



## Canine Research

# Exploring the utility of traditional breed group classification as an explanation of problem-solving behavior of the domestic dog (*Canis familiaris*)

Tracey Clarke<sup>a,b,\*</sup>, Daniel Mills<sup>a</sup>, Jonathan Cooper<sup>a</sup><sup>a</sup> Animal Behavior, Cognition and Welfare Research Group, School of Life Sciences, University of Lincoln, United Kingdom<sup>b</sup> Enfield, North London, United Kingdom

## ARTICLE INFO

## Article history:

Received 15 March 2019

Received in revised form

10 May 2019

Accepted 26 June 2019

Available online 3 July 2019

## Keywords:

behavior

dog breed groups

classification

problem-solving

## ABSTRACT

Classification plays a pivotal role in our attempts to develop an understanding and expectation of animal behavior. The hypothesis underpinning traditional breed group classification of domestic dogs is that behavioral differences among breeds may be explained by selection to perform particular roles. Consequently, breed group membership may provide an explanation of differences in performance in problem-solving tests. This study examined owner-reported performance of 8,063 pedigree dogs of three problem-solving tests designed to assess performance of different aspects of animal cognition. We asked (1) whether there are significant differences in problem-solving performance between members of breed groups in their performance of 3 cognitive tests and (2) the utility of breed group profiles in providing an explanation for the highest performing breeds. Results indicate that counter to popular perception of breeds as distinct populations manifesting differing and predictable “breed-group typical” cognitive abilities, the findings revealed no such differences in problem-solving performances between breed groups although there was variation between breeds. High-performing breeds could not be explained by a particular morphology type or original breed origin function as reflected in Kennel Club classifications. It is suggested that breed group classifications are inadequate in yielding useful explanations of problem-solving performance. The results caution against an overreliance on such classifications for understanding dog behavior.

Crown Copyright © 2019 Published by Elsevier Inc. All rights reserved.

## Introduction

Classification plays a pivotal role in our attempt to impose some order on the natural world and to advance our understanding of animal behavior (Ritvo, 1987). A common theoretical assumption underpinning such classification is that individual members of a particular group should manifest similar behavioral traits as others in that group. As applied to dogs, this might be described as “breed-typical” behavior.

This study focused on classification of dogs by function, of which there is a long history. The first lists of recognized breeds and types by function can be found in the Boke (Book) of St. Albans written in 1486 by Dame Juliana Berners (Sampson and Binns, 2006) and in De

Canibus Britannicus in 1576 by Dr. John Caius. When the U.K. Kennel Club was founded in 1920, two groups (sporting and nonsporting) were identified. In 1999, the U.K. Kennel Club classified the seven “traditional” groups, Hound, Gundog, Terrier, Utility, Working, Pastoral, and Toy, which we recognize today. The descriptions of “breed-group typical” behavioral profiles (Table 1) continue to affect our perception of breeds and expectations of their behavior (Clarke et al., 2013, 2016).

The traditional U.K. Kennel Club Breed Group Classification of dog breeds aims to offer a “word picture of the breeds” with breeds allocated to groups according to their original function (The Kennel Club, 2011). We question the relevance of such static classification in understanding dog behavior, given the ongoing and dynamic selective processes of domestication and breed diversification. Domestication involves biological and cultural changes in both the domesticated and domesticator via acculturation (Clarke et al., 2013) and breed diversification—the selection of dogs to occupy specific roles in human society (Coppinger and Schneider, 1995).

\* Address for reprint requests and correspondence: Tracey Clarke, 59 Gordon Hill, Enfield, Middlesex EN2 0QS, United Kingdom.

E-mail address: [brando.buddy@blueyonder.co.uk](mailto:brando.buddy@blueyonder.co.uk) (T. Clarke).

