food and possession) and aggression towards children respectively. These tools allow the tester to safely approach, pet the dog and move their food dish. Other protocols have followed suit, with many shelters utilizing their own versions of the assessor hand and toddler doll.

Bollen, who has been compiling data for behavioural assessments based on Sternberg's Assess-a-pet, tracked 2,017 dogs that she assessed personally using follow-up calls at six months for every dog and at 12 months for random dogs. She found that if a dog showed overt aggression that caused it to fail one part of the test it was likely to show overt aggression in other parts of the test. She also found that, of the dogs considered adoptable, a high proportion showed no aggression after adoption. Performing the evaluations reduced the number of dogs returned to the shelter following adoption because the number of aggressive dogs being placed back into the community was decreased (Bollen & Harowitz, 2008).

Table 3: Description of Assess-a-Pet procedures and the behaviour they evaluate modified from Sternberg (2004)*

Test	Description
1. <i>Approach cat in cage</i>	Dog is walked up to or past a cat in a cage. The dogs reaction to the cat is observed.
2. <i>Stand and ignore</i>	Walk dog into testing room/area on lead, stand and ignore for 60 seconds and observe behaviour and sociability
3. <i>Stroke dog from head to tail three times</i>	Stroke dog three times from head to tail observing its behaviour and social interaction between each stroke.
4. <i>Sit and ignore</i>	Sit down on a chair and ignore the dog (still on lead) while observing its behaviour. Does the dog make soft social contact within five seconds?
5. <i>Twenty seconds of affection</i>	Pat the dog, giving it lots of attention while talking to it for a period of 20 seconds and observe its sociability and behaviour.
6. <i>Examination of teeth</i>	Hold hand gently over muzzle and lift the dog's lips to expose the teeth. Hold for five seconds or until the dog's moves away. Repeat five times. Does the dog accept the examination?
7. <i>Veterinary technician hug</i>	The assessor simulates a veterinary technician hug and observes the dog's reaction.
8. <i>Removal of rawhide using hand on stick</i>	The assessor gives the dog a rawhide to chew, then approaches the dog. Using an artificial hand, the assessor pets the dog and attempts to remove the rawhide while observing the dog's behaviour.
9. <i>Food bowl guarding using hand on stick</i>	The assessor gives the dog a bowl of food, then approaches the dog. Using an artificial hand, the assessor pets the dog and attempts to remove the bowl of food while observing the dog's behaviour.
10. <i>Play response with toy</i>	The assessor initiates play using a toy.
11. <i>Response to sudden loud noise</i>	A sudden loud noise is made and the dog's reaction is observed.
12. <i>Reaction to strangers</i>	While the assessor sits on a chair with the dog on lead, a stranger enters the room and performs various threatening and non-threatening gestures. The dog's reaction is observed.
13. <i>Chase dog around with doll, corner dog with doll, walk doll away from dog</i>	A child-like doll is used to assess the dog's reaction to a child running up to it, cornering the dog and walking away.
14. <i>Response to approach by friendly dog</i>	The dog's reaction to the approach of a friendly dog is observed

*(Christensen et al., 2006)

Am I Safe?

Kalnajs has also developed a behavioural assessment protocol called "Am I Safe?" This protocol aims to not only identify dogs that may pose a risk to the public but also to determine problem behaviours that can be improved, using behaviour modification, before adoption (Kalnajs, 2006). The assessor approaches the kennel, face forward, and looks directly at the dog for 15 seconds. The assessor then turns sideways, crouches down, talks softly to the dog and avoids strong eye contact. A treat is then offered to the dog. Observation of the dogs' reactions, both positive and negative, is then recorded. The protocol involves 11 tests, some of which contain subtests. Table 4 shows a brief description of each test. Data on the validity and reliability of Am I Safe have not been published in the peer reviewed literature.

Amy Marder's Behavioural Assessment Protocol

Marder, a veterinarian, has also developed a behavioural assessment. Her protocol involves 10 separate tests with various subtests (see Table 5).

