Perceptions of dog breeding practices, breeding dog welfare and companion dog acquisition in a self-selected sample of Australian adults

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Abstract

Welfare considerations surrounding dog (Canis familiaris) breeding practices are contentious in some sectors of the community. However, public perceptions surrounding dog breeding practices are poorly understood. The aims of this study were to describe perceptions of dog breeding and associated welfare concerns held by members of the general public and identify whether factors exist that potentially predict these perceptions. Australian residents (n = 986) completed an online questionnaire investigating their perceptions of, and attitudes towards, companion dog breeding and other acquisition methods. Participants predominantly indicated that breeding dog welfare was important, that dog breeding should be regulated, and that tougher laws are necessary to improve breeding dog welfare. Furthermore, three groups of respondents were identified: those who supported breeder-sourced companion dogs but felt that current regulations were inadequate to ensure satisfactory welfare, those who disapproved of dog breeding and felt adoption was the only appropriate acquisition method, and those who felt breeding was acceptable and that current industry practices provide adequate welfare. Several participant factors predicted cluster membership, including age, characteristics considered important when acquiring a companion dog, the source of their most recent dog, and their dog breeding knowledge and/or experience. This study provides a direct preliminary examination of public perceptions of dog breeding, breeding practices, and associated welfare concerns, and the factors associated with these perceptions. This information can be used to guide those who provide companion dogs to the public and inform evidence-based policy development concerning companion dog breeding and acquisition.

Keywords: animal breeding, animal welfare, anthrozoology, breeding perceptions, Canis familiaris, dog adoption

Introduction

Dogs (*Canis familiaris*) and humans have lived alongside one another for at least 20,000 years (Druzhkova *et al* 2013). Although this close association traditionally served a practical purpose, such as improved hunting or livestock protection, dogs nowadays function primarily as human companions (Bennett & Rohlf 2007). They made this transition with exceptional efficacy and are the most widespread companion animal in the world (Miklósi 2014), with nearly 40% of households in Australia (Headey 2006) and 30% of households in the UK (Murray *et al* 2010) containing a dog. Humans regularly form close emotional bonds with their dogs (Crawford *et al* 2006), consider them psychological kin (Topolski *et al* 2013), and regularly describe them as part of their family unit (Tannen 2004; Franklin 2006). Dog owners are prepared to pay for the privilege of living closely with a dog, with Australian and British households annually spending almost A$4.7 billion (Animal Health Alliance 2013) and £10.6 billion (Roberts 2016) on their dogs' care, respectively.

Consistent with their substantial economic and emotional investment in individual dogs, humans in developed countries have a high regard for the welfare of companion dogs in general (Cobb *et al* 2014). Animal welfare is a multi-faceted construct (Mason & Mendl 1993), but can be broadly conceptualised as a state subjectively experienced by an animal relating to the sensations and perceptions felt as a consequence of their experiences (Mellor 2016). It can be assessed according to an animal's ability to engage in positive experiences as well as to minimise or avoid those that are negative (Mellor & Beausoleil 2015). Dog welfare has been discussed publicly since at least the early 1800s, with public sentiment for enhancing it increasing as dogs moved from being hunting and herding partners, to occupying backyards and the end of their owners' beds (Ritvo 1994). In line with this, legal regulations have been implemented in various parts of the world to uphold companion dog welfare specifically. Numerous shelters have also been founded exclusively for dogs, such as the Barking Mad Dog Rescue in the UK, and The Lost Dogs Home in Melbourne, Australia.

There has been a substantial increase in media coverage of ethical issues affecting the welfare of companion dogs in recent years (Kavin 2016). Some of the most contentious are those concerned with companion dog breeder practices, such as those resulting in the existence of breeds with serious genetic health problems (Copping 2013), and welfare issues associated with high volume breeding and 'puppy farming' (Barrowclough 2015), which is often linked to overpopulation (Naughton 2016). Public responses to these stories have led to attempts by some governments to propose increasingly stringent legislation to regulate breeding practices (for examples, see Brown 2017 and Kavin 2017). Recently, strict legislative reforms designed to curb putative welfare-compromising breeding practices were proposed in the Australian state of Victoria (Le Grand 2016). The proposed reforms include limiting each breeder to a maximum of ten fertile females, and requiring all breeders, even those with a single breeding dog, to comply with stringent housing, husbandry and administrative regulations previously imposed only on large-scale, commercial breeding establishments (Government of Victoria 2016). These requirements, and many others outlined in the proposal, were robustly challenged by breeder groups on the basis that they were not empirically based and would greatly compromise their ability to supply suitable dogs to the Australian public. Meanwhile, some animal welfare groups claimed that they were not sufficiently restrictive, representing only an initial step in the right direction for ensuring good welfare for dogs used for breeding. Following a tumultuous public debate, the draft reform was recalled for parliamentary enquiry and further consultation with stakeholders (Sullivan 2017). This process produced an amended bill, which passed the Victorian parliament in late 2017 and will come into full effect in 2020 (Government of Victoria 2018). Despite the amendments being more acceptable to stakeholders, discourse surrounding the legislation's suitability and likely effectiveness continues in the public domain. As public opinion has a marked effect on the formation and successful implementation of legislative change (Burstein 2003), there is a pressing need for better understanding of these perceptions surrounding dog breeding for progress in this area to occur.

To our knowledge, there has been only one study conducted to date that examined public preferences related to dog acquisition methods, including dog breeders. Bir *et al* (2017), asked American residents (n = 507) to respond to ten statements about their perceptions of appropriate sources for dog acquisition. Results indicated that perceptions differed significantly according to gender, age, income, education level, and region of residence. When asked about their preferred source for acquiring a dog, there was a general trend towards respondents wanting to adopt unwanted dogs. Within this, however, three subgroups were identified: members of one subgroup strongly preferred adoption, but only through a shelter or rescue organisation; members of another preferred having access to a variety of sources, including shelters, rescues, breeders and pet shops; and members of the third preferred 'rescuing homeless dogs', but were open not only to adoption from shelters or rescues, but also to acquisition of stray dogs.