**Table 1**

The U.K. Kennel Club breed groups and behavioral breed group profiles Source: <http://www.thekennelclub.org.uk/activities/dog-showing/breed-standards/>

---

Gundog:	Originally trained to find live game and/or to retrieve game that had been shot and wounded. This group is divided into four categories —retrievers, spaniels, hunt/point/retrieve, pointers and setters—although many of the breeds are capable of doing the same work as the other subgroups.
Hound:	Breeds originally used for hunting either by scent or by sight. The scent hounds include the Beagle and Bloodhound and the sight hounds breeds such as the Whippet and Greyhound. Many of them enjoy a significant amount of exercise and can be described as dignified, aloof but trustworthy companions.
Pastoral:	The Pastoral group consists of herding dogs that are associated with working cattle, sheep, reindeer, and other cloven-footed animals. Breeds such as the Collie family, Old English Sheepdogs, and Samoyeds who have been herding reindeer for centuries are but a few included in this group.
Terrier:	Dogs originally bred and used for hunting vermin. “Terrier” comes from the Latin word Terra, meaning earth. This hardy collection of dogs were selectively bred to be extremely brave and tough and to pursue fox, badger, rat, and otter (to name but a few) above and below ground. Dogs of terrier type have been known here since ancient times and as early as the Middle Ages, these game breeds were portrayed by writers and painters.
Toy:	Toy breeds are small companion or lap dogs. Many of the Toy breeds were bred for this capacity although some have been placed into this category simply due to their size. They should have friendly personalities and love attention. They do not need a large amount of exercise and some can be finicky eaters.
Utility:	This group consists of miscellaneous breeds of dog mainly of a nonsporting origin, including the Bulldog, Dalmatian, Akita, and Poodle. The name “Utility” essentially means fitness for a purpose and this group consists of an extremely mixed and varied bunch, most breeds having been selectively bred to perform a specific function not included in the sporting and working categories.
Working:	Over the centuries, these dogs were selectively bred to become guards and search and rescue dogs. Arguably, the working group consists of some of the most heroic canines in the world, aiding humans in many walks of life, including the Boxer, Great Dane, and St. Bernard. This group consists of the real specialists in their field who excel in their line of work.

---

Both processes have selected for social intelligence in dogs (Cooper et al., 2003).

Previous research concerning behavioral differences between breeds has found only mixed support for the popular idea that selection for cooperative roles may be a predictor of performance in cognitive tests (Horschler et al., 2018) and meaningful within-breed differences (Mehrkam and Wynne, 2014). The complex nature of this subject area perhaps explains the seemingly enduring appeal of simple and traditional breed group classification to the general public.

Previous studies have examined the usefulness of breed group classification for explaining differences in behavioral traits (e.g., Svartberg, 2005) and studies of problem-solving in breeds of domestic dog are largely limited to comparisons between a small number of breeds (Scott and Fuller, 1965; Pongracz et al., 2005) or confined to addressing specific working tasks (Pfaffenberger, 1976; Goddard and Beilharz, 1982; Rooney and Bradshaw, 2004).

This study took data from at the “Test your Pet” survey organized by the BBC in 2004. These consisted of owner-reported performance of 11,007 pedigree dogs in six problem-solving tests. Data from three tests were included in our analysis as there were relatively complete data on each test, as the criteria for owner assessment were relatively clear cut as they tested elements of spatial memory and/or understanding of the physical properties of the environment. These were

(1) The Drop the Treat test was designed to explore the dog’s understanding of how objects, especially horizontal objects, relate to each other and the concept of gravity. Previous research found that dogs generally understand invisible displacement by gravity; however, breed effect on performance was not considered (Osthaus et al., 2003).

(2) The Round the Bend test is essentially a detour test designed to test flexibility of spatial problem-solving by investigating speed of learning and the dog’s understanding that it has first to move from the target to reach it at the end of the route. The “barrier” or detour test devised by Kohler (1927) was adapted by Scott and Fuller (1965) for use with 6-week-old domestic dog puppies, investigating whether insight learning is developed without previous experience. Considering supposedly “breed-group typical” behavior, it might be expected that members of the Pastoral Breed Group might perform better than other breed groups in this test. Their increased performance may be explained by the dog’s original function as a herder of livestock and familiarity with detouring.

