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

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7 **Purchasing popular purebreds: Investigating the influence of breed-type on the pre-**
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10 **purchase motivations and behaviour of dog owners**
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37
38 **Abstract**
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43 How and why dog owners select a specific breed may impact upon the health of the dog they
44 acquire, and upon the wider health of the breed they select. Brachycephalic (BC) breeds are
45 rapidly increasing in popularity despite increasing evidence linking brachycephalism with
46 chronic and severe health conditions. This study used a questionnaire to explore pre, during
47 and post-purchase behaviours and attitudes of dog-owners who own popular BC dog breeds
48 (n=3 breeds) compared to popular non-BC dog breeds (n=7 breeds). The survey received
49 1427 valid responses. BC breed owners were younger, more likely to live with children, and
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3 26 to be buying their chosen breed for the first time. The factor that most highly influenced BC
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5 27 owner's decisions to buy their breed was appearance, followed by breed size suited to
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7 28 lifestyle, good dog breed for children and good companion breed. Perceived health of the
8
9 29 breed was less influential in decision-making for BC owners compared to non-BC owners.
10
11 30 The way in which owners acquired their dog differed by breed type, with BC owners more
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13 31 likely to use puppy-selling websites to find their dog, less likely to see either parent of their
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15 32 puppy, and less likely to ask to see any health records. Despite many BC breed health issues
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17 33 being directly related to conformation, appearance remains the most significant determinant
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19 34 in why people desire these breeds. More targeted educational interventions are needed to
20
21 35 change buyer attitudes and, if ineffective, other more direct mechanisms (e.g. legislation)
22
23 36 may be required to protect canine welfare.
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31 **Keywords:** Animal Welfare, Brachycephalic, Companion Animal, Inherited Disorders,
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33 Pedigree, Pet Ownership
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37 41 **Introduction**

38 42

39 43 Contemporary estimations of the domestic dog (*Canis familiaris*) population of the United
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41 44 Kingdom (UK) place it at around 10.5 million (Murray et al. 2010), approximately 75-80% of
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43 45 which are purebred (Asher et al. 2011; O'Neill et al. 2014). The process of selecting for
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45 46 breed-specific characteristics in purebred dogs has been identified as having the potential to
46
47 47 reduce dog welfare (Rooney & Sargan 2010), with strong links between breed standards and
48
49 48 inherited diseases in the top 50 Kennel Club (KC) breeds (Asher et al. 2009). In addition,
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51 49 reduced genotypic variation within these same breeds substantially increases the prevalence
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53 50 of genetic disease (Summers et al. 2010). Public concerns regarding the welfare of purebred
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3 51 dogs and associated selective breeding practices have resulted in a number of high profile
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5 52 reports to address those concerns (All-Party Parliamentary Group for Animal Welfare 2010;
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7 53 Bateson 2010).
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11 55 Humans have a large appetite for variety in the appearance and behaviour of dogs, with 216
12
13 56 breeds currently KC recognised (The Kennel Club, 2015). Breed popularity within the dog
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15 57 population has remained largely stable, but with substantial, and often culturally driven,
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17 58 surges in the popularity of specific breeds (Herzog et al. 2004). Social influence (fashion) is
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19 59 the primary influence on the popularity of companion dog breeds, which is often related to
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21 60 media exposure e.g. featuring in movies (Herzog 2006, Ghirlanda et al. 2014). Both in the
22
23 61 United States of America (USA) and the UK, breed popularity appears to lack direct
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25 62 associations with functional traits (e.g. health, trainability) (Herzog 2006, Ghirlanda et al.
26
27 63 2013) whilst displaying a concerning tendency for more popular breeds to have greater
28
29 64 numbers of inherited disorders (Ghirlanda et al. 2013). Increased demand may, therefore,
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31 65 place pressure on breeders to provide more individuals from a genetically constrained
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33 66 breeding population. In turn this demand will increase the number of extant recessive
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35 67 disorders being expressed. With regards to the appearance of popular breeds, if demand is
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37 68 based on the extreme appearance of certain breeds, this may result in higher levels of
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39 69 conformation-related disorders in the canine population.
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47 71 Evidence suggests that brachycephalic (BC) (short-muzzled) breeds in particular, such as the
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49 72 Pug, French Bulldog and Bulldog have shown substantial increases in numbers in the UK
50
51 73 over the past decade (The Kennel Club 2016a). Herzog (2006) suggests that breed popularity,
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53 74 once established, may persist for a decade or more, indicating that BC dog populations will
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55 75 grow, or are unlikely to decline, in the foreseeable future. Brachycephaly has been linked
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3 76 with a variety of inherited diseases including respiratory disorders (Brachycephalic
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5 77 Obstructive Airway Syndrome; BOAS) (Packer et al. 2015a), ophthalmic disease (Packer et
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7 78 al. 2015b) and results in reduced lifespan compared to non-BC breeds (O'Neill et al. 2015).
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9
10 79 These conformation-related problems have previously led veterinarians to express concerns
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12 80 about the continued breeding of BC dogs (Farrow et al. 2014), with calls to out-cross or even
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14 81 ban certain breeds (Packer et al 2014).
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23 83 Little information exists on how and why prospective companion animal owners make
24
25 84 decisions round the purchase of purebred dogs. Pre-purchase decisions will be guided by a
26
27 85 number of factors, although these may not be entirely predictable (Ghirlanda et al. 2013). In a
28
29 86 study of the ideal Australian companion dog, behavioural and physical factors identified as
30
31 87 important included being medium sized, short haired, safe with children, friendly, obedient
32
33 88 and healthy (King et al 2009). Owner characteristics relevant to decision-making have not
34
35 89 been fully investigated, and may include sociodemographic factors (e.g. income, level of
36
37 90 education, marital status), social influences (e.g. current breed popularity, celebrity
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39 91 endorsement) and historical influences (e.g. previous dog ownership, childhood dog
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41 92 ownership). External factors, such as access to breed health information may also influence
42
43 93 decisions. The processes by which decisions are made during the acquisition of a companion
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45 94 animal are likely to be important at both an individual level (e.g. the health of the dog
46
47 95 acquired) and at a population level (e.g. which types of dog and health characteristics are 'in
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49 96 demand'). Understanding this process may allow prospective owners to be better targeted
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51 97 with information, thus improving matching between households and their companion animals
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53 98 and allowing alternative, potentially healthier, breed choices to be promoted.
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3 100 This research aimed to explore differences in owner characteristics, motivations for
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5 101 acquisition and pre-, during and post-purchase behaviours and attitudes between owners of
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7 102 BC and non-brachycephalic (non-BC) breeds within the 10 most popular KC registered
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9 103 pedigrees of 2014 (The Kennel Club 2016a).
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13 14 105 **Methods**