These preferences may be indicative of perceptions held about dog acquisition methods and associated welfare considerations, but these were not examined specifically. Also lacking was any investigation, beyond demographics, into what factors may underlie these preferences, such as whether the participant had a history of breeding and/or selling dogs. To build upon these important early results, and with the aim of bridging additional gaps in knowledge, we first aimed to specifically describe perceptions of dog breeding and the associated welfare concerns held by members of the public. Secondly, we aimed to identify whether distinct groups of people exist that have consistent perceptions about companion dog acquisition methods, across different aspects of dog breeding and the welfare concerns that may be associated with different practices. Lastly, we aimed to investigate whether factors exist that predict these perceptions. As a first step to understanding public perceptions of dog breeding practices, we purposely restricted our sample to Australian residents due to the current national discussion concerning dog breeding legislation. This enabled us to measure the extent to which dog breeding issues have been considered, and understood, by a community which has been exposed to the main issues raised by both sides of the debate concerning dog breeding practices.

Materials and methods

Approval

This study was approved by the La Trobe University College of Science, Health and Engineering Human Ethics Committee (number: S17-176).

Participants

Participants consisted of Australian residents who were at least 18 years of age and who volunteered to complete an online survey.

Materials

To address public perceptions of companion dog breeding in Australia, a questionnaire was created and hosted on the online survey platform, Qualtrics. The questionnaire was developed by modifying existing surveys by Mornement (2015) and Bir *et al* (2017) and obtained via personal communication with the authors. The survey contained 26 multi-component questions in total and was divided into four sections (for full survey, see the supplementary material to papers published in *Animal Welfare* on the UFAW website: https://www.ufaw.org.uk/the-ufaw-journal/supplementary-material).

Section A contained 17 questions requesting respondents' demographic information, such as their location, gender, age, education, and household income. There were also several questions concerning their history of companion dog ownership, such as information pertaining to their most recent dog, how many dogs they had ever owned, and whether any of those dogs had ever reproduced whilst in their care.

Next, Section B contained two self-report items on participants' knowledge of companion dog breeding. Section C contained five questions pertaining to participant attitudes

towards future acquisition of a companion dog, such as their likelihood of acquiring a dog in the future, characteristics of their future dog, and dog source(s) they find desirable. Lastly, Section D was comprised of one question containing 38 randomised statements relating to respondents' attitudes towards companion dogs and companion dog breeding in Australia (eg 'What a dog experiences when it is a puppy influences its behaviour as an adult', and 'I believe that dogs can be bred ethically'). Participants indicated their level of agreement with each statement on a seven-point Likert-type scale, where 1 indicated strong disagreement and 7 indicated strong agreement.

Procedure

The survey data were collected from a convenience snowball sample for one month between September and October 2017. Participation was anonymous for all respondents. The link to the survey was advertised via the Anthrozoology Research Group's Facebook pages. Targeted advertising on Facebook was also conducted, whereby the researchers paid a small fee (A$30.00) for the advertisement to appear to people residing in Australia aged 18 years and over.

Statistical analysis

All analyses were conducted using IBM SPSS version 24. Descriptive statistics, including percentages, frequencies, means and standard deviations, were utilised to summarise participant demographics (Section A), and their general responses to questions and statements included in Sections B, C, and D.

To meet the first aim of describing perceptions of dog breeding, we began by reducing the number of variables from Section C and D. A number of Principal Axis Factoring (PAF) analyses were conducted on the 17 items presented in the last question in Section C and all items in Section D, respectively. PAF analyses are the recommended alternative to the more popular Principal Components Analysis in exploratory research (Costello & Osborne 2005). The suitability of the data for this type of analysis was assessed according to Tabachnick and Fidell's (2001) recommendations, with promax rotation and Kaiser normalisation utilised to facilitate interpretation of the resulting factors. In each analysis, factorability of the data was supported by multiple coefficients in the correlation matrix above 0.3 and acceptable Kaiser-Meyer-Olkin and Bartlett's test of sphericity values. For Section D, in particular, an iterative process was used to develop a final factor solution. This involved running multiple analyses, removing cross-loading or low-loading items, as well as items that appeared conceptually distinct from the other items on each factor, until a final solution was reached that had independent, conceptually sound factors, and was simple in structure (Thurstone 1947).

The factors generated from the Section D items were then used to explore, via cluster analysis, whether discrete participant groups were present that had consistent perceptions concerning companion dog acquisition, dog breeding practices, and welfare concerns associated with these practices. A two-step method was utilised due to the large sample size (Mooi & Sarstedt 2011). Participant scores for the factors were used as the predictor variables. Log-likelihood was selected as the similarity measure and Schwarz's Bayesian inference criterion (BIC) was implemented as the selection criterion. To facilitate further interpretation, clusters were named through discussions within the research team based on intuitive interpretations and the pattern of responses within each cluster.

To meet our third aim of identifying possible factors that predict perceptions about dog acquisition, dog breeding, and welfare considerations, several one-way between-groups ANOVAs or Chi-square tests for independence were performed, depending on whether the relevant variables were continuous or categorical in nature. First, one-way between-groups ANOVAs were conducted to explore whether the participants in each cluster differed on what they deemed important in companion dogs and dog source, as measured by the factors generated in the PAF. A second series of one-way between-groups ANOVAs was conducted to explore whether members of the clusters varied in terms of age, annual household income, breeding history, and knowledge about dog breeding. Student-Newman-Keuls (SNK) *post hoc* testing was utilised to investigate how each cluster differed on each of the dependent variables.