Table 4: Sub tests of the 'Am I Safe' assessment

Test	Description
1: <i>Affiliation</i> a) Stand b) Sit c) Stroke	Assessor looks for sociable interaction and dog's reaction to their presence in three situations.
2: "Sit" & "Down"	Assessor gives visual and verbal "sit" and "down" commands. Does the dog know basic obedience or can they be lured into position?
3: <i>Handling</i> a) Body b) Paw c) Ear d) Tail e) Mouth f) The hug g) Muzzle "U" h) Dominance lean	In tests a) to e) the dog's body, paws, ears, tail and mouth are gently handled. Test f) involves the assessor placing their arms around the dog to simulate a hug. In test g) the assessor places a hand over the dog's muzzle, using no pressure, forming a "U" with their thumb and index finger. Test h) involves the assessor leaning over the dog and making direct hard eye contact.
4: <i>Play/Arousal/Settle</i>	The assessor elicits play and arousal and observes how quickly the dog settles.
5: <i>Frustration tolerance</i>	Measured by placing the dog in a sit position while holding a bowl of food. Does the dog remain in position while the bowl is placed on the ground?
6: <i>Resource guarding (food bowl)</i>	Does the dog allow the food bowl to be touched or pulled away while he's eating?
7: <i>Item guarding (pigs ear/toy)</i>	Does the dog allow the item to be touched or pulled away while he's eating?
8: <i>Novelty/Prey drive</i>	What's the dog's reaction to a remote controlled toy?
9: <i>Startle</i> a) Visual (umbrella) b) Sound (pots & pans)	Test a) involves quickly opening an umbrella to measure visual startle response. Test b) involves clashing pots and pans to measure sound startle response.
10: <i>Dog-dog test (male/female/pup)</i>	Dog are tested outdoors for their reaction to a male, female and puppy.
11: <i>Cat test (only if adopter has cat)</i>	A cat is presented to the dog in a carry cage. The dog's reaction is observed.

Table 5: Sub tests of the Amy Marder assessment protocol

Test	Description
1: <i>Cage Behaviour</i>	Approach the dog's cage, stare and rattle the cage door
2: <i>Room Behaviour</i>	Sit down in room, drop leash and observe the dogs behaviour
3: <i>Obedience</i>	Does the dog walk nicely on lead?
a) <i>leash manners</i>	Will the dog respond to commands with and without treats?
b) <i>commands without treats</i>	
c) <i>commands with treats</i>	
4: <i>Handling</i>	Will the dog allow his feet to be handled, the handler to push it into a sit position and it's muzzle to be held?
a) <i>pick up feet (back feet first)</i>	
b) <i>push dog into "sit"</i>	
c) <i>Gently hold muzzle for 3 seconds, repeat</i>	
5: <i>Response to toys</i>	How does the dog respond to different types of toys?
a) <i>ball</i>	
b) <i>plush squeaky</i>	
c) <i>tug rope</i>	
6: <i>Run and Freeze</i>	What is the dog's response to an invitation to play?
7: <i>Resource guarding</i>	How does the dog respond when a valued resource is taken away?
a) <i>dry food</i>	
b) <i>wet food</i>	
c) <i>rawhide</i>	
8: <i>Approach by toddler doll</i>	What is the dog's reaction when approached by a toddler doll in a friendly manner?
9: <i>Reaction to people</i>	How does the dog react when approached by a stranger wearing a hat and using a cane; a normal person raising their voice and threatening to strike the handler; and a man approaching?
a) <i>stranger</i>	
b) <i>threatening person</i>	
c) <i>men</i>	
10: <i>Reaction to dogs</i>	What is the dog's reaction to dogs of similar size of the opposite and same sex when walked past and on approach?
a) <i>opposite sex</i>	
b) <i>same sex</i>	
c) <i>repeat (if needed)</i>	

What behaviours are being assessed?