15 16 106 17 18 107 *Questionnaire design and dissemination*

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23 109 The questionnaire was designed iteratively amongst the authors (and a small number of pilot
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25 110 respondents) to ensure ease of understanding and comprehensiveness of scope. In general,
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27 111 sections included:

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30 112 1. General owner demographics: e.g. gender; age; children; house type; income and
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32 113 education level; first time dog owner; first time breed owner;
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34 114 2. General information on their dog: e.g. signalment; age at acquisition;
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36 115 3. Pre-purchase motivations: e.g. factors that influenced purchase/acquisition of their
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38 116 specific breed (dog appearance; breed popularity; previous breed experience; celebrity
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40 117 endorsement; companionship; cost);
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42 118 4. Pre-purchase knowledge and behaviours: e.g. Research conducted on their breed of
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44 119 choice prior to acquisition; amount of time spent considering acquisition of their dog;
 - 45
46 120 5. Acquisition behaviours: e.g. where and how their dog was acquired; which parents of
47
48 121 their puppy were seen (if any); requests for health records;
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50 122 6. Post-purchase attitudes: e.g. Things they would change about the acquisition of their
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52 123 dog if they could go back in time; whether they would recommend their breed;
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54 124 whether they plan to breed from their dog
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6 126 ***Participants***7
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11 128 Owners of the top ten KC registered pedigrees of 2014 (1. Labrador Retriever; 2 Cocker
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13 129 Spaniel; 3 English Springer Spaniel; 4 French Bulldog; 5 Pug; 6. German Shepherd Dog; 7
14
15 130 Golden Retriever; 8 Border Terrier; 9 Bulldog; 10 Miniature Schnauzer) were purposively
16
17 131 sampled via online forums and social media platforms as well as KC breed health
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19 132 coordinators. An explanatory letter was also sent to the administrators of dog-related social
20
21 133 media sites seeking permission to engage their online users. Following granting of permission
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23 134 potential respondents were provided with a link to an online questionnaire hosted on
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25 135 SurveyMonkey© (www.surveymonkey.com).

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33 137 All participants were required to live in the UK, be 18 years of age or older and own one of
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35 138 the eligible breeds. Respondents were informed of the aims of the project and that submission
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37 139 of the survey would implicitly consent to the usage of their data for research purposes.
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39 140 Respondents with more than one dog fitting the inclusion criteria were requested to answer
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41 141 the survey in regard to the one most recently acquired. This survey was approved by the
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43 142 Royal (Dick) School of Veterinary Studies Student Survey Overview Group.

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49 144 ***Statistical analyses***50
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53 146 Data analyses were carried out in IBM SPSS Statistics v21 (SPSS Inc, Chicago, IL, USA). Of
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55 147 the 10 targeted breeds, three were characterised as BC (French Bulldog, Pug and Bulldog),
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57 148 with the other seven being non-BC. Associations between breed-type (BC vs. non-BC) and

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3 149 variables related to respondent demographics, pre-purchasing, purchasing and post-
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5 150 purchasing behaviour were explored using Chi-squared tests for categorical variables and
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7 151 Mann-Whitney U tests for non-normally distributed continuous data (with data distribution
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9 152 ascertained by visual inspection of histograms) or ordinal data (e.g. how influential a factor
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11 153 was in the decision to choose a breed on a scale of 0-4). Correction factors were used to
12
13 154 control for Type I errors introduced by multiple univariate comparisons. For this, the False
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15 155 Discovery Rate (FDR) (Benjamini & Hochberg 1995) set at 0.05 was used to take into
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17 156 account the number of statistical tests performed in the univariate analyses, and all p values
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19 157 are presented in their raw form and FDR-corrected forms. A binary logistic regression model
20
21 158 was used to determine which factors were most influential in the purchase of BC vs. non-BC
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23 159 dogs (binary outcome measure). Factors with liberal associations in univariable tests ($P < 0.2$)
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25 160 were taken forward for multivariable evaluation. Model development used backwards
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27 161 stepwise elimination and the Hosmer-Lemeshow test statistic was used to evaluate model fit.
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34 163 **Results**