To investigate whether clusters differed according to predictors that were categorical in nature, multiple Chi-square tests for independence were conducted. Participant location, level of education, whether they sourced their most recent dog from a breeder or a rescue, and current dog type (ie, purebred or mix-breed) were used as predictor variables. In order to avoid violating the expected cell frequency assumptions due to low numbers in some variable categories, some variables were collapsed into larger categories before the analyses were performed. Location, which was comprised of the state participants reportedly lived in, was collapsed into high or low legislation states as determined by whether they had specific, currently enacted legislation pertaining to dog breeding welfare and/or government breeder registration requirements. The high legislation category included residents of Victoria, New South Wales, the Australian Capital Territory, Queensland and South Australia, whilst the low legislation category included those who reported residing in Tasmania, Western Australia, and the Northern Territory. Highest completed education was collapsed into two categories: high school or below and tertiary or above. *Post hoc* testing was conducted using the cross-tabulation matrix with adjusted *z*-score residuals, as recommended by Beasley and Schumacker (1995).

Results

Sample demographics

Data were collected from 1,106 eligible participants. After removing incomplete submissions, data from 986 respondents were retained for analysis. Of these participants, the greatest proportions resided in three of Australia's four most populous states: Victoria (39.3%), New South Wales (21.5%) and Western Australia (15.3%). The state of Queensland, Australia's third most populous state, was underrepresented (12.0%). The mean (± SD) age for respondents was 43.95 (± 14.15) years (mode = 27, range = 18 to 81 years) and the majority were female (92.9%). A large proportion (34.0%) of participants had completed an associate degree, diploma, trade certificate, or apprenticeship as their highest level of education, followed by a bachelor's degree (31.5%) and a postgraduate degree (15.1%). Nearly one-third (30.2%) of participants reported an annual household income of over A$100,000, followed by 17.0% earning between A$75,001 and A$100,000. To provide context, the Australian household mean income is A$107,276 (Australian Bureau of Statistics 2017).

In total, dog owners made up 91% of the sample. The majority (61.5%) of those who had owned a dog reported no history of dog breeding. Of those who reported having at least one litter (38.5%), nearly half (48.3%) reported having had two to five litters in total and having bred from both males and females (68.6%).

The majority of dogs most recently acquired by respondents were desexed (64.5%), registered with their local council (82.1%), and six months of age or younger at acquisition (67.7%). Just over half (54.4%) were female. Border Collies (4.9%), Labrador Retrievers (3.8%), 'Staffy' mixes (2.9%), German Shepherd Dogs (2.7%), and Kelpie mixes (2.5%) were the most commonly reported breed and breed mixes. They were most commonly sourced from breeders (45.5%) or shelters or rescue organisations (26.1%). Almost half (47.5%) were purebred with certification papers. The remainder were of mixed or unknown parentage (29.0%), or purebred with no certification papers (19.1%). Of those who acquired their dog from a breeder, the majority (76.7%) reported obtaining it from a breeder registered with a formal body affiliated with the Australian National Kennel Council (ANKC), such as Dogs Victoria or Dogs New South Wales. Another 10.4% reported acquiring their dog from an unregistered breeder, 6.8% from a breeder registered with an organisation other than those affiliated with the ANKC, and 6.1% of respondents were unaware of their dog's breeder's registration status.

Preliminary analysis of statements measuring perceptions

Mean participant responses to the 38 statements in Section D are displayed in Figure 1 (see the supplementary material to papers published in *Animal Welfare* on the UFAW website: https://www.ufaw.org.uk/the-ufaw-journal/supplementary-material), which arranges the data, for illustrative purposes, around an axis set at 0 = neither agree nor disagree, with end points of –3 = strongly disagree and +3 = strongly agree. The statement 'the welfare of dogs in general is important to me' had

the mean (± SD) highest level of agreement across participants (2.86 [± 0.48]). This was followed by 'the welfare of dogs used for breeding is important to me' (2.81 [± 0.56]) and 'tougher penalties for those committing welfare offences are necessary to ensure breeding dog welfare' (2.49 [± 1.03]). In line with these sentiments, 'dog breeding should not be regulated in Australia' had the highest level of disagreement across participants (–2.04 [± 1.57]), followed by 'as long as welfare standards are being met, it does not matter how many dogs a breeder has in their breeding programme' (–1.22 [± 1.88]) and 'until the population of homeless dogs/puppies is substantially decreased, dog breeding in all forms should be banned' (–1.19 [± 2.10]). Worth noting from Figure 1 (https://www.ufaw.org.uk/the-ufaw-journal/supplementary-material) is that responses to 29 of the 38 statements were quite variable, with SDs above 1.5. Multimodal distributions were also observed in some of the histograms generated for each statement (data not shown), indicating that responses varied considerably among participants. This suggested the potential presence of different 'types' of participant response groups within the questionnaire, warranting further investigation.

Factor analysis for data reduction

Principal Axis Factoring analysis conducted on the 17 items presented to participants in Section C, which concerned characteristics they found desirable in their future dog and future dog source(s), resulted in a four-factor solution that contained all 17 items and explained 58.06% of the total variance (see Table 1). These factors were deemed simple in structure (Thurstone 1947) and theoretically interpretable, with no cross-loading and all factors showing a number of strong loadings. Internal consistency analyses revealed that Cronbach's alpha scores for Factors 1, 2, and 4 were above the typically accepted minimum level of 0.70 (Tabachnick & Fidell 2001), whilst for Factor 3 the alpha was slightly below this cut-off, but greater than the more lenient cut-off of 0.60 deemed acceptable in the context of preliminary, exploratory research (Litwin 2003). Based on their composition, the factors were named 'dog characteristics' (Factor 1), 'dog history availability' (Factor 2), 'perceived costs' (Factor 3) and 'dog source' (Factor 4). Hereafter, these factors will be collectively referred to as 'future dog preferences'.

