

Association between prospective owner viewing of the parents of a puppy and later referral for behavioural problems

Westgarth, C., Reeve, K., Barclay, R.

Association of Pet Behaviour Counsellors, PO BOX 46, Worcester, WR8 9YS, UK

Corresponding author: carri.westgarth@liverpool.ac.uk

Abstract

A case-control study was designed to test whether there is an association between the owners seeing the mother of a puppy, and later development of behavioural problems. The sample consisted of dogs that were seen by Animal Behaviourists (Members of the Association of Pet Behaviour Counsellors) and equivalent dogs (without a behavioural problem, but the owners would consider referral to an Animal Behaviourist were the dog to develop a behavioural problem) seen at a veterinary practice that referred to each Animal Behaviourist. After adjustment for confounding factors using multivariable logistic regression, case dogs were: more likely to be younger than controls ($P < 0.001$); less likely to be obtained at six (OR=0.27, 95%CI=0.09-0.85, $P=0.03$), nine (OR=0.22, 95%CI=0.06-0.80, $P=0.02$) or ten weeks (OR=0.35, 95%CI=0.12-1.01, $P=0.05$), than eight weeks; more likely for the owner to have seen only one parent (OR=2.49, 95%CI =1.15-5.37, $P=0.02$) than both parents, and more likely to have not seen either parent (OR=3.82, 95%CI=1.12-12.97, $P=0.03$) than both. Advice to 'see the mother' has been shown to be partly scientifically accurate in relation to future unwanted behavioural problems amongst dogs; in fact it may be better for prospective owners to be recommended to view both parents.

Introduction

It is not uncommon for pet dogs to exhibit some form of unwanted behaviour (Voith 2009). Whilst many of these may not be considered a serious issue by the owner, Lindell (2002)

reports that, in an unpublished survey of 722 dogs from 502 UK households, 76% had shown some form of aggression. Aside from the distress felt by the dog owner, such behaviours can present a significant problem to society and to the welfare of the animal involved (Voith 2009). Behaviour problems remain one of the primary reasons that pet dogs are relinquished to shelters (Miller and others 1996; Patronek and others 1996) and then euthanized (Marston and others 2004). Veterinarians in Spain estimate that at least 10% of all pet losses are related to behaviour problems (Fatjo and others 2006).

Both genetic and environmental factors influence behavioural development. Studies particularly highlight the importance of the socialisation period (occurring between 3 and 12-14 weeks of age) during which the effects of the environment have a greater influence on behaviour than at any other time (Fox 1978).

Research has shown that a puppy's very early experiences have significant effects on the development of problem behavior (Appleby and others 2002; Pluijmakers and others 2010; Serpell and Jagoe 1995). There is evidence that puppies purchased from environments associated with a lack of exposure to social and/or environmental stimuli, such as pet shops, animal shelters (Jagoe 1994), or non-domestic environments such as kennels, garages, barns or sheds (Appleby and others 2002), may be pre-disposed to develop problem behaviours. A number of age-related effects were noted by Jagoe (1994) such as a linear increase in both fear of traffic and fear of other dogs as the age of re-homing increased (from 6-24 weeks), and a significant increase in the prevalence of problem behaviour as puppies' age at first vaccination increased (which one would expect to be directly associated with the age of rehoming). Appleby and others (2002) also found that dogs re-homed at 8 weeks of age or over were more likely to display aggression or avoidance behaviour.

There is growing evidence to suggest that educating owners about puppy raising practices and the provision of ongoing socialisation and habituation, can reduce the incidence of problem behaviour (Appleby and others 2002; Duxbury and others 2003; Gazzano and others 2008a; Sterry and others 2005; Thompson and others 2009). There is also the more difficult task of accessing prospective owners **before** they obtain their new puppy and advising them on what to look for when purchasing a puppy.

To the authors' knowledge such studies have not examined whether prospective owners reported seeing the parents of the puppy. The often quoted belief that it is

important to see the mother before buying a puppy is found on websites hosted by the RSPCA, Blue Cross, Kennel Club and PDSA. Seeing the puppy's mother provides a wealth of information which allows prospective owners to assess the temperament of the dam; the general condition of both the dam and the puppies; and the interaction between them, highlighting any indicators of stress, nervous behaviour or poor maternal care. Such observations are important as research indicates genetic heritability of traits such as aggression, nervousness and fearfulness (Goddard and Beilharz 1985; Liinamao and others 2007; Murphree 1973; Pérez-Guisado and others 2006). Furthermore, it is suggested that in a number of species, the offspring of stressed mothers tend to be more emotionally reactive and less able to recover from stressful events, as are the offspring of poor or inattentive mothers (Gazzano and others 2008b; Huizink and others 2004).