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38 165 Data were collected between June and July 2015. The survey received 1910 responses, of
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40 166 which 1427 responses were complete and valid for inclusion. Between one and two hundred
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42 167 responses were received for each breed: Labrador Retriever (LR, $n = 156$), Cocker Spaniel
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44 168 (CS, $n = 199$), English Springer Spaniel (ESS, $n = 200$), French Bulldog (FB, $n = 143$), Pug
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46 169 (P, $n = 127$), German Shepherd Dog (GSD, $n = 115$), Golden Retriever (GR, $n = 110$), Border
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48 170 Terrier (BT, $n = 146$), Bulldog (B, $n = 114$) and Miniature Schnauzer (MS, $n = 117$). Based
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50 171 on breed (FB, B, P), around one quarter ($N = 384/1427$; 26.9%) of dogs in the sample were
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52 172 classed as BC with the remainder being non-BC.
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3 174 ***Canine demographics***
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7 176 Over half of all dogs were male (56.9%) and the most common age was 2-4 years (38.3%)
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9 177 followed by 1 year or less (26.7%). There was no association between sex of the dog and
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11 178 skull shape ($P = 0.972$; P -adjusted = 0.972); however, there was an association between the
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13 179 age of the dog and skull shape, with BC dogs younger than non-BC dogs e.g. 33.1% of BCs
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15 180 were 1 year or less vs. 24.4% of non-BCs ($X^2 = 38.54$, $P < 0.001$; P -adjusted < 0.001) (Table
16
17 181 1). The majority of dogs were neutered (43.5%) with a further 18.0% planned to be neutered
18
19 182 in the future. A higher proportion of BC dogs were entire compared to non-BC dogs (49.8%
20
21 183 vs. 34.2% respectively, $X^2 = 41.11$, $P < 0.001$; P -adjusted < 0.001). BC dogs had been owned
22
23 184 for a significantly shorter length of time than non-BC dogs (BC median: 21 months; 25th-
24
25 185 75th percentile: 10.0 - 33.6 months; non-BC median: 24 months; 25th-75th percentile: 10.0-
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27 186 58.0 months; $MW = 194135.5$, $P < 0.001$, P -adjusted < 0.001)
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37 190 ***Respondent demographics***
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41 192 The majority of respondents were female (88.5%), with no difference in sex distribution
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43 193 between respondents for BC and non-BC breeds ($P = 0.148$; P -adjusted = 0.187). The most
44
45 194 common age group of respondents was 45-54 years (29.1%) followed by 35-44 (24.1%) and
46
47 195 25-34 (18.4%). Those with BC dogs were significantly younger than those with non-BC
48
49 196 breeds, respondents aged 18-24 comprised 13.3% and 5.2% of the BC and non-BC group
50
51 197 respectively, and likewise 25-34 years of age was 27.9% and 15.0% ($X^2 = 93.70$; $P < 0.001$ P -
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53 198 adjusted = 0.0027). Of the respondents, 84.3% had attended higher education, with 15.3%
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55 199 attending secondary education, with no difference between BC and non-BC groups ($P =$
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3 200 0.311; P -adjusted = 0.373). The most common household income bracket was £35,000-
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5 201 £49,999 (21.0%), followed by less than £25,000 (17.0%) and £50,000-£74,999 (16.4%),
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7 202 again with no difference in income between BC and non-BC groups ($P = 0.450$; P -adjusted =
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9 203 0.511). The majority of respondents lived in a house (92.0%) vs. only 7.8% in a
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11 204 flat/apartment, with the BC group more likely to live in a flat/apartment (BC = 15.6% vs.
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13 205 non-BC = 5.0%; $X^2 = 44.55$; $P < 0.001$; P -adjusted = 0.0027). Children did not live in the
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15 206 majority of respondents' homes (71.3%), with BC owners more likely to live with children
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17 207 when compared to the non-BC group (BC = 34.6% vs. Non-BC = 26.6%; $X^2 = 8.94$; $P = 0.003$;
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19 208 P -adjusted = 0.0069).
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25 210 Over three quarters of respondents (77.3%) had owned a dog before, with 22.6% being first
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27 211 time dog owners. Around half of respondents (51.8%) had not previously owned the breed of
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29 212 dog for which they were answering. After FDR-correction, there was no difference in the
30
31 213 proportion of BC vs. non-BC groups that were first time dog owners (BC = 26.0% vs. non-
32
33 214 BC = 21.4%; $X^2 = 6.29$; $P = 0.043$; P -adjusted = 0.0712); however, respondents in the BC
34
35 215 group were more likely to be owning that breed for the first time (BC = 64.8% vs. non-BC =
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37 216 47.0%; $X^2 = 37.05$; $P < 0.001$; P -adjusted=0.0027).
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218 *Pre-purchase behaviour*

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220 The majority of respondents stated that they had carried out some pre-purchase research
221 before acquiring their dog (84.3%); however 15.7% (n = 207) admitted that they had carried
222 out no research. Of the respondents who stated they were first time dog owners (n = 398),
223 there was no difference in the proportion carrying out pre-purchase research between the BC
224 and non-BC groups (94.9% vs. 92.0%; $P = 0.342$, P -adjusted = 0.400). The majority of the

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3 225 sample strongly disagreed that their dog was an ‘impulse’ purchase (74.3%) and that they
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5 226 should have spent more time considering their purchase (72.5%). Likewise, most reported
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7 227 that they had thought about getting their dog for a long time (56.5%). None of the responses
8
9 228 to these questions differed between BC and non-BC groups (Table 2). Most respondents
10
11 229 strongly agreed that they had spent an appropriate amount of time considering the purchase of
12
13 230 their pet (61.4%), with more respondents strongly agreeing within the BC group as compared
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15 231 to the non-BC group (67.1% vs. 59.3%; $P = 0.004$).
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23 [Table 2]

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235 Respondents rated fifteen factors on a scale of 0-4 (from 0= no influence, to 4= heavily
26
27 236 influenced) depending upon how much they influenced the purchase/acquisition of their
28
29 237 breed of dog. The highest scoring factor in the overall population was ‘good companion
30
31 238 breed’ (median = 4 (2-4); Table 3), followed by ‘the size of the breed suited to lifestyle’ (3
32
33 239 (3-4)), appearance (3 (3-4)) and ‘good dog breed for children’ (3 (0-4)). Eleven of the fifteen
34
35 240 factors differed in how influential they were in decision-making between BC and non-BC
36
37 241 groups (Table 3), for example, appearance was rated as more influential in choosing a BC
38
39 242 breed than a non-BC one (and the joint highest most influential factor in acquiring a BC
40
41 243 breed) ($P < 0.001$; P -adjusted < 0.001), whereas the perception of the breed being ‘generally
42
43 244 healthy’, or ‘with a long life expectancy’ was less influential for BC breeds compared with
44
45 245 those that are non-BC ($P < 0.001$; P -adjusted < 0.001). Exercise encouragement ($P < 0.001$;
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47 246 P -adjusted = 0.00) and working ability ($P < 0.001$; P -adjusted < 0.001) were comparatively
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49 247 more influential in the choice of non-BC, as opposed to BC, breeds.
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249 [Table 3]

