Purchasing popular purebreds: investigating the influence of breed-type on the pre-purchase motivations and behaviour of dog owners

Packer, RMA

http://hdl.handle.net/10026.1/9801

10.7120/09627286.26.2.191
Animal Welfare
Universities Federation for Animal Welfare

All content in PEARL is protected by copyright law. Author manuscripts are made available in accordance with publisher policies. Please cite only the published version using the details provided on the item record or document. In the absence of an open licence (e.g. Creative Commons), permissions for further reuse of content should be sought from the publisher or author.
Purchasing popular purebreds: Investigating the influence of breed-type on the pre-purchase motivations and behaviour of dog owners

Journal: Animal Welfare

Manuscript ID: C2003.R1

Manuscript Type: Original Article

Date Submitted by the Author: 22-Nov-2016

Complete List of Authors: Packer, Rowena; Royal Veterinary College - Hawkshead Campus, Clinical Science and Services
Murphy, Danielle; University of Edinburgh College of Medicine and Veterinary Medicine, Royal (Dick) School of Veterinary Studies
Farnworth, Mark; University of Plymouth, Biological Sciences

Keywords: Animal Welfare, Brachycephalic, Companion Animal, Inherited Disorders, Pedigree, Pet Ownership
Working title: Pre-purchase owner behaviour and purebred dogs

Purchasing popular purebreds: Investigating the influence of breed-type on the pre-purchase motivations and behaviour of dog owners

RMA Packer †*, D Murphy ‡ and MJ Farnworth§

†Clinical Science and Services, Royal Veterinary College, Hawkshead Lane, North Mymms, Hertfordshire AL9 7TA, UK
‡ Royal (Dick) School of Veterinary Studies, The University of Edinburgh, Easter Bush Veterinary Centre, Roslin, EH25 9RG, UK
§ School of Biological Sciences, Plymouth University, Drake Circus, Plymouth, Devon PL4 8AA, UK

*Contact for correspondence: rpacker@rvc.ac.uk

Abstract

How and why dog owners select a specific breed may impact upon the health of the dog they acquire, and upon the wider health of the breed they select. Brachycephalic (BC) breeds are rapidly increasing in popularity despite increasing evidence linking brachycephalism with chronic and severe health conditions. This study used a questionnaire to explore pre, during and post-purchase behaviours and attitudes of dog-owners who own popular BC dog breeds (n=3 breeds) compared to popular non-BC dog breeds (n=7 breeds). The survey received 1427 valid responses. BC breed owners were younger, more likely to live with children, and
to be buying their chosen breed for the first time. The factor that most highly influenced BC
owner’s decisions to buy their breed was appearance, followed by breed size suited to
lifestyle, good dog breed for children and good companion breed. Perceived health of the
breed was less influential in decision-making for BC owners compared to non-BC owners.
The way in which owners acquired their dog differed by breed type, with BC owners more
likely to use puppy-selling websites to find their dog, less likely to see either parent of their
puppy, and less likely to ask to see any health records. Despite many BC breed health issues
being directly related to conformation, appearance remains the most significant determinant
in why people desire these breeds. More targeted educational interventions are needed to
change buyer attitudes and, if ineffective, other more direct mechanisms (e.g. legislation)
may be required to protect canine welfare.

Keywords: Animal Welfare, Brachycephalic, Companion Animal, Inherited Disorders,
Pedigree, Pet Ownership

Introduction

Contemporary estimations of the domestic dog (*Canis familiaris*) population of the United
Kingdom (UK) place it at around 10.5 million (Murray et al. 2010), approximately 75-80% of
which are purebred (Asher et al. 2011; O’Neill et al. 2014). The process of selecting for
breed-specific characteristics in purebred dogs has been identified as having the potential to
reduce dog welfare (Rooney & Sargan 2010), with strong links between breed standards and
inherited diseases in the top 50 Kennel Club (KC) breeds (Asher et al. 2009). In addition,
reduced genotypic variation within these same breeds substantially increases the prevalence
of genetic disease (Summers et al. 2010). Public concerns regarding the welfare of purebred
dogs and associated selective breeding practices have resulted in a number of high profile reports to address those concerns (All-Party Parliamentary Group for Animal Welfare 2010; Bateson 2010).

Humans have a large appetite for variety in the appearance and behaviour of dogs, with 216 breeds currently KC recognised (The Kennel Club, 2015). Breed popularity within the dog population has remained largely stable, but with substantial, and often culturally driven, surges in the popularity of specific breeds (Herzog et al. 2004). Social influence (fashion) is the primary influence on the popularity of companion dog breeds, which is often related to media exposure e.g. featuring in movies (Herzog 2006, Ghirlanda et al. 2014). Both in the United States of America (USA) and the UK, breed popularity appears to lack direct associations with functional traits (e.g. health, trainability) (Herzog 2006, Ghirlanda et al. 2013) whilst displaying a concerning tendency for more popular breeds to have greater numbers of inherited disorders (Ghirlanda et al. 2013). Increased demand may, therefore, place pressure on breeders to provide more individuals from a genetically constrained breeding population. In turn this demand will increase the number of extant recessive disorders being expressed. With regards to the appearance of popular breeds, if demand is based on the extreme appearance of certain breeds, this may result in higher levels of conformation-related disorders in the canine population.

Evidence suggests that brachycephalic (BC) (short-muzzled) breeds in particular, such as the Pug, French Bulldog and Bulldog have shown substantial increases in numbers in the UK over the past decade (The Kennel Club 2016a). Herzog (2006) suggests that breed popularity, once established, may persist for a decade or more, indicating that BC dog populations will grow, or are unlikely to decline, in the foreseeable future. Brachycephaly has been linked
with a variety of inherited diseases including respiratory disorders (Brachycephalic Obstructive Airway Syndrome; BOAS) (Packer et al. 2015a), ophthalmic disease (Packer et al. 2015b) and results in reduced lifespan compared to non-BC breeds (O’Neill et al. 2015). These conformation-related problems have previously led veterinarians to express concerns about the continued breeding of BC dogs (Farrow et al. 2014), with calls to out-cross or even ban certain breeds (Packer et al 2014).