Circumstances in which prospective owners are not able to see the mother may be (in some cases) due to deliberate concealment of poor breeding decisions, compromised welfare or an inadequate breeding environment. In light of growing concern over the large scale production of puppies in puppy farms/mills these issues were highlighted in a BBC TV documentary in 2009 which produced the slogan "If they don't show you the mummy, don't show them the money". As a result, we decided to investigate whether this piece of general advice was scientifically accurate in relevance to future behavioural problems.

Many of the studies investigating the predictors of behavioural problems have utilised general dogs visiting a veterinary surgeon, dogs in the pet dog population, or dogs referred for treatment of a different unwanted behaviour to that under investigation as the control population (e.g. Serpell and Jagoe, 1995; Appleby and others 2002). However, none of these control populations are truly comparable to the cases. The vet-visiting dog population could be different from the general dog population, some of which may have never or rarely visited a vet. Likewise, a dog seen at the referral stage may be more likely to be insured and/or owned by a higher socioeconomic household. Furthermore, a dog that has not been referred for a behavior problem is not necessarily without a behavior problem; indeed Fatjo and others (2006) report that more than 35% of veterinarians never referred behaviour cases. Finally, the comparison of a dog with aggression to a dog with separation

problems is not the same as comparing a dog with aggression to a comparable dog but without aggression. In addition, previous studies have not controlled appropriately for confounding variables using multivariable modeling; this is important as risk factors for the development of behavior problems are likely to be associated with each other, for example size and how the dog is managed (Westgarth and others 2008).

To address these issues we designed a case-control study using dogs that are seen by Animal Behaviourists (sometimes referred to as Pet Behaviour Counsellors) and equivalent dogs seen at one of the veterinary practices that refers to each Behaviourist in the study. Thus, a criterion for inclusion of control dogs was that they had not developed a behavioural problem, but the owners were likely to consider referral to an Animal Behaviourist were the dog to develop a behavioural problem in the future. The main hypothesis was that puppies for which the owners had not seen the mother would be more likely to be later referred to an Animal Behaviourist for treatment of a behavioural problem, than puppies for which the mother had been seen.

Materials and Methods

Data collection

In November 2009, all Full and Provisional Members of the Association of Pet Behaviour Counsellors (APBC) that reside in the UK (n=108) were posted information packs containing a cover letter inviting them to participate in the study, case and control questionnaires, and a cover letter to send the participating veterinary practice. Members were asked to complete ten case questionnaires, and data collection was retrospective, as each member was instructed to start with their most recent case and survey backwards, until ten eligible cases were found. This eliminated the potential bias of people choosing to submit particular cases to the study. Eligible criteria for inclusion were:

1. The dog was referred from a vet to an APBC member due to the dog's behaviour.

2. The dog was between one and ten years old at the time of the initial consultation.
3. The dog was obtained by the owners as a puppy (before twelve weeks old).

Each participating member contacted a local veterinary practice that refers behavioural cases to them. A contact veterinary surgeon or veterinary nurse was selected by the APBC member and asked to complete ten control questionnaires using dogs presented for vaccinations. Before inclusion in the study again there were inclusion criteria that must be met:

1. The dog was currently between one and ten years old.
2. The dog was obtained by the owners as a puppy (before twelve weeks).
3. The dog had never been referred to a Pet Behaviour Counsellor or Animal Behaviourist due to its behaviour.
4. If the dog were to develop any unwanted behaviours, the owners would seek referral from their vet to a Pet Behaviour Counsellor or Animal Behaviourist.

Once ten eligible control questionnaires had been completed, the APBC member collected them from the veterinary practice and posted all case and control questionnaires back to the APBC office in a pre-paid envelope. Three reminders to return were used at time points seven, fourteen and seventeen weeks; members were sent a reminder email, plus a reminder was posted on the APBC internet forum. Data collection closed at the end of April 2010 (twenty-three weeks). This study was discussed intensively and ethically approved by the APBC Committee.