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

262

263 [Table 4]

264

265 *Purchasing behaviour*

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267 The median (25th-75th percentile) age (months) at acquisition was 2.25 months (2-3). A
268 minority of dogs (n=24, 1.7%) were acquired while under the legal age of eight weeks. The
269 median cost at purchase was £600 (£400-£900). BC dogs were significantly more expensive
270 to purchase than non-BC dogs (BC median= £1200 (£1000-£1800) vs. non-BC £500 (£350-
271 £700); $U = 15044.5$; $P < 0.001$; P -adjusted = 0.0027). The most common source of
272 acquisition was from a KC registered breeder, with 41.6% from KC non-Assured Breeders
273 and 13.5% from KC Assured Breeders (Table 5). There was no significant association
274 between the source of the dog and skull type ($X^2 = 12.50$; $P = 0.052$; P -adjusted = 0.08).

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5 276 [Table 5]6
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9 278 Of the 1065 dogs acquired from a breeder, the most common way of hearing of the breeder
10 279 was via a puppy selling website (Champdogs, Epupz or Pets4Homes, 27.2%), followed by
11 280 the Kennel Club website (22.2%) and recommendations from family/friends (18.5%). There
12 281 was a significant association between where the respondent heard of the breeder and the skull
13 282 type of the dog they bought, with BC dog buyers more likely to find breeders from puppy
14 283 websites (BC = 35.7% vs. Non-BC = 23.8%) or selling sites (BC = 5.8% vs. Non-BC = 2.6%)
15 284 ($\chi^2 = 57.90$; $P < 0.001$; P -adjusted = 0.0027) (Figure 1).

16 285

17 286 [Figure 1]

18 287

19 288 The majority of owners met the breeder at their home or kennels (97.2%) with a minority
20 289 meeting at their own home (1.2%) or at a dog show/event (0.6%). A small number of owners
21 290 did not meet the breeder of their dog ($n = 4$, 0.4%) and a further 0.6% of owners met the
22 291 breeder at the following locations: a car park ($n = 2$), an airport ($n = 2$), or at their vet practice
23 292 ($n = 2$). Following FDR correction, there was no difference in where the owners met the
24 293 breeder between BC and non-BC dogs (BC = 95.2% vs. non-BC = 98.0%; $\chi^2 = 9.69$; $P = 0.046$;
25 294 P -adjusted = 0.0736).

26 295

27 296 Half of owners met only the mother of their dog (47.1%), 0.5% met only the father, and 44.3%
28 297 met both the mother and father. A minority of owners saw neither parent of their dog ($n = 72$;
29 298 6.8%). Owners of BC dogs were more likely to see neither parent than non-BC dogs (BC =
30 299 12.3% vs. non-BC = 4.8%; $\chi^2 = 26.95$; $P < 0.001$; P -adjusted = 0.0027). The majority of

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3 300 owners only visited the breeder they purchased their dog from (90.6%), with half of owners
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5 301 visiting that breeder on more than one occasion in addition to the purchasing visit (48.9%),
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7 302 one quarter only once in addition to the purchasing visit (26.4%), and one quarter only
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9 303 visiting to purchase the dog (24.7%). There was no difference between BC and non-BC
10
11 304 respondents in whether they visited more than one breeder ($P = 0.671$, P -adjusted = 0.7002);
12
13 305 however, BC dogs were more likely to be purchased during the first and only visit (BC = 32.4%
14
15 306 vs. non-BC = 21.7%; $X^2 = 12.90$; $P = 0.002$; P -adjusted = 0.0048) whilst non-BC dogs were
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17 307 more likely to be purchased after one or more additional visits.
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22
23 309 The majority of respondents did not join a waiting list to buy their dog (88.2%), and less than
24
25 310 half of respondents purchased from breeders who had a lifetime returns policy (44.4%).
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27 311 There was no difference between skull type groups for either of these pre-purchase elements
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29 312 (waiting list: $P = 0.123$; P -adjusted = 0.164; return policy: $P = 0.573$; P -adjusted = 0.625).
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34 314 Nearly half (46.1%) of all owners did not ask to see health records for either the sire or
35
36 315 dam, although they were available in over half of all dogs purchased (56.4%). Significantly,
37
38 316 BC dog purchasers were less likely to ask to see the health records of both parents (Table 6;
39
40 317 $P = 0.002$; P -adjusted = 0.005) and less likely to have records for available for perusal when
41
42 318 they did ask ($P < 0.001$; P -adjusted = 0.003) when compared to non-BC purchasers. A large
43
44 319 proportion of owners were not sure if the parents of their dog had undergone either genetic
45
46 320 (43.3%) or other health tests (63.6%). Respondents for BC breeds were comparatively less
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48 321 likely to know whether their dogs parents had undergone any genetic tests than non-BC
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50 322 respondents ($P = 0.006$; P -adjusted = 0.012). Following FDR-correction there was no
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52 323 significant difference between BC and non-BC groups as to whether respondents knew if
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3 324 their dog's parents had undergone any other (non-genetic) health testing ($P = 0.043$; P -
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5 325 adjusted = 0.0712) (Table 6).
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9 327 [Table 6]
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12 13 329 ***Post purchase attitudes***