Little information exists on how and why prospective companion animal owners make decisions round the purchase of purebred dogs. Pre-purchase decisions will be guided by a number of factors, although these may not be entirely predictable (Ghirlanda et al. 2013). In a study of the ideal Australian companion dog, behavioural and physical factors identified as important included being medium sized, short haired, safe with children, friendly, obedient and healthy (King et al 2009). Owner characteristics relevant to decision-making have not been fully investigated, and may include sociodemographic factors (e.g. income, level of education, marital status), social influences (e.g. current breed popularity, celebrity endorsement) and historical influences (e.g. previous dog ownership, childhood dog ownership). External factors, such as access to breed health information may also influence decisions. The processes by which decisions are made during the acquisition of a companion animal are likely to be important at both an individual level (e.g. the health of the dog acquired) and at a population level (e.g. which types of dog and health characteristics are ‘in demand’). Understanding this process may allow prospective owners to be better targeted with information, thus improving matching between households and their companion animals and allowing alternative, potentially healthier, breed choices to be promoted.
This research aimed to explore differences in owner characteristics, motivations for acquisition and pre-, during and post-purchase behaviours and attitudes between owners of BC and non-brachycephalic (non-BC) breeds within the 10 most popular KC registered pedigrees of 2014 (The Kennel Club 2016a).

Methods

Questionnaire design and dissemination

The questionnaire was designed iteratively amongst the authors (and a small number of pilot respondents) to ensure ease of understanding and comprehensiveness of scope. In general, sections included:

1. General owner demographics: e.g. gender; age; children; house type; income and education level; first time dog owner; first time breed owner;
2. General information on their dog: e.g. signalment; age at acquisition;
3. Pre-purchase motivations: e.g. factors that influenced purchase/acquisition of their specific breed (dog appearance; breed popularity; previous breed experience; celebrity endorsement; companionship; cost);
4. Pre-purchase knowledge and behaviours: e.g. Research conducted on their breed of choice prior to acquisition; amount of time spent considering acquisition of their dog;
5. Acquisition behaviours: e.g. where and how their dog was acquired; which parents of their puppy were seen (if any); requests for health records;
6. Post-purchase attitudes: e.g. Things they would change about the acquisition of their dog if they could go back in time; whether they would recommend their breed;
7. Whether they plan to breed from their dog.
Participants

Owners of the top ten KC registered pedigrees of 2014 (1. Labrador Retriever; 2 Cocker Spaniel; 3 English Springer Spaniel; 4 French Bulldog; 5 Pug; 6. German Shepherd Dog; 7 Golden Retriever; 8 Border Terrier; 9 Bulldog; 10 Miniature Schnauzer) were purposively sampled via online forums and social media platforms as well as KC breed health coordinators. An explanatory letter was also sent to the administrators of dog-related social media sites seeking permission to engage their online users. Following granting of permission potential respondents were provided with a link to an online questionnaire hosted on SurveyMonkey© (www.surveymonkey.com).

All participants were required to live in the UK, be 18 years of age or older and own one of the eligible breeds. Respondents were informed of the aims of the project and that submission of the survey would implicitly consent to the usage of their data for research purposes. Respondents with more than one dog fitting the inclusion criteria were requested to answer the survey in regard to the one most recently acquired. This survey was approved by the Royal (Dick) School of Veterinary Studies Student Survey Overview Group.

Statistical analyses

Data analyses were carried out in IBM SPSS Statistics v21 (SPSS Inc, Chicago, IL, USA). Of the 10 targeted breeds, three were characterised as BC (French Bulldog, Pug and Bulldog), with the other seven being non-BC. Associations between breed-type (BC vs. non-BC) and
variables related to respondent demographics, pre-purchasing, purchasing and post-
purchasing behaviour were explored using Chi-squared tests for categorical variables and
Mann-Whitney U tests for non-normally distributed continuous data (with data distribution
ascertained by visual inspection of histograms) or ordinal data (e.g. how influential a factor
was in the decision to choose a breed on a scale of 0-4). Correction factors were used to
control for Type I errors introduced by multiple univariate comparisons. For this, the False
Discovery Rate (FDR) (Benjamini & Hochberg 1995) set at 0.05 was used to take into
account the number of statistical tests performed in the univariate analyses, and all p values
are presented in their raw form and FDR-corrected forms. A binary logistic regression model
was used to determine which factors were most influential in the purchase of BC vs. non-BC
dogs (binary outcome measure). Factors with liberal associations in univariable tests ($P < 0.2$)
were taken forward for multivariable evaluation. Model development used backwards
stepwise elimination and the Hosmer-Lemeshow test statistic was used to evaluate model fit.

Results

Data were collected between June and July 2015. The survey received 1910 responses, of
which 1427 responses were complete and valid for inclusion. Between one and two hundred
responses were received for each breed: Labrador Retriever (LR, n = 156), Cocker Spaniel
(CS, n = 199), English Springer Spaniel (ESS, n = 200), French Bulldog (FB, n = 143), Pug
(P, n = 127), German Shepherd Dog (GSD, n = 115), Golden Retriever (GR, n = 110), Border
Terrier (BT, n = 146), Bulldog (B, n = 114) and Miniature Schnauzer (MS, n = 117). Based
on breed (FB, B, P), around one quarter ($N = 384/1427; 26.9\%$) of dogs in the sample were
classed as BC with the remainder being non-BC.
Canine demographics

Over half of all dogs were male (56.9%) and the most common age was 2-4 years (38.3%) followed by 1 year or less (26.7%). There was no association between sex of the dog and skull shape ($P = 0.972$; $P$-adjusted = 0.972); however, there was an association between the age of the dog and skull shape, with BC dogs younger than non-BC dogs e.g. 33.1% of BCs were 1 year or less vs. 24.4% of non-BCs ($X^2 = 38.54, P < 0.001$; $P$-adjusted < 0.001) (Table 1). The majority of dogs were neutered (43.5%) with a further 18.0% planned to be neutered in the future. A higher proportion of BC dogs were entire compared to non-BC dogs (49.8% vs. 34.2% respectively, $X^2 = 41.11, P < 0.001$; $P$-adjusted < 0.001). BC dogs had been owned for a significantly shorter length of time than non-BC dogs (BC median: 21 months; 25th-75th percentile: 10.0 - 33.6 months; non-BC median: 24 months; 25th-75th percentile: 10.0-58.0 months; MW=194135.5, $P < 0.001$, $P$-adjusted < 0.001)