The final solution yielded from the PAF analysis of the Section D items contained three factors comprised of 18 items (see Table 2). The first and third factors each comprised seven items, whilst the second factor comprised four. Cumulatively, the factors explained 55.37% of the variance. Internal consistency analysis revealed Factor 1 and 2 achieved Cronbach's alpha scores above the aforementioned minimum level of 0.70 (Tabachnick & Fidell 2001). Factor 3 had a lower value than this, but it was greater than the 0.60 cut-off acceptable in the aforementioned context of preliminary, exploratory research (Litwin 2003). Based on their component items, the factors were named 'beliefs about dog acquisition' (Factor 1), 'beliefs about current breeding practices' (Factor 2), and 'beliefs about breeding regulation' (Factor 3). Hereafter, these factors will be collectively referred to as 'dog breeding beliefs'.

Table 1   Final four factor solution yielded through PAF conducted on characteristics/factors the respondents considered important when acquiring a future dog. Items in bold denote component loadings for items retained in each component.

Future dog/Source characteristics	Component				Communalities
	1	2	3	4	
The sex of the dog or puppy	**0.51**	0.10	0.03	–0.16	0.27
The behaviour of the dog or puppy	**0.63**	–0.18	0.14	0.16	0.46
The personality of the dog or puppy	**0.62**	–0.22	0.10	0.22	0.47
The breed/breed type of the dog or puppy	**0.72**	0.11	–0.08	–0.09	0.55
The health of the dog or puppy	**0.50**	0.18	0.05	0.14	0.51
The age of the dog or puppy	**0.53**	0.09	0.24	–0.11	0.38
The dog or puppy's need for a home	**–0.61**	–0.09	0.40	0.14	0.47
Ability to meet the parents of the dog or puppy	0.04	**0.82**	0.12	0.02	0.74
Ability to meet the breeder of the dog or puppy	–0.07	**0.79**	0.10	0.13	0.66
Genetic and/or health testing of the dog or puppy or his/her parents prior to acquisition	0.28	**0.52**	–0.12	0.13	0.62
The price of the dog or puppy	0.13	0.08	**0.54**	–0.30	0.30
The location of the dog or puppy	–0.06	0.10	**0.59**	–0.18	0.32
The exercise and attention the dog or puppy requires	0.07	–0.01	**0.42**	0.27	0.33
Grooming requirements for the dog or puppy	0.03	0.03	**0.60**	0.14	0.44
Amount of coat-shedding by the dog or puppy	0.01	0.01	**0.54**	–0.02	0.29
The source of the dog or puppy	–0.07	0.08	–0.09	**0.67**	0.42
The reputation/experience of the source of the dog or puppy	–0.01	0.19	–0.13	**0.67**	0.55
Eigenvalue	5.03	2.31	1.37	1.17	
% of variance	29.58	13.56	8.03	6.90	
Cronbach's alpha	0.78	0.85	0.67	0.71	
Mean component score*	3.84	3.54	2.85	4.40	
Standard deviation	0.77	1.28	0.79	0.82	

* Component scores were calculated by reverse scoring negatively loading items, summing the scores for each item on each factor and then dividing by the number of items in each factor.

Perceptions cluster analysis

Cluster analysis performed on participant scores from 'dog breeding beliefs' factors revealed a three-cluster model to be the best fit for the data. The cluster quality was deemed fair, with an average silhouette for cohesion and separation for each cluster of 0.4. Cluster 1 contained 43.6% (n = 426) of the participants, whilst Cluster 2 contained 34.4% (n = 214) and Cluster 3 contained 21.9% (n = 336). 'beliefs about dog acquisition' was the most important predictor (1.00) of cluster membership, followed by 'beliefs about breeding regulation' (0.55) and then 'beliefs about current breeding practices' (0.54). Means and standard deviations for each of these predictors by cluster are displayed in Figure 2. As can be seen from this figure, participants in Cluster 1 had a high negative score for 'beliefs about dog acquisition', that indicated support for acquiring a dog through a breeder, a low positive score on 'beliefs about current breeding practices' indicating discontent with current practices, and a high positive score for 'beliefs about breeding regulation', which indicated support for increased regulation and guidelines. As a result, this cluster was called 'improve breeding'. Participants in Cluster 2 had the highest negative score for 'beliefs about dog acquisition', the highest positive score for 'beliefs about current breeder practices' and the lowest score for 'beliefs about breeding regulation', comparatively. Based on these scores, the cluster was called 'breeding as is'. Lastly, participants in Cluster 3 had the only positive average for 'beliefs about dog acquisition' indicating a negative perception of dog breeding, the only negative 'beliefs about current breeding practices' average indicating a negative perception of current breeder practices, and a high positive average 'beliefs about breeding regulation' score. As a result, this cluster was named 'adoption only'.

Table 2   Factor solution yielded from PAF conducted on responses to the 38 statements measuring participants' perceptions of companion dog breeding. Items in bold denote component loadings for items retained in each component.