The questionnaire

Questionnaires were designed and piloted by a team of experts in veterinary epidemiology and companion animal behaviour and training. The questionnaire and study design was approved by the APBC committee. Questions asked were: age of dog; sex; neutered status; type (describe crossbreed or pedigree); where was the puppy obtained from (domestic environment – kitchen/living area at breeder's, domestic environment – back room at breeder's, non-domestic environment – kennel, barn or shed at breeder's, rescue shelter, other – please specify); age of puppy when brought home; did the owner see the parents (both, mother only, father

only, neither, if not ,why); is the dog insured; does the insurance cover for behavioural problems; is the dog up-to-date with annual vaccinations. Case questionnaires asked the Animal Behaviourist to describe in detail up to three problematic behaviours that they were asked to treat; whether the dog was referred to them from the same veterinary practice that they had selected for control purposes; and how many different veterinary practices were used in referral of these ten submitted cases. Each control questionnaire took approximately two minutes to complete and case questionnaire five minutes (as it involved searching through notes).

Data analysis

Data were entered by hand into an excel spreadsheet and analysed in Minitab. Breed types were classified into UK Kennel Club breed groups. Seeing only the mother or the father was combined for analysis purposes due to the low numbers that saw only the father. Unwanted behaviours treated were classified into the following categories: aggression towards household members; aggression towards non-household members (not including vet); aggression towards vet; aggression towards dogs living in home; aggression towards dogs out of home; separation problems; house training problems; fears and phobias; chasing problems; or miscellaneous problems most likely related to training, attention seeking or medical issues. Subjects were then categorised as yes/no presenting this category of behavioural problem as one of their three main problems.

The outcome of case (referral to an Animal Behaviourist for a behavioural problem) was compared with the alternative outcome of control (essentially no behavioural problem requiring referral to an Animal Behaviourist). Data were initially analysed using chi-squared tests and binary logistic regression for categorical predictor variables, or Mann-Whitney Test for the continuous variable age. A binary logistic multivariable model was then constructed (using fixed effects of practice, age, sex, neutered, type, source, age took puppy home, and saw the parents) to allow adjustment for these confounding factors. The model was also tested using backwards elimination of non-significant variables.

Control questionnaires were collected from a veterinary practice that referred to the behavioural practice where the cases were collected. This is important as geographic and socioeconomic differences may affect dog and owner types. However, this does mean that the resulting data was non-independent, effectively clustered by area. Therefore this was accounted for in the analysis using the fixed effect of practice ID.

Results

Response rate

A total of 2160 questionnaires were sent to the 108 Animal Behaviourists. Twenty returned at least some questionnaires (18.5%). Of these twenty, 400 completed questionnaires should have been returned; three returned only cases, a few returned less than their full twenty, and some completed questionnaires were for ineligible dogs. Cases or controls of ineligible dogs were excluded, as were cases if that member submitted no controls. In total, 264 (66.3%) of the potential questionnaires from the participating members were eligible. This gave a final overall useable response rate of 265/2160 (12.3%). This included 123 controls (46.4%) and 142 cases (53.6%).

Descriptive statistics

Descriptive statistics by cases and controls can be seen in Table 1.

The most common puppy source was a domestic environment; living in a kitchen/living area at the breeder's home. Most commonly puppies were brought home at eight weeks. Seeing only the mother was most commonly reported, with seeing only the father rare.. Reasons given for not seeing a parent or both parent(s) included 'puppy was abandoned', 'accidental mating'/'father not known', 'brought over from another country', 'farm dogs' or 'dogs out working', 'father lived elsewhere', 'rescue so parents not available', 'already in second home', 'were not available', 'didn't ask to see parents', 'last of litter in a shop', 'breeder brought to their home',

'breeder didn't offer choice', 'met breeder at a hotel' or 'met breeder at side of the road', or 'breeder didn't feel was relevant'.

Behavioural problems presented are shown in Figure 1. The most common unwanted behaviour reported was aggression to dogs outside of the home (33%). It was also the most common primary reason for referral to the Animal Behaviourist (20.4%) followed closely by aggression to household members (19.7%) and aggression towards non-household members (16.9%). Twenty five percent of the cases submitted were referred to the Animal Behaviourist by the veterinary practice used as a control population for that Animal Behaviourist.