Respondent demographics

The majority of respondents were female (88.5%), with no difference in sex distribution between respondents for BC and non-BC breeds ($P = 0.148$; $P$-adjusted = 0.187). The most common age group of respondents was 45-54 years (29.1%) followed by 35-44 (24.1%) and 25-34 (18.4%). Those with BC dogs were significantly younger than those with non-BC breeds, respondents aged 18-24 comprised 13.3% and 5.2% of the BC and non-BC group respectively, and likewise 25-34 years of age was 27.9% and 15.0% ($X^2 = 93.70, P < 0.001$ $P$-adjusted = 0.0027). Of the respondents, 84.3% had attended higher education, with 15.3% attending secondary education, with no difference between BC and non-BC groups ($P = 0.316$).
The most common household income bracket was £35,000-£49,999 (21.0%), followed by less than £25,000 (17.0%) and £50,000-£74,999 (16.4%), again with no difference in income between BC and non-BC groups ($P = 0.450; P\text{-adjusted} = 0.511$). The majority of respondents lived in a house (92.0%) vs. only 7.8% in a flat/apartment, with the BC group more likely to live in a flat/apartment (BC = 15.6% vs. non-BC = 5.0%; $X^2 = 44.55; P < 0.001; P\text{-adjusted} = 0.0027$). Children did not live in the majority of respondents’ homes (71.3%), with BC owners more likely to live with children when compared to the non-BC group (BC = 34.6% vs. Non-BC = 26.6%; $X^2 = 8.94; P = 0.003; P\text{-adjusted} = 0.0069$).

Over three quarters of respondents (77.3%) had owned a dog before, with 22.6% being first time dog owners. Around half of respondents (51.8%) had not previously owned the breed of dog for which they were answering. After FDR-correction, there was no difference in the proportion of BC vs. non-BC groups that were first time dog owners (BC = 26.0% vs. non-BC = 21.4%; $X^2 = 6.29; P = 0.043; P\text{-adjusted} = 0.0712$); however, respondents in the BC group were more likely to be owning that breed for the first time (BC = 64.8% vs. non-BC = 47.0%; $X^2 = 37.05; P < 0.001; P\text{-adjusted} = 0.0027$).

**Pre-purchase behaviour**

The majority of respondents stated that they had carried out some pre-purchase research before acquiring their dog (84.3%); however 15.7% ($n = 207$) admitted that they had carried out no research. Of the respondents who stated they were first time dog owners ($n = 398$), there was no difference in the proportion carrying out pre-purchase research between the BC and non-BC groups (94.9% vs. 92.0%; $P = 0.342, P\text{-adjusted} = 0.400$). The majority of the
sample strongly disagreed that their dog was an ‘impulse’ purchase (74.3%) and that they should have spent more time considering their purchase (72.5%). Likewise, most reported that they had thought about getting their dog for a long time (56.5%). None of the responses to these questions differed between BC and non-BC groups (Table 2). Most respondents strongly agreed that they had spent an appropriate amount of time considering the purchase of their pet (61.4%), with more respondents strongly agreeing within the BC group as compared to the non-BC group (67.1% vs. 59.3%; \( P = 0.004 \)).

[Table 2]

Respondents rated fifteen factors on a scale of 0-4 (from 0= no influence, to 4= heavily influenced) depending upon how much they influenced the purchase/acquisition of their breed of dog. The highest scoring factor in the overall population was ‘good companion breed’ (median = 4 (2-4); Table 3), followed by ‘the size of the breed suited to lifestyle’ (3 (3-4)), appearance (3 (3-4)) and ‘good dog breed for children’ (3 (0-4)). Eleven of the fifteen factors differed in how influential they were in decision-making between BC and non-BC groups (Table 3), for example, appearance was rated as more influential in choosing a BC breed than a non-BC one (and the joint highest most influential factor in acquiring a BC breed) \( (P < 0.001; \text{ P-adjusted} < 0.001) \), whereas the perception of the breed being ‘generally healthy’, or ‘with a long life expectancy’ was less influential for BC breeds compared with those that are non-BC \( (P < 0.001; \text{ P-adjusted} < 0.001) \). Exercise encouragement \( (P < 0.001; \text{ P-adjusted} = 0.00) \) and working ability \( (P < 0.001; \text{ P-adjusted} < 0.001) \) were comparatively more influential in the choice of non-BC, as opposed to BC, breeds.

[Table 3]
Of the eleven purchasing influences that were associated with breed type at the univariate level, nine remained significant in a logistic regression model (Table 4). Higher influence scores for four factors were significantly associated with BC dog ownership ($P < 0.001$): appearance, good dog breed for children, good companion breed, and breed size suited to lifestyle. In contrast, high influence scores for the remaining five factors were associated with non-BC dog ownership: popularity of the breed, childhood experiences, exercise encouragement, generally healthy breed and working ability. For example, every 1 point increase in influence score for the factor ‘generally healthy breed’ (from 0-4: no influence to heavily influenced) was associated with a 1.6 increased odds of non-BC dog ownership. In contrast, every 1 point increase for the factor ‘appearance’ was associated with a 0.77 decreased odds of non-BC ownership (Table 4).

Purchasing behaviour

The median (25%-75% percentile) age (months) at acquisition was 2.25 months (2-3). A minority of dogs (n=24, 1.7%) were acquired while under the legal age of eight weeks. The median cost at purchase was £600 (£400-£900). BC dogs were significantly more expensive to purchase than non-BC dogs (BC median= £1200 (£1000-£1800) vs. non-BC £500 (£350-£700); $U = 15044.5; P < 0.001; P\text{-adjusted} = 0.0027$). The most common source of acquisition was from a KC registered breeder, with 41.6% from KC non-Assured Breeders and 13.5% from KC Assured Breeders (Table 5). There was no significant association between the source of the dog and skull type ($X^2 = 12.50; P = 0.052; P\text{-adjusted} = 0.08$).
Of the 1065 dogs acquired from a breeder, the most common way of hearing of the breeder was via a puppy selling website (Champdogs, Epupz or Pets4Homes, 27.2%), followed by the Kennel Club website (22.2%) and recommendations from family/friends (18.5%). There was a significant association between where the respondent heard of the breeder and the skull type of the dog they bought, with BC dog buyers more likely to find breeders from puppy websites (BC = 35.7% vs. Non-BC = 23.8%) or selling sites (BC = 5.8% vs. Non-BC = 2.6%) ($X^2 = 57.90; P < 0.001; P\text{–adjusted} = 0.0027$) (Figure 1).