While existing protocols differ in their content and methodology, there is some consistency in the types of behaviour being assessed. Fear and dominance based aggression are a high priority as many dogs are surrendered to shelters because of aggressive behaviour towards people and other dogs (Wells & Hepper 2000). Resource guarding (e.g. food, toys, couch etc) and a dog's willingness to interact with and be handled by people (often referred to as "sociability") are other behaviours assessed in the majority of protocols (Sternberg 2004; Kalnajs 2006; Weiss 2006). Other commonly assessed behaviour includes hyperactivity, trainability/knowledge of basic commands and playfulness.

Reliability

Measures of reliability include consistency within the observer of the test (intra-observer), between observers (inter-observer), within the dog (test-retest) and within the components of the measures designed to assess the same behaviour (internal consistency)(Taylor & Mills 2006). It is rarely stated that evidence of consistency and predictability of the dog's behaviour is what distinguishes a temperament test from a behavioural one (Hsu & Serpell, 2003). Demonstration of test-retest reliability is therefore extremely important in order for a temperament test to be reliable (Marston & Bennett 2003). Furthermore, if such tests are not reliable, they will not be valid (Diederich & Giffroy, 2006). Achieving reliability can be a significant challenge, especially in cases of testing reactions to novelty, as repeat testing with the same object may result in habituation (Taylor & Mills 2006). It has also been demonstrated that certain types of canine behaviour may be judged differently by different owners and that many factors can affect the types of behaviour displayed by dogs in their new homes (Ledger & Baxter, 1997).

Validity

A behavioural evaluation must assess those traits that are of interest (e.g. aggression) if it is to be valid. Validity evaluations for temperament tests are laden with difficulty because it is unlikely that any test will be entirely predictive of a dog's behavioural reaction in every given circumstance. Therefore the aim of testing should be to improve our knowledge of the dog and its probable future behaviour above that of chance alone (Taylor & Mills 2006).

In developing a test, the purpose and standardization of the test must be considered. The selection of appropriate tests and corresponding behaviour scores are an important consideration (Taylor & Mills, 2006). In standardization, all potential sources of variability must be identified and controlled for so that the only variable is the dog's behavioural response (Diederich & Giffroy, 2006). This helps to increase test-retest reliability. However, due to the variability of available resources (including funding, land, staff etc) it may not be possible to control such variables. Considerations for environmental variation such as location of the test, duration of the test and types of stimuli presented must also be given. These factors must remain consistent for all dogs and should be determined in advance. For example, (Goddard & Beilharz, 1985) found that potential guide dogs reacted differently when presented with a juvenile compared to an adult male conspecific.

Similarly, the same considerations may need to be paid to potential variation in the humans (handler or observer) present during the test. Wickens et al. (1995) reported poor agreement between a male and female assessor for several measures of the same dog during a test. This may be due to the dog's different reaction to the gender of the assessor or to familiar and unfamiliar people and may be influenced by body language or behaviour (Hennessy et al., 1998) towards the dog. This phenomenon has also been reported elsewhere in the literature (Wells & Hepper, 1999) and could mean that the sex of the assessor may have to remain the same across testing situations (Taylor & Mills, 2006). Standardization also relates to formally reporting the dog's behavioural responses using check sheets and the like. Various tests have used different methods for recording behaviour, ranging from attempting to count all responses (Ledger & Baxter, 1997) to placing the dog's reaction into a qualitative or ordinal category (Kroll et al., 2004; Netto & Planta, 1997) to subjectively assessing the dog on a variety of characteristics (Mondelli et al., 2003; van der Borg et al, 1991).

Feasibility

In order for a protocol to be feasible, it must be standardised, relatively short in duration, easy to conduct and to record each dog's individual responses. Existing protocols used to assess canine behaviour may be too long for practical use in the shelter or pound environment (Hsu & Serpell, 2003) taking up to one hour per dog (Ledger & Baxter, 1997; Netto & Planta, 1997; van der Borg et al., 1991). Protocols that are impractical, too long, or difficult to conduct are more likely to be performed inaccurately. The selection of a wide range of tests could be useful during the development of an assessment

protocol, especially if knowledge about what may be predictive of future behaviour is inadequate. However, the protocol must be refined; a process which may involve condensing the number of subtests and observations.