Univariable analysis

On univariable analysis, being a case (referred for unwanted behaviour) was associated with age, age took puppy home, whether the parents were seen, being insured, and being insured for behaviour problems (Table 1). Cases had a median age of two years compared to controls five years (Mann-whitney $P < 0.001$). The insurance status of controls was more likely to be known, due to the data being collected from the owner rather than retrospectively from case notes. However, the insurance status of cases for the treatment of behavioural problems was more likely to be known, likely due to the Animal Behaviourist knowing this due to an insurance claim. There was no evidence of a difference in the number of cases and controls submitted by each Animal Behaviourist ($P = 1.0$).

Multivariable analysis

The Hosmer-Lemeshow statistic for the final model was 0.70, suggesting reasonably good model fit. After adjustment for the other variables as confounding factors (Table 1), case dogs were more likely to be younger and less likely to be obtained at six or nine weeks, or possibly ten weeks (borderline significance). If the owner had only seen one parent (as opposed to both parents) then the dog was 2.5 times more likely to be a case dog. If the owner had not seen either parent the dog was 3.8 times more likely to be a case dog. Backwards elimination of non-significant variables resulted in little change to findings. UK Kennel club groupings were not

used in multivariable analyses due to small numbers. Insurance status was not included because the 'don't know' status was reported for cases only due to data collection methods. However, proportions of known insured and not insured were similar in both case and control populations, so this was an unlikely confounding variable.

Discussion

In most cases (80%) prospective owners did see at least one of the puppy's parents allowing them to observe their temperament and behaviour as well as seeing the environmental conditions in which the dam and puppies had been kept. Prospective owners who had seen only one parent were 2.5 times more likely to be referred to an Animal Behaviourist than those who saw both, whereas those seeing neither parent were 4 times more likely to be referred. Thus, rather than simply recommending that owners see the puppies' mother it may be more appropriate to recommend that they see both parents. It is possible that lack of availability of parents is a surrogate marker for deficiencies in rearing or breeding practice, and/or seeing both parents enables the buyer to make a better assessment of the quality of a puppy. It must also be noted that our findings may reflect a reverse effect. They may in part be due to the effect of more responsible and knowledgeable dog owners being more likely to make the effort to see both parents of a puppy that they are going to obtain. They may also be less likely to own dogs with behavioural problems due to a more responsible and/or experienced approach to management and training; there is evidence of complex associations between dog type, management and behaviour (O'Sullivan and others 2008; Westgarth and others 2008). However, such owners might also be expected to be more likely to seek behavioural advice due to acting responsibly with regards to their dog's problem behaviour. It is also possible that these are chance statistical findings.

This study did not test whether insisting on seeing both parents has a preventative effect. We do not know whether the owners in the present study actually used the meeting to assess the health and temperament of the parent(s), and the rearing environment, and subsequently based their purchase on this information. Nor do we know whether an unfavourable viewing would sufficiently deter a potential owner

from purchasing the puppy. Although one would expect that seeing both parents (as opposed to one or indeed none) would provide prospective owners with more information on which to make an informed decision, these results may simply reflect a certain 'type' of breeder who may be more likely to own both the sire and dam, primarily as pets (as opposed to using a stud dog to further a show or working line), that is able to produce puppies more suited to their role as companion animals.

There were many reasons given for not being able to see the parents of a puppy, and previous studies have found that puppies obtained from sources where it is unlikely that the parents are available (such as pet shops, animal shelters or dogs picked up as strays) were also overrepresented within a behaviour problem group (Jagoe 1994). The present study also highlighted other circumstances in which seeing the parents was not possible such as 'the puppy was delivered to the home;' 'met the breeder at hotel/the side of the road;' or 'breeder didn't offer choice'. Such arrangements may well be indicative of poor breeding practice in general or the deliberate concealment of the puppy's parents or the breeding environment, whereas situations like 'puppy was already in second home' may imply that the dog was already displaying some kind of problem behaviour.

Another finding of this study was that younger dogs were more likely to see an Animal Behaviourist. Our results showed that the median age of dogs presented for referral to an Animal Behaviourist was two years as compared to five years of age in the control group, consistent with prior research. In the 1995 APBC annual review nearly 50% of dogs referred to APBC members were between six months and two years of age (Appleby and Magnus 1995). Around 6-12 months has previously been reported as the most common ages for a dog to be presented to a behaviour specialist (Lund and others 1996) or relinquished to an animal shelter (Miller and others 1996). It is during this time the dog enters the adolescent stage of development commencing at sexual maturity at which point there is anecdotal evidence to suggest a phase of heightened sensitivity to fear arousing stimuli (Dehasse 1994; Fox 1972; Serpell and Jagoe 1995; Shepherd 2002). The adolescent period is characterised by the development of social skills (Shepherd 2002). Competition with same sex conspecifics may occur (Dehasse 1994) and both territorial defence behaviour and aggression towards strangers (conspecifics and

humans) can emerge (Fox 1978).. The adolescent period ends at the onset of social maturity (at 18-24 months) at which time a variety of behavioural problems may have developed (Overall 1997).