The majority of owners met the breeder at their home or kennels (97.2%) with a minority meeting at their own home (1.2%) or at a dog show/event (0.6%). A small number of owners did not meet the breeder of their dog (n= 4, 0.4%) and a further 0.6% of owners met the breeder at the following locations: a car park (n=2), an airport (n=2), or at their vet practice (n=2). Following FDR correction, there was no difference in where the owners met the breeder between BC and non-BC dogs (BC = 95.2% vs. non-BC=98.0%; $X^2 = 9.69; P = 0.046; P\text{–adjusted} = 0.0736$).

Half of owners met only the mother of their dog (47.1%), 0.5% met only the father, and 44.3% met both the mother and father. A minority of owners saw neither parent of their dog (n = 72; 6.8%). Owners of BC dogs were more likely to see neither parent than non-BC dogs (BC = 12.3% vs. non-BC = 4.8%; $X^2 = 26.95; P < 0.001; P\text{–adjusted} = 0.0027$). The majority of
owners only visited the breeder they purchased their dog from (90.6%), with half of owners visiting that breeder on more than one occasion in addition to the purchasing visit (48.9%), one quarter only once in addition to the purchasing visit (26.4%), and one quarter only visiting to purchase the dog (24.7%). There was no difference between BC and non-BC respondents in whether they visited more than one breeder ($P = 0.671$, $P$-adjusted $= 0.7002$); however, BC dogs were more likely to be purchased during the first and only visit (BC $= 32.4\%$ vs. non-BC $= 21.7\%; \chi^2 = 12.90; P = 0.002; P$-adjusted $= 0.0048$) whilst non-BC dogs were more likely to be purchased after one or more additional visits.

The majority of respondents did not join a waiting list to buy their dog (88.2%), and less than half of respondents purchased from breeders who had a lifetime returns policy (44.4%). There was no difference between skull type groups for either of these pre-purchase elements (waiting list: $P = 0.123$; $P$-adjusted $= 0.164$; return policy: $P = 0.573$; $P$-adjusted $= 0.625$).

Nearly half (46.1%) of all owners did not ask to see health records for either the sire or dam, although they were available in over half of all dogs purchased (56.4%). Significantly, BC dog purchasers were less likely to ask to see the health records of both parents (Table 6; $P = 0.002$; $P$-adjusted $= 0.005$) and less likely to have records for available for perusal when they did ask ($P < 0.001$; $P$-adjusted $= 0.003$) when compared to non-BC purchasers. A large proportion of owners were not sure if the parents of their dog had undergone either genetic (43.3%) or other health tests (63.6%). Respondents for BC breeds were comparatively less likely to know whether their dogs parents had undergone any genetic tests than non-BC respondents ($P = 0.006$; $P$-adjusted $= 0.012$). Following FDR-correction there was no significant difference between BC and non-BC groups as to whether respondents knew if
their dog’s parents had undergone any other (non-genetic) health testing ($P = 0.043$; $P$-adjusted $= 0.0712$) (Table 6).

[Table 6]

Post purchase attitudes

The majority of respondents would recommend their breed to a friend or family member (96.5%) and reported they would not do anything differently if they could reverse time (84.3%). There were no differences in attitude between BC and non-BC owners for the former ($X^2 = 0.55; P = 0.458$, $P$-adjusted $= 0.5133$) or, following FDR-correction, the latter (19.5% vs. 14.3%; $X^2 = 4.60; P = 0.032$; $P$-adjusted $= 0.0569$). For those owners who would behave differently in the pre-purchase phase ($n = 224; 15.7$%), the most common reason was to change where they acquired their dog ($n = 88; 39.1$%), followed by level of pre-purchase research ($n = 79; 35.2$%), the age of their dog when they acquired them ($n = 23; 10.1$%), the breed of dog they bought ($n = 20; 8.9$%), and when they acquired their dog ($n = 15; 6.7$%). There was no difference between BC and non-BC dog owners in these reasons ($X^2 = 2.14; P = 0.711$, $P$-adjusted $= 0.7261$). Around one tenth of dogs were planned to be bred from in the future (11.6%), which was significantly higher in BC dogs (17.2%) compared to non-BC dogs (9.6%; $X^2 = 22.29; P < 0.001$, $P$-adjusted $< 0.001$).

Discussion

Brachycephalic dogs have dramatically increasing in popularity in the UK, and our study has characterised aspects of why and how people acquire these breeds. Identifying factors that impact upon the breed choice of buyers, such as those highlighted in this study, may allow for
more targeted educational interventions during the decision-making process; however, these
data also suggest that such interventions may not have the desired impact. Despite the recent
increase in scientific knowledge of the health consequences of BC conformations (e.g. Packer
et al. 2015a/b), several high-profile scientific reports (e.g. Bateson 2010, Rooney and Sargan
2010) widespread media coverage, and educational resources for prospective puppy buyers
(e.g. UFAW 2016), purchasers of BC dogs appear to still prioritise appearance over both
health and longevity. A previous study of veterinary attitudes towards tackling inherited
disorders in pedigree dogs found that one of the most common suggestions to decrease
disorder prevalence was to educate the public or buyers (Farrow et al. 2014). It appears that
improvements in BC dog welfare are unlikely to result solely from the provision of public
information or from allowing market forces to dictate desirable features in BC dogs. As such,
focusing efforts on both the supply and demand sides of this equation may result in greater
improvements in canine health. In this regard, altering the supply of BC dogs in line with
health will require fundamental changes to reduce the prevalence of conformation-related
disorders. Firstly by altering conformation (which may in part be facilitated by the revision of
breed standards by kennel clubs) and, secondly, changing breeding practices (including the
development and mandatory implementation of health testing of relevant disorders, and
potentially outcrossing to achieve healthier body shapes). If kennel clubs and BC breeders are
unwilling to make such changes, and to ensure that BC breeders operating outside of kennel
club registration systems are included in any changes, legislation may be the only mechanism
to circumvent those purchaser decisions which lie at odds with improvements to BC dog
welfare.