Items	Factor			Communalities
	1	2	3	
I believe that dogs can be bred ethically	**−0.70**	0.16	0.20	0.61
The sale of dogs/puppies is socially irresponsible	**0.77**	−0.05	0.07	0.67
Shelter dog populations would decrease if people stopped breeding and buying purebred dogs/puppies	**0.80**	0.02	0.05	0.65
The only responsible way to obtain a dog/puppy is through a shelter or rescue	**0.92**	0.03	0.01	0.82
My friends and family would approve if I got a dog/puppy from a breeder	**−0.54**	0.30	0.14	0.55
The only way to discourage 'puppy farming' is adopting a dog/puppy through a shelter or rescue	**0.88**	0.11	0.09	0.70
Until the population of homeless dogs/puppies is substantially decreased, dog breeding in all forms should be banned	**0.89**	0.02	−0.02	0.76
Most dog breeders try to breed dogs/puppies suited to modern day living	0.08	**0.56**	−0.06	0.28
Certification through organisations with agreed codes of practice for dog breeders (eg ANKC) is an effective way to regulate dog breeding practices to ensure positive welfare outcomes for dogs	−0.17	**0.51**	0.24	0.38
I believe the current welfare of dogs used for breeding in Australia is satisfactory	−0.04	**0.59**	−0.23	0.49
Most dog breeders in Australia do the right thing to ensure the welfare of their breeding dogs	−0.06	**0.69**	−0.04	0.55
Dog breeding should not be regulated in Australia	−0.05	0.27	**−0.34**	0.25
Tougher penalties for those committing welfare offences are necessary to assure breeding dog welfare	0.20	−0.01	**0.43**	0.28
Education programmes should be mandatory for all dog breeders	0.08	−0.12	**0.40**	0.23
Only dogs free from genetic disorders should be used for breeding	−0.27	−0.12	**0.46**	0.22
Only dogs that pass temperament evaluations assessing their suitability as a companion should be used for breeding	−0.22	−0.01	**0.51**	0.25
Government certification of dog breeders is an effective way to regulate dog breeding practices to ensure positive welfare outcomes for the dogs in breeding programmes	0.20	0.29	**0.53**	0.33
Dog breeding should be regulated if the breeder is breeding for profit	0.21	−0.13	**0.43**	0.34
Eigenvalue	6.43	2.13	1.41	
% of variance	35.70	11.84	7.83	
Cronbach's alpha	0.93	0.70	0.64	
Mean factor score*	−1.00	−0.14	1.81	
Standard deviation	1.70	1.23	0.81	

* Mean factor scores were calculated by reverse scoring negatively loading items, summing the scores for each item on each factor and then dividing by the number of items on the factor (−3 strongly disagree to +3 strongly agree).
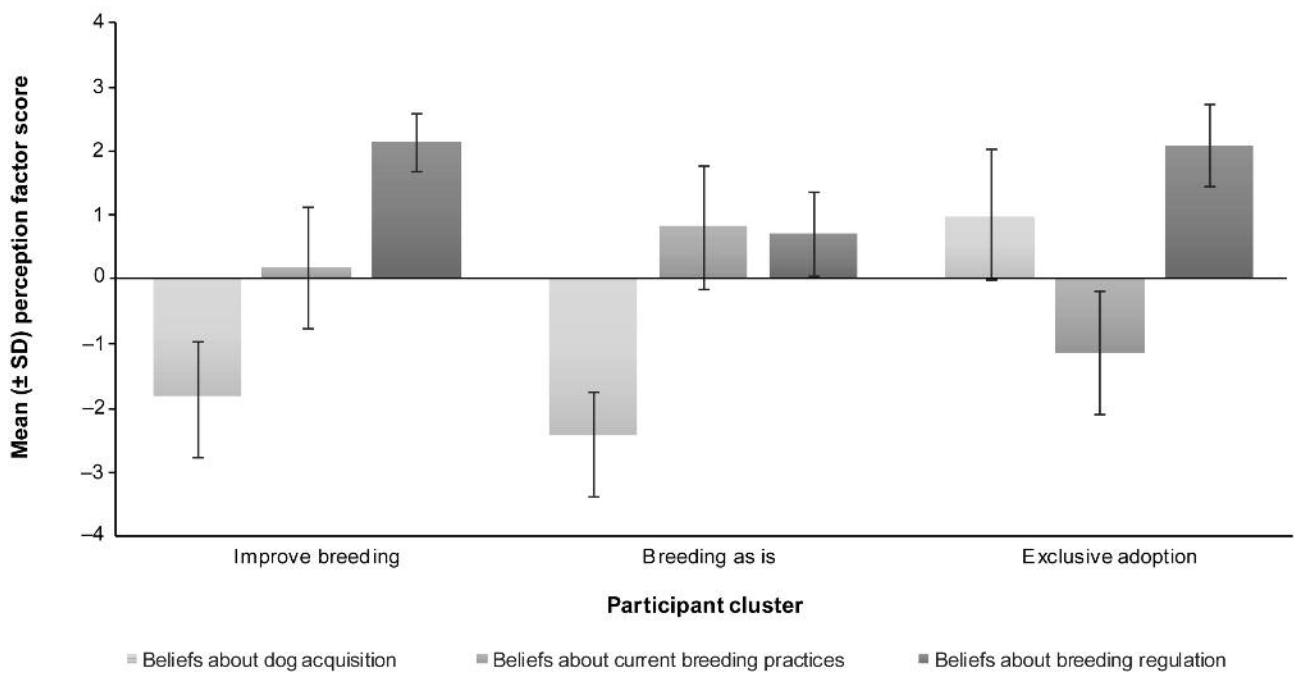
Relationship between participant cluster membership and 'future dog preferences'

The unweighted mean 'future dog preferences' factor scores for each cluster are presented in Figure 3. These were generated by reverse-scoring negatively loading items, summing the scores for each item on each factor, and then dividing by the number of items. Error bars were calculated using standard deviations.

Results from four one-way between-groups analyses of variance, conducted to explore whether clusters members differed on their 'future dog preferences' factor scores, are displayed in Table 3.