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18 331 The majority of respondents would recommend their breed to a friend or family member
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20 332 (96.5%) and reported they would not do anything differently if they could reverse time
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22 333 (84.3%). There were no differences in attitude between BC and non-BC owners for the
23
24 334 former ($X^2 = 0.55$; $P = 0.458$, P -adjusted = 0.5133) or, following FDR-correction, the latter
25
26 335 (19.5% vs. 14.3%; $X^2 = 4.60$; $P = 0.032$; P -adjusted = 0.0569). For those owners who would
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28 336 behave differently in the pre-purchase phase ($n = 224$; 15.7%), the most common reason was
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30 337 to change where they acquired their dog ($n = 88$; 39.1%), followed by level of pre-purchase
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32 338 research ($n = 79$; 35.2%), the age of their dog when they acquired them ($n = 23$; 10.1%), the
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34 339 breed of dog they bought ($n = 20$; 8.9%), and when they acquired their dog ($n = 15$; 6.7%).
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36 340 There was no difference between BC and non-BC dog owners in these reasons ($X^2 = 2.14$; $P =$
37
38 341 0.711; P -adjusted = 0.7261). Around one tenth of dogs were planned to be bred from in the
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40 342 future (11.6%), which was significantly higher in BC dogs (17.2%) compared to non-BC
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42 343 dogs (9.6%; $X^2 = 22.29$; $P < 0.001$; P -adjusted < 0.001).
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48 49 345 **Discussion**

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53 347 Brachycephalic dogs have dramatically increasing in popularity in the UK, and our study has
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55 348 characterised aspects of why and how people acquire these breeds. Identifying factors that
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57 349 impact upon the breed choice of buyers, such as those highlighted in this study, may allow for
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3 350 more targeted educational interventions during the decision-making process; however, these
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5 351 data also suggest that such interventions may not have the desired impact. Despite the recent
6
7 352 increase in scientific knowledge of the health consequences of BC conformations (e.g. Packer
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9 353 et al. 2015a/b), several high-profile scientific reports (e.g. Bateson 2010, Rooney and Sargan
10
11 354 2010) widespread media coverage, and educational resources for prospective puppy buyers
12
13 355 (e.g. UFAW 2016), purchasers of BC dogs appear to still prioritise appearance over both
14
15 356 health and longevity. A previous study of veterinary attitudes towards tackling inherited
16
17 357 disorders in pedigree dogs found that one of the most common suggestions to decrease
18
19 358 disorder prevalence was to educate the public or buyers (Farrow et al. 2014). It appears that
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21 359 improvements in BC dog welfare are unlikely to result solely from the provision of public
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23 360 information or from allowing market forces to dictate desirable features in BC dogs. As such,
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25 361 focusing efforts on both the supply and demand sides of this equation may result in greater
26
27 362 improvements in canine health. In this regard, altering the supply of BC dogs in line with
28
29 363 health will require fundamental changes to reduce the prevalence of conformation-related
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31 364 disorders. Firstly by altering conformation (which may in part be facilitated by the revision of
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33 365 breed standards by kennel clubs) and, secondly, changing breeding practices (including the
34
35 366 development and mandatory implementation of health testing of relevant disorders, and
36
37 367 potentially outcrossing to achieve healthier body shapes). If kennel clubs and BC breeders are
38
39 368 unwilling to make such changes, and to ensure that BC breeders operating outside of kennel
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41 369 club registration systems are included in any changes, legislation may be the only mechanism
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43 370 to circumvent those purchaser decisions which lie at odds with improvements to BC dog
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45 371 welfare.
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373 **Who buys a brachycephalic dog and why?**

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3 375 Respondents to our survey who owned BC breeds were commonly found to be younger,
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5 376 buying their chosen breed for the first time and had no history of childhood ownership.
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7 377 Although it is unclear as to why this effect occurs, and further research is required, it may
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9 378 reflect increased media influence among younger age groups which, in turn, contributes to
10
11 379 the popularity of certain breeds (e.g. their use in advertisement). The media has been
12
13 380 identified as a stakeholder with a role to play in improving pedigree dog welfare (Rooney &
14
15 381 Sargan, 2010), and moderating the use of BC dogs in the media has been highlighted as a
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17 382 way of mitigating the current high demand for these breeds. In our sample, BC dogs were
18
19 383 significantly younger than their non-BC counterparts; recent increases in breed popularity
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21 384 may function to drive down the median age of the BC cohort.
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27 386 Owners of BC breeds were more likely to be living with children at the time of the survey. It
28
29 387 should be noted that responses only identified if people currently lived with one or more child,
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31 388 not whether they had independent adult children. However, BC owners were also more likely
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33 389 than non-BC owners to consider ‘being good with children’ as an influential factor in their
34
35 390 purchasing decision. Why owners may perceive BC dogs to be good with children requires
36
37 391 further exploration; however, factors such as their small size and ‘cute’ neotenous looks
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39 392 (large, round, wide-set eyes and rounded faces; Lorenz, 1971) may be influential. In addition,
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41 393 owner’s expectations of the behaviour of BC breeds are likely to influence perceptions of
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43 394 suitability with children, and indeed, as an ‘overall good companion breed’, another factor
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45 395 identified here as influencing BC ownership. The breed standards of the three BC breeds
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47 396 explored here suggest that breeders are selecting for an “affectionate nature” in the Bulldog
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49 397 (The Kennel Club, 2016b), a “deeply affectionate” temperament in the French Bulldog (The
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51 398 Kennel Club, 2016c), and an “even-tempered, happy” predisposition in the Pug (The Kennel
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53 399 Club, 2016d). These traits point towards a dog that has a positive and close relationship with
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3 400 their owners and is primarily a companion dog. Indeed, desire for a dog with working ability
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5 401 was negatively associated with BC ownership. This is unsurprising for the Pug and French
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7 402 Bulldog breeds particularly, who have historically been selected for a temperament that
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9 403 suited a ‘lap-dog’ role (Noller et al, 2008). Respondents owning BC breeds were also more
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11 404 likely to live in apartments than their counterparts, reflective of the size of a dog being an
12
13 405 important factor in breed choice. Evidence that shorter and smaller breeds have become
14
15 406 relatively popular in Australia supports the concept that people attempt to purchase dogs that
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17 407 can fit their lifestyle niche (Teng et al, 2016). Identifying and promoting breeds with fewer
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19 408 health conditions that fit behavioural, lifestyle and trait niches could ensure that owners are
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21 409 aware that a wide variety of dogs can fulfil their needs without the concomitant health
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23 410 implications associated with a particular breed.
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29 412 Appearance was considered highly influential in breed selection for BC dogs. Although their
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31 413 conformation may have driven their popularity, breeding for this appearance poses two
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33 414 problems. Firstly, selecting for an extreme brachycephalic appearance runs counter to dog
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35 415 welfare due to its association with conformation-related inherited diseases. Secondly, by
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37 416 prioritising appearance, insufficient selection pressure may be exerted on some traits that
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39 417 would improve animal welfare (McGreevy and Nicholas, 1999). Concerns have been
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41 418 expressed that while it is still common practice to describe “genetically disabled” and
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43 419 “deformed” pets as cute, progress toward functional and healthy animals is likely be difficult
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45 420 (Ott, 1996). Increasing consumer awareness that the appearance of BC breeds is linked with a
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47 421 high risk of welfare-compromising disorders remains a priority of many animal welfare
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49 422 charities. For example, the RSPCA initiated a campaign ‘Bred for Looks - Born to Suffer’,
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51 423 which sought an end to the breeding of dogs based on looks (RSPCA, 2013). Our data
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3 424 suggests that, despite such actions, the purchasing of BC breeds remains predicated largely
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5 425 on appearance, likely at the expense of health and welfare.
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10 427 A desire for a dog that encourages exercise was negatively associated with BC dog ownership.