Who buys a brachycephalic dog and why?
Respondents to our survey who owned BC breeds were commonly found to be younger, buying their chosen breed for the first time and had no history of childhood ownership.

Although it is unclear as to why this effect occurs, and further research is required, it may reflect increased media influence among younger age groups which, in turn, contributes to the popularity of certain breeds (e.g. their use in advertisement). The media has been identified as a stakeholder with a role to play in improving pedigree dog welfare (Rooney & Sargan, 2010), and moderating the use of BC dogs in the media has been highlighted as a way of mitigating the current high demand for these breeds. In our sample, BC dogs were significantly younger than their non-BC counterparts; recent increases in breed popularity may function to drive down the median age of the BC cohort.

Owners of BC breeds were more likely to be living with children at the time of the survey. It should be noted that responses only identified if people currently lived with one or more child, not whether they had independent adult children. However, BC owners were also more likely than non-BC owners to consider ‘being good with children’ as an influential factor in their purchasing decision. Why owners may perceive BC dogs to be good with children requires further exploration; however, factors such as their small size and ‘cute’ neotenous looks (large, round, wide-set eyes and rounded faces; Lorenz, 1971) may be influential. In addition, owner’s expectations of the behaviour of BC breeds are likely to influence perceptions of suitability with children, and indeed, as an ‘overall good companion breed’, another factor identified here as influencing BC ownership. The breed standards of the three BC breeds explored here suggest that breeders are selecting for an “affectionate nature” in the Bulldog (The Kennel Club, 2016b), a “deeply affectionate” temperament in the French Bulldog (The Kennel Club, 2016c), and an “even-tempered, happy” predisposition in the Pug (The Kennel Club, 2016d). These traits point towards a dog that has a positive and close relationship with
their owners and is primarily a companion dog. Indeed, desire for a dog with working ability was negatively associated with BC ownership. This is unsurprising for the Pug and French Bulldog breeds particularly, who have historically been selected for a temperament that suited a ‘lap-dog’ role (Noller et al, 2008). Respondents owning BC breeds were also more likely to live in apartments than their counterparts, reflective of the size of a dog being an important factor in breed choice. Evidence that shorter and smaller breeds have become relatively popular in Australia supports the concept that people attempt to purchase dogs that can fit their lifestyle niche (Teng et al, 2016). Identifying and promoting breeds with fewer health conditions that fit behavioural, lifestyle and trait niches could ensure that owners are aware that a wide variety of dogs can fulfil their needs without the concomitant health implications associated with a particular breed.

Appearance was considered highly influential in breed selection for BC dogs. Although their conformation may have driven their popularity, breeding for this appearance poses two problems. Firstly, selecting for an extreme brachycephalic appearance runs counter to dog welfare due to its association with conformation-related inherited diseases. Secondly, by prioritising appearance, insufficient selection pressure may be exerted on some traits that would improve animal welfare (McGreevy and Nicholas, 1999). Concerns have been expressed that while it is still common practice to describe “genetically disabled” and “deformed” pets as cute, progress toward functional and healthy animals is likely be difficult (Ott, 1996). Increasing consumer awareness that the appearance of BC breeds is linked with a high risk of welfare-compromising disorders remains a priority of many animal welfare charities. For example, the RSPCA initiated a campaign ‘Bred for Looks - Born to Suffer’, which sought an end to the breeding of dogs based on looks (RSPCA, 2013). Our data
suggests that, despite such actions, the purchasing of BC breeds remains predicated largely on appearance, likely at the expense of health and welfare.

A desire for a dog that encourages exercise was negatively associated with BC dog ownership. Owners of BC breeds may perceive them to be ‘low maintenance’ with regards to exercise. However, it is hard to separate reduced exercise requirement from reduced ability to exercise.

A large proportion of BC dogs may be unable to engage in normal levels of activity due to the inherent respiratory difficulties (Packer et al. 2015, Liu et al. 2016). BOAS, a chronic respiratory disorder is prevalent in the three BC breeds explored here, with exercise intolerance one of the key clinical signs of BOAS. This suggests that some companion animal breeds have effectively become ‘handicapped’ by selection for appearance traits that appeal to our anthropomorphic perceptions (Serpell, 2002). Here it appears that BC dogs may have also become ‘handicapped’ by humans selecting for (or not strongly selecting against) a disease trait that results in a dog that fits a human lifestyle choice, but is not conducive to good welfare.

In contrast to BC owners, non-BC dog owners were more highly influenced by a breed being perceived to be ‘generally healthy’. This may coincide with their desire for a dog with good working ability that provides exercise encouragement, both of which would may limited in BC breeds. Recent studies indicate that breeds with more inherited disorders have become more (rather than less) popular, suggesting that health considerations have been secondary in the decision to acquire dogs (Ghirlanda et al. 2013). In a systematic review of inherited diseases in the dog, the Pug and Bulldog were affected by more disorders related to their body shape (16 each) compared with the seven non-BC breeds studied here (affected by a median of 9 (range: 3-15) (Asher et al. 2009). For reform to occur in the health of BC breeds,
owners must be aware they are consumers, and their choices affect dogs at a breed health
level, as well as individual dog level. If owners are not motivated to buy a healthy individual
within a breed, inherent health problems within breeds will be perpetuated, and the
motivation of breeders to tackle health problems in their breed lowered. In the absence of
such motivations it is important that stakeholders consider direct mechanisms to improve
breed health which are not subject to consumer demands.

Purchasing a dog

Respondents that owned BC dogs were less likely to follow recommended processes (e.g.
those embedded within the Puppy Information Pack for the BVA AWF & RSPCA Puppy
Contract) when purchasing their dog. They were more likely to use puppy-selling websites,
less likely to see either parent of their puppy, and less likely to ask for any health records.
Despite few owners explicitly admitting to purchasing their dog on impulse, BC dogs were
more likely to be purchased during the first and only visit to their breeder. Despite media
campaigns such as “Where’s Mum” (Pup Aid, 2016) that promote buyers seeing their puppy
with its mother (to avoid purchasing from puppy farms), more than 1 in 10 BC owners
(12.3%) saw neither of their dog’s parents, compared to 1 in 20 non-BC owners (4.8%), thus
potentially perpetuating the unethical breeding of these dogs.