Finally, (3) The Hide and Seek test is a spatial memory test that tests two parts of the animal’s memory, (a) if the dog can find the treat, they have managed to remember the position of the treat in relation to all the other objects in the room and (b) the ability to

recall the location of a hidden object is also regarded as evidence of object representation. Considering supposedly “breed-group typical” behavior, it might be expected that members of the Gundog breed groups might perform better than other breed groups in this test. Their increased performance may be explained by the use of members of this group in police work and search and rescue tasks.

## Methods and materials

The project team had access to raw data from the “Test Your Pet” survey generated from interactive television programs screened in the United Kingdom in 2004. The “Test Your Pet” problem-solving tests generated data on 11,007 dogs from 182 breeds. It was suggested that this example of citizen science is valuable to our understanding and perception of dog behavior and to exploring the research question of whether there are consistent differences in problem-solving performance reflected in breed group membership.

### Survey design

Six problem-solving tests were designed to assess performance of different aspects of animal cognition. These tests were devised by the authors, using published studies and in consultation with Dr. Britta Osthaus, Canterbury Christ Church University, United Kingdom.

We chose 3 tests—Drop the Treat, Round the Bend, and Hide and Seek—because they were the easiest to score objectively and they applied the same scale to score performance outcome. Scoring was defined as immediate successful completion of test (score 5), latency in successful completion of test (score 3), and failure to complete test (score 1).

## Method

Test instructions for each of the three tests of interests were provided on the designated website (Table 2).

### Treatment of data

#### Subjects

Data were available for 11,007 dogs from 182 breeds recognized and assigned to breed groups by the U.K. Kennel Club. All of the U.K. Kennel Club seven breed groups were represented. To explore differences in performance between breeds groups as classified by the U.K. Kennel Club, a data set of breeds with a representative sample of no less than 100 dogs was drawn from the original data set. This resulted in a data set of 8,063 dogs (Table 3).

**Table 2**  
Test instructions for Drop the Treat, Round the Bend, and Hide and Seek tests

<b>Drop the Treat</b> —test instructions			
Step 1:	Place your dog in front of the table, or hold the tray, so that the surface is above your dog's eye level.		
Step 2:	Place a cushion or folded towel on the table or tray.		
Step 3:	Stand on the opposite side of the table or tray to your dog.		
Step 4:	Hold the pet treat or toy above the table or tray, and when your dog is watching it, drop it onto the cushion.		
Step 5:	Score your dog's reaction		
A)	Dog looks at the table top or tray (score 5)		
B)	Dog looks at the floor and then back up at the table or tray (score 3)		
C)	Dog looks on the floor for the treat (score 1)		
<b>Round the Bend</b> —test instructions			
First,	your pet has to work out a route to the reward, and then, they have to walk away from the treat to get it.		
Step 1:	Arrange the two chairs so that they face each other. Lay them on their sides, so that their bases make a V-shaped barrier with a gap in the middle that is too small for your pet to fit through.		
Step 2:	Place your pet outside the V-barrier next to the gap.		
Step 3:	Stand outside the barrier, with the pet, and drop the pet treat or toy onto the floor the other side of the barrier so that your pet can see it through the gap.		
Step 4:	Score your dog's reaction		
A)	Dog walks immediately around the barrier to retrieve the treat (score 5)		
B)	After some time, dog walks around the barrier to retrieve treat (score 3)		
C)	Dog ignores the test or simply tries to get at the treat through the gap (score 1)		
<b>Hide and Seek</b> —test instructions			
Step 1:	Take a pet treat or toy. Let your pet see you hide it somewhere in a room (e.g., under a chair).		
Step 2:	Take your pet out of the room and hide a further 3 pet treats or toys in other places.		
Step 3:	Let your pet back in the room and ask it to find the treat or toy.		
Step 4:	Score your dog's reaction		
A)	Dog finds the first treat you hid immediately (score 5)		
B)	Dog finds the first treat you hid eventually but before the other treats (score 3)		
C)	Dog does not find the treat at all or finds the first treat you hid after another treat (score 1)		

**Statistical analysis**

We asked (1) if there were significant differences in problem-solving performance between breed groups in their performance of 3 cognitive tests and (2) whether The Kennel Club classification provided an explanation for the highest performing breeds.