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12 428 Owners of BC breeds may perceive them to be ‘low maintenance’ with regards to exercise.

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14 429 However, it is hard to separate reduced exercise requirement from reduced ability to exercise.

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16 430 A large proportion of BC dogs may be unable to engage in normal levels of activity due to

17
18 431 the inherent respiratory difficulties (Packer et al 2015, Liu et al 2016). BOAS, a chronic

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20 432 respiratory disorder is prevalent in the three BC breeds explored here, with exercise

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22 433 intolerance one of the key clinical signs of BOAS. This suggests that some companion animal

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24 434 breeds have effectively become ‘handicapped’ by selection for appearance traits that appeal

25
26 435 to our anthropomorphic perceptions (Serpell, 2002). Here it appears that BC dogs may have

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28 436 also become ‘handicapped’ by humans selecting for (or not strongly selecting against) a

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30 437 disease trait that results in a dog that fits a human lifestyle choice, but is not conducive to

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32 438 good welfare.
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37 440 In contrast to BC owners, non-BC dog owners were more highly influenced by a breed being

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39 441 perceived to be ‘generally healthy’. This may coincide with their desire for a dog with good

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41 442 working ability that provides exercise encouragement, both of which would may limited in

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43 443 BC breeds. Recent studies indicate that breeds with more inherited disorders have become

44
45 444 more (rather than less) popular, suggesting that health considerations have been secondary in

46
47 445 the decision to acquire dogs (Ghirlanda et al. 2013). In a systematic review of inherited

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49 446 diseases in the dog, the Pug and Bulldog were affected by more disorders related to their

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51 447 body shape (16 each) compared with the seven non-BC breeds studied here (affected by a

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53 448 median of 9 (range: 3-15) (Asher et al. 2009). For reform to occur in the health of BC breeds,
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3 449 owners must be aware they are consumers, and their choices affect dogs at a breed health
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5 450 level, as well as individual dog level. If owners are not motivated to buy a healthy individual
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7 451 within a breed, inherent health problems within breeds will be perpetuated, and the
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9 452 motivation of breeders to tackle health problems in their breed lowered. In the absence of
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11 453 such motivations it is important that stakeholders consider direct mechanisms to improve
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13 454 breed health which are not subject to consumer demands.
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456 **Purchasing a dog**

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458 Respondents that owned BC dogs were less likely to follow recommended processes (e.g.
459 those embedded within the Puppy Information Pack for the BVA AWF & RSPCA Puppy
460 Contract) when purchasing their dog. They were more likely to use puppy-selling websites,
461 less likely to see either parent of their puppy, and less likely to ask for any health records.
462 Despite few owners explicitly admitting to purchasing their dog on impulse, BC dogs were
463 more likely to be purchased during the first and only visit to their breeder. Despite media
464 campaigns such as “Where’s Mum” (Pup Aid, 2016) that promote buyers seeing their puppy
465 with its mother (to avoid purchasing from puppy farms), more than 1 in 10 BC owners
466 (12.3%) saw neither of their dog’s parents, compared to 1 in 20 non-BC owners (4.8%), thus
467 potentially perpetuating the unethical breeding of these dogs.

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469 The lack of requests to see health records from BC owners may reduce the priority placed on
470 health by BC breeders, by reducing demand for healthy, tested dogs. The development and
471 mandatory implementation of health testing in BC breeds may go some way to improve
472 health, for example functional respiratory tests introduced by the German Pug Club
473 (Deutscher Mopsclub) (Bartels et al. 2015). However, while market forces of supply and