Although there is little conclusive evidence available in this area, sources suggest that the optimal time for re-homing is from six to eight weeks (Lindsay 2000; Serpell and Jagoe 1995). This allows sufficient time for socialisation with conspecifics whilst enabling the puppy to adjust to its new environment and new owners before fear imprinting at 8 – 10 weeks (McCune and others 1995). An increase in the incidence of problems related to fear and avoidance (Appleby and others 2002; Jagoe 1994) and aggression (Appleby and others 2002; McGreevy and Masters 2008; O'Sullivan and others 2008) have been observed in dogs re-homed after eight weeks. A longitudinal study also suggested that puppies purchased at six or seven weeks showed significantly less problem behaviours throughout their first year than puppies purchased at eight to thirteen weeks (Thompson and others 2009). In 1959, the UK Guide Dogs for the Blind Association (GDBA) found that placing puppies in foster homes at six weeks rather than ten-twelve weeks improved the success rate for dogs going on to qualify as guide dogs. Although this policy was implemented alongside an improved breeding programme, the combined effect was to increase success rates from 9-11% to 75% (Freeman 1991). The results of the present study suggest that dogs rehomed at six, nine and ten weeks were less likely to exhibit behaviour problems than those rehomed at 8 weeks, which is contrary (in part) to previous findings.

However, the optimal time for re-homing is difficult to define without taking into consideration the type and quality of the breeding environment. In particular, non-domestic environments (garage, kennel, barn or shed) (Appleby and others 2002); shelters or kennels (Serpell and Jagoe 1995) and large scale 'puppy mills/farms' (Lindsay 2000; Lockwood 1995; McCune and others 1995) are highlighted as sub-optimal breeding environments. A sub-optimal environment prior to, or indeed after, re-homing may produce dogs predisposed to develop behaviour problems. It could be argued that 'reputable' breeding environments can provide sufficient human contact for inter-specific socialisation and that in these cases, later re-homing may be preferable to allow more time interacting with the dam and littermates. This may

account for results in the present study, that dogs rehomed at nine or ten weeks were less likely to develop problem behaviour.

We found no evidence that the source (environment) that the puppy was obtained from was significantly associated with being referred for problem behaviours. This is inconsistent with previous research. The further attenuation of the crude association with source may suggest that source has been acting as a proxy measure for the effect of seeing the parents in previous studies. Factors such as poor health or genetics may also be a larger factor leading to behavioural issues than the environment.

Aggression was the most common behaviour problem reported which is consistent with past research (Fatjo and others 2006; Lindell 2002). More specifically aggression towards other dogs outside of the home was the most common reason for referral (at 33%). However, when the results for aggression towards household members and non-household members were combined, aggression towards humans became most common reason for referral (40%), This is consistent with the past APBC annual review of cases (Appleby and Magnus 2005).

Our study has strengths and weaknesses. Its strengths are that it has the most appropriate control population design to date, although this could have been improved even further with additional funding and time resources, in particular enabling 1-1 matching of control by veterinary practice to each case referred, as opposed to one veterinary practice per behavioural practice. Although an inclusion criteria for controls was that the dog had not previously been referred to a pet behaviour counsellor/behaviourist, the owner may not be aware of a behaviour, or not define a behaviour as a problem. Another issue is that control dogs of at least one year of age presenting at a veterinary surgeon for vaccination was taken as a proxy equivalent to dogs of at least one year of age seen on veterinary referral to a behaviourist (who we thought likely to also be vaccinated). This may not be strictly true although 69% of cases were reported to be up to date with their vaccinations (and 29% not known). It may account for some of the age difference seen between cases and controls here, although the evidence for an association between age and presentation for behavioural problems is now fairly well established, and age was

included as a confounder in the modelling. A major strength of this study is that multivariable analysis was used to control for multiple potential confounding factors, including clustering of data within practice areas. However, it must be noted that multiple statistical tests were still performed which increases the chances of false detection of apparent associations.