Statistical analysis was performed using SPSS14. A multivariate analysis of variance was used to examine whether there was any significant difference in performance of the 20 breeds for the three cognitive tests of interest. An *a priori* determination of a significance level of  $P < 0.05$  was made.

The number of breeds from which any one breed differed was examined to test whether any cluster might be explained by morphology or original breed function as reflected in the U.K. Kennel Club classifications.

**Table 3**  
Breed group representation of 20 breeds with a minimum of 100 dogs, count and percent

Breed group	No. of breeds	Count	Percent
Gundog	5	3,391	42.1
Hound	1	102	1.3
Pastoral	2	1,623	20.1
Terrier	5	1,381	17.1
Toy	3	842	10.4
Utility	2	297	3.7
Working	2	427	5.3
Total	20	8,063	100

**Table 4**  
Test of between-subject effects of breed performance

Test	Type III sum of squares	df	Mean square	F	Sig
Drop the Treat	61.12	19	3.22	1.98	0.01
Round the Bend	24.64	19	1.33	0.70	0.82
Hide And Seek	27.32	19	1.44	0.91	0.64

df, degrees of freedom; F, F-value for test; Sig, statistical significance.

Cross-tabulation was used to explore any morphological or original breed function characteristics “breed-typical” explanations among highest performing breeds.

**Results**

No significant differences in breed performance were found in relation to two of the three tests of interest—Hide and Seek and Round the Bend tests. There was a statistically significant difference in performance of the Drop the Treat test based on the breed,  $F = 1.98, P < 0.05$  (Table 4).

Further exploration of the data reveals significant differences in performance at  $P < 0.05$  for 13 of the 20 breeds. The boxer and Shih Tzu were different compared with 12 breeds, the golden retriever and Cairn terrier were different compared with 5 breeds, the rottweiler and bichon frise were different compared with 4 breeds, West Highland white terrier and cocker spaniel were different compared with 2 breeds and the Border collie, Cavalier King Charles spaniel, German shepherd dog, Parsons Russell terrier and Labrador retriever were all different to one other breed, the fewest differences with other breeds (Figure).

The Shih Tzu (utility group) and the boxer (working group) each differed from 12 other breeds in performance of the Drop the Treat test (Table 5).

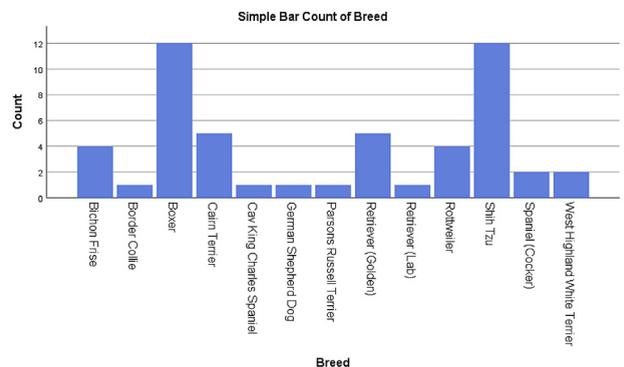
**Cross-tabulation—Drop the Treat, Hide and Seek, and Round the Bend**

**Drop the treat**

The results of cross-tabulation of data revealed that in the Drop the Treat test, the greatest percentage of highest performance scores (score 5) was achieved by members of the Hound group, represented by one breed, the Greyhound (Table 6).