Post hoc testing revealed that those in the 'exclusive adoption' cluster rated 'dog characteristics' as significantly less important (−0.76 [± 0.87]) than did those in the 'breeding as is' (0.45 [± 0.61]; $P < 0.001$) and 'improve breeding' (0.39 [± 0.67]; $P < 0.001$) clusters. Similarly, these respondents also rated 'dog history' as significantly less important (−0.70 [± 0.92]) than did the 'improve breeding' (0.41 [± 0.68]; $P < 0.001$) and 'breeding as is' (0.30 [± 0.67]; $P < 0.001$) groups. However, there was no statistical difference ($P > 0.05$) between the 'improve breeding' and 'breeding as is' clusters on 'dog characteristics' or 'dog history'. Those in the 'breeding as is' cluster rated 'perceived

Figure 2

Mean (± SD) perception factor score by generated clusters.

Figure 3
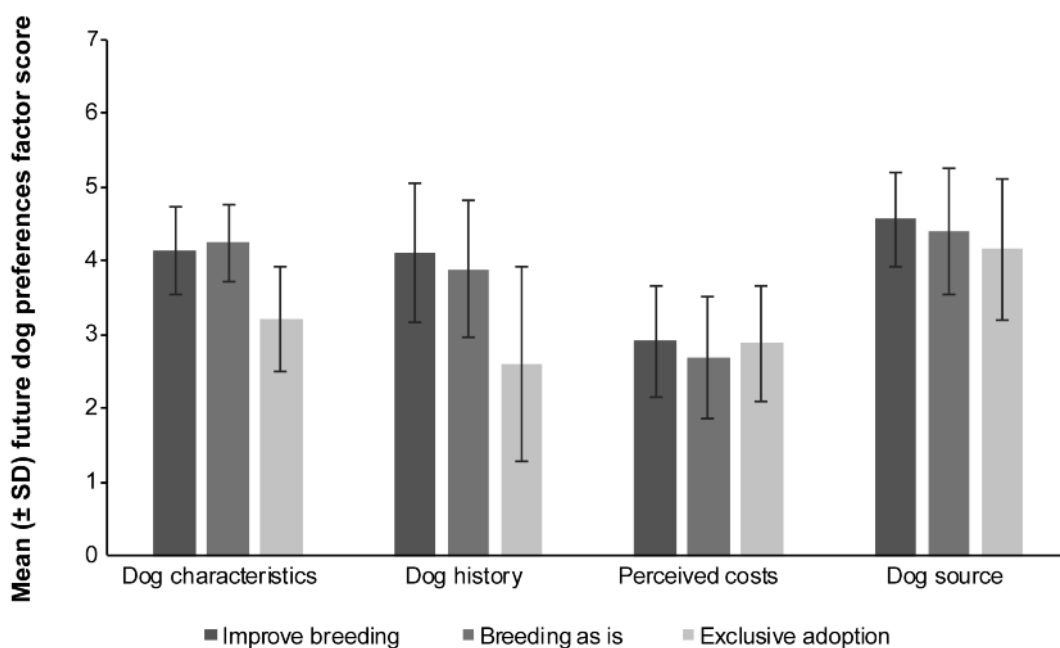
Mean (± SD) future dog preferences unweighted for each perception cluster.

Table 3   Summary of one-way ANOVA results between participant cluster membership and 1) participant demographics, 2) breeding knowledge, 3) breeding history and 4) future dog factor scores.

Factor	F*	df	P-value	η²
Participant demographics				
Age	7.65*	2, 956	0.001	0.01
Annual household income	0.23*	2, 956	0.79	0.0004
Number of dogs owned in lifetime	51.65*	2, 956	< 0.001	0.09
Breeding knowledge	36.86*	2, 956	< 0.001	0.07
Breeding history	116.89	2, 956	< 0.001	0.24
Future dog factor scores				
Dog characteristics	234.38	2, 552.74	< 0.001	0.37
Dog history	178.17	2, 539.68	< 0.001	0.31
Perceived costs	15.78	2, 527.40	< 0.001	0.03
Dog source	37.76	2, 500.44	< 0.001	0.08

* Indicates Welch's *F* statistic.

Table 4   Summary of one-way ANCOVA results between cluster membership and participant demographics, dog breeding knowledge and dog breeding history, with age entered as a covariate.

Factor	F*	df	P-value	η²
Annual household income	0.23*	2, 956	0.77	0.001
Number of dogs owned in lifetime	51.65*	2, 956	< 0.001	0.19
Breeding history	116.89	2, 956	< 0.001	0.08
Breeding knowledge	36.86*	2, 956	< 0.001	0.07

costs' as less important (–0.30 [± 0.91]) than did the 'exclusive adoption' (0.12 [± 0.82]; *P* < 0.001) and 'improve breeding' (0.05 [± 0.83]; *P* < 0.001) clusters, which were not statistically different from one another. Lastly, when considering 'dog source', all clusters were statistically different from each other (*P* ≤ 0.001). Members of the 'exclusive adoption' group rated it as significantly less important (–0.30 [± 0.98]) than the 'breeding as is' (0.01 [± 0.83]) cluster, who rated it significantly less important than the 'improve breeding' (0.24 [± 0.67]) cluster.

One-way between-groups ANOVAs were conducted to explore whether members of the three clusters varied in terms of age, annual household income, breeding history, and knowledge about dog breeding. Results yielded from this analysis can be found in Table 3.

Post hoc testing revealed that members of 'exclusive adoption' were significantly younger (41.72 [± 13.65]) than those in the 'improve breeding' (44.40 [± 14.57]; *P* = 0.009) and 'breeding as is' (46.25 [± 13.50]; *P* < 0.001) clusters. Members of 'exclusive adoption' also reported breeding significantly fewer litters (1.24 [± 0.60]) than those in the 'improve breeding' (1.89 [± 1.13]; *P* < 0.001) and 'breeding

as is' (2.59 [± 1.27]; *P* < 0.001) clusters. Those in 'improve breeding' also bred significantly fewer litters than those in 'breeding as is' (*P* < 0.001). In terms of history of dog ownership, members of 'exclusive adoption' reported owning significantly fewer dogs in their lifetime (4.18 [± 1.59]) than those in 'improve breeding' (4.81 [± 1.66]; *P* < 0.001) and 'breeding as is' (5.61 [± 1.64]; *P* < 0.001). Those in 'improve breeding' had also owned significantly fewer dogs than those in 'breeding as is' (*P* < 0.001). Lastly, members of 'exclusive adoption' (5.16 [± 1.30]) reported knowing significantly less about companion dog breeding compared to most other people in their community than did 'improve breeding' (5.81 [± 1.20]; *P* < 0.001) and 'breeding as is' (6.00 [± 1.19]; *P* < 0.001), which were not significantly different from one another.