It is also a sample of one group of Animal Behaviourists, APBC members, only, and we would hope that in future similar studies the response rate of practitioners would be higher. It was noted that the recruitment of control dogs from veterinary practices was the more difficult aspect, especially finding eligible dogs for which the owners would seek referral to an Animal Behaviourist for an unwanted behaviour, were the dog to develop one. This is interesting in itself, as there must be a population of dogs with unwanted behaviours which Animal Behaviourists, or at least APBC members, do not see, and we do not know what happens to them.

The findings from this useful pilot study would benefit from repetition to include a wider population of practitioners advising on unwanted behaviours (vets, trainers, behaviourists), direct matching of control to each case in terms of veterinary practice and age of dog, and control for more potential confounders such as detailed environmental factors and experiences such as training. It is a cross-sectional study and thus can only show potential association, thus longitudinal studies in this area are much needed. However, at this stage and using the evidence to date, the recommendation that prospective owners see both of the parents of their future puppy, is likely a very sensible idea.

Acknowledgements

We would like to thank the APBC Members who participated in the study, the APBC Research Team, in particular Tanya Jeffery, for help designing the study and writing the manuscript, and the APBC Committee, particularly David Appleby, for comments on the manuscript. We would like to thank Rachel Leather for data entry and the anonymous reviewers for helpful comments. The questionnaires and postage were funded by the APBC.

Competing interests

All authors declare that they are Full Members of the Association of Pet Behaviour Counsellors and CW and RB are Committee Members. RB and KR are self employed pet behaviour counsellors and CW has been in the past.

References

- APPLEBY, D. & MAGNUS, E. (1995) APBC Annual Review of Cases. Association of Pet Behaviour Counsellors
- APPLEBY, D. & MAGNUS, E. (2005) APBC Annual Review of Cases 2005. Association of Pet Behaviour Counsellors
- APPLEBY, D. L., BRADSHAW, J. W. S. & CASEY, R. A. (2002) Relationship between aggressive and avoidance behaviour by dogs and their experience in the first six months of life. *Veterinary Record* 150, 434-438
- DEHASSE, J. (1994) Sensory, emotional and social development of the young dog. *Bulletin for Veterinary Clinical Ethology* 2, 6-29
- DUXBURY, M. M., JACKSON, J. A., LINE, S. W. & ANDERSON, R. K. (2003) Evaluation of association between retention in the home and attendance at puppy socialization classes. *Journal of the American Veterinary Medical Association* 223, 61-66
- FATJO, J., RUIZ-DE-LA-TORRE, J. L. & MANTECA, X. (2006) The epidemiology of behavioural problems in dogs and cats: a survey of veterinary practitioners. *Animal Welfare* 15, 179-185
- FOX, M. W. (1972) *Understanding Your Dog*. New York, Coward, McCann and Geoghegan
- FOX, M. W. (1978) *The Dog: Its Domestication and Behaviour*. New York, Garland STPM Press
- FREEMAN, D. (1991) *Barking up the right tree*. Letchworth, Herts, Ringpress
- GAZZANO, A., MARITI, C., ALVARES, S., COZZI, A., TOGNETTI, R. & SIGHIERI, C. (2008a) The prevention of undesirable behaviors in dogs: effectiveness of veterinary behaviorists' advice given to puppy owners. *Journal of Veterinary Behavior-Clinical Applications and Research* 3, 125-133
- GAZZANO, A., MARITI, C., NOTARI, L., SIGHIERI, C. & MCBRIDE, E. A. (2008b) Effects of early gentling and early environment on emotional development of puppies. *Applied Animal Behaviour Science* 110, 294-304
- GODDARD, M. E. & BEILHARZ, R. G. (1985) A multivariate analysis of the genetics of fearfulness in potential Guide Dogs. *Behavior Genetics* 15, 69-89
- HUIZINK, A. C., MULDER, E. J. H. & BUITELAAR, J. K. (2004) Prenatal stress and risk for psychopathology: Specific effects or induction of general susceptibility? *Psychological Bulletin* 130, 115-142
- JAGOE, J. A. (1994) *Behaviour Problems in the Domestic Dog: A retrospective and prospective study to identify factors influencing their development*. Cambridge, University of Cambridge
- LIINAMO, A. E., BERG, L. V. D., LEEGWATER, P. A. J., SCHILDER, M. B. H., ARENDONK, J. A. M. V. & OOST, B. A. V. (2007) Genetic variation in aggression-related traits in Golden Retriever dogs. *Applied Animal Behaviour Science* 104, 95-106
- LINDELL, L. (2002) Chapter 8: Control problems in dogs. In *BSAVA Manual of Canine and Feline Behavioural Medicine*. Eds D. HOROWITZ, D. MILLS, S. HEATH. Gloucester, BSAVA. pp 69-79
- LINDSAY, S. R. (2000) *Handbook of Applied Dog Behaviour and Training: Volume One - Adaptation and Learning*, Iowa State Press
- LOCKWOOD, R. (1995) Chapter 9: The ethology and epidemiology of canine aggression. In *The Domestic Dog - its Evolution, Behaviour and Interactions with People*. Ed J. SERPELL. Cambridge, Cambridge University Press. pp 131-138