The lack of requests to see health records from BC owners may reduce the priority placed on
health by BC breeders, by reducing demand for healthy, tested dogs. The development and
mandatory implementation of health testing in BC breeds may go some way to improve
health, for example functional respiratory tests introduced by the German Pug Club
(Deutscher Mopsclub) (Bartels et al. 2015). However, while market forces of supply and
demand are not being effectively applied to canine health breed health is unlikely to improve substantially unless breeders are intrinsically motivated to carry out health testing themselves.

Post purchase attitudes

In general the vast majority of the respondents to the survey were content with the breed they had purchased, with relatively few citing any regrets about their dog. Most of those expressing reservations did so in relation to the manner in which they purchased their dog, perhaps reinforcing the need to target prospective owners with pre-purchasing guidelines. It is of value to consider that the current study is only a snapshot of the owners’ and their dogs’ lives. Post-purchase questions can only be answered relative to the experiences of the respondents so far. With a median age of 20 months, the BC dogs in this population were still relatively young and thus their lifetime conformation-related disease burden may not yet be realised; for example, the mean age at which BC dogs are presented to vets for treatment of BOAS is 3-4 years of age (Monnet 2008). The emotional and financial burden of owning a dog with conformation-related disorders may have an impact upon an owner’s perception of the breed, and future longitudinal studies, studies of owners with older BC dogs, or studies of people who have owned BC dogs in the past may provide insights into whether and how their perceptions of BC dogs change as a result of experience.

Our data identified that BC owners were less likely to have neutered their dog, and more likely to be planning to breed from their dog in the future. This is of concern, as increased breeding by younger, first time owners could function to proliferate breed-related issues if they are unaware of the health issues associated with their breed, and how to reduce the risk of them occurring.
As with all self-selected survey samples there are limitations to the data gathered. It is not possible to establish a non-response bias or identify from which forum the majority of respondents accessed the survey. What can be identified is a substantial response bias towards women and those individuals with a higher education. A female response bias to surveys is relatively common (Sax et al. 2003) confounded by the possibility that animal-based interests and occupations may also have greater proportion of women within them. The use of special interest forums may have predisposed the sampling to more educated individuals, although this demographic is generally more likely to respond to surveys (Goyder et al., 2002). Notwithstanding the limitations on the data gathered, and the associated need for some caution in interpreting the results, this research provides novel data in an area of welfare-concern which is otherwise lacking.

Animal welfare implications

The motivations for the purchasing of dogs and processes by which this is implemented have clear implications for the welfare of current and future generations of dogs. All popular pedigree dog breeds have been found to experience some breed-related health issues and, within this, BC breeds experience some of the most chronic and severe issues. This research improves our understanding of pre-purchase behaviour and motivations for these high-risk breeds, and may allow prospective owners who wish to purchase a BC dog to be counselled more effectively on healthier alternatives, and where that is not possible, to make responsible purchasing choices of BC dogs that drive improvements in breed health rather than perpetuating problems. However, these data may also indicate that breed-related health information alone may not be sufficient to make significant impacts on responsible breed
selection, with appearance still prioritised over health and longevity. If education strategies are ineffective at reducing demand for BC breeds in the long-term, other more direct strategies controlling the supply of these breeds may be required to protect canine welfare.

Acknowledgements

Thanks go to all the people and websites that assisted in distribution of the questionnaire and the owners who completed it. This manuscript was internally approved for submission by the Royal Veterinary College (Manuscript ID number CSS_01417).

References

Asher L, Buckland E, Phylactopoulos CL, Whiting M, Abeyesinghe S and Wathes C 2011 Estimation of the number and demographics of companion dogs in the UK. *BMC Veterinary Research* 7: 74


Murray JK, Browne WJ, Roberts MA, Whitmarsh A and Gruffydd-Jones TJ 2010 Number and ownership profiles of cats and dogs in the UK. Veterinary Record 166: 163-168


Packer RMA, Hendricks A and Burn CC 2012 Do dog owners recognise clinical signs related to a conformational inherited disorder that is 'normal for the breed'? A potential constraint to improving canine welfare. *Animal Welfare* 21(S1): 81-93


Serpell JA 2002 Anthropomorphism and Anthropomorphic Selection-Beyond the "Cute Response". Society and Animals 10, 437-454

Teng KT, McGreevy PD, Toribio JLML, Dhand NK 2016 Trends in popularity of some morphological traits of purebred dogs in Australia. *Canine Genetics and Epidemiology* 3: 2

Figure 1 Owner reports of where they heard about the breeder of their brachycephalic (BC) or non-brachycephalic (non-BC) dog. Data consider only those dogs reported as purchased from a breeder (n = 1065/1427)
Table 1: Signalment of BC and non-BC groups in study sample (n=1427 dogs)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Sub-category</th>
<th>Brachycephalic (n=384)</th>
<th>Non-brachycephalic (n=1043)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Border Terrier (n = 146)</td>
<td>0.0%</td>
<td>14.0%</td>
</tr>
<tr>
<td></td>
<td>Bulldog (n = 114)</td>
<td>29.7%</td>
<td>0.0%</td>
</tr>
<tr>
<td></td>
<td>Cocker Spaniel (n = 199)</td>
<td>0.0%</td>
<td>19.1%</td>
</tr>
<tr>
<td></td>
<td>English Springer Spaniel (n = 200)</td>
<td>0.0%</td>
<td>19.2%</td>
</tr>
<tr>
<td></td>
<td>French Bulldog (n = 143)</td>
<td>37.2%</td>
<td>0.0%</td>
</tr>
<tr>
<td></td>
<td>German Shepherd Dog (n = 115)</td>
<td>0.0%</td>
<td>11.0%</td>
</tr>
<tr>
<td></td>
<td>Golden Retriever (n = 110)</td>
<td>0.0%</td>
<td>10.5%</td>
</tr>
<tr>
<td></td>
<td>Labrador Retriever (n = 156)</td>
<td>0.0%</td>
<td>15.0%</td>
</tr>
<tr>
<td></td>
<td>Miniature Schnauzer (n = 117)</td>
<td>0.0%</td>
<td>11.2%</td>
</tr>
<tr>
<td></td>
<td>Pug (n = 127)</td>
<td>33.1%</td>
<td>0.0%</td>
</tr>
<tr>
<td></td>
<td>1 year or less</td>
<td>33.1%</td>
<td>24.4%</td>
</tr>
<tr>
<td></td>
<td>2-4 years</td>
<td>40.6%</td>
<td>37.5%</td>
</tr>
<tr>
<td></td>
<td>5-7 years</td>
<td>13.3%</td>
<td>18.5%</td>
</tr>
<tr>
<td></td>
<td>8 years or more</td>
<td>4.9%</td>
<td>14.5%</td>
</tr>
<tr>
<td></td>
<td>Unknown</td>
<td>8.1%</td>
<td>5.2%</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>Female</td>
<td>43.2%</td>
<td>43.1%</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>56.8%</td>
<td>56.9%</td>
</tr>
<tr>
<td>Neuter</td>
<td>No</td>
<td>49.8%</td>
<td>34.2%</td>
</tr>
<tr>
<td></td>
<td>No, but I plan to</td>
<td>22.6%</td>
<td>16.3%</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>17.5%</td>
<td>49.5%</td>
</tr>
</tbody>
</table>
Table 2 Owners perception (% within category) of their pre-purchase behaviour overall and in relation to owners of BC and non-BC breeds.