**Hide and seek**

Counter to expectations of “breed-typical” performance, the results of cross-tabulation of data revealed that in the Hide and



**Figure.** Simple Bar Graph of 13 Breeds and Count of Dog Breeds to which they varied in performance of the Drop The Treat Test.

**Table 5**

Table of differences in performance of the boxer and Shih Tzu breeds and 12 breeds in the Drop the Treat test

Breed	Comparison breed	Sig	Lower confidence	Upper confidence.
Shih Tzu	Bichon frise	0.01	−0.95	−0.14
	Parsons Russell terrier	0.02	−0.78	−0.07
	Golden retriever	0.00	−0.79	−0.17
	Labrador retriever	0.01	−0.67	−0.08
	Spaniel (English springer)	0.02	−0.68	−0.05
	Staff bull terrier	0.03	−0.68	−0.04
	Weimaraner	0.03	−0.81	−0.04
	West Highland white terrier	0.04	−0.65	−0.01
	Border collie	0.01	−0.68	−0.06
	Yorkshire terrier	0.00	−0.82	−0.16
	Cairn terrier	0.00	−0.98	−0.17
	Cavalier King Charles spaniel	0.05	−0.64	0
Boxer	Bichon frise	0.01	−0.77	−0.1
	Parsons Russell terrier	0.02	−0.59	−0.04
	Golden retriever	0.00	−0.57	−0.16
	Labrador retriever	0.00	−0.45	−0.08
	Spaniel (English springer)	0.02	−0.47	−0.04
	Staff Bull terrier	0.03	−0.48	−0.03
	Weimaraner	0.04	−0.62	−0.01
	West Highland white terrier	0.05	−0.44	0
	Border collie	0.01	−0.44	−0.06
	Yorkshire terrier	0.00	−0.62	−0.15
	Cairn terrier	0.01	−0.8	−0.13
	Cavalier King Charles spaniel	0.05	−0.44	0

Seek test, the greatest percentage of highest performance scores was achieved by members of the utility group (Table 7).

#### Round the bend

Counter to expectations of “breed-typical” performance, cross-tabulation of data revealed that in the Round the Bend test, the highest percentage of successful scores was achieved by members of the Hound group (Table 8).

#### Discussion

This study examines the usefulness of traditional breed group classification in explaining the performance of domestic dog breeds in relation to three different problem-solving tests drawn from the so-called Test Your Pet data—an extensive data set of “citizen science” owner-reported performance of 8,063 pedigree dogs.

The findings of the Hide and Seek test revealed no significant differences in performance, which might be explained by the breed

**Table 6**

The results of cross-tabulation of data for the Drop the Treat test highlight that the highest percentage successful scores (score 5) was achieved by the Greyhound, a member of the Hound group (in bold)

Breed group	Score 1	Score 3	Score 5
Gundog	9.11%	32.72%	58.17%
<b>Hound</b>	9.64%	28.92%	<b>61.45%</b>
Pastoral	8.95%	33.81%	57.24%
Terrier	8.31%	35.10%	56.60%
Toy	8.64%	33.51%	57.85%
Utility	11.07%	37.27%	51.66%
Working	13.54%	34.64%	51.82%

**Table 7**

Results of cross-tabulation of percentage of breed group scores for the Hide and Seek test of 20 breeds of minimum of 100 representatives, the group with the greatest percentage of successful scores (score 5) was the utility group (in bold)

Breed group	Score 1	Score 3	Score 5
Gundog	8.80%	14.13%	77.07%
Hound	10.53%	13.16%	76.32%
Pastoral	9.38%	14.30%	76.33%
Terrier	9.26%	14.64%	76.10%
Toy	8.47%	15.33%	76.20%
<b>Utility</b>	7.09%	11.42%	<b>81.50%</b>
Working	9.76%	12.43%	77.81%

or breed group effect or morphological type. This result supports earlier studies of spatial navigation in domestic dogs, which has suggested a number of factors effecting performance (Beritashvili, 1965; Fiset et al., 2003).