During the refinement process, the welfare of the dogs being tested needs to be taken into consideration (Martin & Bateson 1993), especially when tests might evoke fear, anxiety or aggressive behaviour. The umbrella test, commonly used to assess reaction to novelty in several behavioural assessment protocols (Ledger & Baxter, 1997; Marder et al., 2003; van der Borg et al., 1991; Weiss & Greenberg, 1997) evoked the most fearful responses in the aggression test by van den Berg et al. (1991), rather than other tests, which may be perceived by humans to be potentially more threatening, such as crowds and gestures.

Benefits and limitations of temperament tests

There are obvious benefits associated with the use of behavioural assessments to evaluate dogs. Varied behaviour, both desirable and undesirable, can be seen under relatively controlled conditions (including playfulness, trainability and sociability with people and other dogs) and the information collected during the assessment can be used to predict the behaviour of the dog in other situations. Unfortunately, however, behavioural assessment has its limitations. In a recent study which evaluated aggression in dogs that passed a temperament test, it was found that 40.9% of those dogs displayed lunging, growling, snapping and/or biting post adoption. These results indicate that there are certain types of aggressive tendencies (territorial, predatory, intra-specific aggression) that are not reliably exhibited during behavioural assessment (Christensen et al., 2006). Assessing dogs requires skill and training; the results greatly depend on the environment in which the assessment is conducted; and the predictive validity of such assessment protocols has not been established. Hence, it is possible that thousands of dogs are unnecessarily euthanased each year, while others may be rehomed or declared 'safe' inappropriately.

It is impossible to construct a temperament test that will predict every situation that may stimulate a dog to bite (Taylor & Mills, 2006). Dog bites can occur due to teasing, rough play, interfering with food, invading a dog's territory and by running away from a dog which may stimulate prey drive (Blackshaw, 1999). In an extensive test to predict aggressive behaviour in dogs, that included tests during which dogs were cornered and threatened by humans and other dogs, Netto and Planta (1997) found that 97% of the dogs tested showed aggression, while 67% bit at some point. This was despite the fact that not all dogs were considered aggressive before the test, but it demonstrates that almost all dogs can be provoked into aggression, not that they would be aggressive under 'normal' circumstance.

Conclusion

There have been very few reports of behavioural tests specifically designed to identify dangerousness in companion dogs, including those in welfare shelters. Taylor and Mills (2006) state that fewer than ten such reports could be found in the peer-review scientific literature and that even among these, reports of reliability, validity and feasibility are incomplete with authors' often reporting one, but not all, aspects. Many shelters and pounds carry out their own behavioural evaluations or temperament tests to assess dogs' suitability for adoption. It is worrying that not only are many of these tests designed without consulting a behavioural expert, in addition they have not been formally presented in the scientific literature. Even more concerning is that those tests that do appear in the literature often have incomplete reports relating to the quality of the test. This is alarming considering that important decisions about the future of many dogs are made on the basis of these tests (Taylor & Mills, 2006).