A one-way between-subjects ANCOVA was run, with age entered as a covariate, to test whether the significant cluster differences found in the above analyses in 'dogs owned in lifetime, 'breeding history' and 'breeding knowledge' were significantly mediated by participant's age. Results indicated that, despite age being a significant covariate, the significant differences in the predictor variables remained even when controlling for the effects of age (see Table 4).

Table 5   Summary of Chi-squared tests for independence *post hoc* testing conducted between cluster membership and education, state legislation, and most recent dog type and source.

	Improve breeding (n = 331)		Breeding as is (n = 145)		Exclusive adoption (n = 235)	
	%	Z	%	Z	%	Z
State legislation level						
High	44.43	0.90	23.16	1.86	32.41	–2.57*
Low	40.76	–0.90	16.85	–1.86	42.39	2.57*
Dog source						
Breeder	58.17	8.38*	28.54	7.28*	13.29	–15.12*
Rescue	25.40	–8.38*	5.6	–7.28*	69.05	15.12*
Dog type						
Purebred certification papers	57.33	7.94	36.32	9.88	6.35	–17.09*
Purebred no certification papers	40.86	–0.98	14.52	–2.89	44.64	3.58*
Designer breed	51.85	0.83	18.52	–0.50	29.63	–0.43
Mixed/unknown parentage	23.66	–8.16*	5.38	–8.13*	70.97	15.78*

* $P < 0.017$ (Bonferroni adjusted; $P = 0.05/3 = 0.017$).

Association between cluster membership, level of education, most recent dog type and source, and state legislation levels

Lastly, Chi-squared tests for independence were conducted to investigate whether the clusters differed according to the level of breeding legislation in the state participants reside in, their level of education, their current dog type (ie purebred or mix breed), and whether they sourced their most recent dog from a breeder or a rescue service. Those who did not answer the items associated with the collapsed variables were excluded from these analyses. Results showed no association between cluster membership and level of education ($\chi^2_{2,974} = 0.89$; $P = 0.64$). However, a significant association was found between cluster membership and: whether participants sourced their most recent dog from a breeder or a rescue service ($\chi^2_{2,691} = 246.94$; $P < 0.001$); whether their most recent dog was a pure breed (with or without certification papers), 'designer' breed, or mixed breed ($\chi^2_{6,949} = 350.71$; $P < 0.001$); and whether they resided in a state with high or low levels of dog breeding legislation ($\chi^2_{2,974} = 7.51$; $P < 0.05$).

Results of *post hoc* testing can be seen in Table 5, and indicate that, for the clusters 'improve breeding' and 'breeding as is', participants were more likely than expected to have sourced their dog from a breeder ($P < 0.05$) and to have dogs of pure parentage ($P < 0.05$). This is in contrast to the 'exclusive adoption' cluster, who were more likely than expected to have sourced their dog from a rescue and to have dogs of mixed or unknown parentage ($P < 0.05$). Lastly, members of the 'exclusive adoption' cluster were more likely than expected to reside in a state with low levels of breeding legislation.

Discussion

This study aimed to investigate perceptions held by members of the public pertaining to dog breeding practices and associated welfare concerns. To do this, we disseminated an online survey to members of the Australian public, a demographic we expected to be reasonably familiar with issues surrounding dog breeding, due to the current presence of these issues in the media. In the survey, statements were used to gauge respondents' views regarding both companion dogs in general and companion dog breeding practices more specifically.

On the whole, respondents predominantly agreed that both the welfare of dogs in general, and the welfare of breeding dogs in particular, were of importance. This consensus is instructive, as public debate around these issues has been tumultuous. Finding a common point upon which all sides agree potentially offers a constructive way forward, although it must be noted that the participants in this study were self-selected through an advertisement that was transparent about the study's subject matter and, thus, were perhaps motivated to participate by the importance they place on these issues. Additionally, however, participants were mostly supportive of increased regulation of dog breeding in Australia; agreeing that tougher penalties for welfare offences were a necessary step to ensuring the welfare of breeding dogs, and that education programmes should be implemented for dog breeders. No government-mandated education programmes currently exist specifically for companion dog breeders in Australia, although such programmes are required for both obtaining and maintaining membership in various state branches of the ANKC.

Even though most participants strongly felt that breeding dog welfare was important, their views regarding other aspects of dog acquisition and breeding were not uniform. For the majority of the statements presented, high variability in responses was observed, often with multimodal distributions that may indicate the presence of participant 'types' with different perceptions. This was unexpected, and cluster analysis was subsequently performed using the factors generated from the perception statements to investigate this further. Results showed that participants fell into one of three clusters.

The greatest portion of participants (43.6%) fell into the first cluster, 'improve breeding'. Whilst members of this cluster believed dogs can be bred and sold both ethically and responsibly, they also felt the current state of the dog breeding industry in Australia to be unsatisfactory, and that dog breeding should come with stricter regulatory guidelines to govern practices. This was consistent with their preferred characteristics of a companion dog. Members of this cluster rated their future dog's source as being significantly more important than did members of the other clusters. They were also less likely to have a dog of mixed or unknown heritage.