Similarly, the findings of the Round the Bend test revealed no significant differences in performance by breed or breed group effect or morphological type. This supports the findings of studies by Scott and Fuller (1965) who found that correlations within the 5 pure breeds and hybrids were highly variable. Similarly, more recent research of 10 breeds showed no significant differences between breeds in the solving of a simple detour task (Pongracz et al., 2005).

The findings of the Drop the Treat test revealed significant differences in performance between 13 of the 20 breeds, but there were no differences which might be explained by morphology or original breed function as provided by the Kennel Club classifications. Similarly, the highest performing breeds violated “breed-typical” explanations.

The findings of this study highlight the inadequacy of breed group classifications in yielding useful explanations of behavioral differences in problem-solving. Exploration of these data has served a useful exercise in evaluating the legitimacy of popular assumptions concerning perceptions of breed group typical behavior.

The domestication of dogs is a dynamic and ongoing process. Breeds having experienced a number of changes in selection, notably the shift from animals of function to animals selectively bred for form. The findings of this study suggest that the traditional Kennel Club classifications of breeds by origin of function are not useful in assisting an understanding of the behavioral differences between extant breeds. This is supported by findings of research which found no relationships between breed-characteristic behavior and function in the breeds’ origins (Svartberg, 2005). A useful overview of the scientific findings of breed differences in behavior is provided by Mehrkam and Wynne (2014).

A fundamental criticism of breed group classifications is that they are crude and simplistic and take no account of the effect of individual experience (cultural and educational environment factors), which is likely to be strong influences on behavior. Research suggests that a dog’s training history is a significant predictor of performance in a number of behavioral tasks (Horschler et al., 2018). One limitation

**Table 8**

Results of cross-tabulation of percentage of breed group scores for the Round the Bend test of 20 breeds of minimum of 100 representatives, highlighted in bold members of the Hound group achieve the highest percentage of successful scores (score 5)

Breed group	Score 1	Score 3	Score 5
Gundog	11.53%	15.80%	72.67%
<b>Hound</b>	11.54%	6.41%	<b>82.05%</b>
Pastoral	12.25%	15.46%	72.29%
Terrier	10.71%	16.44%	72.85%
Toy	10.12%	16.92%	72.95%
Utility	11.72%	20.31%	67.97%
Working	13.02%	18.01%	68.98%

Exploring the usefulness of traditional breed group classification as an explanation of problem-solving behavior of the domestic dog (*Canis familiaris*).

from this study is the absence of such data. Future research should address limitations by controlling for training history. A further limitation of this study stems from the representation in the in the round group being limited to one breed—the Greyhound.

Applying other classifications such as those applied by the American Kennel Club may also be useful to explore for any consistency or differences with the findings of this study. Previous studies exploring dog breed differences in executive function applied the American Kennel Club breed group classification in assessing performance in cognitive tasks and found only mixed support for usefulness of such classifications in predicting performance (Horschler et al., 2018). The authors found that counter to popular notions, breeds belonging to the herding group were among the least likely to follow an arm-pointing gesture over memory in a memory vs. pointing task.

In conclusion, our findings caution against an overreliance on breed group classifications as an explanation of problem-solving behavior of the domestic dog. It is suggested that rigid and fixed perceptions of breed behavior perpetuated by a reliance on traditional classifications and popular concepts of “intelligence” have had the intentional and/or unintentional effect of limiting, directing, or shaping our understanding of dog behavior.

### Acknowledgments

Daniel Mills, among others, was a consultant on the initial design of the studies. Tim Guilford of the Animal Behavior Research Group, University of Oxford, is acknowledged for the contributions to the final design of tests and the survey and for allowing us to use the raw data on which the analysis was conducted.

### Ethical considerations

This study did not require ethical approval.

### Conflict of interest

The authors declare that they have no conflicts of interest.