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3 474 demand are not being effectively applied to canine health breed health is unlikely to improve
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5 475 substantially unless breeders are intrinsically motivated to carry out health testing themselves.
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9 477 *Post purchase attitudes*
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14 479 In general the vast majority of the respondents to the survey were content with the breed they
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16 480 had purchased, with relatively few citing any regrets about their dog. Most of those
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18 481 expressing reservations did so in relation to the manner in which they purchased their dog,
19
20 482 perhaps reinforcing the need to target prospective owners with pre-purchasing guidelines. It
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22 483 is of value to consider that the current study is only a snapshot of the owners' and their dogs'
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24 484 lives. Post-purchase questions can only be answered relative to the experiences of the
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26 485 respondents so far. With a median age of 20 months, the BC dogs in this population were still
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28 486 relatively young and thus their lifetime conformation-related disease burden may not yet be
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30 487 realised; for example, the mean age at which BC dogs are presented to vets for treatment of
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32 488 BOAS is 3-4 years of age (Monnet 2008). The emotional and financial burden of owning a
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34 489 dog with conformation-related disorders may have an impact upon an owner's perception of
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36 490 the breed, and future longitudinal studies, studies of owners with older BC dogs, or studies of
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38 491 people who have owned BC dogs in the past may provide insights into whether and how their
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40 492 perceptions of BC dogs change as a result of experience.
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47 494 Our data identified that BC owners were less likely to have neutered their dog, and more
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49 495 likely to be planning to breed from their dog in the future. This is of concern, as increased
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51 496 breeding by younger, first time owners could function to proliferate breed-related issues if
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53 497 they are unaware of the health issues associated with their breed, and how to reduce the risk
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55 498 of them occurring.
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5 500 As with all self-selected survey samples there are limitations to the data gathered. It is not
6
7 501 possible to establish a non-response bias or identify from which forum the majority of
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9 502 respondents accessed the survey. What can be identified is a substantial response bias
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11 503 towards women and those individuals with a higher education. A female response bias to
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13 504 surveys is relatively common (Sax et al. 2003) confounded by the possibility that animal-
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15 505 based interests and occupations may also have greater proportion of women within
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17 506 them. The use of special interest forums may have predisposed the sampling to more
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19 507 educated individuals, although this demographic is generally more likely to respond to
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21 508 surveys (Goyder et al., 2002). Notwithstanding the limitations on the data gathered, and the
22
23 509 associated need for some caution in interpreting the results, this research provides novel data
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25 510 in an area of welfare-concern which is otherwise lacking.
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32 **Animal welfare implications**

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36 514 The motivations for the purchasing of dogs and processes by which this is implemented have
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38 515 clear implications for the welfare of current and future generations of dogs. All popular
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40 516 pedigree dog breeds have been found to experience some breed-related health issues and,
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42 517 within this, BC breeds experience some of the most chronic and severe issues. This research
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44 518 improves our understanding of pre-purchase behaviour and motivations for these high-risk
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46 519 breeds, and may allow prospective owners who wish to purchase a BC dog to be counselled
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48 520 more effectively on healthier alternatives, and where that is not possible, to make responsible
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50 521 purchasing choices of BC dogs that drive improvements in breed health rather than
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52 522 perpetuating problems. However, these data may also indicate that breed-related health
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54 523 information alone may not be sufficient to make significant impacts on responsible breed
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3 524 selection, with appearance still prioritised over health and longevity. If education strategies
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5 525 are ineffective at reducing demand for BC breeds in the long-term, other more direct
6
7 526 strategies controlling the supply of these breeds may be required to protect canine welfare.
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10 527

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12 529

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17
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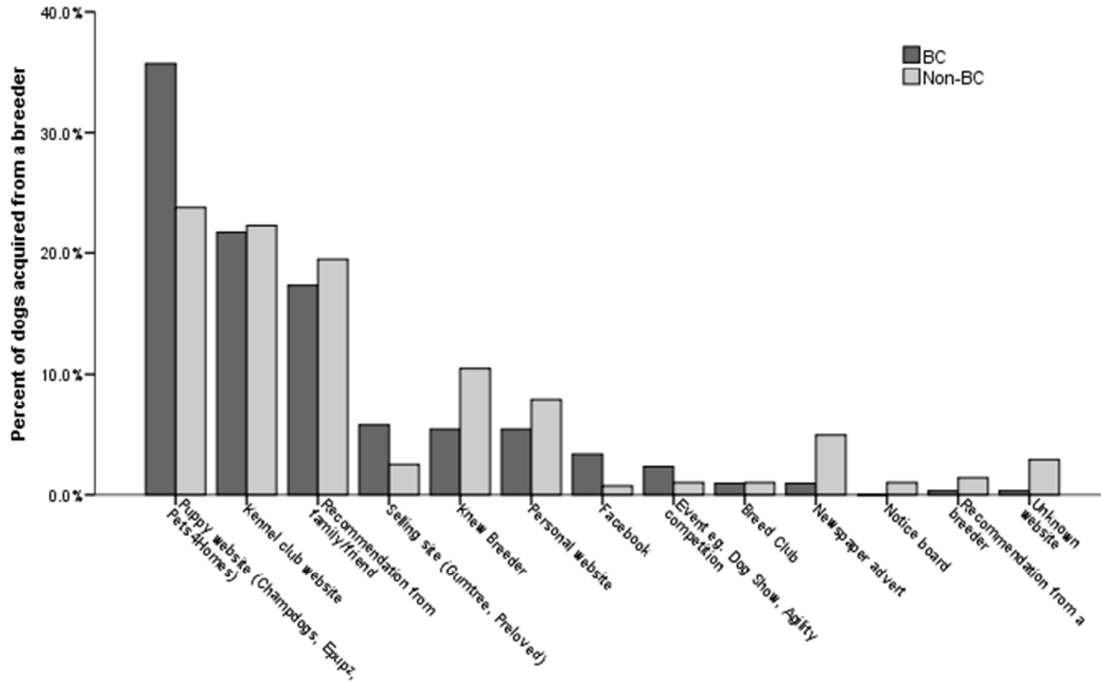
10 670 **UFAW** 2016 Genetic Welfare Problems of Companion Animals. Available from:

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12 671 <http://www.ufaw.org.uk/genetic-welfare-problems-intro/genetic-welfare-problems-of->

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For Review Only



Where did you hear of the breeder?