- LUND, J. D., AGGER, J. F. & VESTERGAARD, K. S. (1996) Reported behaviour problems in pet dogs in Denmark: age distribution and influence of breed and gender. *Preventive Veterinary Medicine* 28, 33-48
- MARSTON, L. C., BENNETT, P. C. & COLEMAN, G. J. (2004) What happens to shelter dogs? An analysis of data for 1 year from three Australian shelters. *Journal of Applied Animal Welfare Science* 7, 27-47
- MCCUNE, S., MCPHERSON, J. A. & BRADSHAW, J. W. S. (1995) Chapter 6: Avoiding problems: The importance of socialisation. In *The Waltham Book of Human-Animal Interaction: Benefits and responsibilities of dog ownership*. Ed I. ROBINSON, Pergamon. pp 71-86
- MCGREEVY, P. D. & MASTERS, A. M. (2008) Risk factors for separation-related distress and feed-related aggression in dogs: Additional findings from a survey of Australian dog owners. *Applied Animal Behaviour Science* 109, 320-328
- 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 Medical Association* 209, 738-742
- MURPHREE, O. D. (1973) Inheritance of human aversion and inactivity in 2 strains of Pointer Dog. *Biological Psychiatry* 7, 23-29
- O'SULLIVAN, E. N., JONES, B. R., O'SULLIVAN, K. & HANLON, A. J. (2008) The management and behavioural history of 100 dogs reported for biting a person. *Applied Animal Behaviour Science* 114, 149-158
- OVERALL, K. L. (1997) *Clinical Behavioural Medicine for Small Animals*. Missouri, Mosby
- PATRONEK, G. J., GLICKMAN, L. T., BECK, A. M. & MCCABE, G. P. (1996) Risk factors for relinquishment of dogs to an animal shelter. *Journal of the American Veterinary Medical Association* 209, 572-581
- PÉREZ-GUISADO, J., LOPEZ-RODRÍGUEZ, R. & MUÑOZ-SERRANO, A. (2006) Heritability of dominant-aggressive behaviour in English Cocker Spaniels. *Applied Animal Behaviour Science* 100, 219-227
- PLUIJMAKERS, J. J. T. M., APPLEBY, D. L. & BRADSHAW, J. W. S. (2010) Exposure to video images between 3 and 5 weeks of age decreases neophobia in domestic dogs. *Applied Animal Behaviour Science* 126
- SERPELL, J. A. & JAGOE, J. A. (1995) Chapter 6: Early experience and the development of behaviour. In *The Domestic Dog - its Evolution, Behaviour and Interactions with people*. Ed J. SERPELL. Cambridge, Cambridge University Press. pp 79-102
- SHEPHERD, K. (2002) Chapter 2: Development of behaviour, social behaviour and communication in dogs. In *BSAVA Manual of Canine and Feline Behavioural Medicine*. Eds D. HOROWITZ, D. MILLS, S. HEATH. Gloucester, BSAVA. pp 8-20
- STERRY, J., APPLEBY, D. & BIZO, L. (2005) The relationship between measures of problematical behaviour in adult dogs and age of first exposure outside the first owner's home and attendance at puppy classes. In *Proceedings of the CABTSG (Companion Animal Behaviour and Therapy Study Group) Study Day*. Birmingham
- THOMPSON, K. F., MCBRIDE, E. A. & REDHEAD, E. (2009) Early experience and the development of behaviour problems in the dog. Unpublished Masters Thesis, University of Southampton
- VOITH, V. L. (2009) The Impact of Companion Animal Problems on Society and the Role of Veterinarians. *Veterinary Clinics of North America-Small Animal Practice* 39, 327-345
- WESTGARTH, C., PINCHBECK, G. L., BRADSHAW, J. W. S., DAWSON, S., GASKELL, R. M. & CHRISTLEY, R. M. (2008) Dog-human and dog-dog interactions of 260 dog-owning households in a community in Cheshire. *Veterinary Record* 162, 436-442

Tables

Table 1. Univariable analysis and multivariable modelling* of factors associated with referral for unwanted behaviours.