### References

- Beritashvili, I.S., 1965. *Neural Mechanisms of Higher Vertebrate Behavior*. J. & A. Churchill, London.
- Clarke, T., Cooper, J., Mills, D., 2013. Acculturation – perceptions of breed differences in behavior of the dog (*Canis familiaris*). *Hum. Anim. Interact. Bull.* 1 (2), 16–33.
- Clarke, T., Mills, D., Cooper, J., 2016. “Type” as central to perceptions of breed differences in behavior of domestic dog. *Soc. Anim.* 24 (5), 467–485.
- Cooper, J.J., Ashton, C., Bishop, S., West, R., Mills, D.S., Young, R.J., 2003. Clever hounds: social cognition in the domestic dog (*Canis familiaris*). *Appl. Anim. Behav. Sci.* 81 (3), 229–244.
- Coppinger, R., Schneider, R., 1995. Evolution of working dogs. In: Serpell, J.A. (Ed.), 1995. *The Domestic Dog. Its evolution, behavior and interactions with people*, 3. Cambridge University Press, pp. 21–47.
- Fiset, S., Beaulieu, C., Landry, F., 2003. Duration of dog’s (*Canis familiaris*) working memory in search for disappearing objects. *Anim. Cogn.* 6, 1–10.
- Goddard, M.E., Beilharz, R.G., 1982. Genetic and environmental factors affecting the suitability of dogs as guide dogs for the blind. *Theor. Appl. Genet.* 62, 97–102.
- Horschler, D.J., Hare, B., Call, J., Kaminski, J., Miklosi, A., MacLean, E.L., 2018. Absolute brain size predicts dog breed differences in executive function. *Anim. Cogn.* 22, 187–198.
- Kohler, W., 1927. *The Mentality of Apes*, Second Edition. Vintage Books, New York.
- Mehrkam, L.R., Wynne, C.D., 2014. Behavioral differences among breeds of domestic dogs (*Canis lupus familiaris*): Current status of the science. *Appl. Anim. Behav. Sci.* 155, 12–27.
- Osthau, B., Slater, A.M., Lea, S.E.G., 2003. Can dogs defy gravity? A comparison with the human infant and a non-human primate. *Dev. Sci.* 6 (5), 489–449.
- Pfaffenberger, C.J., Scott, J.P., Fuller, J.L., Binsburg, B.E., Beifelt, S.W., 1976. *Guide Dogs for the Blind: Their Selection, Development and Training*. Elsevier, Amsterdam.
- Pongracz, P., Miklosi, A., Molnar, C.S., Csanyi, V., 2005. Human listeners are able to classify dog barks recorded in different situations. *J. Comp. Psych.* 119, 136–144.
- Ritvo, H., 1987. *The Animal Estate: The English and Other Creatures in the Victorian Age*. Harvard University Press, Cambridge, MA.
- Rooney, N.J., Bradshaw, J.W.S., 2004. Breed and sex differences in the behavioral attributes of specialist search dogs – a questionnaire survey of trainers and handlers. *Appl. Anim. Behav. Sci.* 86, 123–135.
- Sampson, J., Binns, M.M., 2006. In: Ostrander, E.A., Giger, U., Lindblad-Toh, K. (Eds.), 2006. *The Kennel Club and the Early History of Dog Shows and Breed Clubs in The Dog and Its Genome*, 2. Cold Spring Harbor Laboratory Press, pp. 19–30.
- Scott, J.P., Fuller, J.L., 1965. *Genetics and the Social Behavior of the Dog*. University of Chicago Press, Chicago.
- Svartberg, K., 2005. Breed typical behavior in dogs – historical remnants or recent constructs? *Appl. Anim. Behav. Sci.* 96 (3–4), 293–313.
- The Kennel Club, 2011. *The Kennel Club’s Illustrated Breed Standards*. In: *The Official Guide to Registered Breeds Breed Information*, Fourth Edition. Edbury Press, London.