References

- Bollen, K., and Horowitz, J. (2008). Behavioural evaluation and demographic information in the assessment of aggressiveness in shelter dogs. *Applied Animal Behaviour Science*, 112, 120–135.
- Blackshaw, J. K. (1999). Meaningful temperament assessment for aggression in dogs - can it be done? *Proceedings of the Eighth National Conference on Urban Animal Management*, Gold Coast Australia, Australian Veterinary Association.
- Craats, R. (2004). Dr. Emily Weiss makes adoptions SAFER. *PetLynx: The SuperNET for Pets & People*. 2:1. Retrieved February 7, 2007, from www.petlinx.net.
- Christensen, E., Scarlett, J., Campagna, M., and Albro Houpt, K. (2006). Aggressive behavior in adopted dogs that passed a temperament test. *Applied Animal Behaviour Science*, 106, 85–95.
- Diederich, C. and J. M. Giffroy (2006). Behavioural testing in dogs: A review of methodology in search for standardisation. *Applied Animal Behaviour Science* 97: 51–72.
- Fredrickson, M. A. (1993). Temperament testing procedures for animals involved in nursing homes, school and hospital visiting program through Delta Society Pet Partners. *Applied Animal Behaviour Science* 37: 83.
- Goddard, M. E. and R. G. Beilharz (1983). Genetics of traits which determine the suitability of dogs as guide dogs for the blind. *Applied Animal Ethology* 9: 299–315.
- Goddard, M. E. and R. G. Beilharz (1984). The relationship of fearfulness, sex, age and experience on exploration and activity in dogs. *Applied Animal Behaviour Science* 12: 267–278.
- Goddard, M. E. and R. G. Beilharz (1985). Individual variation in agonistic behaviour in dogs. *Animal Behaviour* 33: 1338–1342.
- Heady, B. (2006). *National People and Pets Survey*. Melbourne: Melbourne Institute of Applied Economic and Social Research, Melbourne University.
- Hennessy, M. B., M. T. Williams, D. D. Miller, C. W. Douglas and V. L. Voith (1998). "Influence of male and female petters on plasma cortisol and behaviour: can human interaction reduce the stress of dogs in a public animal shelter?" *Applied Animal Behaviour Science* 61: 63–77.
- Hsu, Y. and J. A. Serpell (2003). Development and validation of a questionnaire for measuring behaviour and temperament traits in pet dogs. *Journal of American Veterinary Medicine Association* 223: 1293–1300.
- Jones, A. C. and S. D. Gosling (2005). Temperament and personality in dogs (*Canis familiaris*): A review and evaluation of past research. *Applied Animal Behaviour Science* 95: 1–53.
- Kalnajs, S. (2006). Am I Safe? The Art and Science of Canine Behavior Assessments. Blue Dog Training and Behavior. Illinois, Tawzer Dog Videos.
- Kroll, T. L., K. A. Houpt and N. Hollis (2004). The use of novel stimuli as indicators of aggressive behavior in dogs. *Journal of the American Animal Hospital Association* 40: 13–19.
- Ledger, R. A. and M. R. Baxter (1997). The development of a validated test to assess the temperament of dogs in a rescue shelter. *Proceedings of the First International Conference on Veterinary Behavioural Medicine*, Birmingham, UK, Universities Federation for Animal Welfare.
- Lucidi, P., N. Bernabo, M. Panunzi, P. Dalla Villa and M. Mattiolo (2005). Ethotest: A new model to identify (shelter) dogs' skills as service animals or adoptable pets. *Applied Animal Behaviour Science* 95: 103–122.
- Marder, A. R., J. M. Engel and D. Carle (2003). Predictability of a shelter dog behavioural assessment test. *Proceedings of the 4th International Veterinary Behaviour Meeting*, Coloundra, Australia.
- Marston, L. C. and P. C. Bennett (2003). Reforging the bond - towards successful canine adoption. *Applied Animal Behaviour Science* 83: 227–245.
- Marston, L., Bennett, P., & Coleman, G. (2004). What happens to shelter dogs? An analysis of data for 1 year from three Australian shelters. *Journal of Applied Animal Welfare Science*, 7(1), 27–47.
- Martin, P. and P. Bateson (1993). *Measuring Behaviour: an introductory guide*, 2nd ed. Cambridge, UK, Cambridge University Press.
- Miller, D. D., Staats, S. R., Partlo, C., & Rada, K. (1996). Factors associated with the decision to surrender a pet to an animal shelter. *Journal of the American Veterinary Association*, 209(738–742).
- Mondelli, F., S. Montanari, E. Prato Previde and P. Valsecchi (2003). Temperament evaluation of dogs housed in an Italian rescue shelter as a tool to increase adoption success. *Animal Welfare* 13: 251.
- Murphy, J. A. (1998). Assessment of the temperament of potential guide dogs for the blind. *Applied Animal Behaviour Science* 58: 163–178.
- Netto, W. J. and D. J. Planta (1997). Behavioural testing for aggression in the domestic dog. *Applied Animal Behaviour Science* 52: 243–263.
- Patronek, G. J., Glickman, L. T., Beck, A. M., McCabe, G. P., & Ecker, C. (1996). Risk factors for relinquishment of dogs to an animal shelter. *Journal of the American Veterinary Medical Association*, 209, 572–581.
- Pfaffenberger, C. J., Scott, J. P., Fuller, J. L., Ginsberg, B. E. and S. W. Bielfelt (1976). *Guide dogs for the blind: Their selection, development and training*. Amsterdam, Elsevier.
- Reuterwall, C. and N. Ryman (1973). An estimate of the magnitude of additive genetic variation of some mental characteristics in Alsatian dogs. *Hereditas* 73: 277–284.
- Schaffer, C. B. and J. Phillips (1994). The Tuskagee behavior test for selecting therapy dogs. *Applied Animal Behaviour Science* 39: 192.