Members of the second largest cluster, 'breeding as is', also believed, like those in the previous cluster, that dogs could be bred and sourced from breeders in a responsible manner. Contrarily, however, 'breeding as is' members viewed the current state of the Australian dog breeding industry in a favourable light and were less supportive of regulatory guidelines to govern practices than were the 'improve breeding' members. Investigation into what characterised membership of this cluster revealed that members had the most prominent breeding and ownership history, having bred and owned the most dogs compared to the other clusters. Members of this cluster rated perceived costs of their future companion dog, such as price, location and attentional needs, as significantly less important than did the members of other clusters.

Members of the last and smallest cluster, 'exclusive adoption', stood somewhat alone, as they favoured adoption as the most ethical acquisition method, whilst holding an unfavourable view of dog breeding. Additionally, they felt the industry in Australia was unsatisfactory and supported increases in government legislation pertaining to companion dog breeding. Unsurprisingly, further investigation revealed they were the least likely to have bred companion dogs before and had owned the least number of dogs comparatively. Furthermore, when considering the importance of their future dog's source, members of the 'exclusive adoption' cluster rated it least important out of all clusters. This possibly reflects the fact that dogs in rescues and shelters originally come from multiple, often unknown, sources. These findings are also in line with their past behaviour, as members were also more likely to have a dog of mixed or unknown parentage sourced from a shelter/rescue.

Members of the 'exclusive adoption' cluster were significantly younger than the members of the other two clusters. This is in line with the findings of Bir *et al* (2017), who reported that younger participants were more likely to oppose pro-breeding statements like 'people should have choices as to where/how to obtain dogs' and 'people should be able to buy purebred dogs'. Finally, members of this cluster were more likely than expected to reside in a state with low levels of breeding legislation. This was somewhat unexpected as legislation is usually guided by public sentiment (Burstein 2003), but may be due to the fact that residents of Western Australia, a low legislation state, were overrepresented and motivated to participate by their discontent with current state regulations. Bir *et al* (2017) also reported that area of residence significantly impacted endorsement rates of a number of statements presented to participants about breeding, so these differences may reflect actual differences based on participant location. It is worth noting, however, that the small size of this cluster is somewhat contrary to Bir *et al* (2017)'s findings, as they reported that the majority (61.54%) of their participants belonged to groups who strongly preferred adoption as an acquisition method.

Clusters did not significantly differ on annual household income and education level. As indicators of socioeconomic status, these findings are in contrast to previous research that has identified a general association between higher animal welfare concern and lower socioeconomic status (Kendall *et al* 2006). These findings are generally considered within the framework of social stratification theories, which postulate that those with lower socioeconomic standings have a greater concern for disadvantaged others (such as non-human animals), whilst those with high socioeconomic standings are more likely to support current systems, regardless of their impact on non-human animal welfare (Kendall *et al* 2006). We hypothesise that our findings may be due to the unique position that companion dogs hold in human society compared to other non-human animals, such as those used for farming and consumption. Despite the breeding and ownership of companion dogs historically being reserved for those in high socioeconomic positions, dogs are now present in the homes of people of all socioeconomic backgrounds in developed nations, and evidence suggests that concern for their welfare often outweighs the concern held for other animal species (Phillips & McCulloch 2005), including even humans in some circumstances (Levin *et al* 2017).

In summary, several important findings emerged from this study. The first is that, at least within this self-selected sample, members of the public in general both care about the welfare of breeding dogs and support regulation, education programmes and increased penalties for violations, when these are used to ensure the welfare of dogs used for breeding purposes. Beyond this, there also appear to be certain groups of people with similar beliefs about dog breeding and acquisition, from how they should be bred, to the ways in which breeding practices are regulated to uphold acceptable welfare standards. These groups differed on several fronts, such as what they look for in a companion dog, whether they have a history of dog breeding themselves, and on demographic factors, such as age and area of residence.

These findings provide valuable preliminary insight into how members of the public, with various levels of knowledge of dog breeding, think about the ways in which companion dogs should be acquired, and how they perceive the welfare considerations surrounding these acquisition methods. They also affirm previous findings, both from empirical studies and anecdotal media coverage, suggesting that many members of the public care a great deal about the welfare of dogs used for breeding. With the current discourse underway worldwide about how to obtain companion dogs in a way that preserves the welfare of all dogs involved, these results provide a starting point for understanding public perception of these issues and could be used to inform the formulation of legislation guiding practices involved in providing the public with companion dogs. They may also be of use to stakeholders in the industry, such as breeders and shelters, to inform their practices going forward to reflect these concerns or to educate the public about how current practices meet their expectations.

While the results of this study are instructive, limitations in the methodology mean that generalisability of the findings is constrained. The participants were all drawn from Australia. This was intentional because of recent public debate about breeding-related welfare issues in this country, however, it means that replication in other countries is required. Even within Australia, the participants are unlikely to be entirely representative of the general public. The sample consisted of a high proportion of companion dog breeders and, more than likely, rescue operators/volunteers. This was unavoidable due to the transparent nature of our recruitment methodology but may have resulted in polarised responses unrepresentative of the Australian public's perceptions. Males were also clearly underrepresented, an unfortunately common trend in these types of studies (Rohlf *et al* 2012).

Animal welfare implications and conclusion

Despite these limitations, the current study is the first to investigate perceptions of dog breeding and associated welfare concerns held by members of the public, with specific reference to underlying factors that may determine, or at least be associated with, these perceptions. While future studies should focus on using a more representative sample to confirm whether these findings generalise to the wider population, the preliminary insights gained into how members of the public think about dog acquisition, a topic which is currently being discussed worldwide by the public, organisations, and government bodies alike, should be of great value to breeders and rescuers, seeking to market to, or educate, the 'other side of the fence'. They should also be of value to regulatory agencies seeking to consult public sentiment when forming legislation concerning dog breeding practices.

Acknowledgements

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