<table>
<thead>
<tr>
<th>Question</th>
<th>Breed type</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly agree</th>
<th>X^2</th>
<th>P</th>
<th>P-adjusted</th>
</tr>
</thead>
<tbody>
<tr>
<td>My dog was an impulse purchase</td>
<td>Overall</td>
<td>74.3</td>
<td>16.1</td>
<td>4.8</td>
<td>3.3</td>
<td>1.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BC</td>
<td>73.1</td>
<td>14.2</td>
<td>7.5</td>
<td>3.8</td>
<td>1.4</td>
<td>8.89</td>
<td>0.064</td>
<td>0.096</td>
</tr>
<tr>
<td></td>
<td>Non-BC</td>
<td>74.7</td>
<td>16.8</td>
<td>3.8</td>
<td>3.2</td>
<td>1.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I thought about getting my dog for a long time</td>
<td>Overall</td>
<td>4.8</td>
<td>4.7</td>
<td>7.1</td>
<td>26.9</td>
<td>56.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BC</td>
<td>4.0</td>
<td>2.9</td>
<td>6.0</td>
<td>24.9</td>
<td>62.2</td>
<td>8.17</td>
<td>0.085</td>
<td>0.1179</td>
</tr>
<tr>
<td></td>
<td>Non-BC</td>
<td>5.1</td>
<td>5.3</td>
<td>7.5</td>
<td>27.6</td>
<td>54.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I should have spent more time considering the purchase of my pet</td>
<td>Overall</td>
<td>72.5</td>
<td>17.4</td>
<td>7.0</td>
<td>1.9</td>
<td>1.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BC</td>
<td>69.6</td>
<td>18.8</td>
<td>7.5</td>
<td>2.6</td>
<td>1.4</td>
<td>2.72</td>
<td>0.605</td>
<td>0.6453</td>
</tr>
<tr>
<td></td>
<td>Non-BC</td>
<td>73.5</td>
<td>16.9</td>
<td>6.9</td>
<td>1.7</td>
<td>1.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I think I spent an appropriate amount of time considering the purchase of my pet</td>
<td>Overall</td>
<td>3.8</td>
<td>1.4</td>
<td>6.9</td>
<td>26.6</td>
<td>61.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BC</td>
<td>4.6</td>
<td>2.0</td>
<td>7.4</td>
<td>18.9</td>
<td>67.1</td>
<td>15.5</td>
<td>0.004</td>
<td>0.0083</td>
</tr>
<tr>
<td></td>
<td>Non-BC</td>
<td>3.6</td>
<td>1.2</td>
<td>6.6</td>
<td>29.4</td>
<td>59.3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 3 Owner ratings of the degree to which different factors influenced their decision to purchase their chosen breed (0 = not at all; 4 = Major influence) with univariate statistics

<table>
<thead>
<tr>
<th>Factor</th>
<th>Overall</th>
<th>BC</th>
<th>Non-BC</th>
<th>U</th>
<th>P</th>
<th>P-adjusted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>3 (3-4)</td>
<td>4 (3-4)</td>
<td>3 (3-4)</td>
<td>125511.0</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Popularity of the breed</td>
<td>1 (0-2)</td>
<td>0 (0-1)</td>
<td>1 (0-2)</td>
<td>180982.5</td>
<td>0.004</td>
<td>0.008</td>
</tr>
<tr>
<td>Childhood experiences</td>
<td>0 (0-2)</td>
<td>0 (0-1)</td>
<td>0 (0-3)</td>
<td>199178.5</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Good dog breed for children</td>
<td>3 (0-4)</td>
<td>3 (0-4)</td>
<td>3 (0-4)</td>
<td>145186.0</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Good companion breed</td>
<td>4 (2-4)</td>
<td>4 (3-4)</td>
<td>4 (3-4)</td>
<td>144060.0</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Working ability</td>
<td>0 (0-2)</td>
<td>0 (0-0)</td>
<td>1 (0-3)</td>
<td>236428.0</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Exercise encouragement</td>
<td>3 (1-3)</td>
<td>1 (0-2)</td>
<td>3 (2-4)</td>
<td>250002.5</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Cost</td>
<td>0 (0-2)</td>
<td>0 (0-1)</td>
<td>0 (0-2)</td>
<td>169743.5</td>
<td>0.147</td>
<td>0.187</td>
</tr>
<tr>
<td>Generally healthy breed</td>
<td>2 (1-3)</td>
<td>1 (0-2)</td>
<td>3 (2-3)</td>
<td>234561.0</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Long life expectancy</td>
<td>2 (1-3)</td>
<td>1 (0-2)</td>
<td>2 (1-3)</td>
<td>213949.5</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Breed size suited to lifestyle</td>
<td>3 (3-4)</td>
<td>3 (3-4)</td>
<td>3 (3-4)</td>
<td>155079.5</td>
<td>0.027</td>
<td>0.049</td>
</tr>
<tr>
<td>This breed is easy to take care of</td>
<td>2 (1-3)</td>
<td>2 (0-3)</td>
<td>2 (1-3)</td>
<td>176236.0</td>
<td>0.025</td>
<td>0.048</td>
</tr>
<tr>
<td>Recommended by a friend/family member</td>
<td>0 (0-2)</td>
<td>0 (0-2)</td>
<td>0 (0-2)</td>
<td>175181.0</td>
<td>0.086</td>
<td>0.118</td>
</tr>
<tr>
<td>Recommended by a veterinary professional</td>
<td>0 (0-1)</td>
<td>0 (0-1)</td>
<td>0 (0-1)</td>
<td>168896.0</td>
<td>0.300</td>
<td>0.369</td>
</tr>
<tr>
<td>Celebrity endorsement/ownership</td>
<td>0 (0-0)</td>
<td>0 (0-0)</td>
<td>0 (0-0)</td>
<td>159813.5</td>
<td>0.074</td>
<td>0.108</td>
</tr>
</tbody>
</table>
Table 4 Logistic regression of nine factors that significantly influenced the acquisition of BC vs. non-BC breeds. Each factor is rated on a scale of 0-4 (Reference category=Non-BC breed). Higher influence scores for four factors were significantly associated with BC dog ownership: appearance, good dog breed for children, good companion breed, and breed size suited to lifestyle.