Serpell, J. A. and Y. Hsu (2000). Development and validation of a novel method for evaluating behaviour and temperament in guide dogs. *Applied Animal Behaviour Science* 72: 347–364.

Slabbert, J. M. and J. S. J. Odendaal (1999). Early prediction of adult police dog efficiency—a longitudinal study. *Applied Animal Behaviour Science* 64(4): 269–288.

Sternberg, S. (2004). Temperament evaluation of shelter dogs. Illinois, Tawzer Dog Videos.

Svartberg, K. and B. Forkman (2002). Personality traits in the domestic dog (*Canis familiaris*). *Applied Animal Behaviour Science* 79: 133–155.

Taylor, K. D. and D. S. Mills (2006). The development and assessment of temperament tests for adult companion dogs. *Journal of Veterinary Behavior* 1: 94–108.

van der Borg, J. A. M., W. J. Netto and D. J. U. Planta (1991). Behavioural testing of dogs in animal shelters to predict problem behaviour. *Applied Animal Behaviour Science* 32: 237–251.

Weiss, E. and G. Greenberg (1996). Service dog selection tests: Effectiveness for dogs from animal shelters. *Applied Animal Behaviour Science* 53: 297–308.

Weiss, E. (2006). SAFER Certification. *Emily Weiss Consulting* Retrieved 7 February 2007 from <http://www.emilyweiss.com/certification.html>

Wells, D. L. and P. G. Hepper (1999). Male and female dogs respond differently to men and women. *Applied Animal Behaviour Science* 61: 341–349.

Wells, D. L., & Hepper, P. G. (2000). Prevalence of behaviour problems reported by owners of dogs purchased from an animal rescue shelter. *Applied Animal Behaviour Science*, 69, 55–65.

Wickens, S. M., I. Astell-Billings, J. A. McPherson, R. Gibb, J. W. S. Bradshaw and E. A. McBride (1995). The behavioural assessment of dogs in animal shelters: inter-observer reliability and data redundancy. *Proceedings of the 29th International Congress of the International Society for Applied Ethology*, Potters Bar, UFAW, UK.

Wilsson, E. and P. E. Sundgren (1996). The use of a behaviour test for selection of dogs for service and breeding. II. Heritability for tested parameters and effect of selection based on service dog characteristics. *Applied Animal Behaviour Science* 54: 235–241.

About the author

Kate Mornement has held a life-long love of animals and a keen interest in their behaviour, how they learn and how their environment influences their behaviour lead her to pursue an education in Zoology. She completed a Bachelor of Science with honours in zoology at LaTrobe University in 2003. Kate is currently completing her PhD in canine behaviour at Monash University, Melbourne. Her research aims to develop and validate a standardised behavioural assessment protocol to determine adoption suitability in shelter dogs. Kate also runs an animal behaviour consulting business called Pets Behaving Badly, is editor of Shelter Research newsletter and writes about pet behaviour for various print on online media.