Variable	Case n (%) or median	Control n (%) or median	OR	Crude 95%CI	P	OR	Adjusted* 95%CI	P
Age (years)	2	5	0.68	0.60-0.76	<0.001	0.61	0.53-0.72	<0.001
Sex					0.06			
Male	88 (62)	62 (51)	1			1		
Female	53 (38)	60 (49)	0.62	0.38-1.02	0.06	0.56	0.29-1.12	0.10
Neutered					0.97			
Entire	39 (28)	32 (28)	1			1		
Castrated/ spayed	101 (72)	82 (72)	1.01	0.58-1.75	0.97	1.47	0.68-3.21	0.33
Type					0.10			
Cross	27 (19)	33 (28)	1			1		
Breed	114 (81)	86 (72)	1.62	0.91-2.90	0.10	1.94	0.83-4.51	0.12
UK Kennel Club Group					0.82			
Hound	9 (6)	5 (6)	1					
Gundog	32 (28)	32 (37)	0.56	0.17-1.84	0.34			
Terrier	18 (16)	11 (13)	0.91	0.24-3.42	0.89			
Utility	11 (10)	5 (6)	1.22	0.27-5.59	0.80			
Working	8 (7)	4 (5)	1.11	0.22-5.63	0.90			
Pastoral	18 (16)	13 (15)	0.77	0.21-2.84	0.69			
Toy	9 (8)	9 (10)	0.56	0.13-2.32	0.42			
Unrecognised	9 (8)	7 (8)	0.71	0.16-3.12	0.65			
Source					0.30			
Kitchen or living area at breeder's	65 (48)	50 (41)	1			1		
Back room at breeder's	22 (16)	27 (22)	0.63	0.32-1.23	0.17	1.09	0.41-2.85	0.87
Non-domestic environment at breeder's	35 (25)	31 (25)	0.87	0.47-1.60	0.65	0.71	0.31-1.63	0.42
Rescue centre	5 (4)	10 (8)	0.38	0.12-1.20	0.10	0.42	0.07-2.47	0.34
Other	9 (7)	5 (4)	1.38	0.44-4.39	0.58	1.33	0.19-9.41	0.78
Age took puppy home					0.05			
8 weeks	49 (35)	32 (26)	1			1		
< 6 weeks	6 (4)	2 (2)	1.96	0.37- 10.32	0.43	4.42	0.47-41.66	0.19
6 weeks	13 (9)	22 (18)	0.39	0.17-0.87	0.02	0.27	0.09-0.85	0.03
7 weeks	15 (11)	13 (11)	0.75	0.32-1.79	0.52	0.70	0.22-2.26	0.55
9 weeks	9 (6)	17 (14)	0.35	0.14-0.87	0.02	0.22	0.06-0.80	0.02
10 weeks	20 (14)	21 (17)	0.62	0.29-1.33	0.22	0.35	0.12-1.01	0.05
11 weeks	3 (2)	3 (2)	0.65	0.12-3.44	0.62	0.41	0.03-7.92	0.48
12 weeks	25 (18)	12 (10)	1.36	0.60-3.09	0.46	1.74	0.58-5.19	0.32
Saw the parents					0.03			
Both	33 (24)	47 (38)	1			1		
Only one	78 (57)	52 (42)	2.14	1.21-3.77	0.01	2.49	1.15-5.37	0.02
Neither	27 (20)	24 (20)	1.60	0.79-3.25	0.19	3.82	1.12-12.97	0.03
Insured					<0.001			
No	41 (29)	48 (40)						
Yes	68 (49)	73 (60)						
Don't know	31 (22)	0 (0)						

Insured for behaviour						<0.001
No	8 (13)	3 (4)	1			
Yes	48 (80)	27 (39)	0.67	0.16-2.73	0.57	
Don't know	4 (7)	37 (57)	0.04	0.01-0.21	<0.001	

*Adjusted for practice, age, sex, neutered, type, source, age took puppy home, saw the parents.

Figure legend

Figure 1. Prevalence (%) of unwanted behaviours in 142 dogs referred to Animal Behaviourists.