<table>
<thead>
<tr>
<th>Factor</th>
<th>B</th>
<th>SE</th>
<th>OR</th>
<th>95% CI (OR)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>-0.259</td>
<td>0.072</td>
<td>0.772</td>
<td>0.670-0.888</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Good dog breed for children</td>
<td>-0.202</td>
<td>0.056</td>
<td>0.817</td>
<td>0.732-0.912</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Good companion breed</td>
<td>-0.463</td>
<td>0.095</td>
<td>0.629</td>
<td>0.523-0.757</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Breed size suited to lifestyle</td>
<td>-0.249</td>
<td>0.071</td>
<td>0.780</td>
<td>0.678-0.897</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Popularity of the breed</td>
<td>0.173</td>
<td>0.069</td>
<td>1.189</td>
<td>1.039-1.360</td>
<td>0.012</td>
</tr>
<tr>
<td>Childhood experiences</td>
<td>0.238</td>
<td>0.063</td>
<td>1.269</td>
<td>1.120-1.437</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Exercise encouragement</td>
<td>0.635</td>
<td>0.067</td>
<td>1.887</td>
<td>1.654-2.154</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Generally healthy breed</td>
<td>0.472</td>
<td>0.068</td>
<td>1.603</td>
<td>1.404-1.831</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Working ability</td>
<td>0.476</td>
<td>0.080</td>
<td>1.609</td>
<td>1.375-1.883</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>
Table 5 Origins of dogs in the study population

<table>
<thead>
<tr>
<th>Source of dog</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breeder: Kennel Club Registered Breeder (non-ABS)</td>
<td>593</td>
<td>41.6</td>
</tr>
<tr>
<td>Breeder: Kennel Club Assured Breeder (ABS) Scheme</td>
<td>192</td>
<td>13.5</td>
</tr>
<tr>
<td>Not stated</td>
<td>173</td>
<td>12.1</td>
</tr>
<tr>
<td>Breeder: Non-Kennel Club Registered Breeder</td>
<td>168</td>
<td>11.8</td>
</tr>
<tr>
<td>Rehoming centre</td>
<td>170</td>
<td>11.9</td>
</tr>
<tr>
<td>Breeder: Unknown type</td>
<td>112</td>
<td>7.8</td>
</tr>
<tr>
<td>Bred their own dog</td>
<td>11</td>
<td>0.8</td>
</tr>
<tr>
<td>Pet shop</td>
<td>8</td>
<td>0.6</td>
</tr>
</tbody>
</table>
Table 6 Responses (% total) to questions regarding pre-purchasing behaviour by brachycephalic (BC; n = 384) and non-brachycephalic (non-BC; n = 1043) breed owners. Breeds used were the 10 most popular breeds according to The Kennel Club’s 2014 statistics (BC = 3; non-BC = 7).

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
<th>Overall</th>
<th>BC</th>
<th>Non-BC</th>
<th>X²</th>
<th>P</th>
<th>P-adjusted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did you ask to see health records of the mother and father of your dog?</td>
<td>No</td>
<td>46.1</td>
<td>47.2</td>
<td>45.7</td>
<td>15.16</td>
<td>0.002</td>
<td>0.0048</td>
</tr>
<tr>
<td></td>
<td>Father only</td>
<td>0.4</td>
<td>1.0</td>
<td>0.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mother only</td>
<td>6.7</td>
<td>10.3</td>
<td>5.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mother and Father</td>
<td>46.8</td>
<td>41.4</td>
<td>48.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>6.8</td>
<td>10.5</td>
<td>5.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>I don’t know</td>
<td>28.9</td>
<td>28.9</td>
<td>28.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Were health records available for the mother and father of your dog?</td>
<td>Father only</td>
<td>0.5</td>
<td>1.0</td>
<td>0.3</td>
<td>24.30</td>
<td>&lt;0.001</td>
<td>0.0027</td>
</tr>
<tr>
<td></td>
<td>Mother only</td>
<td>7.4</td>
<td>11.5</td>
<td>5.8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mother and Father</td>
<td>56.4</td>
<td>48.1</td>
<td>59.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>8.1</td>
<td>6.3</td>
<td>8.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>I don’t know</td>
<td>43.3</td>
<td>47.0</td>
<td>41.8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>I don’t think there are any genetic tests for this breed</td>
<td>2.0</td>
<td>0.7</td>
<td>2.6</td>
<td>16.19</td>
<td>0.006</td>
<td>0.012</td>
</tr>
<tr>
<td></td>
<td>Father only</td>
<td>2.5</td>
<td>4.9</td>
<td>1.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mother only</td>
<td>1.6</td>
<td>1.7</td>
<td>1.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mother and Father</td>
<td>42.6</td>
<td>39.4</td>
<td>43.8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Had the parents undergone any other health tests (e.g. X-rays) prior to breeding?</td>
<td>Yes</td>
<td>25.5</td>
<td>20.3</td>
<td>27.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>10.9</td>
<td>10.3</td>
<td>11.1</td>
<td>6.28</td>
<td>0.043</td>
<td>0.0712</td>
</tr>
<tr>
<td></td>
<td>I don’t know</td>
<td>63.6</td>
<td>69.4</td>
<td>61.4</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>