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)

Variable	Sub-category	Brachycephalic (n=384)	Non-brachycephalic (n=1043)
Breed	Border Terrier (n = 146)	0.0%	14.0%
	Bulldog (n = 114)	29.7%	0.0%
	Cocker Spaniel (n = 199)	0.0%	19.1%
	English Springer Spaniel (n = 200)	0.0%	19.2%
	French Bulldog (n = 143)	37.2%	0.0%
	German Shepherd Dog (n = 115)	0.0%	11.0%
	Golden Retriever (n = 110)	0.0%	10.5%
	Labrador Retriever (n = 156)	0.0%	15.0%
	Miniature Schnauzer (n = 117)	0.0%	11.2%
	Pug (n = 127)	33.1%	0.0%
Age	1 year or less	33.1%	24.4%
	2-4 years	40.6%	37.5%
	5-7 years	13.3%	18.5%
	8 years or more	4.9%	14.5%
	Unknown	8.1%	5.2%
Sex	Female	43.2%	43.1%
	Male	56.8%	56.9%
Neuter	No	49.8%	34.2%
	No, but I plan to	22.6%	16.3%
	Yes	17.5%	49.5%

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Table 2 Owners perception (% within category) of their pre-purchase behaviour overall and in relation to owners of BC and non-BC breeds.

Question	Breed type	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	X^2	P	P -adjusted
My dog was an impulse purchase	Overall	74.3	16.1	4.8	3.3	1.5	8.89	0.064	0.096
	BC	73.1	14.2	7.5	3.8	1.4			
	Non-BC	74.7	16.8	3.8	3.2	1.6			
I thought about getting my dog for a long time	Overall	4.8	4.7	7.1	26.9	56.5	8.17	0.085	0.1179
	BC	4.0	2.9	6.0	24.9	62.2			
	Non-BC	5.1	5.3	7.5	27.6	54.4			
I should have spent more time considering the purchase of my pet	Overall	72.5	17.4	7.0	1.9	1.2	2.72	0.605	0.6453
	BC	69.6	18.8	7.5	2.6	1.4			
	Non-BC	73.5	16.9	6.9	1.7	1.1			
I think I spent an appropriate amount of time considering the purchase of my pet.	Overall	3.8	1.4	6.9	26.6	61.4	15.5	0.004	0.0083
	BC	4.6	2.0	7.4	18.9	67.1			
	Non-BC	3.6	1.2	6.6	29.4	59.3			

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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

Factor	Overall	BC	Non-BC	U	P	P-adjusted
Appearance	3 (3-4)	4 (3-4)	3 (3-4)	125511.0	<0.001	<0.001
Popularity of the breed	1 (0-2)	0 (0-1)	1 (0-2)	180982.5	0.004	0.008
Childhood experiences	0 (0-2)	0 (0-1)	0 (0-3)	199178.5	<0.001	<0.001
Good dog breed for children	3 (0-4)	3 (0-4)	3 (0-4)	145186.0	<0.001	<0.001
Good companion breed	4 (2-4)	4 (3-4)	4 (3-4)	144060.0	<0.001	<0.001
Working ability	0 (0-2)	0 (0-0)	1 (0-3)	236428.0	<0.001	<0.001
Exercise encouragement	3 (1-3)	1 (0-2)	3 (2-4)	250002.5	<0.001	<0.001
Cost	0 (0-2)	0 (0-1)	0 (0-2)	169743.5	0.147	0.187
Generally healthy breed	2 (1-3)	1 (0-2)	3 (2-3)	234561.0	<0.001	<0.001
Long life expectancy	2 (1-3)	1 (0-2)	2 (1-3)	213949.5	<0.001	<0.001
Breed size suited to lifestyle	3 (3-4)	3 (3-4)	3 (3-4)	155079.5	0.027	0.049
This breed is easy to take care of	2 (1-3)	2 (0-3)	2 (1-3)	176236.0	0.025	0.048
Recommended by a friend/family member	0 (0-2)	0 (0-2)	0 (0-2)	175181.0	0.086	0.118
Recommended by a veterinary professional	0 (0-1)	0 (0-1)	0 (0-1)	168896.0	0.300	0.369
Celebrity endorsement/ownership	0 (0-0)	0 (0-0)	0 (0-0)	159813.5	0.074	0.108

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.

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

Table 5 Origins of dogs in the study population

Source of dog	N	%
Breeder: Kennel Club Registered Breeder (non-ABS)	593	41.6
Breeder: Kennel Club Assured Breeder (ABS) Scheme	192	13.5
Not stated	173	12.1
Breeder: Non-Kennel Club Registered Breeder	168	11.8
Rehoming centre	170	11.9
Breeder: Unknown type	112	7.8
Bred their own dog	11	0.8
Pet shop	8	0.6

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2 Table 6 Responses (% total) to questions regarding pre-purchasing behaviour by
3 brachycephalic (BC; n = 384) and non-brachycephalic (non-BC; n = 1043) breed owners.
4 Breeds used were the 10 most popular breeds according to The Kennel Club's 2014 statistics
5 (BC = 3; non-BC = 7).
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Question	Answer	Overall	BC	Non-BC	X ²	P	P-adjusted
Did you ask to see health records of the mother and father of your dog?	No	46.1	47.2	45.7	15.16	0.002	0.0048
	Father only	0.4	1.0	0.1			
	Mother only	6.7	10.3	5.2			
	Mother and Father	46.8	41.4	48.9			
Were health records available for the mother and father of your dog?	No	6.8	10.5	5.4	24.30	<0.001	0.0027
	I don't know	28.9	28.9	28.9			
	Father only	0.5	1.0	0.3			
	Mother only	7.4	11.5	5.8			
	Mother and Father	56.4	48.1	59.6			
Had the parents undergone any genetic testing before breeding?	No	8.1	6.3	8.7	16.19	0.006	0.012
	I don't know	43.3	47.0	41.8			
	I don't think there are any genetic tests for this breed	2.0	0.7	2.6			
	Father only	2.5	4.9	1.6			
	Mother only	1.6	1.7	1.5			
Had the parents undergone any other health tests (e.g. X-rays) prior to breeding?	Mother and Father	42.6	39.4	43.8	6.28	0.043	0.0712
	Yes	25.5	20.3	27.5			
	No	10.9	10.3	11.1			
	I don't know	63.6	69.4	61.4			

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